

turns more than heads



Sigma 3-17KT IVD

Sigma 3-17KT



Refrigerated centrifuge
from serial no. 188383

Operating manual

Original operating manual

Read this information carefully before using the centrifuge and retain it for future reference!

Revision history

Document no. 0704702

Version 12/2025

Revision 1.0 - 2025-12-11

Revision 1.1 - 2026-03-17

Amendments and additions to chapter 4.5 Storing the centrifuge, chapter 8.2.1
Table of possible faults, chapter 8.2.2 Table of error messages

Revision 1.2 - 2026-04-09

Amendments to chapter 10 Technical data

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Sigma Laborzentrifugen GmbH

An der Unteren Söse 50

37520 Osterode am Harz

Germany

Telephone: +49 (0) 55 22 / 50 07-0

E-mail: info@sigma-zentrifugen.de

www.sigma-zentrifugen.de

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1 General information

1.1 Importance of the operating instructions

Familiarity with the operating instructions ensures the safe and trouble-free operation of the centrifuge. This manual is an integral part of the product.

The operating instructions and, in particular, the safety and hazard notes, must be observed by everyone working with this centrifuge.

- The operating instructions and any other applicable documents must be kept at the location of use of the centrifuge. Ensure that these documents are accessible at all times.
- Any changes, additions or updates received must be added to the operating manual.
- The operating instructions and any other applicable documents must be handed over to every subsequent operator of the centrifuge.

1.2 Further applicable documents

The following documents must be observed in addition to this instruction manual:

- Brochure Sigma 3-17KT,
- Cleaning and care leaflet,
- Quality certificate.

1.3 Representation conventions

The following symbols and typographic conventions are used throughout this document.

1.3.1 Warning notes

Warning symbols



This is the hazard symbol. It accompanies all hazard, warning and caution notes. It warns of possible injuries.

- Follow all of the measures marked with a hazard sign to avoid injuries and death.

Section-related warning notes

Warning of injury hazards that exist permanently or repeatedly during a sequence of actions.


Description of a dangerous situation

Will lead to serious or fatal injuries if not avoided.

- Hazard prevention measures.


Description of a dangerous situation

Can lead to serious or fatal injuries if not avoided.

- Hazard prevention measures.


Description of a dangerous situation

Can lead to minor or moderate injuries if not avoided.

- Hazard prevention measures.


Description of damage to property and the environment

Used to indicate damage to property.

- Hazard prevention measures.

Integrated warning notes

Warning of injury hazards that exist when performing one or a few related steps within a sequence of actions.

DANGER – Type of danger. Instructions to avoid a dangerous situation that will lead to serious or fatal injuries.

WARNING – Type of danger. Instructions to avoid a dangerous situation that can lead to serious or fatal injuries.

CAUTION – Type of danger. Instructions to avoid a dangerous situation that can lead to minor or moderate injuries.

ATTENTION – Type of property damage. Instructions to avoid damage to property and the environment.

1.3.2 Typographic conventions

Instructions for a specific course of action

- ▶ Prerequisite.
- 1. Action (single step).
- 2. Action (single step).
 - Intermediate result.
- 3. Action (single step).
- 4. Action (single step).
 - Final result.

Lists

- Bullet point.
 - Subordinate point.

Notices

-  This symbol indicates a notice.

References

-  This symbol refers to separate applicable documents.

1.3.3 References to directions

Throughout this document, references to directions refer to the position from the perspective of the equipment user.

1.4 Warranty and liability

Our general terms and conditions apply. They have been handed over to the purchaser on the conclusion of the contract.

Warranty and liability claims are excluded if they are due to one or several of the following reasons:

- Improper use
- Non-compliance with the safety and hazard notes in the operating instructions and other applicable documents
- Improper set-up, connection, start-up, operation, transport or maintenance of the centrifuge
- Disasters caused by external influences or force majeure

1.5 Copyright

This document is solely intended for the operator and their personnel. It includes instructions and notes that must not be duplicated, distributed or communicated in any other way, neither in full nor in parts.

The copyright concerning this document remains with Sigma Laborzentrifugen GmbH.

Non-compliance may be prosecuted under criminal law.

1.6 Regulations, directives and standards

The applicable regulations, directives and standards are listed in the EC declaration of conformity in the appendix (see chapter 11.7 - "Declarations of conformity").

1.7 Scope of supply

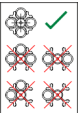
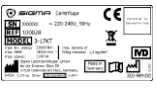
1 Laboratory centrifuge Sigma 3-17KT	
1 power cord with an IEC C13 connection	
1 socket spanner, size 10 (rotor fastener)	Ref. no. 930 100
1 socket spanner, size 6 (emergency lid release system)	Ref. no. 930 056
1 tube (30 g) heavy-duty grease for load-bearing bolts	Ref. no. 71 401
1 operating manual	Ref. no. 0704702
1 brochure	Ref. no. 0613802

Accessories

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

2 Safety

2.1 Marking of the centrifuge

Marking	Description
	ON (mains power)
	OFF (mains power)
	Arrow indicating the direction of rotation (example)
	Information about the loading of the rotor
	Name plate
	F-gases label
	CE mark in compliance with the regulation (EU) 2017/746 on in vitro diagnostic medical devices or with the directive 2006/42/EC
	Symbol indicating the need for the separate disposal of waste electrical and electronic equipment as per the directive 2012/19/EU
	Symbol indicating that compliance with the operating instructions is mandatory
	Symbol indicating that the product is a medical device as per the regulation (EU) 2017/746
	NRTL mark (USA and Canada only)

Marking	Description
	RCM mark (Australia only)
	California Proposition 65 mark (USA only)
	China RoHS 2 mark (China only)

Table 1: Marking of the centrifuge

-  The markings on the centrifuge must not be covered, removed or altered, and they must be replaced if they become illegible.
-  The marking of the centrifuge varies depending on the version and country of destination.

2.2 Marking of the accessories

Marking	Description
	"Biosafe" symbol (biosafety leak tightness as per DIN EN 61010, part 2-020, appendix AA)
	"Biosafe" lettering (biosafety leak tightness as per DIN EN 61010, part 2-020, appendix AA)

Table 2: Marking of the accessories

2.3 Intended use

This chapter and its subchapters describe the centrifuge's intended area of application. Any use other than the one described here or any use going beyond this description is regarded as improper use. Sigma Laborzentrifugen GmbH cannot be held liable for any damage resulting from this.

The intended use also includes:

- Observation of all of the notes and instructions that are included in the operating manual,
- Compliance with the care, cleaning and repair instructions.

2.3.1 Centrifuge

Centrifuges are power-driven machines that use centrifugal force to separate mixtures with a maximum density of 1.2 g/cm³ into their components. They are intended for this specific purpose only.

Safety

Centrifuges with an IVD mark are intended for human biological samples, including donated blood and tissue, in conjunction with diagnostic in-vitro applications. This means that they are medical devices in accordance with the regulation (EU) 2017/746 on in-vitro diagnostic medical devices.

The centrifuge may only be operated by trained and authorised specialist personnel within closed spaces if the following conditions are fulfilled:

- The centrifuge has been properly set up and connected.
- The centrifuge is in a perfect technical state.
- Maintenance and service intervals are adhered to.
- The centrifuge is not located in an area with an explosion hazard.

2.3.2 Rotors, buckets, carriers and accessories

- The rotors, buckets, carriers and accessories have been produced by Sigma Laborzentrifugen GmbH and are authorised for use in this centrifuge.
- The maintenance intervals are adhered to.
- The service life specifications and, in particular, the specifications concerning the cycle limitations are complied with (see chapter 7.6.2 - "Maintaining the rotors, buckets, adapters and carriers").

2.3.3 Starting products

The centrifuge is intended for the centrifugation of solid substances as well as mixtures of liquids or solids. The substances to be centrifuged must fulfil the following requirements:

- The substances must not damage the material of the centrifuge, rotors or inserts nor impair its mechanical strength.
- Biological material may only be centrifuged in special, certified containment systems with a biological seal to prevent the release of the material.

2.4 Reasonably foreseeable misuse

There are applications where it is foreseeable that malfunctions, accidents or unsafe conditions may occur.

- Do not use the centrifuge in an area with an explosion hazard.
- Do not centrifuge explosive or flammable substances.
- Do not centrifuge substances that are prone to a high-energy chemical reaction.

2.5 Responsibility of the operator

The operator is the person who uses the centrifuge for commercial or economic purposes or lets a third party use it and who bears the legal product responsibility for the protection of personnel or third parties during operation.

Personnel

The operator is obliged:

- to comply with the specifications concerning the personnel (see chapter 2.7 - "Personnel qualification"),
- to clearly define the areas of responsibility of the personnel concerning the operation, cleaning and care.
- to ensure that any personnel undergoing training as well as persons with physical, sensory or mental disabilities only work on the centrifuge under the supervision of an experienced person.
- to inform the operating personnel about the procedure concerning serious incidents in connection with products bearing an MD or IVD mark (see chapter 2.6 - "Safety of products with an MD and IVD mark (medical devices)").

Work environment

The operator is obliged:

- to perform a risk assessment concerning potential accidents in connection with the centrifuge and take design-related countermeasures, if necessary.
- to perform a risk assessment concerning the specific hazards with regard to the processing of the various products in the centrifuge (e.g. leakage of harmful substances, contaminated surfaces, fire hazard) and to take appropriate protective measures, if necessary.
- to perform compatibility tests of the substances to be processed in the centrifuge. Substances that damage the materials of the centrifuge, rotors or inserts or that weaken their mechanical strength must not be used.
- to provide standard operating procedures (SOPs) for the processing of the various products in the centrifuge.
- to check the safety-conscious work of the personnel in compliance with the operating instructions, other applicable documents and SOPs as well as with the relevant EU directives and the national laws concerning health and safety and the prevention of accidents at regular intervals (e.g. every month).
- to ensure that a sufficient quantity of suitable fire-extinguishing equipment is provided and ready for use.

Maintenance

The operator is obliged:

- to have the centrifuge checked by authorised specialist personnel at regular intervals to ensure its correct operation.
- to immediately stop using a damaged device and to have defective parts replaced without delay.
- to keep all safety and hazard notes on the centrifuge readable at all times and to replace them, if necessary.
- to check – at their own accord and at regular intervals – the number of cycles performed and the condition of the rotors and accessories.
- to comply with the inspection obligation as per the information FBRCI-025 of the German Berufsgenossenschaft Rohstoffe and chemische Industrie for centrifuges operated in Germany (see chapter 7.7 - "Inspection to be performed by the manufacturer").

2.6 Safety of products with an MD and IVD mark (medical devices)

Centrifuges labelled as medical devices (MD) in accordance with regulation (EU) 2017/745 and those labelled as in-vitro diagnostic medical devices (IVD) in accordance with regulation (EU) 2017/746 are exclusively intended for use by specialist users in their respective field of work.

Serious incident (definition)

Incident means any malfunction or deterioration in the characteristics or performance of an MD or IVD device which is made available on the market for an intended use as defined by the manufacturer, including user errors due to ergonomic features as well as any inadequacy in the information supplied by the manufacturer or any undesirable side effects.

Serious incident means any incident that directly or indirectly led, might have led or might lead to any of the following:

- the death of a patient, user or other person
- the temporary or permanent serious degradation of a patient's, user's or other person's state of health
- a serious public health threat

Reporting of a serious incident to the manufacturer and the competent authorities within the EU

A reportable serious incident is an incident that has a causal relationship with an MD or IVD product or where such a causal relationship is reasonably possible. Such an incident must be reported without delay to the manufacturer, Sigma Laborzentrifugen GmbH or the competent national authorities within the EU. If the report is issued to the manufacturer or their authorised representative, they must fulfil their reporting obligation to the authorities. EUDAMED provides forms for the electronic reporting of incidents by manufacturers and authorised representatives via MIR (Manufacturer Incident Report) or by users, operators and distributors (User Report).

Authorised distributors, vendors and service providers are required by law to cooperate with the manufacturer in order to ensure the safety of medical devices. Non-compliance may result in substantial fines and penalties.

To report a serious incident to the manufacturer:

1. Please complete the "Vorkommnismeldung an den Hersteller" (incident report for the manufacturer) form in full.
2. Send the form to support@sigma-zentrifugen.de

The form for reporting an IVD incident to the manufacturer is available on our website.

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

Scan QR code

If you have any questions about this topic, kindly contact our service department:



2.7 Personnel qualification

Work on the centrifuge may only be performed by specialist personnel that have been authorised by the operator. Specialist personnel can identify and avoid hazards without assistance. Specialist personnel are familiar with the applicable statutory accident prevention regulations as well as the relevant standards and provisions.

The qualifications of the various groups of persons are defined as follows:

Operating personnel

The centrifuge may only be operated by personnel who, due to their training as clinical or medical laboratory technicians or due to comparable training, are able to perform the assigned tasks in a safe manner.

The tasks of the operating personnel include:

- the operation of the centrifuge
- the cleaning, decontamination and maintenance of the centrifuge
- the notification of the competent specialist in the event of malfunctions
- the notification of the manufacturer or competent authority in the event of serious incidents (see chapter 2.6 - "Safety of products with an MD and IVD mark (medical devices)").

Logistics personnel

Logistics personnel are in a position to perform their assigned tasks in a safe manner due to their training, experience and familiarity with the relevant regulations.

The tasks of the logistics personnel include:

- the transport and packaging of the centrifuge, rotors and accessories
- the placement and setup of the centrifuge

Qualified electricians, mechanical specialists and certified refrigeration specialists

Qualified electricians, mechanical specialists and certified refrigeration specialists are in a position to perform their assigned tasks in a safe manner due to their specialised training, experience and familiarity with the relevant regulations.

- The tasks of a **qualified electrician** include the repair and maintenance of the electrical system of the centrifuge.
- The tasks of a **mechanical specialist** include the repair and maintenance of the mechanical components of the centrifuge.
- The tasks of a **certified refrigeration specialist** include the repair and maintenance of the refrigeration system of the centrifuge.

2.8 Personal protective equipment

Personal protective equipment protects you from health and safety hazards at work.

The personnel must wear personal protective equipment when performing certain types of work on the centrifuge. This is pointed out in the respective sections of this manual. In addition, personal protective equipment may be required depending on the substances being centrifuged.

2.9 Remaining risks

The centrifuge was built in accordance with the state of the art and in compliance with the generally recognised safety rules. However, danger to life and limb of the user, or of third parties, or impairments of the centrifuge or other material assets cannot be completely excluded when the centrifuge is in use.



Read and comply with the following safety information prior to using the centrifuge!

2.9.1 Hazards due to electrical voltage

Danger to life caused by electric shock

There is a risk of electric shock when touching current-carrying components.

This may lead to ventricular fibrillation, cardiac arrest or respiratory paralysis.

- Only qualified electricians are authorised to perform work on the electrical system of the centrifuge for which the housing needs to be removed.
- Ensure that the mains voltage matches the voltage that is stated on the name plate of the centrifuge.
- Use the centrifuge only with an intact mains power cable. Damaged or faulty mains power cables must be replaced immediately.
- Ensure that no liquid penetrates the inside of the centrifuge. Spilled liquids or liquids that are used for cleaning can damage the electrical or mechanical components if they penetrate into the centrifuge.

Fire hazard due to electrical overload

Electrical overload due to defective components can cause a fire.

- Have the electrical system of the centrifuge checked by a qualified electrician at regular intervals or at least every 12 months.

2.9.2 Hazards due to mechanical force

Hazards caused by rotors, buckets, carriers and accessories

- Use the centrifuge and the accessories only in a perfect state. Stop using the centrifuge and the accessories immediately if they are damaged.
- In the event of rotor breakage resulting in a crash, there is a risk of injury from ejected parts or movement of the centrifuge. Cutting, impact or crushing injuries may occur.
- Do not move a running centrifuge. If a mobile centrifuge bench is used, lock the locking castors.
- Do not open the lid of a running centrifuge by way of the emergency lid release system.
- Comply with the specified service life of rotors, buckets, carriers and accessories.
- Use only rotors, buckets, carriers and accessories that have been manufactured and authorised for use with this centrifuge by the manufacturer.
- Ensure that the rotor is loaded in a rotationally symmetrical manner and that the weight is evenly distributed. Do not exceed the maximum permissible weight.
- Fasten the rotor correctly in place.
- Operate the rotor at the permissible speed.
- In case of swing-out rotors, ensure that the maximum permissible speed of the buckets is not exceeded.
- Comply with the specified maintenance and replacement intervals for the centrifuge, rotor, carriers and accessories.
- Only use spare parts that have been authorised by the manufacturer.

Hazards caused by the centrifuge lid

- In the event of defective lid stays, there is a risk of injury from the centrifuge lid. Crushing injuries may occur.
- Defective lid stays must be replaced immediately by specialist personnel.

2.9.3 Hazards due to hot surfaces

Risk of burns on hot surfaces inside the rotor chamber

After a centrifugation, the surfaces inside the rotor chamber and, in particular the motor shaft, can be hot.

There is a risk of burns when touching the surfaces.

- Wear suitable protective gloves.
- Do not touch the surfaces without good reason.

2.9.4 Hazards due to biological substances

Health hazard due to biological substances

The release of biological material can cause damage to health as well as cross-contamination.

- Set the centrifuge up in a room that fulfils the safety requirements for the respective biological substances (as per the directive 2000/54/EC).
- Wear personal protective equipment.
- Use special, certified containment systems with biological seals.
- Fill, close and open the rotors and buckets only at workstations that fulfil the safety requirements for the respective biological substances (as per the directive 2000/54/EC).
- The sealing ring of a rotor cover or bucket is made of NBR. Chemicals may damage the material and cause leaks. It is essential to comply with the information provided in the table of chemical resistance data (see chapter 11.6 - "Table of chemical resistance data").
- Observe any national regulations and the safety data sheets of the substances.

2.9.5 Hazards caused by the operating fluids

Hazards caused by the refrigerant

If refrigerant leaks from the centrifuge, harmful substances may be released. Contact with, or the aspiration of, the refrigerant can cause severe damage to health.

- Switch the centrifuge off and leave the affected area immediately.
- Ensure adequate ventilation.
- Have the centrifuge checked and repaired by a certified refrigeration specialist.

2.10 Safety devices and guards

The safety devices and guards are in compliance with the applicable national and international laws, rules and regulations concerning health and safety and the prevention of accidents.

- Check the safety devices and guards at regular intervals to ensure that they are operating correctly.
- Do not tamper with the safety devices and guards.

Mains power plug

Unplugging the mains power plug disconnects the centrifuge from the power supply.

Position: close to the centrifuge; accessible at all times

Mains power switch

The mains power switch disconnects the centrifuge from the power supply.

Position: right side of the centrifuge; accessible at all times

Protective earth conductor

A qualified electrician can test the protective conductor using an appropriate measuring device.

System for stopping the centrifuge due to an imbalance

If the centrifuge runs with an impermissible imbalance, the drive will be switched off. A visual and audible signal will be issued.

Position: user interface

System check

An internal system check monitors the data traffic and sensor signals for plausibility. The system performs continuous self-monitoring to detect faults. Error messages will be displayed in a dialogue box.

Position: user interface

Temperature monitoring system

If the temperature inside the rotor chamber exceeds +50°C, the drive will be switched off automatically. The centrifuge cannot be restarted until it has cooled down. A corresponding error message will be displayed.

Position: user interface

Rotor identification system

The rotor identification system automatically identifies the rotor and adapts the speed and relative centrifugal force (RCF) accordingly. If several buckets are authorised for use with the rotor in question, a dialogue box will show the permissible variants.

Position: user interface

3 Equipment description

3.1 Principle of centrifugation

Centrifugation is a process for separating heterogeneous mixtures of substances (suspensions, emulsions or gas mixtures) into their components. Rotating on a circular trajectory, the mixture of substances is subjected to centrifugal acceleration many times greater than the acceleration due to gravity.

Centrifuges harness inertia in the rotor chamber to separate substances. Due to their higher inertia, particles or media with a higher density migrate outwards, thereby displacing any components with a lower density which are forced towards the centre.

The centrifugal acceleration of an object in a centrifuge depends on the distance of the object from the axis of rotation and on the angular velocity. The larger the radius of the rotor chamber and the higher the speed are, the greater the centrifugal acceleration will be.

For detailed information about the various areas of application, see www.sigma-zentrifugen.de → [Applications].

3.2 Centrifuge overview



Fig. 1: General view, lid open

- 1 Lid
- 2 Rotor chamber
- 3 User interface

Equipment description

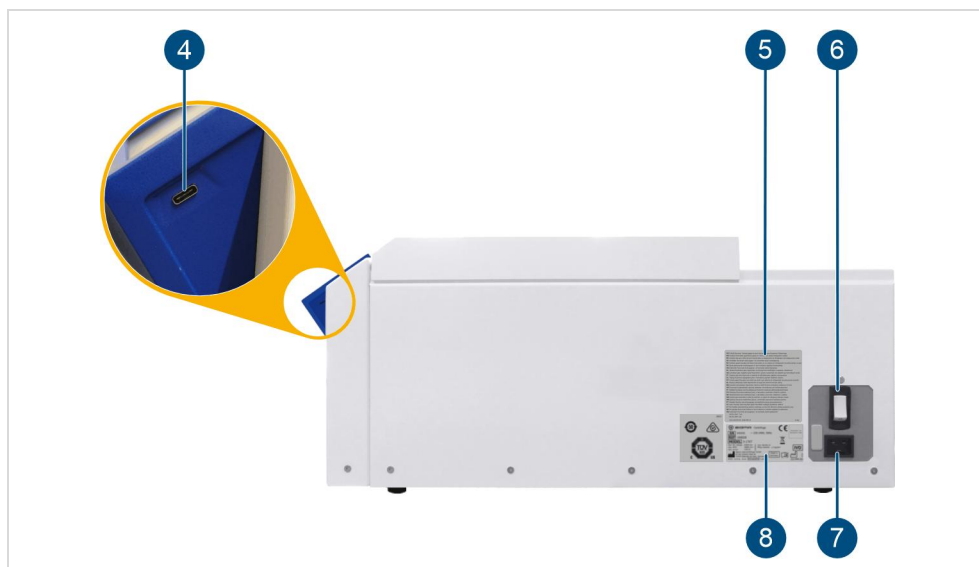


Fig. 2: Right side

- | | |
|----------------------|---------------------|
| 4 USB-C port | 7 Mains power input |
| 5 F-gases label | 8 Name plate |
| 6 Mains power switch | |

3.3 F-gases label

DE Enthält fluorierte Treibhausgase in einer hermetisch geschlossenen Kälteanlage
EN Contains fluorinated greenhouse gases in a hermetically sealed refrigeration system
FR Contient des gaz à effet de serre fluorés dans un équipement de réfrigération hermétiquement scellé
SV Innehåller fluorerade växthusgaser i en hermetiskt sluten kylanläggning
ES Contiene gases fluorados de efecto invernadero en un sistema de refrigeración herméticamente cerrado
NL Bevat gefluoreerde broeikasgassen in een hermetisch gesloten koelinstallatie
DA Indeholder fluorerede drivhusgasser i et hermetisk lukket kølesystem
PL Zawiera fluorowane gazy cieplarniane w hermeticznie zamkniętym urządzeniu chłodniczym
GA Cuimsítear gáis cheaptha teasa fhluairínithe i gcóras cuisniúcháin atá séalaithe go heirméiteach anseo
IT Contiene gas serra fluorurati in impianto di raffreddamento sigillato ermeticamente
SL Vsebuje fluorirane toplogredne pline v hermetično zaprtem hladilnem sistemu
PT Contém gases fluorados com efeito de estufa num sistema de refrigeração hermeticamente fechado
EL Περιέχει φθοριούχα αέρια θερμοκηπίου σε ερμητικά κλειστό σύστημα ψύξης
BG Съдържа флуорирани парникови газове в херметически затворена хладилна система
HU Fluorozott üvegházhatású gázokat tartalmaz, hermetikusan zárt hűtőrendszerben
FI Sisältää fluorattuja kasvihuonekaasuja ilmatiiviisti suljetussa jäähdytysjärjestelmässä
CS Obsahuje fluorované skleníkové plyny v hermeticky uzavřeném chladicím systému
SK Obsahuje fluórované skleníkové plyny v hermeticky uzavretom chladiacom systéme
RO Conține gaze fluorurate cu efect de seră într-un sistem de refrigerare etanșat ermetic
HR Sadržava fluorirane stakleničke plinove u hermetički zatvorenoj rashladnoj opremi
ET Sisaldab fluoritud kasvihuonegaase hermeetiliselt suletud jahutussüsteemis
LV Satur fluorētas siltumnīcefekta gāzes hermētiski noslēgtā dzesēšanas sistēmā
LT Hermetiškai uždandarintoje šaldymo sistemoje yra fluorintų šiltnamio efektą sukeliančių dujų
MT Fih gassijiet fluorurati b'effett ta' serra f'sistema ta' tkessiħ issigillata ermetikament
NO Inneholder fluorinerte drivhusgasser i et hermetisk lukket kjølesystem
R452A GWP: 2140
R513A GWP: 630
R455A GWP: 145
(EU) 2024/2729; 2028-DEC-31

31402 a

Fig. 3: F-gases label in compliance with the implementation regulation (EU) 2024/2729

3.4 Name plate

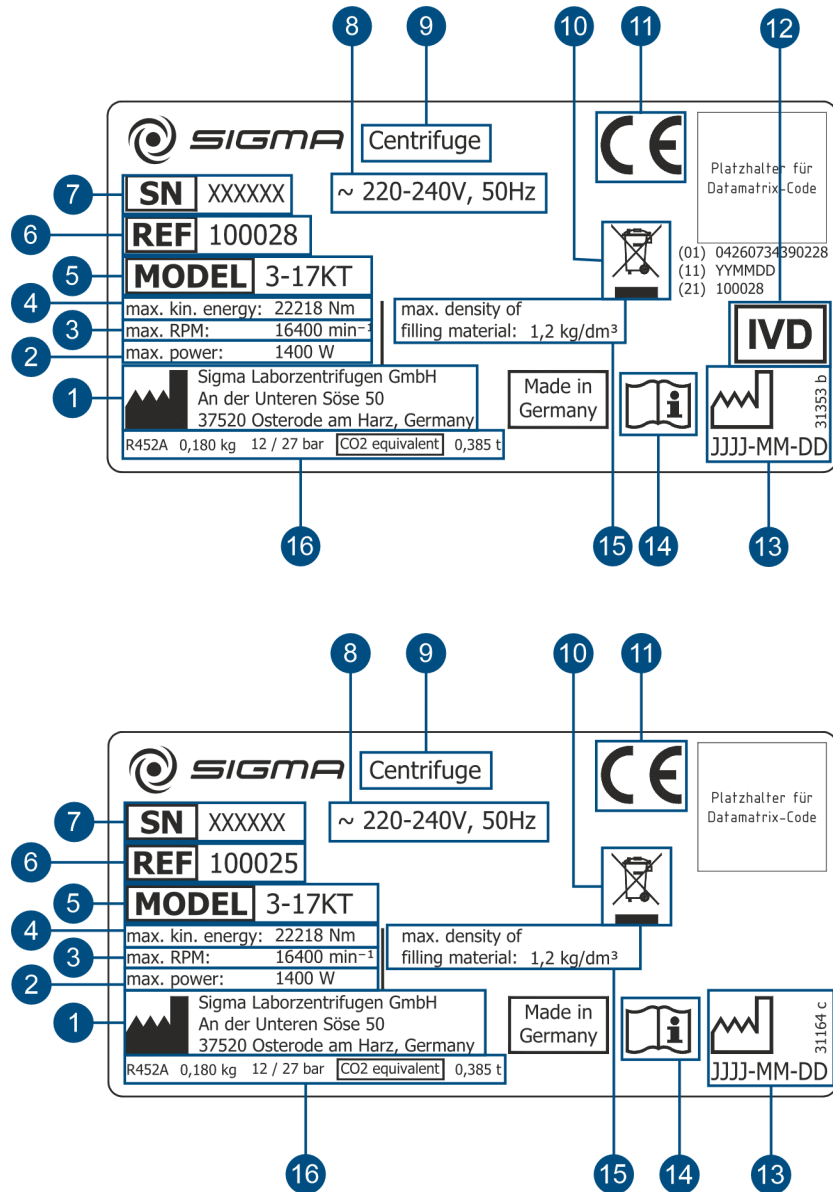


Fig. 4: Name plate (example)

- | | |
|-----------------------|---|
| 1 Manufacturer | 10 Symbol for separate disposal |
| 2 Power consumption | 11 CE mark |
| 3 Max. speed | 12 IVD mark as per the regulation (EU) 2017/746 (if applicable) |
| 4 Max. kinetic energy | 13 Date of manufacture |
| 5 Product name | 14 Symbol indicating that compliance with the operating instructions is mandatory |
| 6 Part number | 15 Max. permissible density |
| 7 Serial number | |
| 8 Nominal voltage | |
| 9 Product designation | |

4 Packaging, transport and storage

4.1 Safety



WARNING

Risk of injury when lifting or carrying the centrifuge

Serious injuries can occur when the centrifuge falls down or tips over.

- Use a suitable lifting device to lift the centrifuge.
- Comply with the fundamental health and safety rules and regulations as well as the rules and regulations for the prevention of accidents.
- Wear personal protective equipment (e.g. safety shoes and work gloves).

4.2 Symbols on the packaging

The following symbols, which are described hereinbelow, are used on the packaging of the centrifuge:

Symbol	Description
	Fragile goods
	Keep away from moisture
	Top
	Temperature limit
	Recycling symbol for corrugated cardboard
	RECY symbol (recycling)
	Symbol indicating that the product is a medical device as per the regulation (EU) 2017/746

Table 3: Symbols on the packaging

4.3 Unpacking the centrifuge

The centrifuge is packaged in a corrugated cardboard container (consisting of a cover, frame and base on a pallet). The rotors and accessories come supplied in a separate cardboard box that is fastened to the corrugated cardboard container.

1. Take the separate cardboard box off the corrugated cardboard container.
2. Remove the cover.
3. Remove the packaging material.
4. Lift the frame upwards to remove it.
5. Lift the centrifuge off the base by way of a suitable lifting device.

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

4.4 Transporting the centrifuge

 Remove the rotor whenever the centrifuge needs to be transported.

In-house transport

The centrifuge can be transported without packaging over short distances within a building.

Onward transport or return transport

- The centrifuge must be packaged in its original or equivalent packaging.
- The symbols on the original packaging, indicating the necessary transport and environmental conditions, must be observed at all times.

 Please note/use the information and forms for returns (see chapter 8.5 - "Returning the centrifuge to the manufacturer").

4.5 Storing the centrifuge

The centrifuge can be stored for up to one year under the following conditions:

- The centrifuge is stored in its original packaging.
- It is stored in dry conditions and free from dust, mechanical load and strong temperature fluctuations.
- Comply with the permissible storage temperature of -20°C to +60°C.
- The requirements concerning the location of use as well as the ambient conditions must be fulfilled (see chapter 5.1 - "Setting up the centrifuge", chapter 10.1 - "Ambient conditions").

 If the centrifuge needs to be stored for more than one year, consult with the manufacturer.

5 Setup and connection

5.1 Setting up the centrifuge

Location requirements

To ensure safe operation, the location of use must fulfil the following requirements:

- The workbench is stable and resonance-free.
- If a mobile centrifuge bench is used, the locking castors are locked.
- The worktop is level and horizontal.
- The centrifuge stands with all four feet firmly on the worktop.
- The centrifuge is not subjected to thermal stress (e.g. caused by heat generators) or UV radiation (e.g. exposure to direct sunlight).

ATTENTION – When transporting the centrifuge from a cold to a warmer environment, condensation forms. Let the centrifuge dry completely (24 hours minimum) before using it.

Ensuring sufficient ventilation

The entire energy supplied to the centrifuge is converted into heat and released into the ambient air.

ATTENTION – The samples may overheat if the air inlet is blocked. Observe the following instructions to ensure adequate ventilation.

- Ensure the fulfilment of the specified climatic conditions (see chapter 10.1 - "Ambient conditions").
- Set the centrifuge up so that it is freely accessible. 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 of the centrifuge remain unobstructed and fully effective.

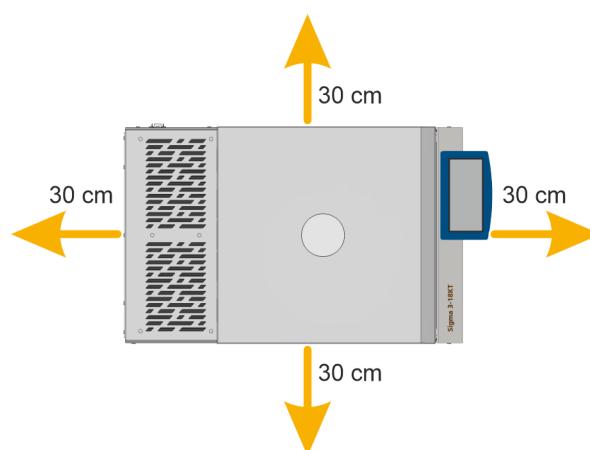


Fig. 5: Safety range around the centrifuge (example)

5.2 Establishing the power supply



The mains power plug serves as a disconnecter.
It must be accessible at all times!

ATTENTION – The centrifuge may be damaged if the operating voltage is incorrect. Ensure that the operating voltage on the name plate corresponds to the local supply voltage.

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

- ▶ The removable power cord must not be longer than 3 m.
- ▶ The original power cord must not be replaced with an insufficiently rated one.
 1. Ensure that the power cord and on-site socket are not visibly damaged.
 2. Plug the power plug into the socket.

5.3 Fuses inside the unit

The centrifuge is equipped with a mains power switch with an integrated thermal circuit breaker.

After the fuses have tripped:

1. Switch the centrifuge off by actuating the mains power switch and let it cool down for approx. 2 minutes.
2. Switch the centrifuge back on.
 - The centrifuge is now ready for operation.

5.4 On-site fuse protection

- The centrifuge must be typically protected with an on-site type B 16 A fuse.
- An AC/DC-sensitive RCD (residual current device) is required in the building's electrical installation to ensure a safe shutdown in the event of a fault.

6 Operation

6.1 Safety



In an emergency, switch the centrifuge off immediately and disconnect the mains power plug!

6.2 Switching the centrifuge on and off

Power on

- ▶ The centrifuge has been properly set up and installed.
- 1. Press the mains power switch.
 - The touch panel lights up. The centrifuge is ready for operation.

Power off

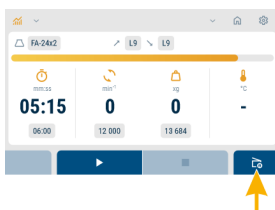
- ▶ The centrifuge is at a standstill.
- 1. Open the lid so that any potential moisture can escape.
- 2. Press the mains power switch.
 - The centrifuge is off.

i After the centrifuge has been switched off, wait at least 30 seconds before switching it back on.

i If the centrifuge remains switched off for a longer period of time (> 3 months), its date and time must be checked and reset when the centrifuge is switched on again.

6.3 Opening and closing the lid

Opening the lid



- ▶ The centrifuge is at a standstill.
- 1. Select the "Lid" button.
 - The lid opens approximately halfway.
- 2. Push the lid manually further into its opening direction.
 - The lid opens completely.

WARNING – Risk of injury caused by defective gas struts. The lid can fall down on its own, potentially crushing fingers or limbs. Have the gas struts checked regularly and replaced, if necessary.

Closing the lid

CAUTION – Risk of injury when closing the lid. Fingers or limbs may be crushed. Never reach between the lid and the housing.

1. Push the lid down until you hear the lid lock engage.
 - The lid is now closed correctly.

6.4 Using rotors, buckets, carriers and accessories

6.4.1 Preparing the accessories

Vessels

► The vessels have been authorised by Sigma Laborzentrifugen GmbH for use in this centrifuge.

1. Fill the vessels outside of the centrifuge.
2. Fill the vessels carefully and only up to the specified maximum fill level.
3. Seal the vessels.

ATTENTION – When using glass vessels, do not exceed 4,000 xg. The only exceptions are heavy-duty centrifuge vials, in which case the manufacturer's instructions apply.

Adapters

Adapters enable the use of vessels of different sizes in a rotor.

- The adapters have been produced by Sigma Laborzentrifugen GmbH and are authorised for use in this centrifuge.
- Load the adapters with the same number of vessels and the same weights.

ATTENTION – When using rotors for microtiter plates, never place the removal tool in the bucket without the plate.

6.4.2 Preparing and installing a rotor



WARNING

Hazard caused by insufficient fastening of the rotor

If a rotor is not properly fastened, it may detach itself from the shaft, thereby causing a crash.

- Prior to starting a centrifugation run, ensure that the rotor tie-down screw has been properly tightened.
 - 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.
-



WARNING

Risk of toxic, pathogenic or radioactive contamination

Toxic, pathogenic or radioactive substances can cause contamination if they are not handled properly.

It may be necessary to clean and/or decontaminate the laboratory centrifuge, rotors and accessories for reasons of safety before they can be maintained, repaired or handed over.

- Disinfect and clean the centrifuge, rotors, buckets, carriers and accessories after a contamination.
 - Comply with the relevant safety instructions concerning the handling of toxic, pathogenic or radioactive substances.
 - Wear personal protective equipment.
 - Document any measures taken (see chapter 8.5 - "Returning the centrifuge to the manufacturer" / Declaration of decontamination)
-



CAUTION

Hazard due to the improper loading of the rotor

Rotors with insufficiently balanced loads can lead to overload as a result of imbalance during operation.

- Always load the rotor in a rotationally symmetrical manner with even weight distribution.
-



The design of Sigma accessories with the "Biosafe" marking ensures that no liquids or aerosols can leave the rotor or bucket if a vessel breaks during the centrifugation.

Angle rotor (Biosafe type)

Loading an angle rotor

- ▶ The rotor and covers, including all of the rubber seals, are clean and undamaged.
- ▶ All of the seals are properly in place.
- ▶ The areas of the bioseals of the cover are absolutely dry.
- ▶ The sample vessels are filled and sealed.

1. Insert the sample vessels into the holes of the angle rotor.
 - Load the rotationally symmetric compartments of the rotors with the same accessories and content.
 - When performing a centrifugation run at low capacity, distribute the sample vessels so that the load is rotationally symmetrical. Loading only one axis of the rotor is not permissible.

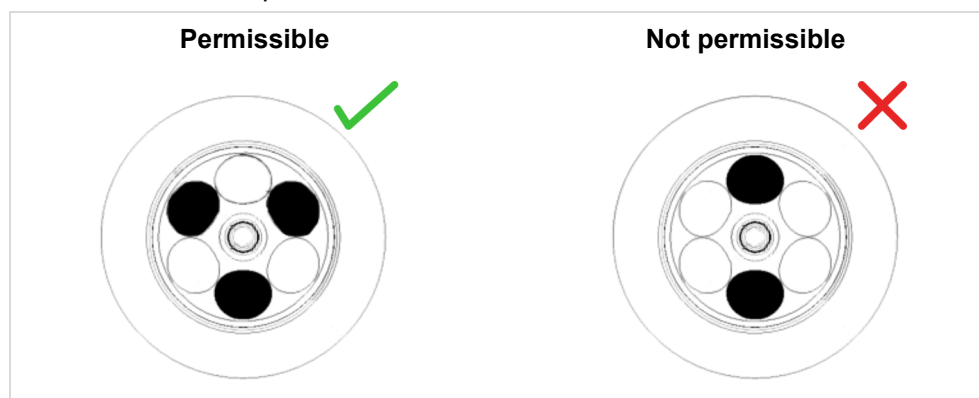


Fig. 6: Permissible and not permissible loading of angle rotors (example)

2. Position the cover horizontally on top of the rotor.
3. For sealing the rotor, turn the cover screw of the bayonet closure clockwise until the mark on the cover screw and the mark on the rotor are aligned (see the following picture).
 - The angle rotor is loaded.

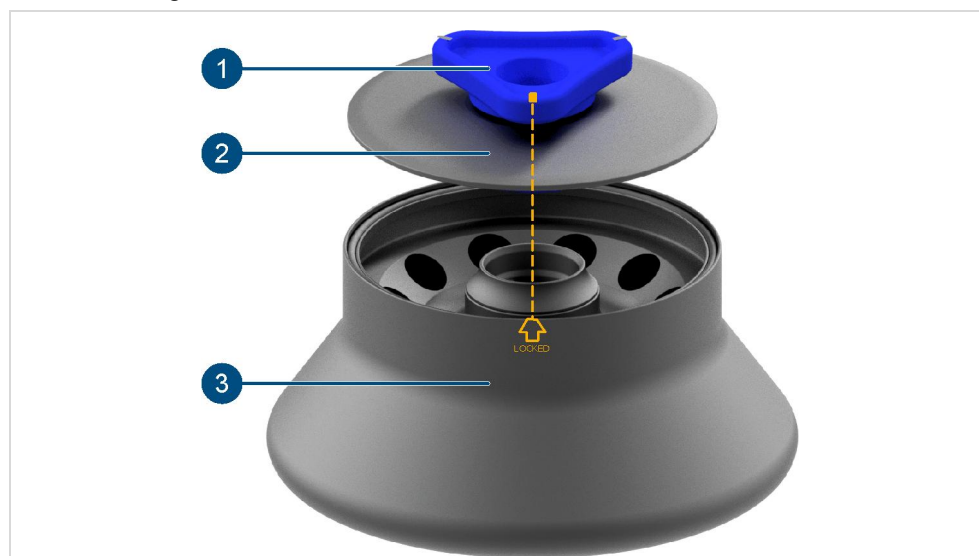


Fig. 7: Biosafe angle rotor and cover with bayonet closure (example)

- 1 Cover screw
- 2 Cover
- 3 Angle rotor

ATTENTION – The cover screw is solely intended for securing the cover on the rotor and not for fastening the rotor to the motor shaft.

Installing an angle rotor

- ▶ The centrifuge lid is open.
- ▶ The rotor chamber and the lid seal are clean and dry.
- 1. Unscrew the rotor tie-down screw from the motor shaft (anticlockwise).
- 2. Lower the rotor with its central bore onto the motor shaft straight from above.
- 3. Hold the rotor on its outer rim and tighten the rotor tie-down screw clockwise by way of the rotor wrench. Tightening torque: 7.5 Nm.
- 4. Close the centrifuge lid.
 - The angle rotor is installed.
 - The centrifuge is ready for operation.

 Using an angle rotor without a cover will result in increased noise levels.

 Angle rotors can also be used without a rotor cover. However, in this case, they do not fulfil the biosafety leak tightness in accordance with DIN EN 61010, part 2-020, appendix AA.

Swing-out rotor (Biosafe type)

Installing a rotor cross

- ▶ The centrifuge lid is open.
- ▶ The rotor chamber and the lid seal are clean and dry.
- ▶ The rotor cross is clean and undamaged.
- 1. Unscrew the rotor tie-down screw from the motor shaft (anticlockwise).
- 2. Lower the rotor cross without any buckets with its central bore onto the motor shaft straight from above.
- 3. Hold the rotor on its outer rim and tighten the rotor tie-down screw clockwise by way of the rotor wrench. Tightening torque: 7.5 Nm.

Loading and installing the buckets

- ▶ The buckets as well as the rubber seals, bucket caps and adapters are clean and undamaged.
- ▶ All of the seals are properly in place.
- ▶ The areas of the bioseals of the buckets are absolutely dry.
- ▶ Only buckets of the same set are used (see the set number on the buckets).
- ▶ The load-bearing bolts of the rotor cross are greased or they have a Sigma Comfort rotor coating.
- 1. Place the sample vessels in the bucket or in the adapter in the bucket.
 - As a general rule, all of the compartments must be filled with buckets.
 - Load the rotationally symmetric compartments of the rotors with the same accessories and content.
 - When performing a centrifugation run at low capacity, distribute the sample vessels so that the load is rotationally symmetrical.
- 2. Place the caps on the buckets and screw them on in a clockwise direction.

 The buckets can also be used without a cover. However, in this case, they do not fulfil the biosafety leak tightness in accordance with DIN EN 61010, part 2-020, appendix AA.

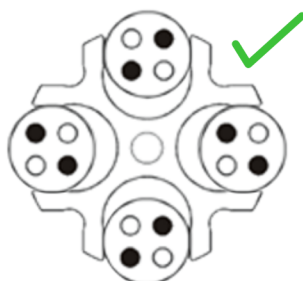


Fig. 8: Biosafe bucket with a cover (example)

- 1 Cover
- 2 Seal
- 3 Bucket

3. Place all of the buckets in the rotor cross. If the buckets have numbers, place them in the corresponding compartments of the rotor (the compartments are numbered as well).

Permissible



Not permissible

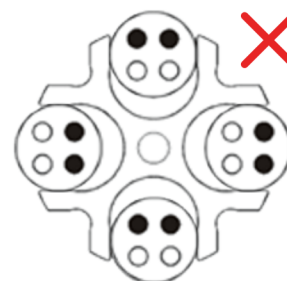


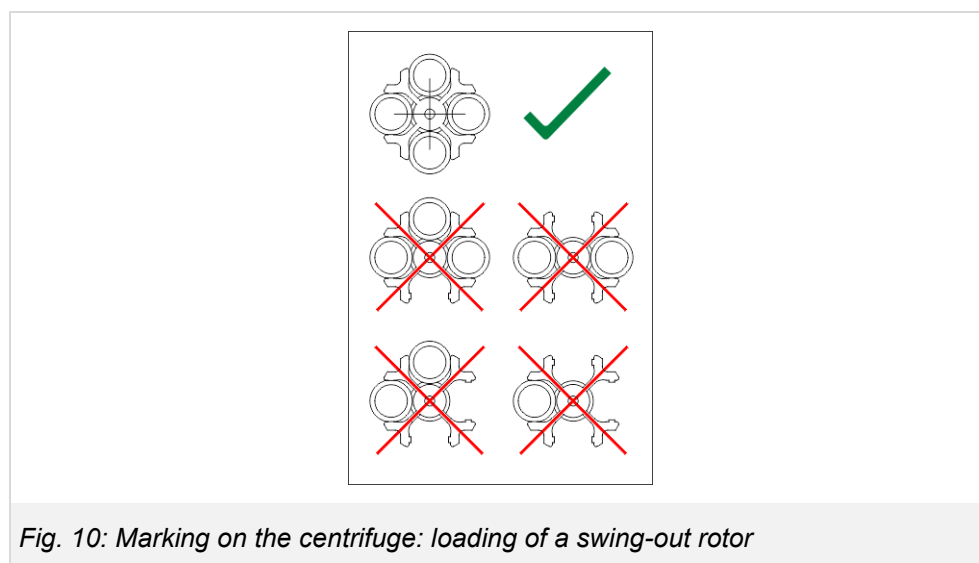
Fig. 9: Permissible and not permissible loading of swing-out rotors (example)

4. Close the centrifuge lid.



Comply with the instructions on the label in the centrifuge lid (see the following illustration)! The adhesive labels must be kept readable at all times. If necessary, they must be replaced.

Operation



6.4.3 Removing the rotor and accessories



WARNING

Risk of toxic, pathogenic or radioactive contamination when opening the vessels

During centrifugation, overpressure may build up in the vessels due to heat generated by air friction.

- This is why it must be ensured that there is no liquid in the cap/sealing area prior to opening the vessels.



CAUTION

Risk of burns on hot surfaces inside the rotor chamber

After a centrifugation, the surfaces inside the rotor chamber and, in particular the motor shaft, can be hot.

- Wear suitable protective gloves.
- Do not touch the surfaces without good reason.

Angle rotor (Biosafe type) removal

► The centrifuge is at a standstill and the lid is open.

1. Unscrew the rotor tie-down screw by turning it anticlockwise by way of the rotor wrench.
2. Lift the rotor with its cover perpendicularly off the motor shaft.
3. Loosen the cover by turning the bayonet lock anticlockwise and then remove it.
4. Remove the sample vessels carefully in order to prevent their contents from being mixed.

Swing-out rotor (Biosafe type) removal

- ▶ The centrifuge is at a standstill and the lid is open.
 - 1. Remove the buckets with their caps from the rotor cross.
 - 2. Remove the caps from the buckets.
 - 3. Remove the sample vessels carefully in order to prevent their contents from being mixed.
 - 4. Unscrew the rotor tie-down screw (anticlockwise) by way of the rotor wrench and lift the rotor cross perpendicularly off the motor shaft.
- Or:
- Fill the buckets with sample vessels again, close them and reinstall them.

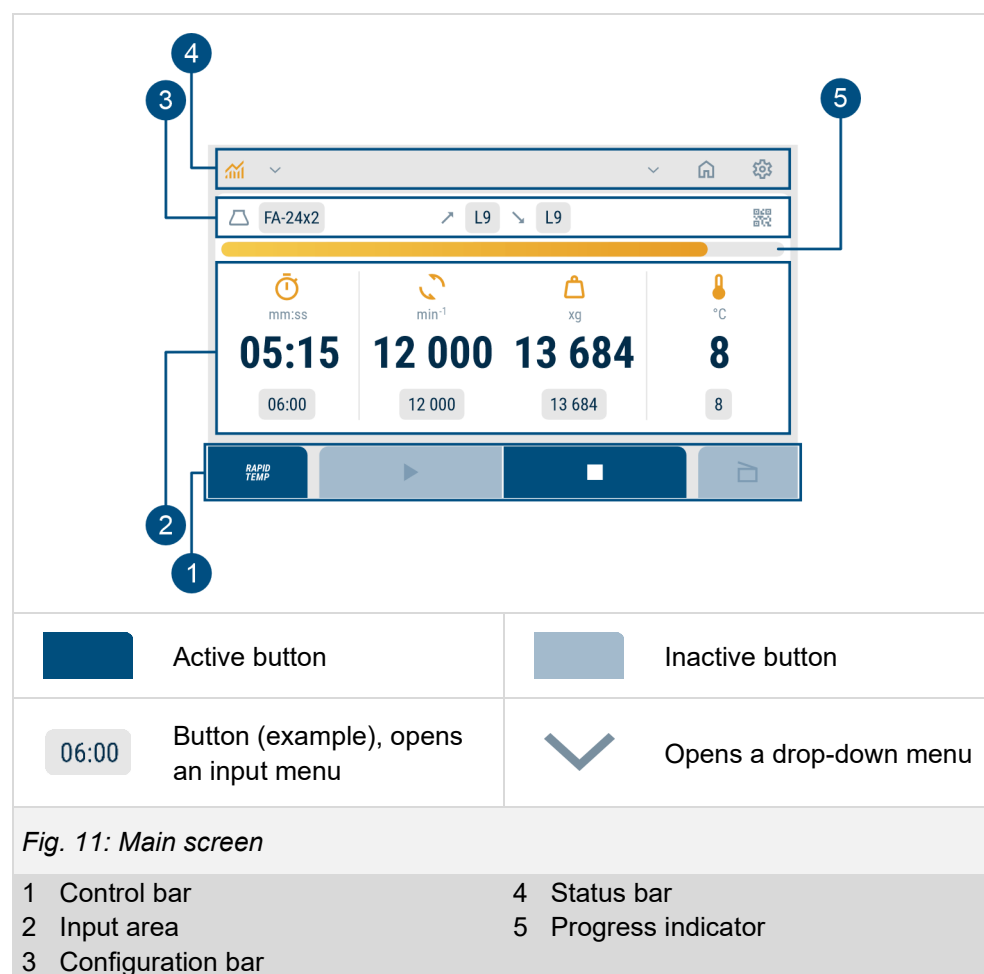
6.5 User interface

The centrifuge is operated by way of a touch screen. Buttons are activated by touch. Depending on the specific function, an additional window with options or input fields will open. Numerous symbols are provided for the navigation within the menus.

6.5.1 Main screen

The main screen is the default display of the control system. This is where all of the transactions are started.

The main screen includes several areas:



Control bar (1)

The buttons of the control bar are used to control the basic functions of the centrifuge as well as the rapid temperature control function:

- Starting a centrifugation (see chapter 6.5.2.1)
- Stopping a centrifugation (see chapter 6.5.2.2)
- Opening the lid (see chapter 6.3)
- *RAPID TEMP* (see chapter 6.5.3.4)

Input area (2)

The input area of the main screen is used to configure the following process parameters:

- Runtime (see chapter 6.5.3.2)
- Speed (see chapter 6.5.3.3)
- RCF (see chapter 6.5.3.3)
- Temperature (see chapter 6.5.3.4)

The individual fields show the current value of the parameter and a button for configuring the set value of the corresponding process parameter.

Inputs are also performed in this area in every subsequent menu.

Configuration bar (3)

The configuration bar includes the following buttons:

- Rotor and bucket selection (see chapter 6.5.5)
- Curve selection (see chapter 6.5.6)
- QR code generation for the Sigma Timer app (see chapter 6.5.10.1)

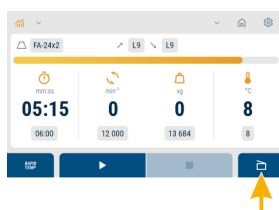
Status bar (4)

In addition to the status indicator, the status bar includes the following buttons:

- Program (see chapter 6.5.7)
- Status menu (see chapter 6.5.8)
- Settings (see chapter 6.5.10)
- Home (this button is used to return to the main screen from any other screen).

6.5.2 Basic functions

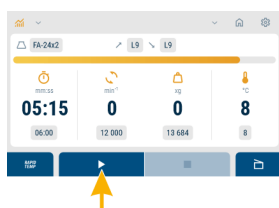
- ▶ The centrifuge is on.



Opening and closing the lid

See chapter 6.3 - "Opening and closing the lid"

6.5.2.1 Starting a centrifugation



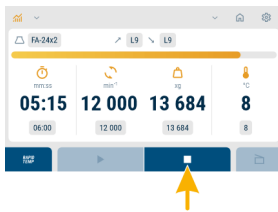
- ▶ The rotor has been prepared for centrifugation.

1. Open the lid.
2. Install the rotor and briefly turn it manually in the direction of rotation (anticlockwise).
 - The system identifies the rotor and displays it on the main screen.
3. Close the lid.

Operation

4. Configuring the centrifugation parameters:
 - Runtime (see chapter 6.5.3.2 - "Runtime: process parameters")
 - Speed or RCF (see chapter 6.5.3.3 - "Speed and relative centrifugal force: process parameters")
 - Temperature (see chapter 6.5.3.4 - "Temperature: process parameters").
5. Select the *Start* button.
 - The centrifugation run starts.

6.5.2.2 Stopping a centrifugation



1. Wait for the set time to elapse.
- Or:
2. Select the *Stop* button.
 - The centrifugation will be stopped prematurely.

Performing a quick stop

During a quick stop, the centrifuge decelerates with maximum deceleration power (curve L9).

- ▶ The centrifuge is on.
 - ▶ A centrifugation run is performed.
1. Select the *Stop* button and hold it for a minimum of three seconds.
 - The centrifugation will be stopped prematurely.
 - A message will be displayed:

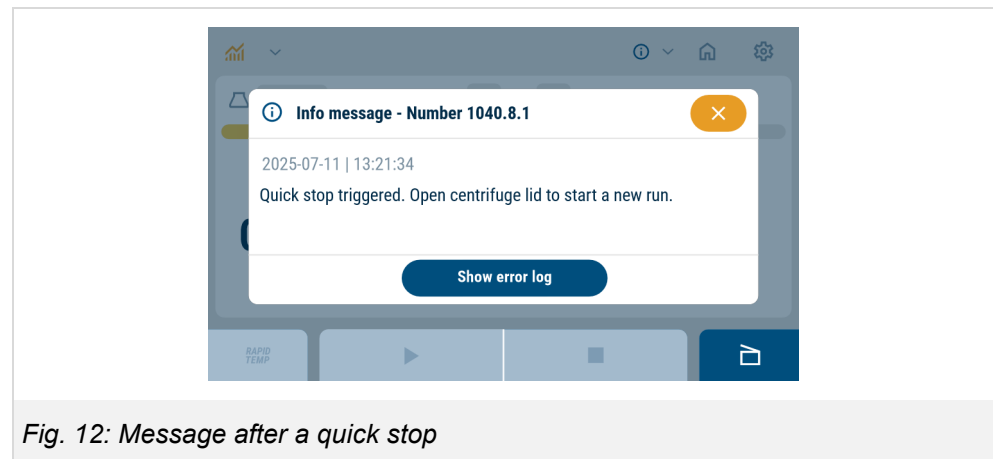


Fig. 12: Message after a quick stop

6.5.3 Process parameters

The process parameters area shows the set and actual values of the runtime, speed, RCF and temperature as well as information about the activated functions.

6.5.3.1 Entering process parameters

Process for entering a process parameter (example: runtime)

► The user interface shows the main screen.

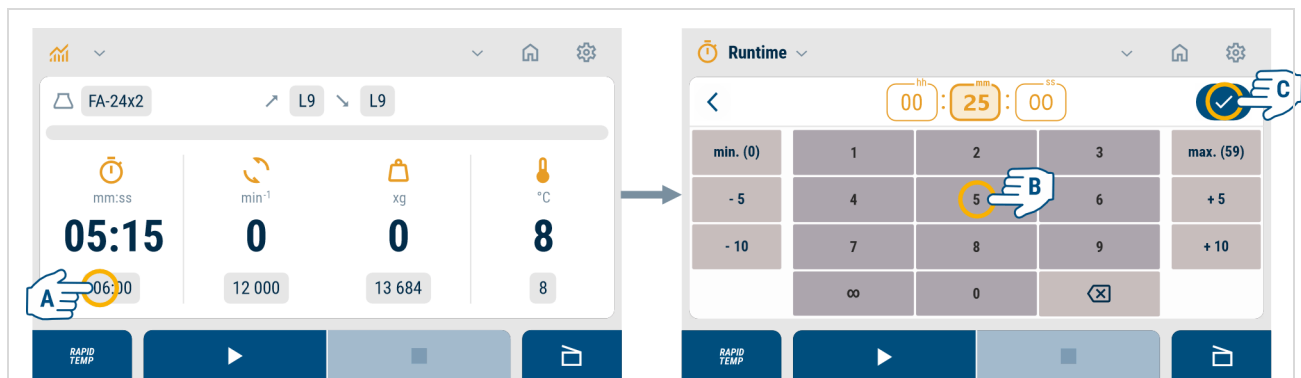
1. Select the *Set value* button (A).

– The input menu opens.

2. Enter the set value by way of the keyboard (B).

3. Confirm the input (C).

– The main screen will be displayed.



	Set value button		Active input field (example)
	Inactive input field (example)		Input error (example)
	Minimum (min.) and maximum (max.) permissible value		Adds 5 or 10 units to the selected value
	Subtracts 5 or 10 units from the selected value		Confirms the input and closes the current view
	Opens the previous view without saving		Opens the main screen

Fig. 13: Entering process parameters (example)

6.5.3.2 Runtime: process parameters

 In the runtime area, the upper value indicates the remaining runtime (current value) with the preselected centrifugation time (set value) below. Values up to 99 h:59 min:59 sec maximum can be entered. The runtime is counted down from the set value. From 59 min:59 sec downwards, the unit switches from "h:min" to "min:s".

In the factory settings, the function *Runtime at set speed* is activated so that the runtime is not counted until the set speed is reached. Then, the countdown continues until the deceleration phase starts. The corresponding symbol is displayed in the runtime area on the main screen. The function can be deactivated (see chapter 6.5.4.2 - "Runtime: process-related parameters").

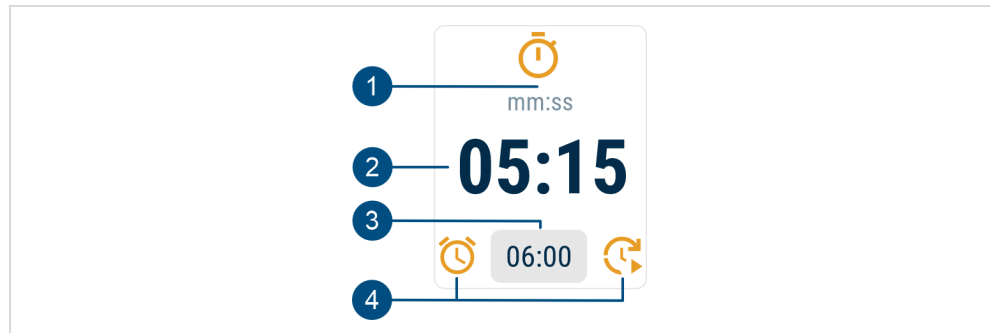
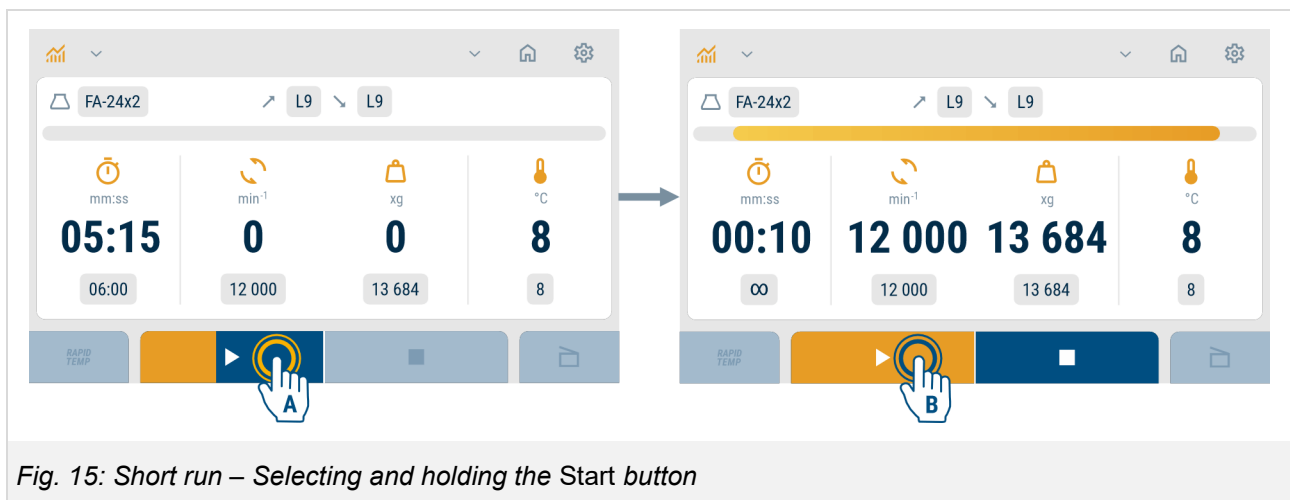


Fig. 14: Runtime area of the main screen (example)

- | | |
|------------------|---|
| 1 Runtime symbol | 3 Set value button for the runtime |
| 2 Current value | 4 Symbols of the activated functions (examples) |

Performing a short run

- The centrifuge is at a standstill.
 - The user interface shows the main screen.
1. Select the *Start* button and hold it for the desired duration of the short run (A).
 - The short run starts when the colour of the button has completely changed from blue to yellow (B).
 - The centrifuge accelerates with maximum possible power (curve L9) up to the set speed.
 - The runtime is counted upwards.

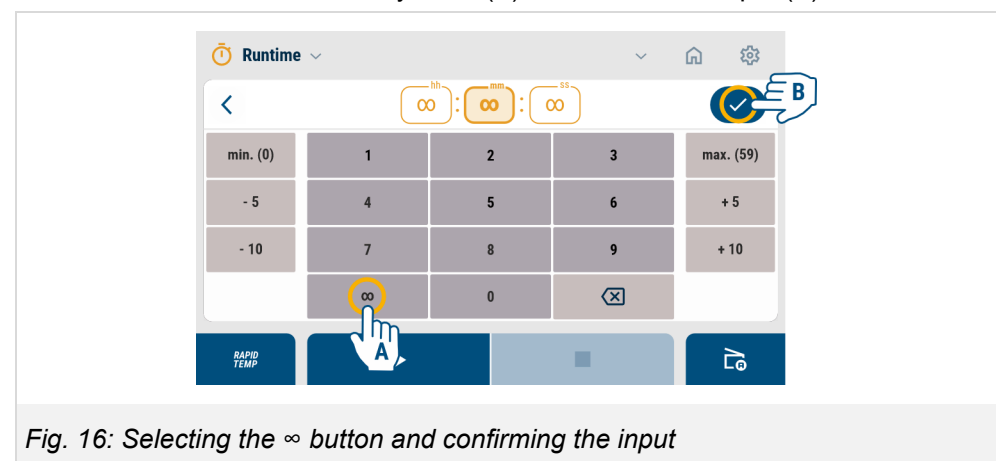


2. Release the *Start* button.
 - The centrifuge decelerates with maximum deceleration power (curve L9) down to a standstill.

Performing a 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.

- ▶ The centrifuge is at a standstill.
 - ▶ The user interface shows the main screen.
1. Select the *Set value* button for the runtime.
 - The input menu opens.
 2. Select the ∞ button on the keyboard (A) and confirm the input (B).



- The main screen will be displayed.
 - The ∞ symbol will be displayed for the set runtime.
3. Select the *Start* button to start a centrifugation run.
 - The continuous run is activated and the runtime will be counted upwards.

Operation

4. Select the Stop button to stop the continuous run.
 - The centrifuge decelerates to a standstill.

6.5.3.3 Speed and relative centrifugal force: process parameters



In the speed and relative centrifugal force (RCF) fields, the upper value indicates the current speed or RCF value. The values below are the preselected (set) values.

The speed is indicated in revolutions per minute (min^{-1}) and the RCF values as multiples of the acceleration due to gravity (xg). The values are interdependent. The maximum speed/RCF values depend on the rotor that is used.

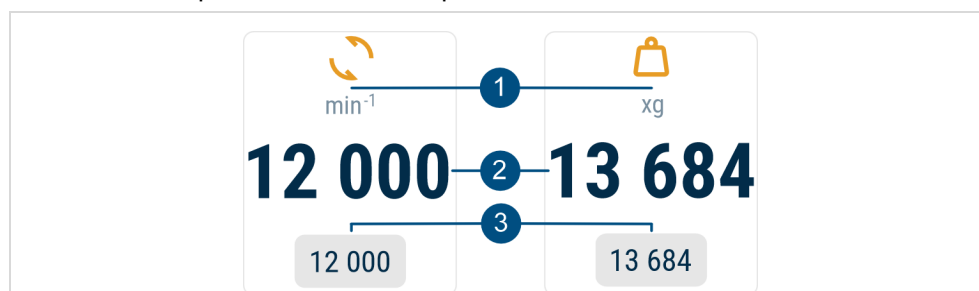


Fig. 17: Speed and RCF areas of the main screen (example)

- | | |
|---------------------------|---|
| 1 Speed/RCF symbol | 3 Set value button of the speed/RCF value |
| 2 Current speed/RCF value | |

6.5.3.4 Temperature: process parameters



In the temperature area, the upper value indicates the current temperature (current value) with the preselected temperature (set value) below. Temperatures between -10°C and $+40^{\circ}\text{C}$ can be preselected.



The centrifuge is designed for spinning samples in the available rotors in a temperature range from $+4^{\circ}\text{C}$ to 23°C . It does not have a heater, which is why temperatures above the rotor temperature depend on the air friction of the spinning rotor.

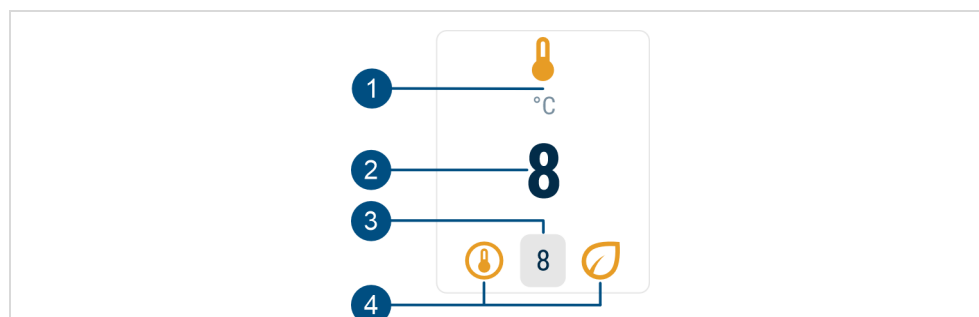


Fig. 18: Temperature area of the main screen (example)

- | | |
|-----------------------------|---|
| 1 Temperature symbol | 3 Set value button for the temperature |
| 2 Current temperature value | 4 Symbols of the activated functions (examples) |

**RAPID
TEMP****Rapid temperature control function *RAPID TEMP***

The *RAPID TEMP* function is used to precool or preheat the system consisting of the rotor chamber and rotor or rotor/bucket combination. The cooling process is controlled by the refrigeration unit while the waste heat of the motor as well as the air friction of the spinning rotor are used for heating.

The system is designed for centrifuging samples at a defined temperature and holding the original sample temperature. The centrifuge is not intended for cooling or heating the samples.

Starting the *RAPID TEMP* function

- ▶ The centrifuge is on.
 - ▶ For rapid cooling, the current temperature of the rotor chamber is above the set value.
 - ▶ For heating, the current temperature of the rotor chamber is below the set value.
1. Select the *RAPID TEMP* button (A).
 2. Select the *Start* button (B).

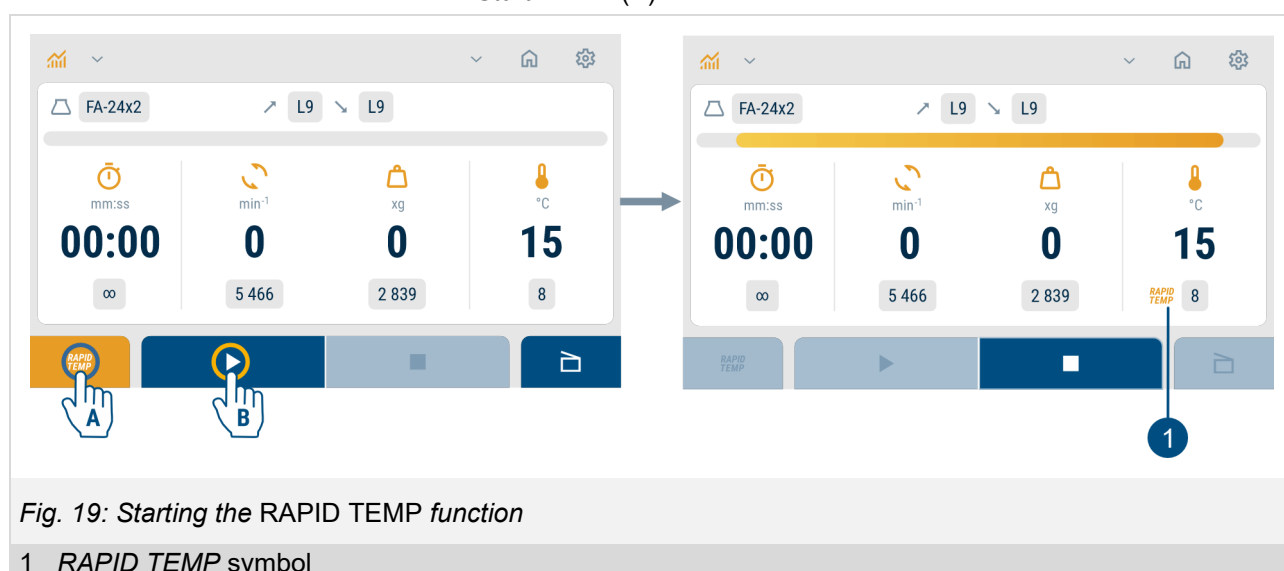


Fig. 19: Starting the *RAPID TEMP* function

1 *RAPID TEMP* symbol

- The *RAPID TEMP* function starts with the following parameters:
 - The set speed for quick cooling corresponds to 1/3 of the maximum rotor speed. The RCF value will be adapted accordingly.
 - The set value for heating corresponds to the maximum permissible rotor speed.
 - The acceleration and deceleration curves correspond to the curve L9.
 - The symbol *RAPID TEMP* is displayed in the temperature area.
 - The symbol for a continuous run is displayed in the runtime area. The runtime is counted upwards.
- The *RAPID TEMP* function stops when the set value is reached. The *RAPID TEMP* symbol disappears.
- After quick cooling, the standstill cooling function will be activated (see chapter 6.5.4.5 - "Temperature: process-related parameters").
- The automatic lid opening function is suppressed in order to prevent repeated heating or cooling.

Aborting the *RAPID TEMP* function

1. Select the *Stop* button.

Or:

2. Make any type of entry.
 - The *RAPID TEMP* function will be aborted. No message will be issued when the set temperature is reached.

6.5.4 Process-related parameters

The drop-down menus of the process parameters can be used to configure additional process-related parameters.

6.5.4.1 Entering process-related parameters

Input based on the Quality Control temperature example

► The user interface shows the "Temperature" input menu.

1. Open the "Temperature" drop-down menu (A).
2. Activate the *Quality Control* function (B).
 - The colour of the *Value input* button changes from grey to yellow.
3. Select the *Value input* button (C) to enter the set values.
 - The input menu opens.
4. Enter the set values (D) and confirm the input (E).
 - The main screen will be displayed.
 - The QC temperature symbol will be displayed in the temperature area.



	Opens a drop-down menu		Closes a drop-down menu
	Activates one or more list entries	 	Active value input (example)
 	Inactive value input (example)		Confirms the input and closes the current view
	Opens the previous view without saving		Opens the main screen

Fig. 20: Entering process-related parameters (example: Quality Control temperature)

1 QC temperature symbol

6.5.4.2 Runtime: process-related parameters

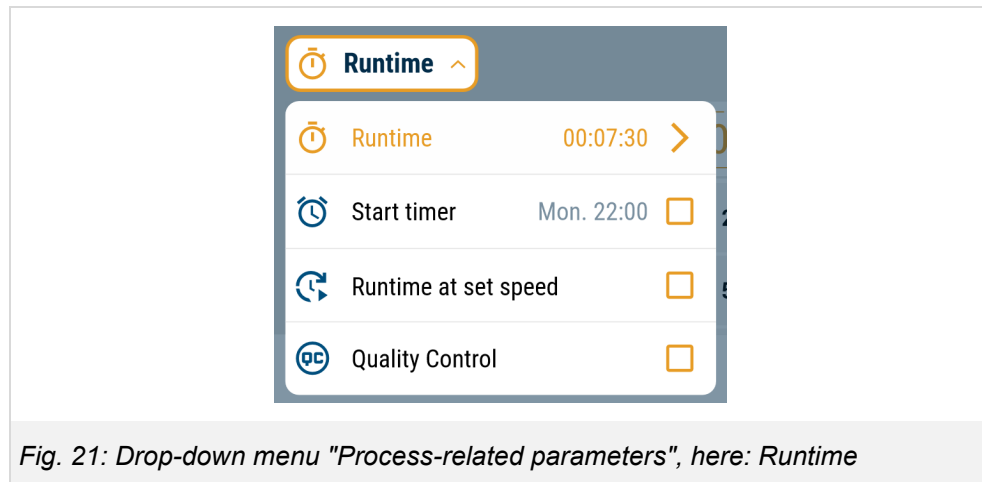


Fig. 21: Drop-down menu "Process-related parameters", here: Runtime

Start timer

When this function is active, the centrifugation run will start a specified time. The start time can be programmed up to 6 days, 23 hours and 59 minutes in advance.

- ▶ The centrifuge is ready for operation.
 1. Activate the start timer.
 - The *Value input* button will be enabled.
 2. Select the *Value input* button.
 3. Enter the start time and confirm the entry.
 - The main screen will be displayed.
 - In the runtime area, the start timer symbol will be displayed.
 - The *Stop* button flashes to indicate that the start timer is active.
 - The progress bar indicates the remaining time up to the start.
 - It is not possible to change parameters or perform any type of input.
 - The centrifuge will start at the programmed time.

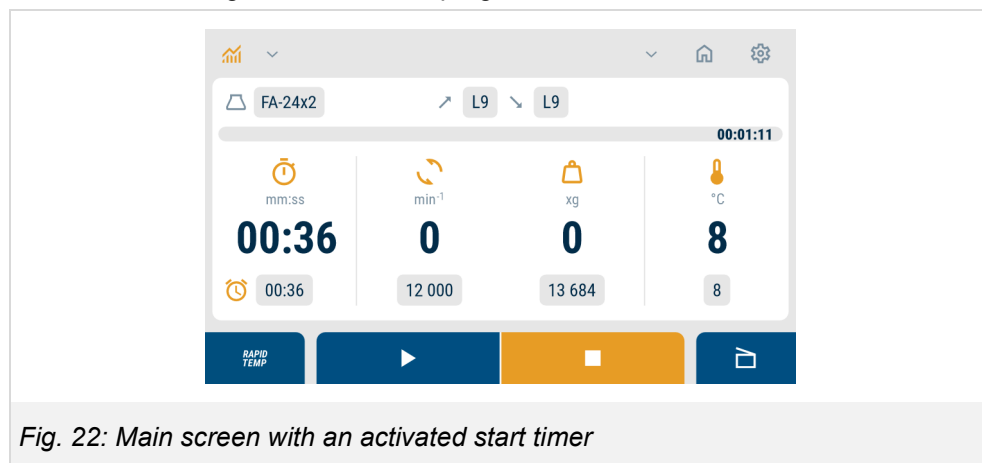


Fig. 22: Main screen with an activated start timer

The start timer mode will be stopped:

- when the centrifugation run starts as scheduled,
- when the *Stop* button is selected,
- if the start conditions are not fulfilled at the start time (e.g. power failure or error message).

In this case, the start timer must be reprogrammed.



Runtime at set speed

If this function is active (factory setting), the runtime will not be counted until the set speed is reached. The "Runtime at set speed" symbol is displayed in the runtime area of the main screen.

If the function is deactivated, the runtime will be counted when the centrifuge starts. The symbol will disappear.



Quality Control

If the function is active, the runtime will be continuously checked (in combination with the speed/RCF parameters) during the centrifugation run. QC is added to the runtime symbol on the main screen.

For detailed information about the Quality Control function, see chapter 6.5.10.7 - "Quality Control".



Display deceleration time

If this function is active, the deceleration time will be displayed instead of the runtime during the deceleration process. The "Display deceleration time" symbol will be displayed instead of the runtime symbol in the runtime area of the main screen. In addition, the time will be displayed in grey and italics.

6.5.4.3 Speed: process-related parameters

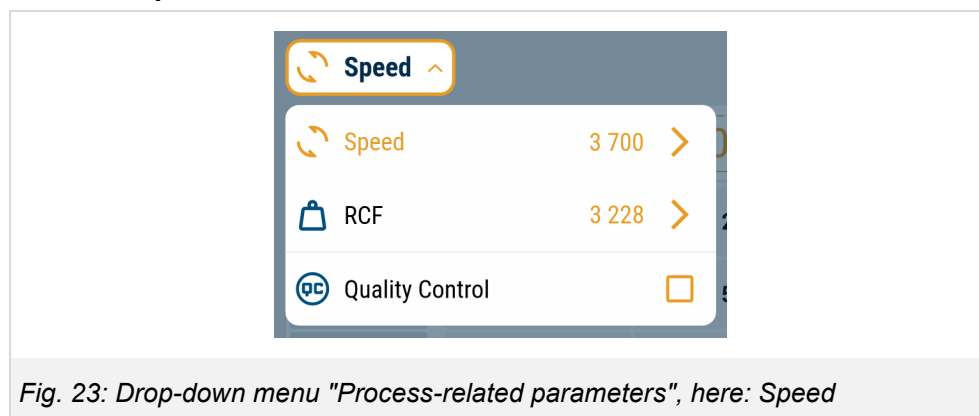


Fig. 23: Drop-down menu "Process-related parameters", here: Speed



RCF

The speed and RCF values are interdependent. The maximum values depend on the rotor that is used. This menu can be used to directly access the RCF input menu.

Quality Control

If the function is active, the speed will be continuously checked (in combination with the runtime and RCF parameters) during the centrifugation run. QC is added to the speed symbol on the main screen.

For detailed information about the Quality Control function, see chapter 6.5.10.7 - "Quality Control".

6.5.4.4 RCF: process-related parameters

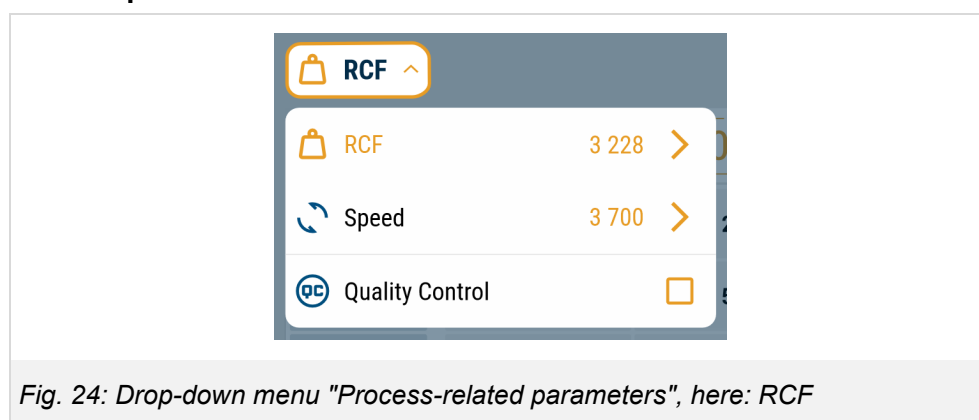


Fig. 24: Drop-down menu "Process-related parameters", here: RCF

Speed

The speed and RCF values are interdependent. The maximum values depend on the rotor that is used. This menu can be used to directly access the speed input menu.

Quality Control

If this function is active, the speed will be continuously checked (in combination with the runtime parameter) during the centrifugation run and the corresponding RCF value will be calculated. QC is added to the RCF symbol on the main screen. For detailed information about the Quality Control function, see chapter 6.5.10.7 - "Quality Control".

6.5.4.5 Temperature: process-related parameters

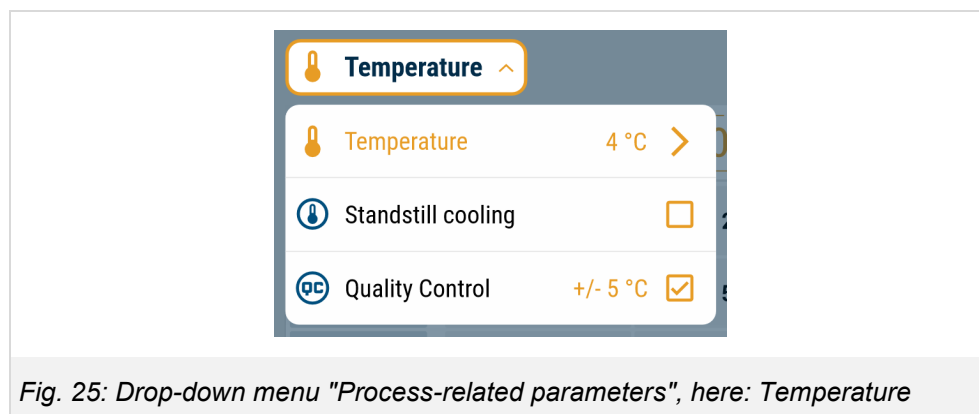


Fig. 25: Drop-down menu "Process-related parameters", here: Temperature

Standstill cooling

The standstill cooling function is activated in the factory settings so that the cooling process will be started when the centrifuge is switched on and the lid is closed and if the set temperature is below the current value. After the centrifugation run, the cooling function remains active in order to hold the samples on the set temperature.

The "Standstill cooling" symbol will be displayed on the main screen.

ATTENTION – Damage to property caused by freezing of the compressor, inaccurate measurement and control behaviour and freezing of the product. Do not cool the rotor below 0°C at a standstill.

Quality Control

If the function is active, the temperature will be continuously checked during the centrifugation run. QC is added to the temperature symbol on the main screen.

For detailed information about the Quality Control function, see chapter 6.5.10.7 - "Quality Control".

6.5.5 Rotor library



The rotor library is a list of all the available rotors and buckets. The rotor or rotor/bucket combination that is used can be selected manually or it will be identified by the automatic rotor identification system.

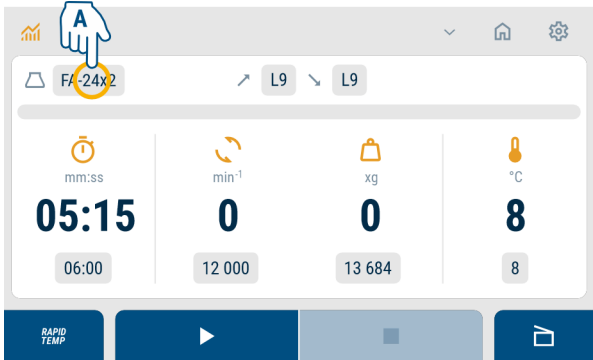
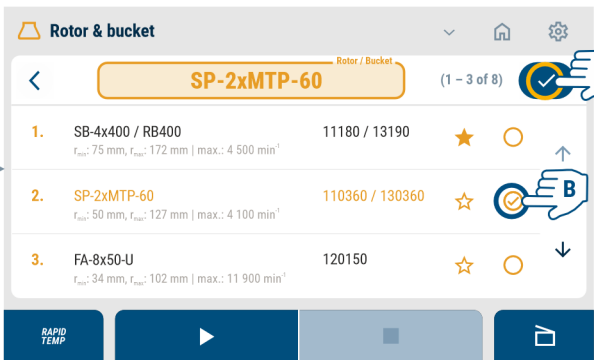
For detailed information about all of the available rotors and rotor/bucket combinations, see chapter 11.1 - "Rotor program".

Operation

6.5.5.1 Selecting rotors and buckets

Selection of a rotor based on the example of a rotor/bucket combination

- ▶ The user interface shows the main screen.
- ▶ A rotor/bucket combination is installed.
 1. Select the *Rotor & buckets* button (A).
 - The selection menu opens.
 2. Select the current rotor/bucket combination (B) and confirm the input (C).
 - The main screen will be displayed.

FA-24x2	Rotor & buckets button, opens the input menu (example)	✓	Selects a list entry. Multiple selections are not possible.
★	Marks list entries as favourites. Favourites are placed at the top of the list.	↑ ↓	Navigates up and down through a list. Grey arrows cannot be selected.
✓	Confirms the input and closes the current view	<	Opens the previous view without saving
🏠	Opens the start screen		

Fig. 26: Selecting a rotor or rotor/bucket combination (example)

Automatic rotor identification

If the rotor is turned manually in the direction of rotation (anticlockwise) or if a centrifugation run is started, the rotor code of the current rotor will be checked against the selected rotor.

- If the system identifies a rotor other than the selected one, the rotor input will be automatically corrected and an error message will be displayed.
- An error message will also be displayed if the system cannot identify the rotor. The rotor cannot be used in the centrifuge.

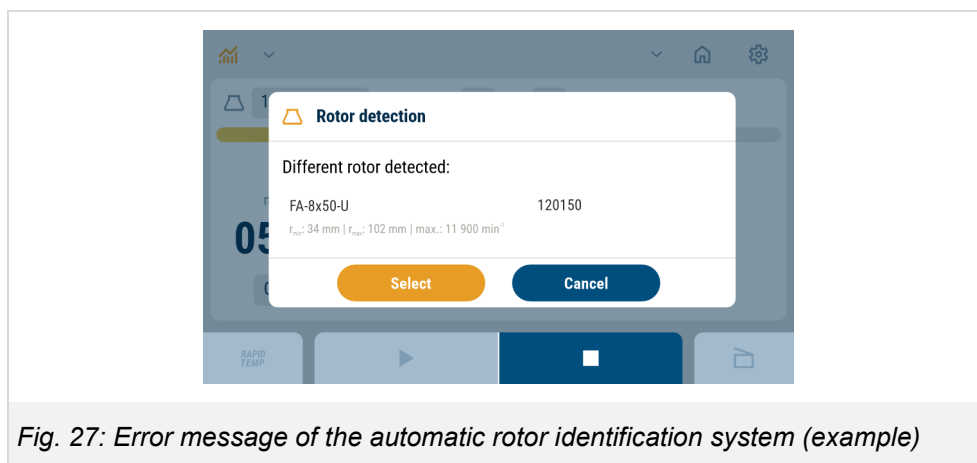


Fig. 27: Error message of the automatic rotor identification system (example)

6.5.6 Curve selection

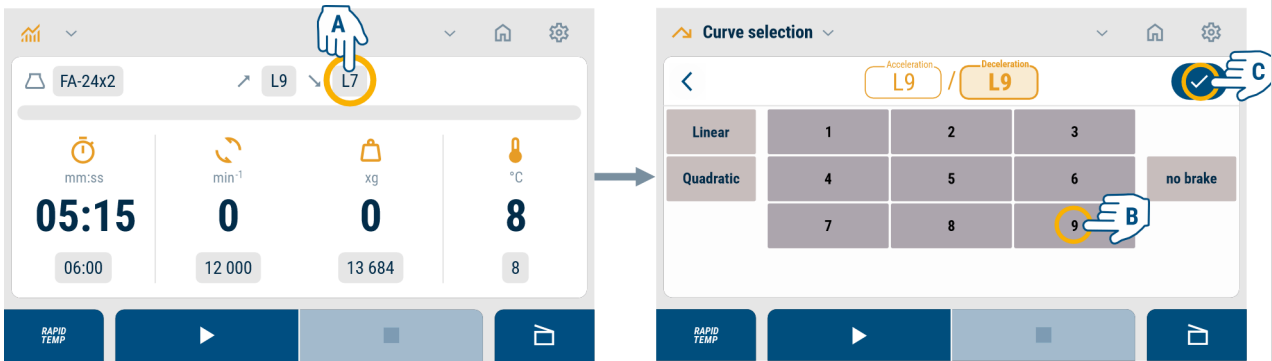
- The *Curve selection* button opens the menu for selecting the acceleration and deceleration curves. The system offers nine linear acceleration and deceleration curves as well as a spin-out option.

For detailed information about the programmed curves, see chapter 11.4 - "Acceleration and deceleration curves".

6.5.6.1 Selecting acceleration and deceleration curves

Selection of curves based on the example of a deceleration

- The user interface shows the main screen.
 1. Select the *Deceleration curve* button (A).
 - The input menu opens.
 2. Select a deceleration curve (B) and confirm the input (C).
 - The main screen will be displayed.



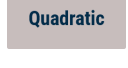
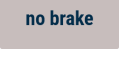
	<i>Deceleration curve</i> button, opens the input menu		Active input field (example)
	Inactive input field (example)		Selects a linear curve (L)
	Selects a quadratic curve (Q)		Selects the brake-free spin-out option
	Confirms the input and closes the current view		Opens the previous view without saving
	Opens the main screen		

Fig. 28: Curve selection – example: deceleration

6.5.7 Program library



In the program library, up to 99 programs can be managed. Programs can be created, selected, edited or deleted. The list shows every program with its name and program-specific parameters (runtime, speed and temperature).

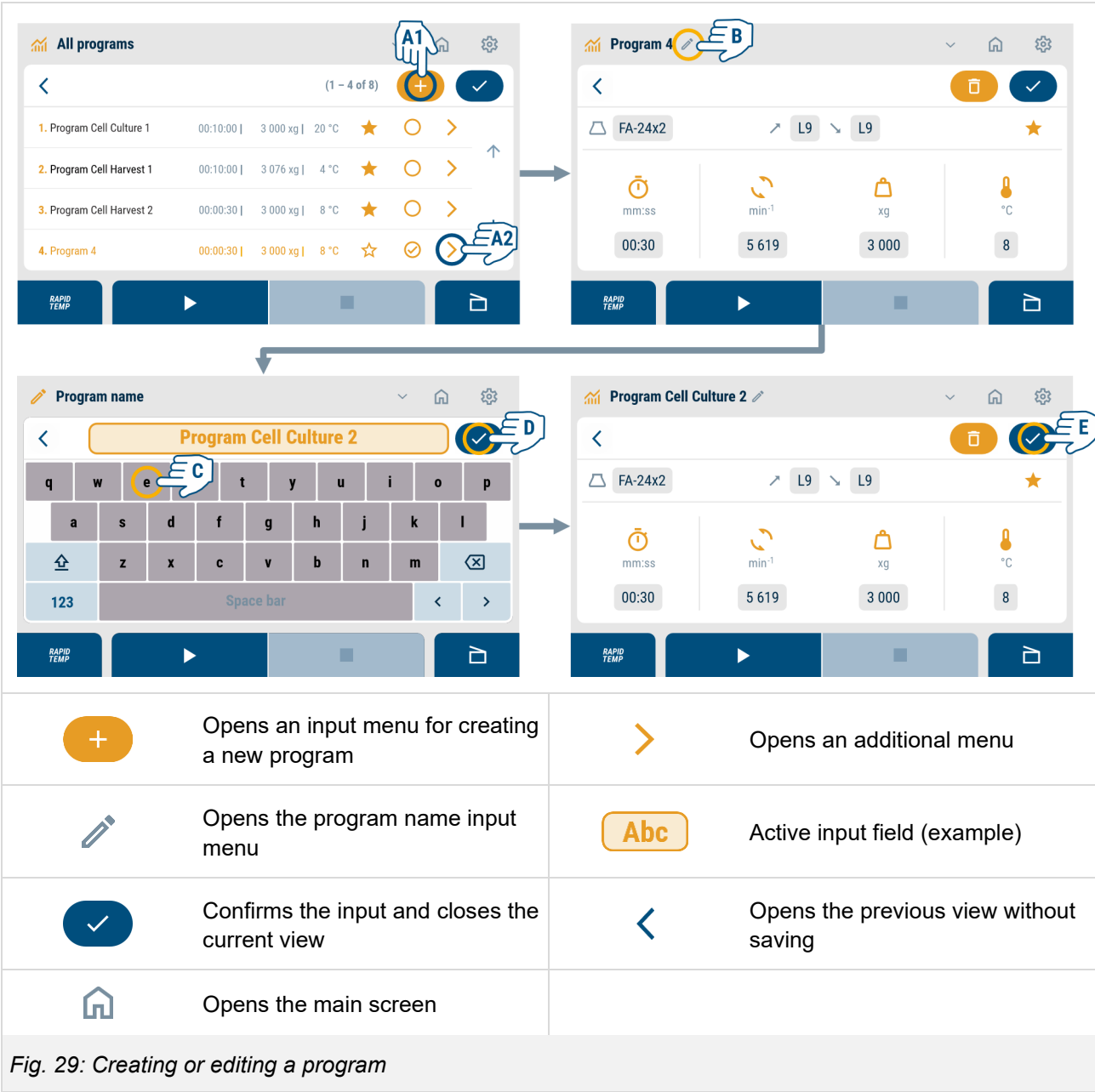
Programs can be marked as favourites so that they will be placed at the top of the program library.

The three most recently used programs can be selected via a quick selection feature.

The functions *Program import* and *Program export* (see chapter 6.5.11.1 - "Exporting and importing programs") can be used to exchange programs between centrifuges with a Spincontrol T control system.

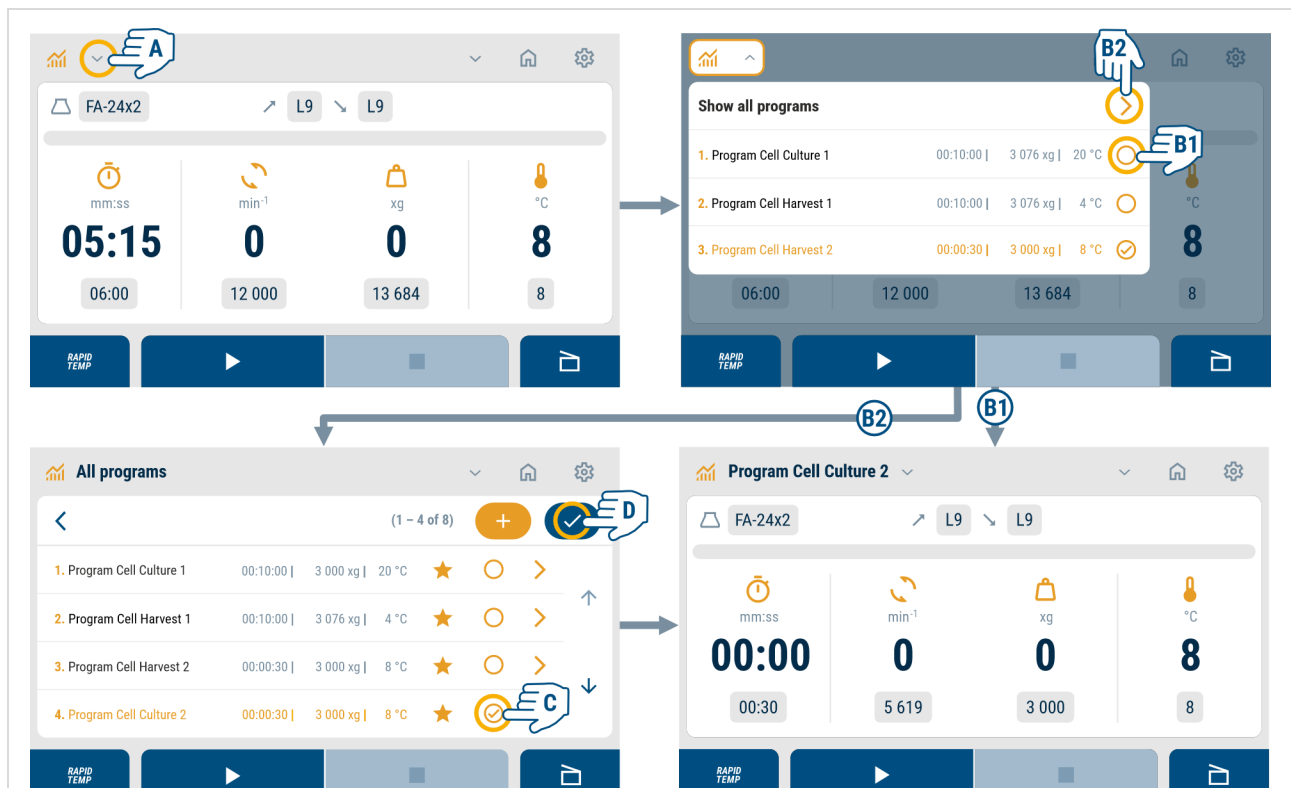
6.5.7.1 Creating or editing a program

- The user interface shows the main screen.
 1. Select the *Program* button.
 - The "Programs" drop-down menu opens.
 2. Select the *Show all programs* button.
 - The user interface shows the program library.
 3. Select the *New* button (A1) to create a new program.
- Or:
 4. Select the *Next* button (A2) to edit an existing program.
 - The input menu of the program will be displayed.
 5. Select the *Edit* button on the status bar to edit the program name (B).
 - The input menu of the program name will be displayed.
 6. Enter a program name (C) and confirm the input (D).
 - The input menu of the program will be displayed.
 7. Enter the process parameters as well as the process-related parameters for the program and confirm the input (E).
 - The program will be saved or edited. The program library will be displayed.
 8. Select the *Confirm*, *Back* or *Home* button.
 - The main screen will be displayed.



6.5.7.2 Executing a program

- The user interface shows the main screen.
- 1. Select the *Program* button (A).
- The "Programs" drop-down menu opens.
- 2. Select one of the three most recently used programs via the quick selection feature (B1).
- Or:
Select the *Show all programs* button (B2).
- The program library opens.
- 3. Select a program (C) and confirm the input (D).
- The program will be loaded and the main screen will be displayed.
- 4. Select the *Start* button to execute the program.



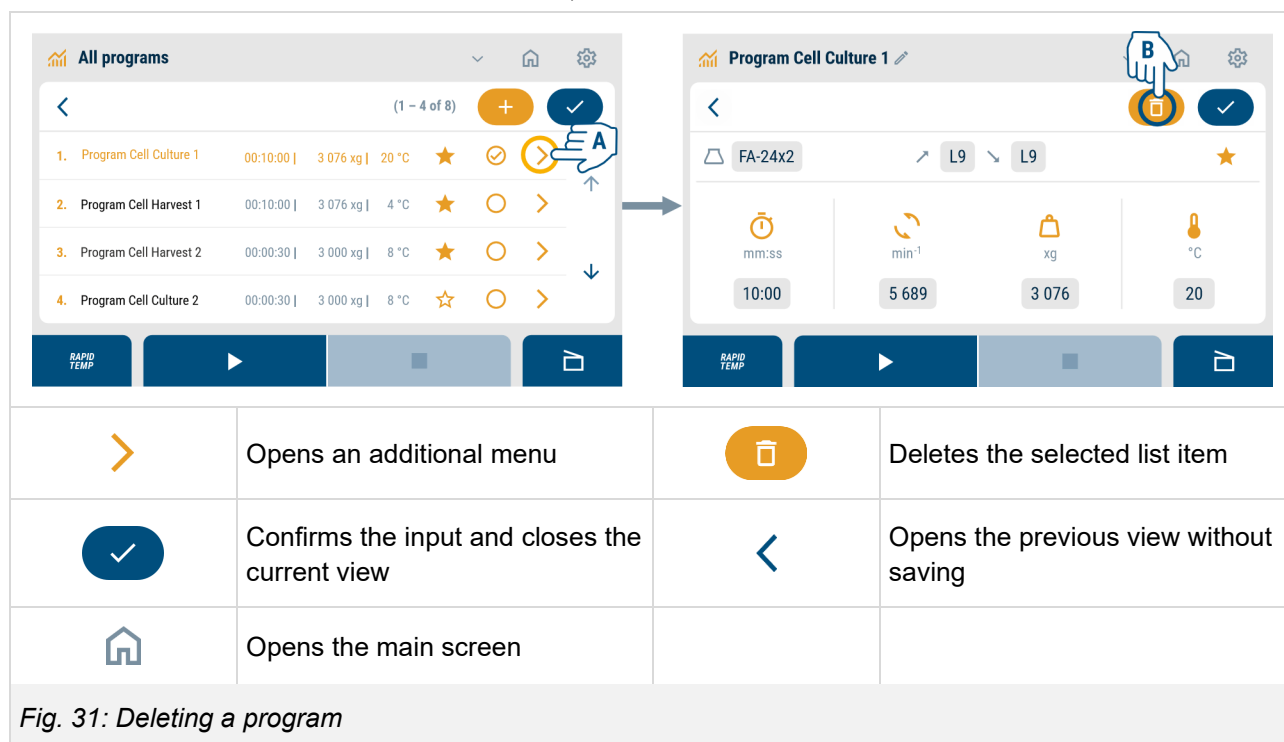
	Opens a drop-down menu		Opens an additional menu
	Selects a list entry. Multiple selections are not possible.		Marks list entries as favourites. Favourites are placed at the top of the list.
	Confirms the input and closes the current view		Opens the previous view without saving
	Opens the main screen		

Fig. 30: Executing a program

Operation

6.5.7.3 Deleting a program

- ▶ The user interface shows the main screen.
 1. Select the *Program* button.
 - The "Programs" drop-down menu opens.
 2. Select the *Show all programs* button.
 - The user interface shows the program library.
 3. Select a program and then the *Next* button (A).
 4. Select the *Delete* button (B).
 - The program will be deleted and the program library will be displayed.
 5. Select the *Confirm*, *Back* or *Home* button to return to the main screen.



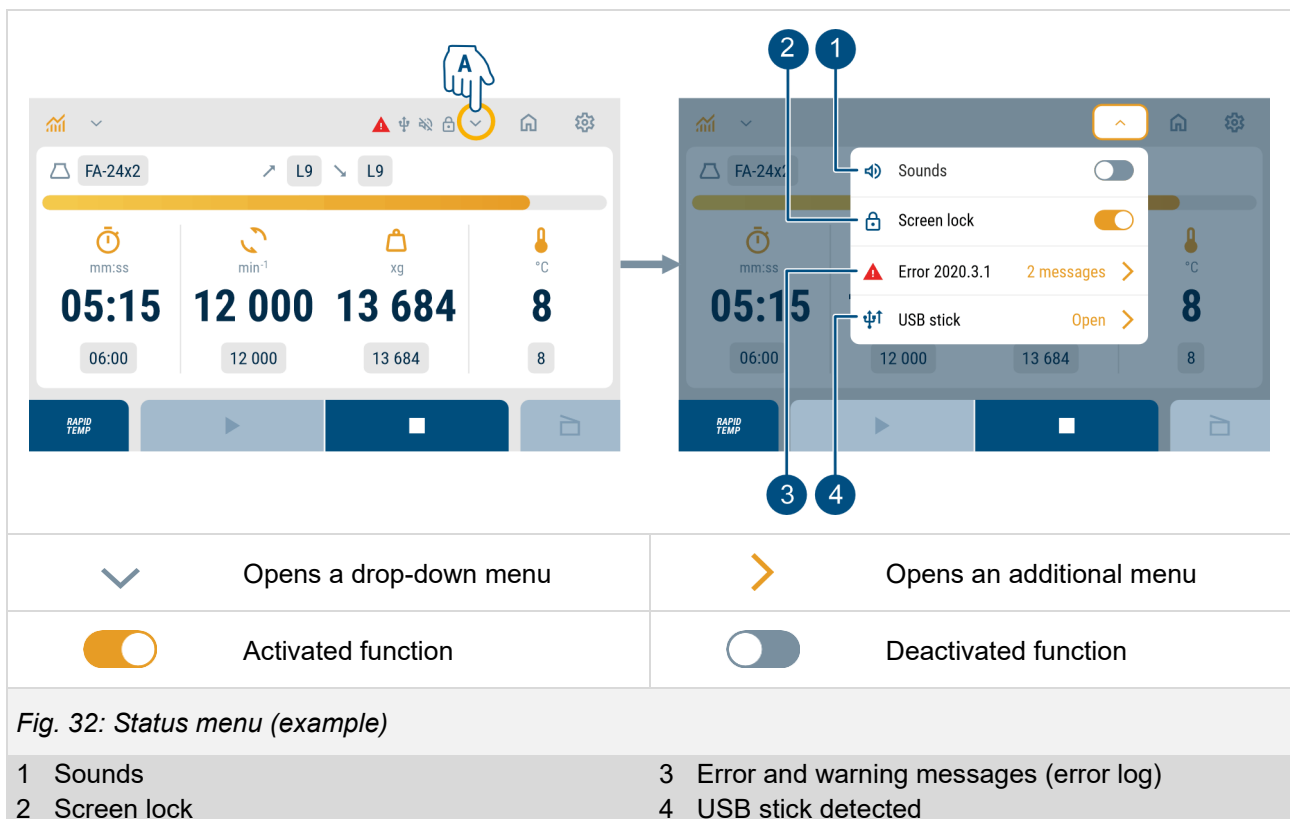
6.5.8 Status indicator and status menu

The status indicator includes a variable number of symbols informing the user about the status of events and functions.

The status menu provides additional information about the status.

6.5.8.1 Opening the status menu

- ▶ The user interface shows the main screen.
 1. Select the *Status menu* button (A).
 - The status menu opens.
 2. Select the desired function.



Activating or deactivating sounds (1)

This element is used to activate or deactivate all of the sound signals in their entirety. For information about the configuration of individual sounds as well as their duration and volume, see chapter 6.5.10.1 - "Device settings"/ Signals.

Activating or deactivating the screen lock (2)

This element is used to immediately activate or deactivate the screen lock. For more information about the configuration of the screen lock, see chapter 6.5.10.1 - "Device settings"/ Display settings / Screen lock.

Error and warning messages (3)

The drop-down menu displays the most recent message as well as the total number of active messages. The *Next* button opens the error log (see chapter 6.5.9 - "Error log").

USB stick (4)

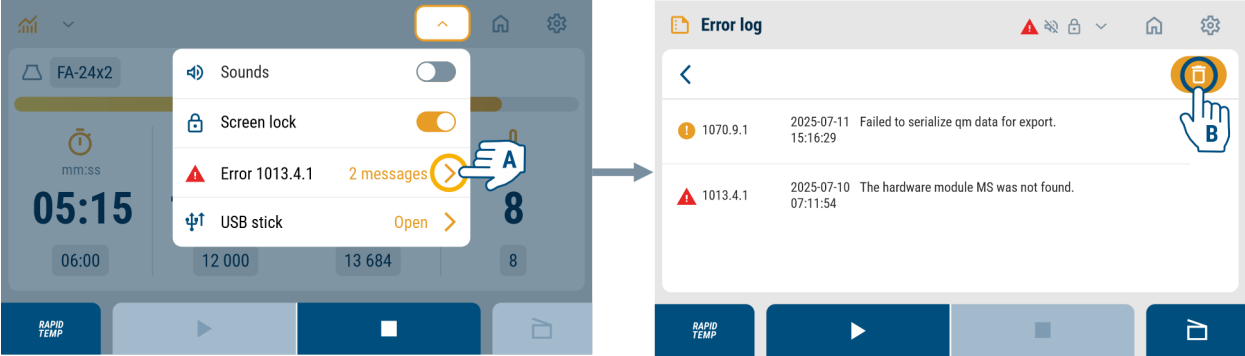
If a USB stick has been plugged into the port of the control panel and if it has been detected by the system, a corresponding line will be displayed. The *Next* button can be used to display the data stored on the USB stick. Programs can be imported or exported and QC data can be transferred (see chapter 6.5.11 - "Data transfer").

6.5.9 Error log

 Any faults that occur are listed in the error log together with an error number, time stamp and description. The error log displays the last 100 entries.

6.5.9.1 Deleting error log entries

- ▶ The status menu is open.
 1. Select the *Next* button in the message line (A).
 - The error log opens.
 2. Select the *Delete* button (B).
 - The messages in the list will be permanently deleted from the error log without further notice.
-  The messages remain accessible to authorised specialist personnel in the error history of the service menu.



The figure shows two screenshots of the Sigma 3-17KT IVD interface. The left screenshot shows the main screen with a status menu open. A hand icon labeled 'A' points to the 'Next' button (a right-pointing arrow) next to the error message 'Error 1013.4.1'. The right screenshot shows the 'Error log' screen with a list of error messages. A hand icon labeled 'B' points to the 'Delete' button (a trash can icon) in the top right corner of the error log screen.

	Opens an additional menu		Deletes all of the list items
	Error message		Warning message
	Opens the previous view without saving		Opens the main screen

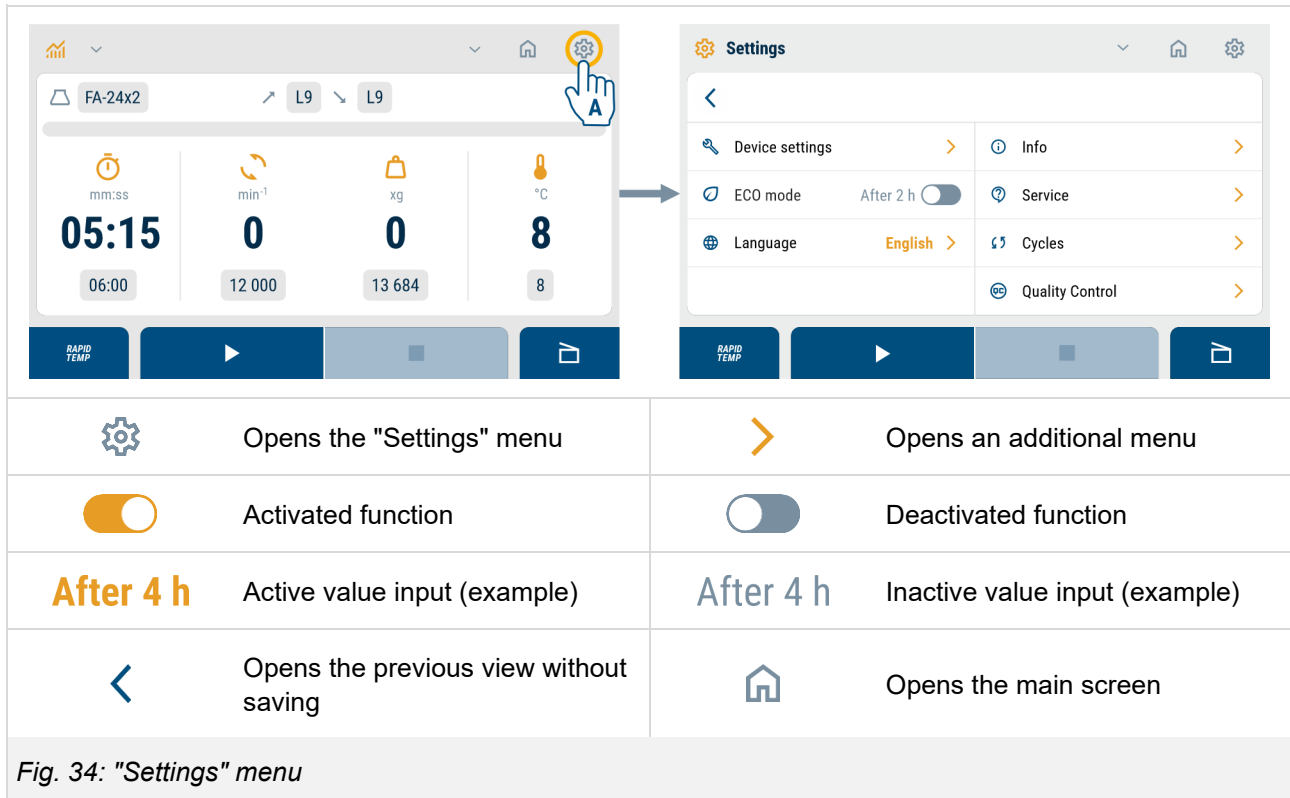
Fig. 33: Deleting error log entries (example)

6.5.10 Settings

 The "Settings" menu can be used to configure device settings and to view information about the centrifuge.

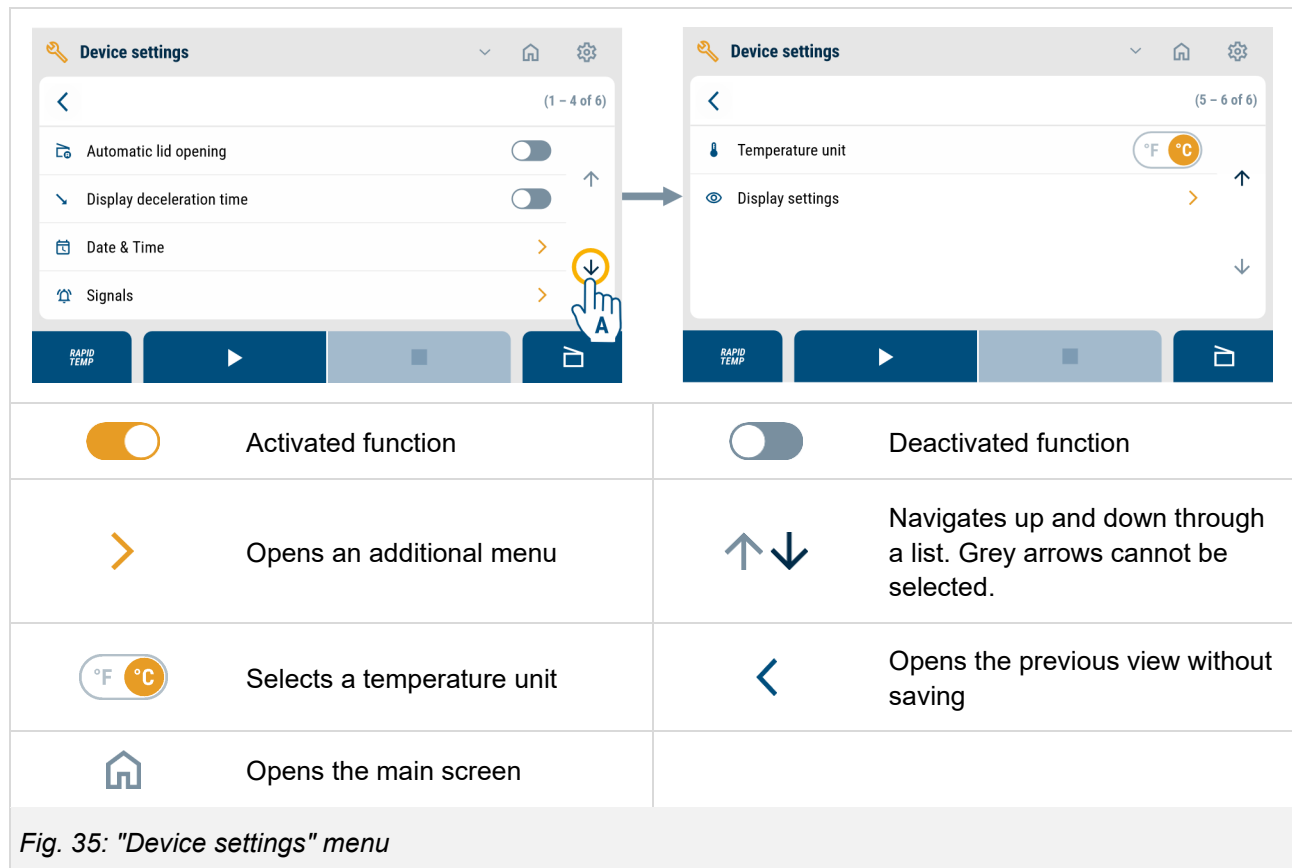
Opening the "Settings" menu:

1. Select the *Settings* button (A).
- The "Settings" menu opens.



6.5.10.1 Device settings

 Device settings are universal. They cannot be adapted in a program-specific manner.



Automatic lid opening function

This function activates or deactivates the automatic opening of the centrifuge lid after the completion of a centrifugation run.

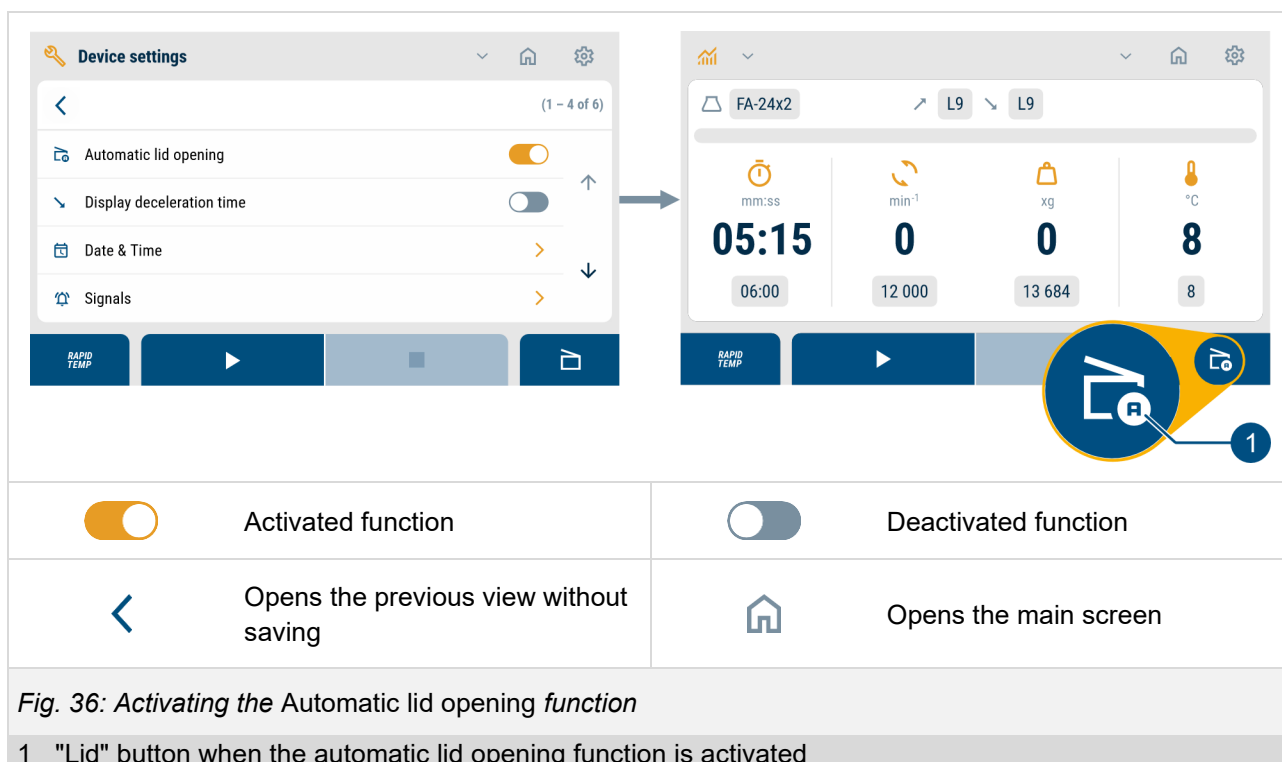
In the factory settings, this function is deactivated.

► The user interface shows the "Device settings" menu.

1. Activate the *Automatic lid opening* function (A).
2. Select the *Home* button (B).

- The main screen will be displayed.
- The *Lid* button on the control bar is marked with an A.

After the centrifugation run, the lid lock will be released and the lid opens automatically.



CAUTION – When the lid is open, the cooling system is inactive. The samples may heat up.

In the following cases, the lid will remain closed even though the automatic lid opening function has been activated:

- The standstill cooling function has been activated.
- A RAPID-TEMP run has been completed.

This prevents the samples from heating up.

Display deceleration time

This function activates or deactivates the indication of the deceleration time during and after the deceleration. The deceleration time will be displayed in the "Runtime" area.

In the factory settings, this function is deactivated.

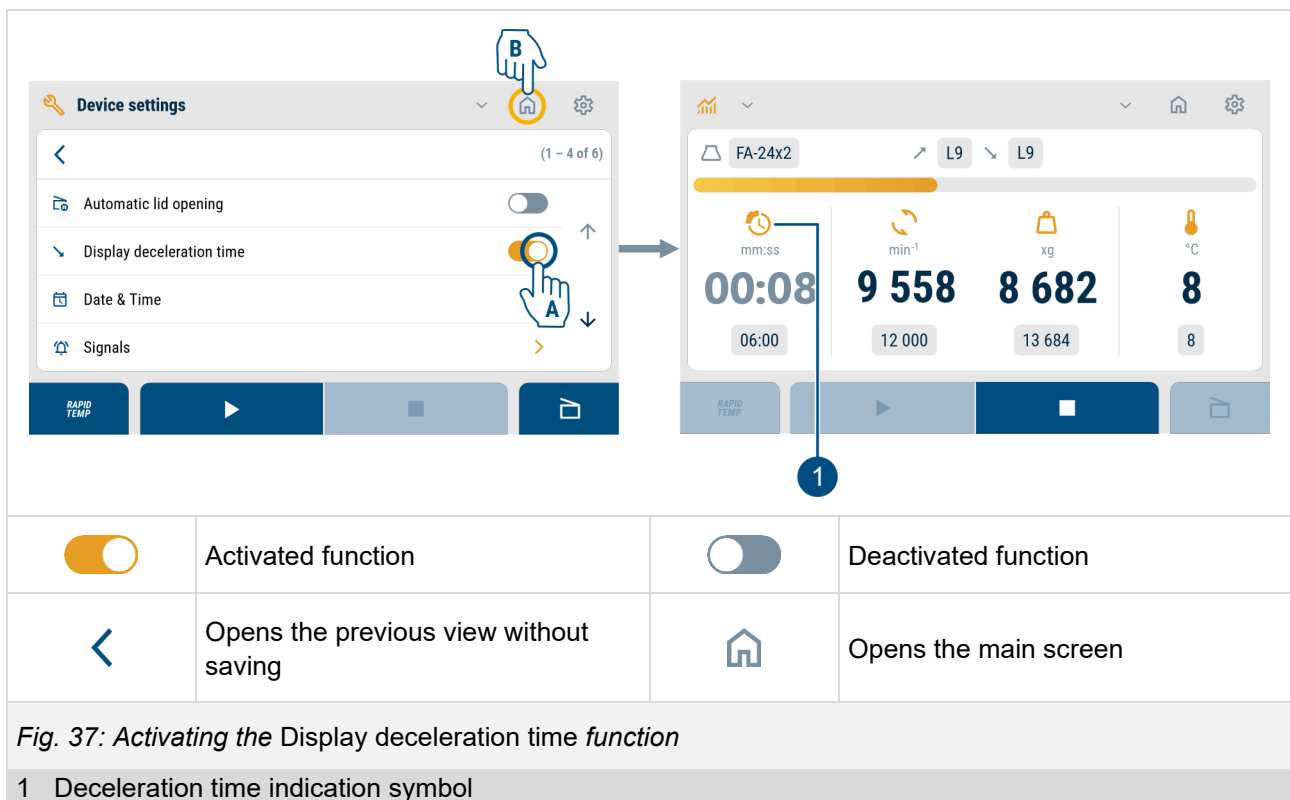
► The user interface shows the "Device settings" menu.

1. Activate the *Display deceleration time* function (A).
2. Select the *Back* or *Home* button (B).

- The main screen will be displayed.
- During the deceleration, the symbol for the deceleration time indication will be displayed in the "Runtime" area.
- The deceleration time will be displayed in grey and in italics.

Once the deceleration is complete, the system will once again display the runtime.

Operation



Date and time

This function can be used to set the date and time. In addition, the time zone of the location of use of the centrifuge can be specified.

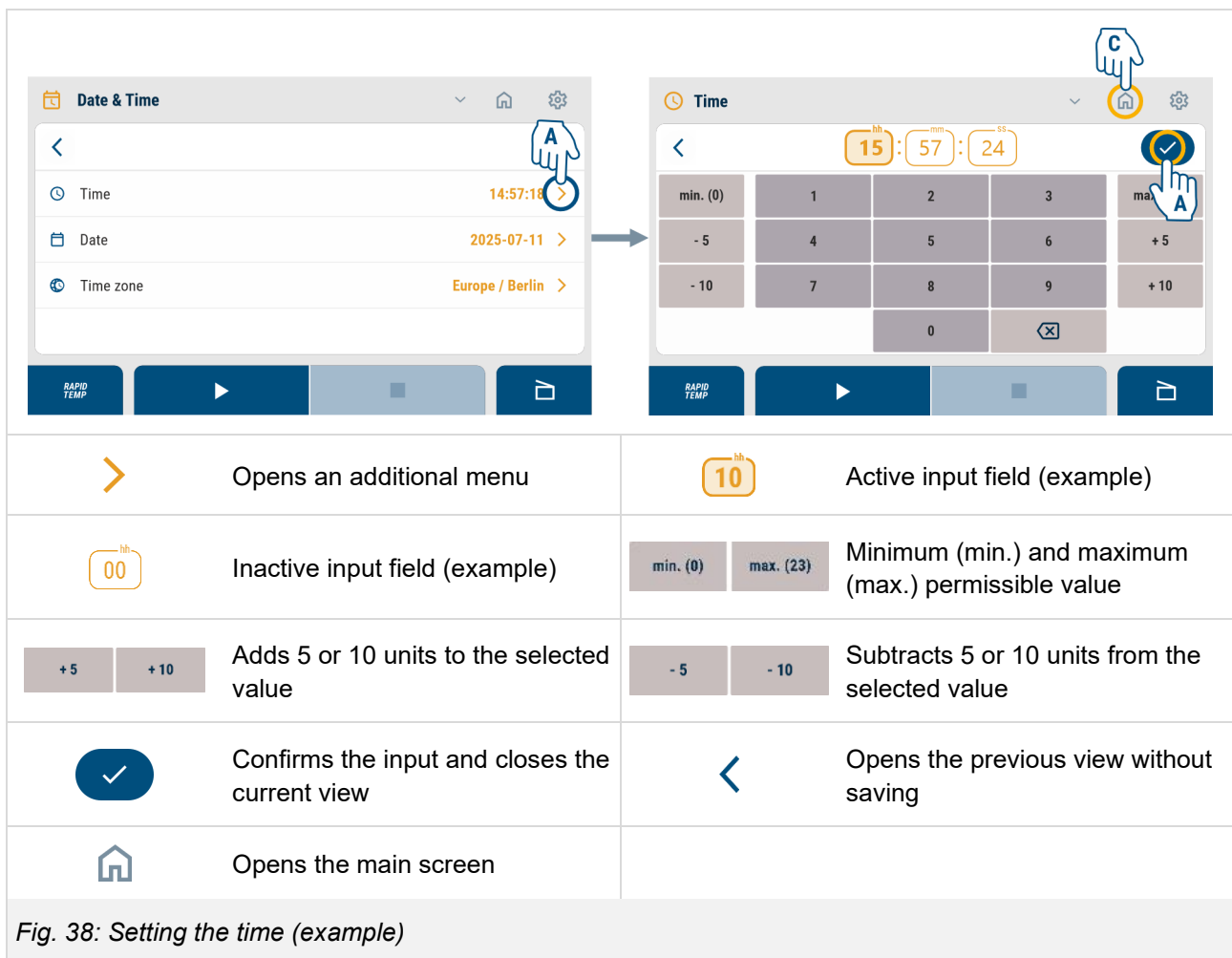
In the factory settings, the time zone for the centrifuge is Central European Time (CET).



If the centrifuge remains switched off for a longer period of time (> 3 months), its date and time must be checked and reset when the centrifuge is switched on again.

Process for setting the time (example):

- The user interface shows the "Device settings" menu.
 1. Select the *Next* button to open the "Date & time" menu.
 2. Select the *Next* button to open the "Time" input menu (A).
 3. Enter the time and confirm the input (B).
 4. Select the *Home* button.
 - The main screen will be displayed.



	Opens an additional menu		Active input field (example)
	Inactive input field (example)		Minimum (min.) and maximum (max.) permissible value
	Adds 5 or 10 units to the selected value		Subtracts 5 or 10 units from the selected value
	Confirms the input and closes the current view		Opens the previous view without saving
	Opens the main screen		

Fig. 38: Setting the time (example)

Signals

This function is used to activate or deactivate a sound signal at the end of a centrifugation run or in the event of imbalance or errors.

A signal duration between 1 and 360 seconds and a volume level between 1 and 5 can be set.

-  The function *Sound off* in the status menu must be deactivated so that the signal sounds are audible. The corresponding symbol must be displayed.

Entering the signal duration (example):

- The user interface shows the "Device settings" menu.
 1. Deactivate the *Sound off* function if it is still active.
 2. Select the *Next* button (A).
 - The "Signals" menu opens.
 3. Activate the desired signals (B).
 4. Scroll down through the list (C) and open the "Signal duration" menu (D).
 5. Enter the signal duration and confirm the input (E).
 6. Select the *Home* button.
 - The main screen will be displayed.

Operation

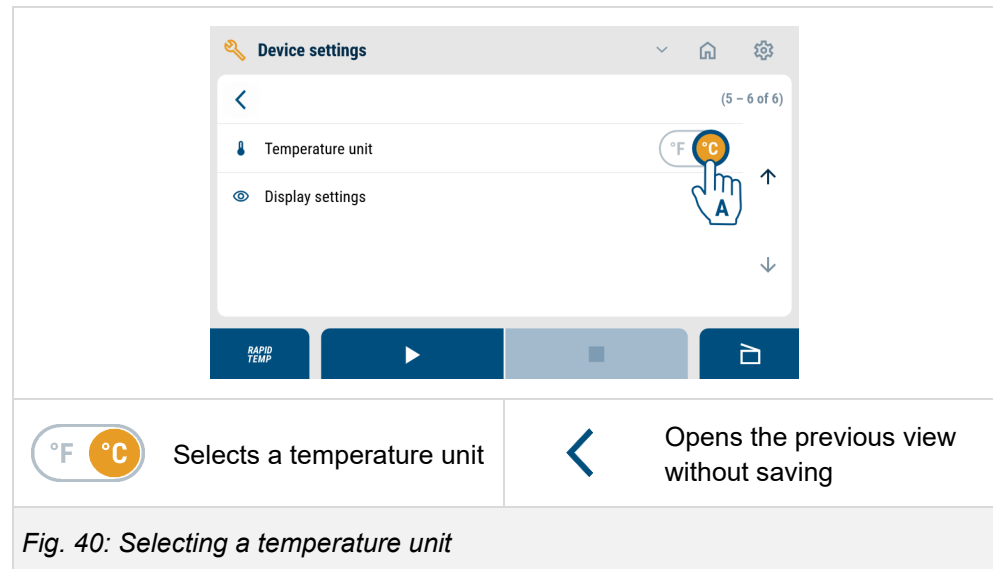


	Sound off function activated		Opens an additional menu
	Activated function		Deactivated function
	Navigates up and down through the list. Grey arrows cannot be selected.		Active input field (example)
	Minimum (min.) and maximum (max.) permissible value		Adds 10 or 50 units to the selected value
	Subtracts 10 or 50 units from the selected value		Confirms the input and closes the current view
	Opens the previous view without saving		Opens the main screen

Fig. 39: Entering the signal duration

Temperature unit

This function can be used to switch between °C (degree Celsius) and °F (degree Fahrenheit) for the temperature unit by way of a toggle button.



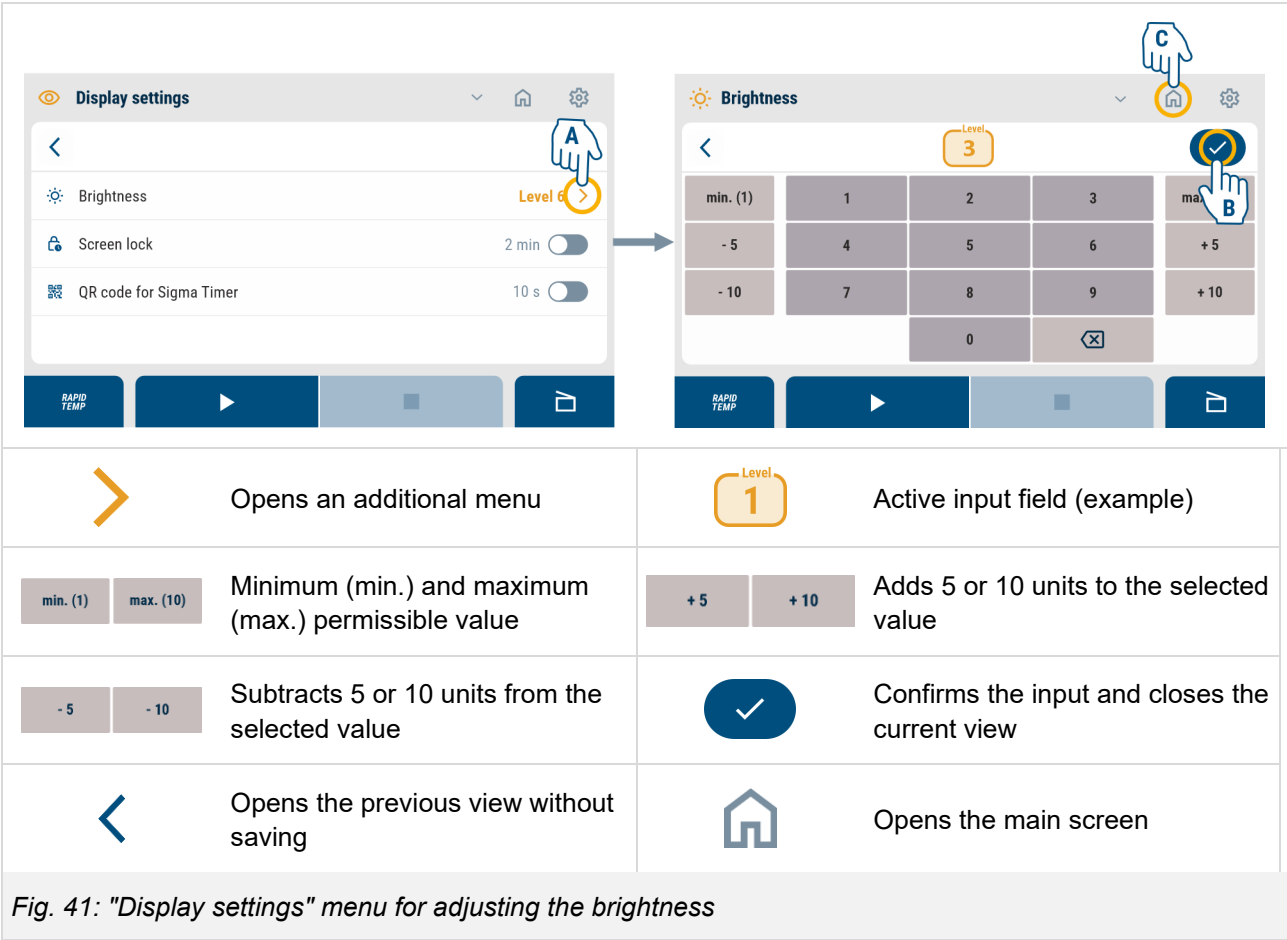
Display settings

Brightness

Configuration of display settings (here: brightness):

- The user interface shows the "Device settings" menu.
 1. Select the *Next* button to open the "Display settings" menu.
 2. Select the *Next* button (A) to open the "Brightness" menu.
 - The input menu opens.
 3. Select a value between level 1 (dark) and level 10 (bright) and confirm your selection (B).
 4. Select the *Home* button (C).
 - The main screen will be displayed.

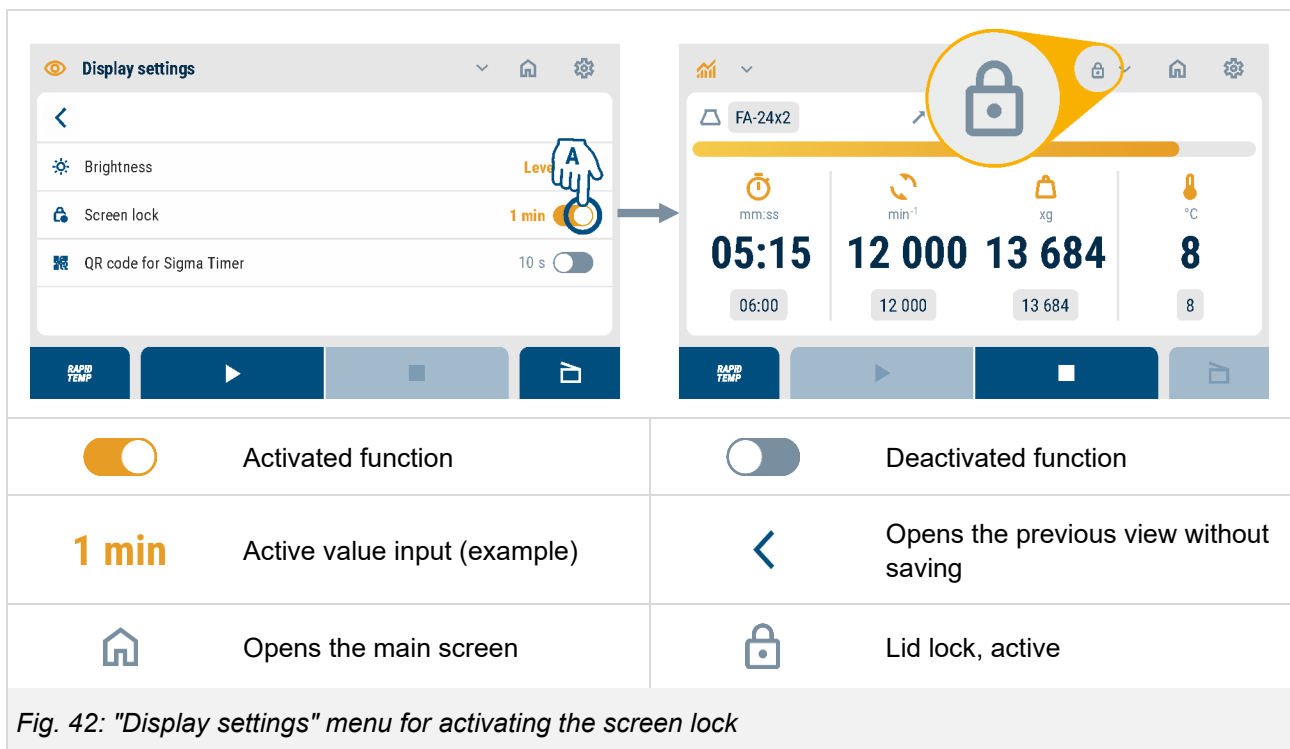
Operation



 Screen lock

The automatic screen lock can be activated for a duration between 1 and 60 minutes. If no input is made during the set period:

- the user interface will be locked automatically,
- the system switches to the main screen,
- all of the submenus will be closed, any unconfirmed inputs will be rejected and
- the corresponding symbol will be displayed on the status bar (see the illustration).



When the screen is locked, the following transactions are still possible:

- Touching of buttons. In this case, a prompt will be displayed asking whether the screen should be unlocked.
- Deactivation of the screen lock in the status menu. The screen will be unlocked, but the general setting in the "Display settings" menu will remain unchanged.

QR code for Sigma Timer

When this function is active, the centrifuge generates a QR code for the Sigma Timer app. With this app, the remaining runtime of the centrifuge can be monitored by way of a mobile device.

The following happens when the function is active:

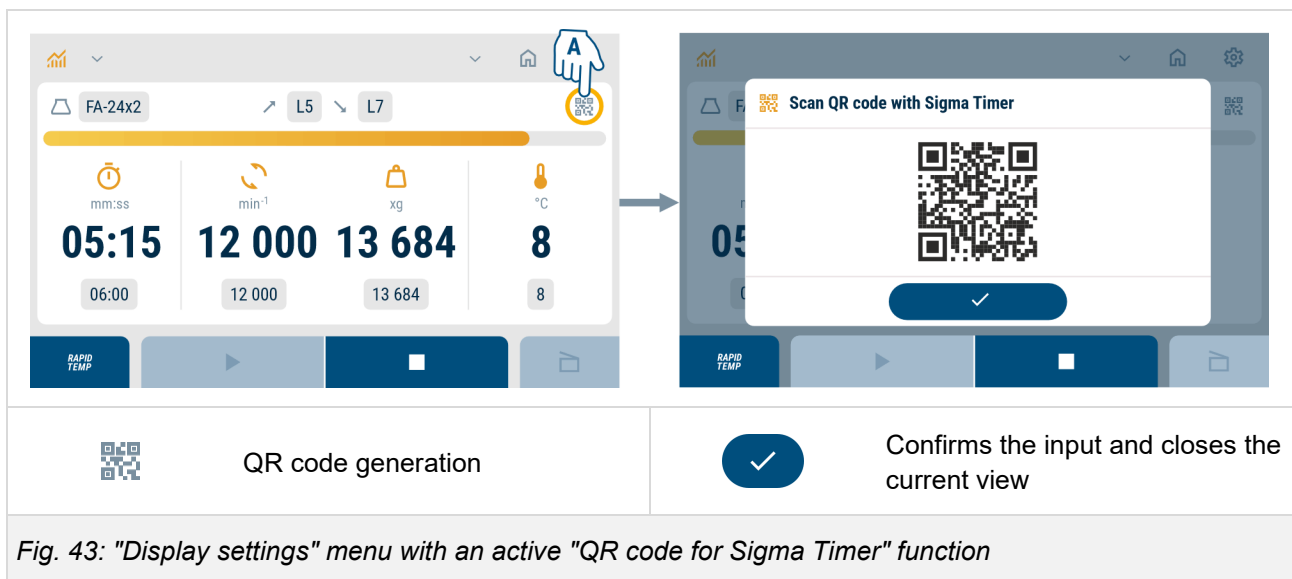
- A QR code will be generated at the start of a centrifugation run. This QR code can then be scanned with the Sigma Timer app.
- The *QR code* button will be displayed on the configuration bar in the main screen during an active centrifugation run. When this button is selected, the QR code will be displayed again for a preset time.

A display time between 10 and 60 seconds can be configured. In the factory settings, this value is set to 10 seconds.

Generating a QR code:

- The user interface shows the main screen.
- 1. Select the *Generate QR code* button (A).
 - The "QR code" dialog box opens.

Operation



6.5.10.2 ECO mode

 If the centrifuge is not used for a defined period of time, the *ECO mode* function will switch off the refrigeration unit. In addition, the brightness of the user interface will be set to level 1 (dark) and the centrifuge lid will be opened so that any moisture can escape.

The setting for this function is universal, i.e. it cannot be activated or deactivated for individual programs.

Activating the ECO mode:

1. Activate the *ECO mode* function.
2. Select the *Value input* button (A).
 - The input menu opens.
3. Enter a set value between 1 and 8 hours in steps of 60 minutes.
4. Confirm the input (B) and select the *Home* button (C).
 - The main screen will be displayed.



	Activated function		Deactivated function
After 4 h	Active value input		Active input field (example)
	Minimum (min.) and maximum (max.) permissible value		Adds 1 or 4 units to the selected value
	Subtracts 1 or 4 units from the selected value		Confirms the input and closes the current view
	Opens the previous view without saving		Opens the main screen

Fig. 44: ECO mode function

- 1 The ECO mode is activated.
- 2 The ECO mode will start in 30 minutes.

The following will happen when the ECO mode is activated:

- The turn-off countdown will start in the background after the last keystroke while the centrifuge is at a standstill.
- The ECO mode symbol will be displayed in the temperature area of the main screen. In the last 30 minutes before the end of the countdown, the symbol will flash green.

Touching the user interface will reset the countdown to its original value so that it will restart.

In the factory settings, the countdown of the ECO mode is set to 4 hours.

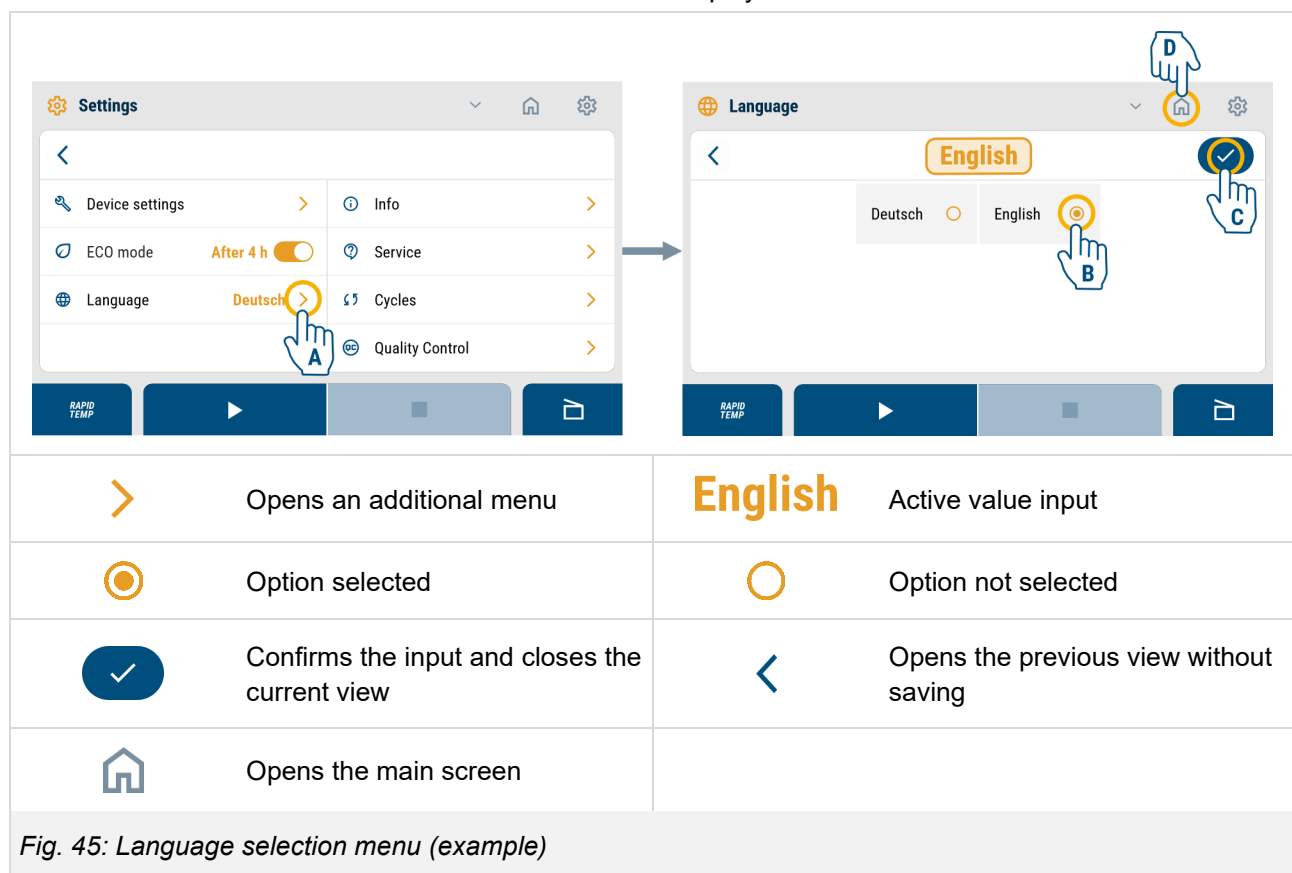
6.5.10.3 Language selection

 This menu can be used to select the language of the user interface.

Selecting another language:

► The user interface shows the "Settings" menu.

1. Select the *Next* button (A).
 - The selection menu opens.
2. Select the desired language (B) and confirm the input (C).
3. Select the *Home* button (D).
- The main screen will be displayed.



6.5.10.4 Info

 This menu shows all of the system and software information, including the serial number.

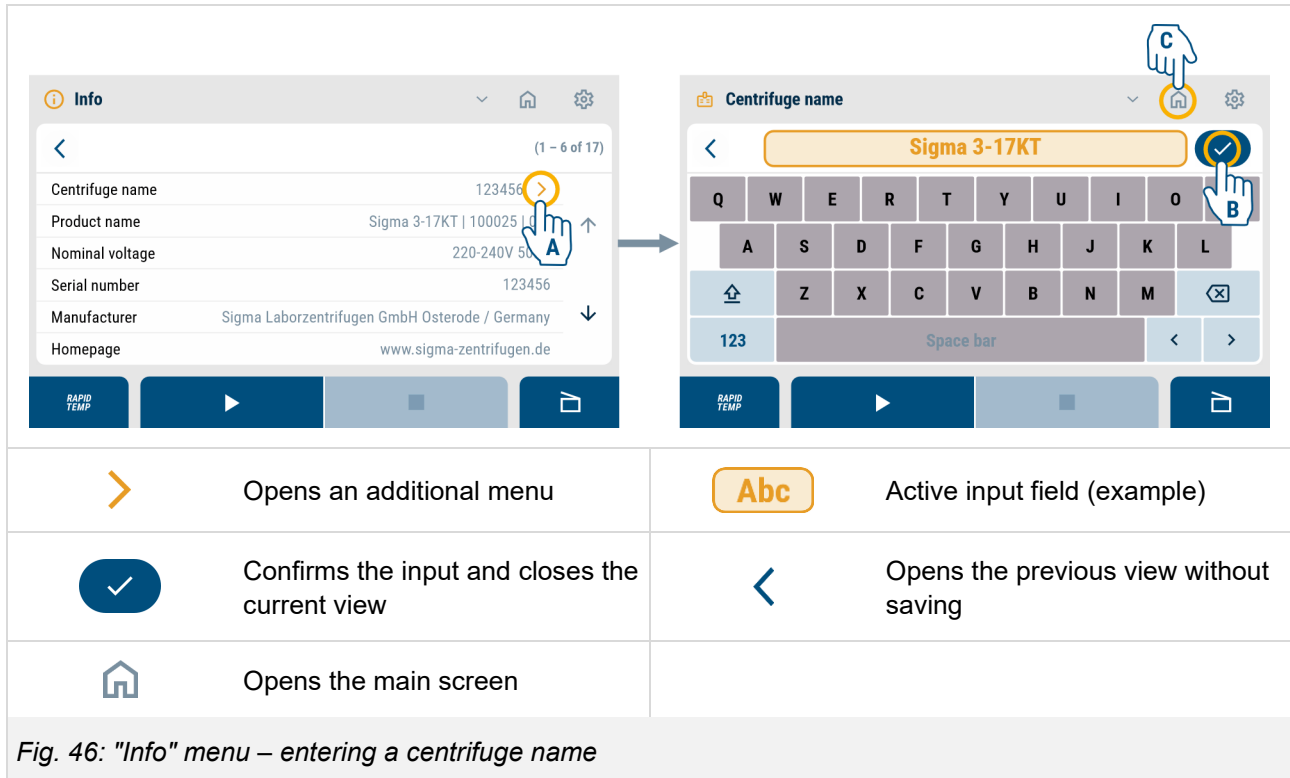
Centrifuge name

This menu can be used to specify a name for the centrifuge to enable its identification.

► The user interface shows the "Settings" menu.

1. Select the *Next* button to open the "Info" menu.
2. Select the *Next* button to open the "Centrifuge name" menu (A).
 - The input menu opens.

3. Enter the centrifuge name. 20 alphanumeric characters are available.
4. Confirm the input (B).
5. Select the *Home* button (C).
- The main screen will be displayed.



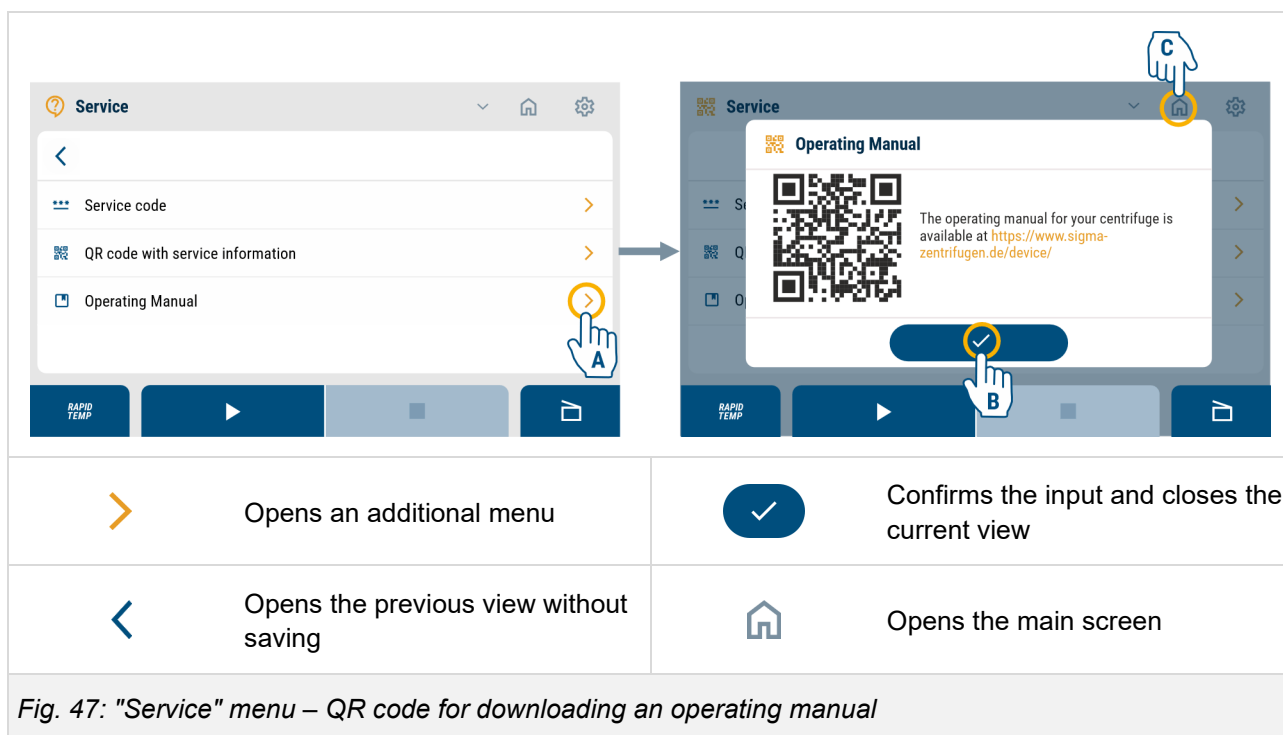
6.5.10.5 Service

-  This menu can be used to retrieve various types of service information.

Retrieving information (here: operating manual):

- The user interface shows the "Settings" menu.
 1. Select the *Next* button to open the "Service" menu.
 2. Select the *Next* button (A) to open the "Operating manual" menu.
 - A dialog box with a QR code for downloading the operating manual will be displayed.
 3. Scan the QR code with a mobile device.
 4. Confirm (B) to close the dialog box.
 5. Select the *Home* button (C).
 - The main screen will be displayed.

Operation



*** Service code

This menu opens a keypad for entering a service code for maintenance and repairs



Only authorised specialist personnel are authorised to enter service codes.



QR code with service information

This menu generates a QR code to access all of the relevant service information in the event of errors or problems. When the QR code is scanned by way of the camera of a mobile phone, the centrifuge data and a list of errors will be copied into an e-mail so that they can be sent to a certified service partner (www.sigma-zentrifugen.de/de/vertriebspartner).



Operating manual

This menu generates a QR code for downloading an operating manual (www.sigma-zentrifugen.de/device).

6.5.10.6 Cycles

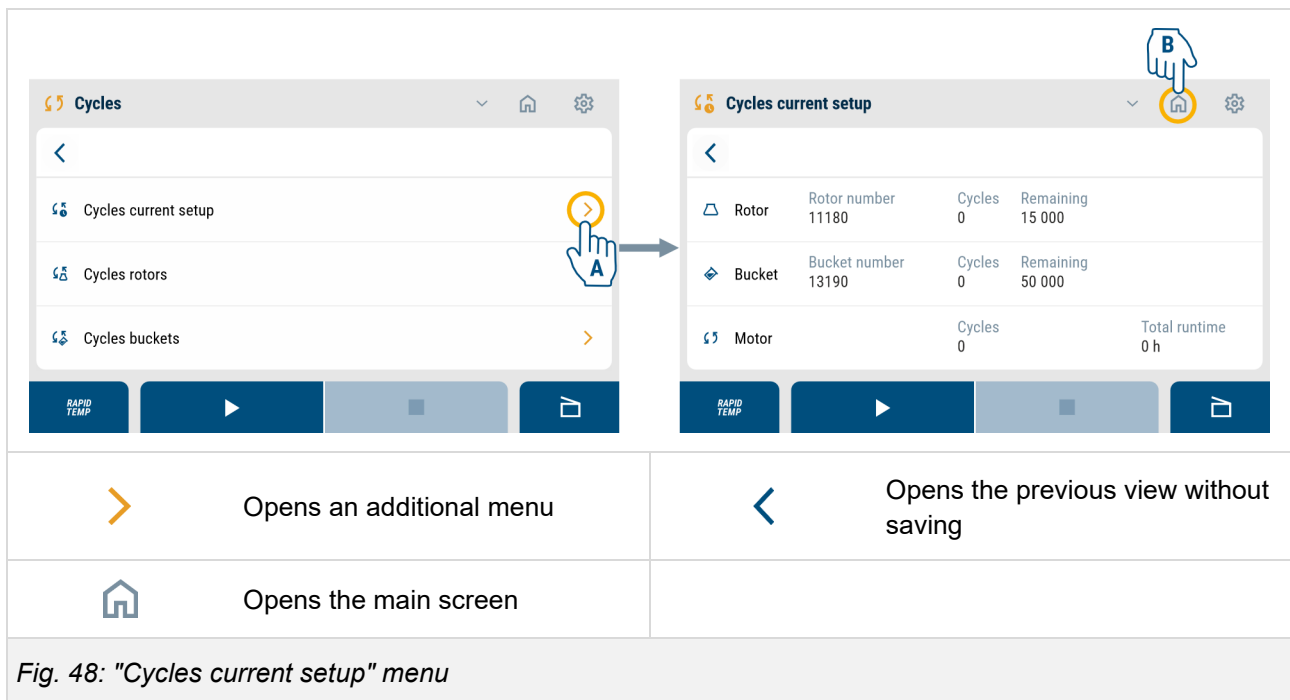
 This menu provides an overview of the cycle data.

Retrieving an overview (here: cycles current setup)

► The user interface shows the "Settings" menu.

1. Select the *Next* button to open the "Cycles" menu.
2. Select the *Next* button (A) to open the "Cycles current setup" menu.
 - An overview of the cycle data of the current setup will be displayed.
3. Select the *Home* button (B).

- The main screen will be displayed.



 The information engraved on the rotor or bucket regarding the service life is binding. The information provided by the control system is for informational purposes only and, thereby, non-binding.

Cycles current setup

This menu shows the rotor and bucket number as well the completed and remaining cycles of the current rotor and buckets. In addition, the number of cycles and the total runtime of the motor are displayed.

Rotor cycles

This menu shows the completed and remaining cycles for all the rotors that are used.

Operation



Bucket cycles

This menu shows the completed and remaining cycles for all the buckets that are used.

6.5.10.7 Quality Control



When the *Quality control* function is active, the runtime, speed and temperature will be continuously checked during the centrifugation.

The QC data can be exported into a USB stick for external evaluation (see chapter 6.5.11.2 - "Exporting QC data").

Opening the "Quality control" overview

► The user interface shows the "Settings" menu.

1. Select the *Next* button to open the "Quality Control" menu.
 - An overview of the overall status of the last centrifugation run will be displayed.
2. Select the *Home* button (B).
 - The main screen will be displayed.

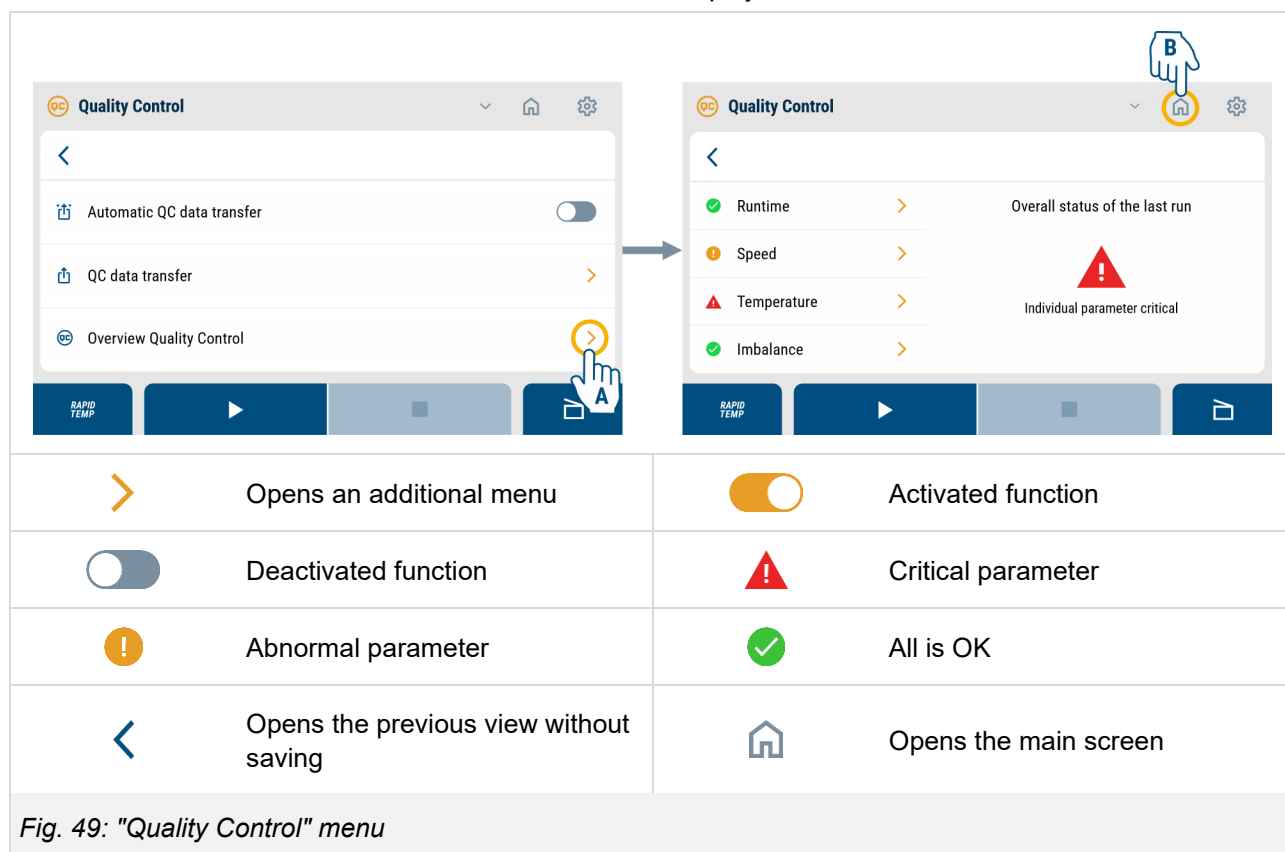


Fig. 49: "Quality Control" menu



Automatic QC data transfer

For the automatic transfer of the QC data, a USB stick must have been plugged in and detected by the system. The *Toggle* button can be used to activate the automatic transfer so that the QC data will be automatically transferred to the USB

stick after every completed centrifugation run. In the factory settings, this function is deactivated.

QC data transfer

This menu can be used to transfer the QC data to a USB stick. When the submenu is opened, a list of all of the available QC data will be displayed. The user can then select specific data for the transfer.

Quality control overview

Runtime and speed

The *Quality control* function is activated jointly for the runtime and speed. The RCF value will be calculated based on the speed value.

- The runtime will be considered faulty if the centrifugation run is stopped prematurely, e.g. by way of the *Stop* button.
- The speed will be considered faulty if the set speed is not reached or if the speed deviates from the set value by $\pm 50 \text{ min}^{-1}$.

Temperature

The *Quality control* function must be activated separately for the temperature parameter. Values between $\pm 2^\circ\text{C}$ and $\pm 8^\circ\text{C}$ can be set for the permissible temperature deviation.

If the current value is outside of the permissible temperature deviation range, an error message will be displayed.

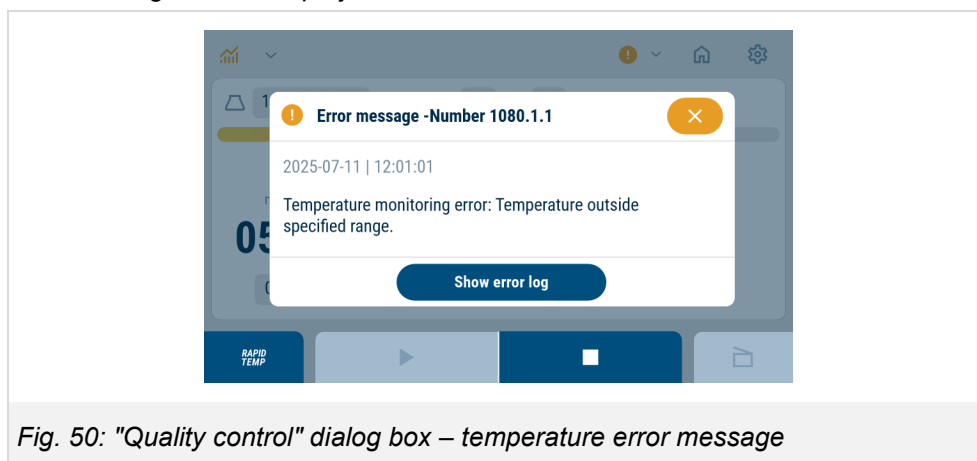


Fig. 50: "Quality control" dialog box – temperature error message

6.5.11 Data transfer

If a USB stick is plugged into the USB port of the control panel and the system detects the USB stick, the USB symbol will be displayed on the status bar.

The following transactions are possible:

- Export and import of programs (see chapter 6.5.11.1 - "Exporting and importing programs")
- Export of QC data for external evaluation (see chapter 6.5.11.2 - "Exporting QC data")

6.5.11.1 Exporting and importing programs



Saved programs can be exchanged between centrifuges with a Spincontrol T control system:

- During the transfer from a refrigerated centrifuge (KT) to a non-refrigerated centrifuge (T), the temperature values will not be transferred.
- During the transfer from a non-refrigerated centrifuge (T) to a refrigerated centrifuge (KT), a temperature of 20°C will be automatically added to the programs. This value must be adapted manually.

For the program import, the centrifuge must be at a standstill.

Procedure (here: program export):

- ▶ A USB stick has been plugged in and detected by the unit.
- ▶ The status menu is open.
- 1. Select the *Next* button (A) to access the USB stick.
- 2. Select the *Drop-down* button (B) to open the drop-down menu for selecting a program export or import.
- 3. Select "Export programs" (C).
 - A list of the available programs will be displayed.
- 4. Select the programs for the export (D).
- 5. Select the *Data transfer* button (E).

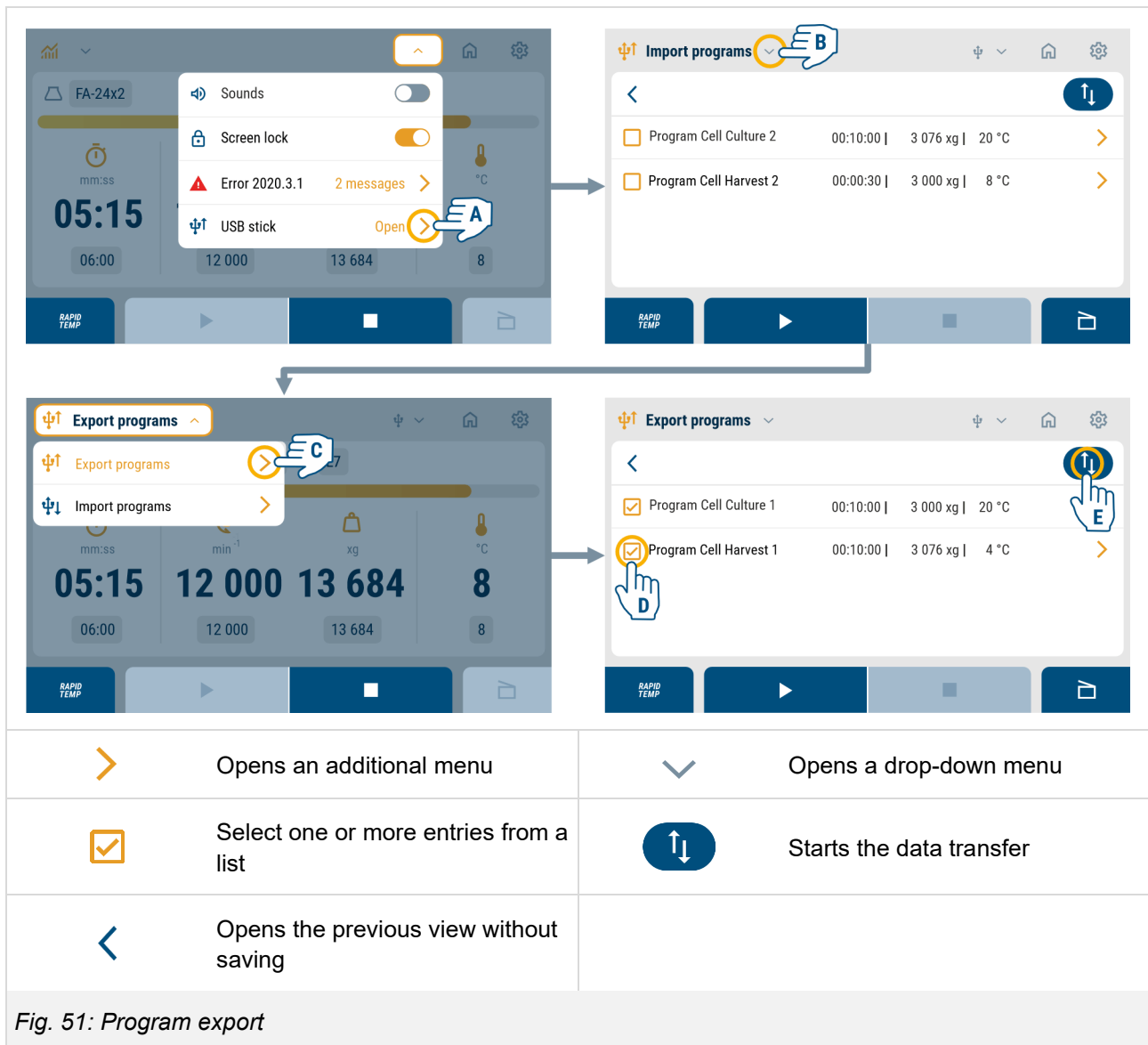


Fig. 51: Program export

- A dialog box will be displayed.
- 6. Select the *Start transfer* button.
- The data will be transferred.

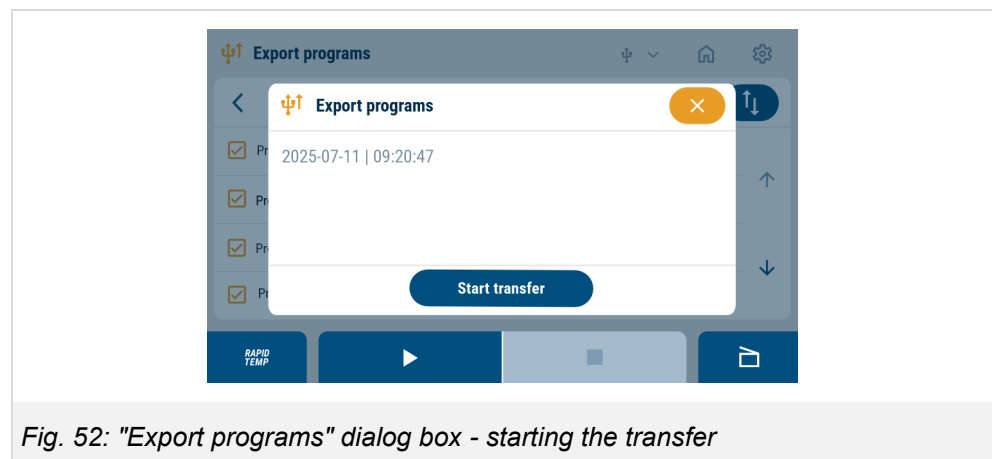


Fig. 52: "Export programs" dialog box - starting the transfer

Operation

- Following the completion of the data transfer, an additional dialog box will be displayed.

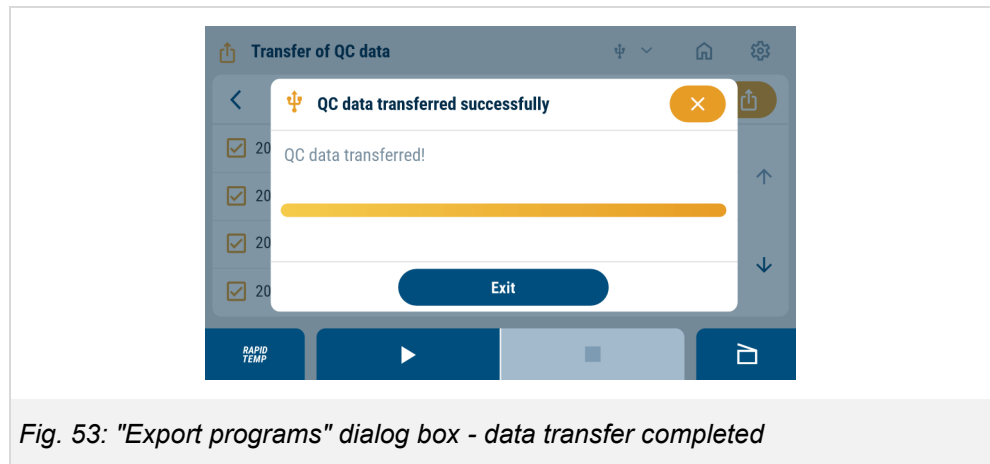


Fig. 53: "Export programs" dialog box - data transfer completed

7. Select the *Exit* button to exit the data transfer.
8. Unplug the USB stick from the unit.
 - The USB symbol disappears from the status bar.

6.5.11.2 Exporting QC data

-  Saved QC data can be exported for external evaluation.
- ▶ A USB stick has been plugged in and detected by the unit.
 - ▶ The user interface shows the main screen.
 - 1. Select the *Settings* button (A) to open the menu.
 - 2. Select the *Next* button (B) to open the "Quality control" menu.
 - 3. Select the *Next* button (C) to open the "QC data transfer" menu.
 - A list of the available data sets will be displayed.
 - 4. Select the QC data for the export (D).
 - 5. Select the *Data export* button (E).
 - The data will be transferred.

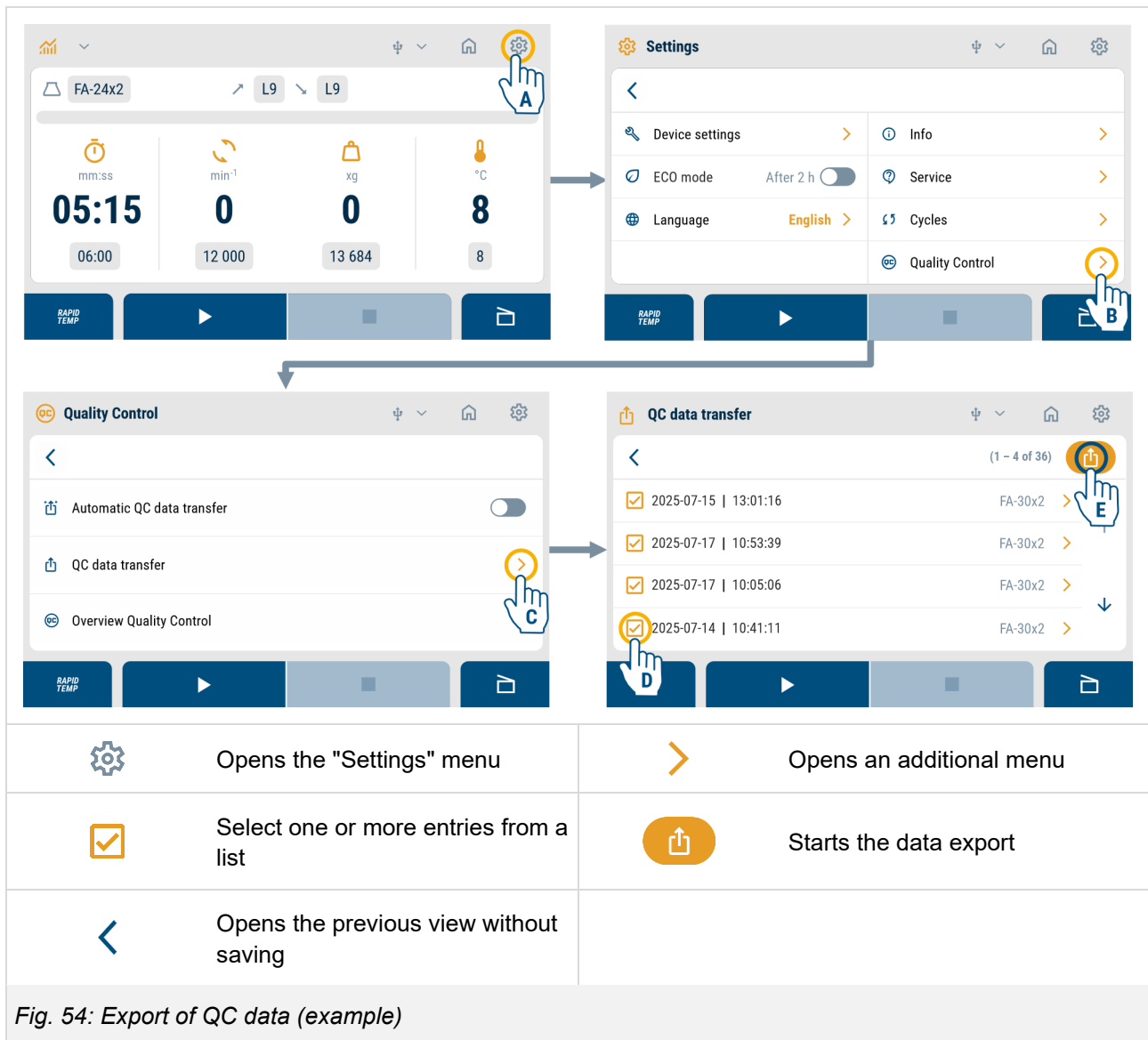


Fig. 54: Export of QC data (example)

- Following the completion of the data export, a dialog box will be displayed.

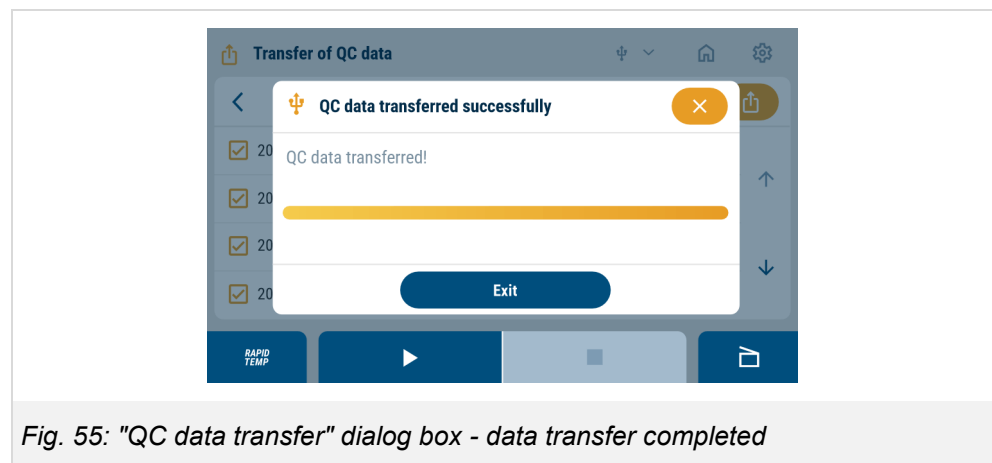


Fig. 55: "QC data transfer" dialog box - data transfer completed

6. Select the *Exit* button to exit the data export.
7. Unplug the USB stick from the unit.
 - The USB symbol disappears from the status bar.

7 Maintenance

7.1 Safety



DANGER

Risk of injury from electric shock or sharp-edged components when removing the housing panels

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

- Maintenance tasks requiring the removal of the housing panels must only be carried out by authorised specialists.
- After the completion of maintenance tasks that involved the removal of the housing panels, a final standard-compliant check must be carried out by a qualified electrician.



WARNING

Risk of toxic, pathogenic or radioactive contamination

Toxic, pathogenic or radioactive substances can cause contamination if they are not handled properly.

It may be necessary to clean and/or decontaminate the laboratory centrifuge, rotors and accessories for reasons of safety before they can be maintained, repaired or handed over.

- Disinfect and clean the centrifuge, rotors, buckets, carriers and accessories after a contamination.
- Comply with the relevant safety instructions concerning the handling of toxic, pathogenic or radioactive substances.
- Wear personal protective equipment.
- Document any measures taken (see chapter 8.5 - "Returning the centrifuge to the manufacturer" / Declaration of decontamination)

7.2 General notes

The centrifuge and its accessories are subject to high mechanical stress. In order to withstand the continuous, extreme levels of stress within their area of application with high centrifugal force, the products are manufactured with the highest levels of precision. The service life of the centrifuge depends on its cleaning, maintenance, correct storage, frequency of use and other specific conditions of use. Diligent care and maintenance by the user will extend the service life of the products and prevent premature wear.

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 7.5 - "Autoclaving").

Protect the centrifuge and its accessories from intensive UV radiation (e.g. direct exposure to sunlight) and thermal stress (e.g. caused by heat generators).

Frequency of the required activities

Chapter	Activity	Frequency
	Cleaning	
chapter 7.3.1	Cleaning of the centrifuge	As required
chapter 7.3.2	Cleaning of the rotors and buckets	As required
chapter 7.3.3	Cleaning of the adapters and carriers	As required
	Disinfection	
chapter 7.4.1	Disinfection of the centrifuge	As required
chapter 7.4.2	Disinfection of the rotors and buckets	As required
chapter 7.4.3	Disinfection of the adapters and carriers	As required
	Maintenance	
chapter 7.6.1	Inspection of the centrifuge for signs of damage	Monthly
chapter 7.6.1	Greasing of the motor shaft	After cleaning
chapter 7.6.1.1	Check of the condenser for soiling	Monthly
chapter 7.6.1.1	Cleaning of the condenser	As required
chapter 7.6.2	Check of the rotors, buckets, adapters and carriers for signs of damage	Monthly
chapter 7.6.2	Greasing of the rotor tie-down screw	After cleaning
chapter 7.6.2	Greasing of the load-bearing bolts	As required/ after cleaning

Table 4: Table of the required activities and their frequency



If corrosion or other damage occurs due to lack of care, the manufacturer cannot be held liable and no warranty claims can be made.

7.3 Cleaning tasks

For cleaning the centrifuge and its accessories:

- Use soapy water or other water-soluble, mild cleaning agents with a pH value between 6 and 8.
- 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.

7.3.1 Cleaning the centrifuge

- ▶ The centrifuge is switched off and disconnected from the power supply.
 - ▶ The lid is open.
1. Remove the rotor and buckets (see chapter 6.4.3 - "Removing the rotor and accessories").
 2. Clean the housing and the rotor chamber with the specified cleaning agents and a soft, lint-free cloth.
 3. Remove any cleaning agent residues completely with water and a soft, lint-free cloth.
 4. After cleaning, dry the surfaces with a soft, lint-free and absorbent cloth.
 - The centrifuge has been cleaned.

7.3.2 Cleaning the rotors and buckets

- ▶ The rotors and buckets are located outside of the centrifuge.
 - ▶ The covers have been removed from the rotors.
 - ▶ Any existing carriers or adapters have been removed.
1. Remove the seals of the caps/covers, rotors or buckets from the groove with the aid of the seal removal tool (ref. no. 170360).
 2. Remove any old grease and deposits from the load-bearing bolts of the swing-out rotors and from the grooves of the buckets.

ATTENTION – Rotors and buckets with an anodised coating must never be cleaned in a dishwasher. The dishwasher will remove the anodised coating of the rotors and buckets, thereby leading to cracks in areas under stress.

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

ATTENTION – The chemical resistance of rotors, buckets and carriers made of plastic decreases at higher temperatures (e.g. during drying). See the table in chapter 11.6 - "Table of chemical resistance data".

7.3.3 Cleaning the adapters and carriers

- ▶ The adapters and carriers have been removed from the rotor or bucket.
- 1. Clean the adapters and carriers 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 complete 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.
 - The adapters and carriers have been cleaned.

ATTENTION – Adapters and carriers with an anodised coating must never be cleaned in a dishwasher. The dishwasher will remove the anodised coating of the adapters and carriers, thereby leading to cracks in areas under stress.

7.4 Disinfection

-  Prior to a disinfection, the cleaning steps described in chapter 7.3 - "Cleaning tasks" must be performed.

7.4.1 Disinfecting 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. Bacillo® 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. Bacillo® 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.
-
- ▶ The centrifuge is off and disconnected from the power supply.
 - ▶ The lid is open.
 - ▶ There is no rotor inside the rotor chamber.
 - ▶ The centrifuge has been cleaned as described in chapter 7.3.1 - "Cleaning the centrifuge".
1. Wipe down the housing and rotor chamber with the above-mentioned disinfectant and a soft, lint-free cloth.
 2. Comply with the specified application time.
 3. Let the disinfected surfaces dry completely.
 - The centrifuge has been disinfected.

7.4.2 Disinfecting the rotors and buckets

- To disinfect the rotors, buckets and their seals, 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.
- The rotors and buckets have been cleaned as described in chapter 7.3.2 - "Cleaning the rotors and buckets".
1. Wipe down the rotor, buckets and their seals 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 rotors, buckets and seals dry completely.
 - The rotors and buckets have been disinfected.

7.4.3 Disinfecting the adapters and carriers

- To disinfect the adapters and carriers, 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.
- The adapters and carriers have been cleaned as described in chapter 7.3.3 - "Cleaning the adapters and carriers".
1. Wipe down the adapters and carriers 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 and carriers dry completely.
 - The adapters and carriers have been disinfected.

7.5 Autoclaving

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

- ▶ The caps have been removed from the vessels in order to prevent the vessels from being deformed.
 - ▶ The seals have been removed from the caps/covers and buckets.
1. Position the accessories in the autoclave and run an autoclave cycle.
 2. After each sterilisation, check the accessories for colour changes, structural changes or leaks and replace the affected parts immediately if any signs are detected.
 3. After the autoclave run, reinstall the seals of the caps/covers and buckets (see chapter 7.3.2 - "Cleaning the rotors and buckets").

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

Category	Name	Material abbreviation	121°C 20 minutes	Notes
Rotors and covers	Aluminium rotors	AL	yes	
	Polypropylene rotors	PP	no	
	Aluminium covers (without seals) for angle rotors	AL	yes	50 cycles max.
	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 (without seals)	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	Seals of the aluminium covers and buckets	NBR	yes	50 cycles max.
	Stainless steel taring weights for blood bag systems	--	yes	

Table 5: Autoclaving table

7.6 Maintenance tasks

7.6.1 Maintaining the centrifuge

The service life of the centrifuge depends on several factors, e.g. the type and frequency of use, the area of application and the performance of care, service and maintenance tasks.

- ▶ The centrifuge is off and disconnected from the power supply.
- ▶ There is no rotor inside the rotor chamber.

Post-centrifugation measures

- In the event of a contamination with toxic, pathogenic or radioactive substances, clean all of the internal surfaces immediately with a suitable decontamination agent depending on the type of contamination (see chapter 7.3 - "Cleaning tasks" and chapter 7.4 - "Disinfection").
- Liquids, such as water, solvents, acids and lyes, must be removed from the rotor chamber immediately using a cloth in order to prevent damage to the motor bearings.

Post-cleaning measures

- Grease the motor shaft and 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.
- Rub talcum powder into the dry lid seal, if necessary.

Visual inspection

- 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
- Open the centrifuge lid completely and ensure that it remains in this position.

7.6.1.1 Cleaning the condenser

Refrigerated centrifuges with an air-cooled refrigeration system use a finned condenser to cool the refrigerant that is compressed by the refrigeration unit.

Dust and dirt on the condenser's ventilation opening impede cooling by the air flow and reduce the heat transfer, thereby compromising the performance of the refrigeration system.

- Check the condenser at least monthly for soiling and clean it whenever necessary.
- In case of dirt build-up on the condenser fins and tubes, contact the Sigma Service (see chapter 8.4 - "Service contact").

7.6.1.2 Removing broken glass



CAUTION

Risk of injury from broken glass

Broken glass in the rotor chamber can cause cuts.

- Broken glass must be removed immediately and completely.
 - Wear personal protective equipment when removing the broken glass.
-

Potential problems caused by broken glass in the rotor chamber

- Broken glass damages the surface coating of the buckets, thereby causing corrosion.
- Broken glass in the adapters of the rotors and buckets causes more glass breakage.
- Broken glass in the swivel bearings of the load-bearing bolts prevents the buckets from swinging out evenly, thereby causing imbalance.
- Broken glass in the rotor chamber causes metallic abrasion due to the strong air circulation. The fine metal dust contaminates the rotor chamber, rotor and samples. At the same time, it also damages the surfaces of the rotor chamber, rotor, buckets, adapters, carriers and accessories.

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. Switch the centrifuge on and let the rotor rotate for a few minutes at medium speed (approx. 2,000 min⁻¹). The broken glass and metal dust will be bound in the grease.
3. Remove the grease with a cloth.
4. Repeat this process until all the broken glass and metal dust has been removed.

7.6.2 Maintaining the rotors, buckets, adapters and carriers

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.

In the case of plastic materials, the resistance against chemicals decreases when the temperature increases (see the table in the chapter chapter 7.3.2 - "Cleaning the rotors and buckets").

Post-centrifugation measures

- Liquids, such as water, solvents, acids and lyes, must be removed immediately and completely from the rotor, buckets, adapters, carriers and plastic accessories with a cloth.

Post-cleaning measures

- 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.
- Grease the bayonet lock in the cover of an angle rotor (see chapter 7.6.2.3 - "Maintaining the bayonet lock").
- When using aluminium buckets, slightly grease the load-bearing bolts of the rotors with a thin layer of grease for load-bearing bolts (see chapter 7.6.2.2 - "Maintaining the load-bearing bolts").

CAUTION – The load-bearing bolts must not be greased if plastic buckets are used.

-  For rotors with a Sigma Comfort coating, it is not necessary to grease the load-bearing bolts until the coating wears off.

Visual inspection

- The products 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 the rotors, buckets, adapters and carriers.
- Damaged parts must be replaced immediately for your own safety.

Service life

Rotors and buckets have a limited service life.

- The rotors and buckets must be put out of service after 10 years. Any use after this period may be permissible in individual cases after an inspection is performed by the manufacturer.
- For safety reasons, rotors must be scrapped after a maximum of 50,000 cycles.

- Aluminium covers of Biosafe angle-rotors must be replaced after 3 years or 50 autoclaving cycles to guarantee the required tightness.
- If different information regarding the service life is engraved on a rotor or bucket, this information applies accordingly:
 - A bucket with the engraving "max. cycles = 10,000" has a maximum service life of 10,000 cycles.
 - A bucket with the engraving "Exp. date 01/27" must be scrapped by January 2027 at the latest.
- If a specification concerning the maximum number of cycles and a specification concerning the service life (i.e. a specific date) are provided, the specification that occurs first shall apply.

i The information engraved on the rotor or bucket regarding the service life is binding. The information provided by the control system is for informational purposes only and, thereby, non-binding.

Disposal of wear parts

When replacing wear parts, e.g. a cover or bucket seal, contamination of the material must be assumed.

1. Dispose of all wear parts in compliance with the special provisions of the waste disposal regulations.

7.6.2.1 Rotors with a Sigma Comfort rotor coating

Marking

All swing-out rotors with a Sigma Comfort coating have a "C" shown after their number. These rotors do not need to be greased during the service life of the coating.

i Rotors with a Sigma Comfort rotor coating must not be used in combination with buckets or carriers with a cleanroom coating.



Fig. 56: Marking of a rotor with a Comfort coating (example)

- 1 Marking indicating the Sigma Comfort coating
- 2 Load-bearing bolt



A list of the available rotors with a Sigma Comfort coating as well as information about the service life of the coating can be found in the "Sigma Comfort rotor coating" document that comes supplied with every rotor which has a Comfort coating.

Service life

The service life of the coating varies and depends on the degree of utilisation of the rotor. Tests have shown a service life of 7,000 to 40,000 cycles. The service life of the Sigma Comfort rotor coating can be increased by way of these specific measures:

The following factors have an influence on the service life:

- **Speed/load:**
The service life of the coating can be increased by a factor of 3.5 if the speed or load is decreased by approximately 15%. In case of a load decrease by 20%, the service life increases approximately by a factor of 5.5.
- **Temperature:**
The service life of the coating decreases by approximately 30% at lower temperatures (approximately +4°C) compared to room temperature (approximately +20°C).
- **Use of buckets:**
The buckets and rotor form a joint unit. For the coating to reach the maximum possible service life, ensure to always use the same set of buckets and to always install the individual buckets in their specific position within the rotor.
- **Cleaning frequency:**
Regular cleaning of the rotors is indispensable. The more frequently a rotor needs to be cleaned, the shorter the service life of the coating will be.



Traces of use on the black coating do not affect the anti-friction properties.



Fig. 57: Load-bearing bolt with traces of use – no greasing required

End of the service life of the Sigma Comfort rotor coating

When the coating has worn off nearly completely and the metallic surface of the load-bearing bolt becomes visible (see the following illustration), the anti-friction effect decreases. As a result, the buckets will swing out irregularly, thereby potentially causing the centrifuge to stop due to an imbalance.

From this moment on, the rotor must be used with greased load-bearing bolts until it reaches the end of its service life.

Mark the rotor accordingly to prevent it from being used without grease on the load-bearing bolts.

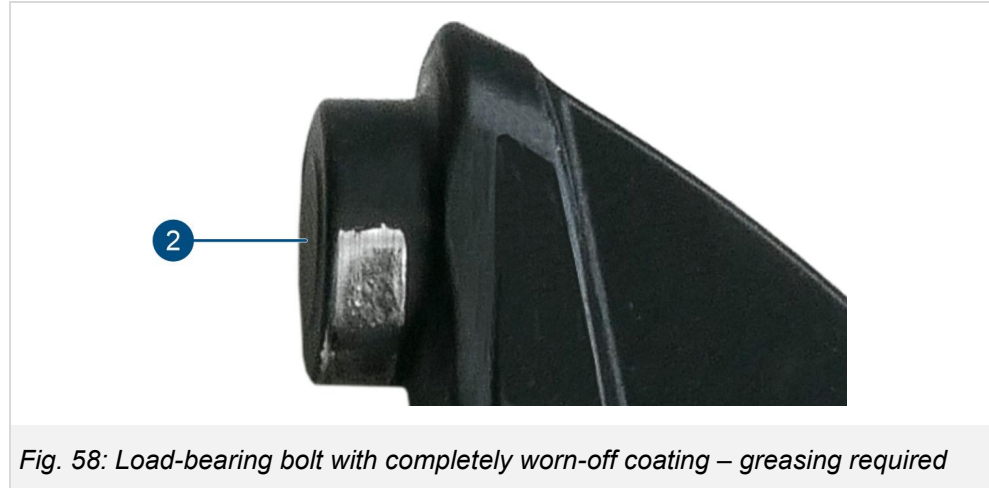


Fig. 58: Load-bearing bolt with completely worn-off coating – greasing required

7.6.2.2 Maintaining the load-bearing bolts

Rotors with Sigma Comfort coating

The load-bearing bolts of some types of swing-out rotors have an anti-friction coating. This coating prevents friction between the buckets and bolts.

-  The bolts do not require any greasing during the service life of the Sigma Comfort rotor coating.

All swing-out rotors with a Sigma Comfort coating have a "C" shown after their number.

-  A list of the available rotors with a Sigma Comfort coating as well as information about the service life of the coating can be found in the "Sigma Comfort rotor coating" document that comes supplied with every rotor which has a Comfort coating.

Rotors without Sigma Comfort coating

The load-bearing bolts of rotors that do not (or no longer) have anti-friction coating must be greased. This is the only way to ensure a uniform swing-out motion of the buckets and, therefore, the smooth operation of the centrifuge. Load-bearing bolts that are insufficiently greased may cause the centrifuge to stop due to an imbalance.

1. Clean the load-bearing bolts and bucket groove in order to remove the old grease.
2. Apply a small amount of grease for load-bearing bolts to each of the load-bearing bolts of the rotor cross (see the following illustration).



Fig. 59: Applying the grease for load-bearing bolts

1 Sufficient quantity of grease for one bolt

3. Install a bucket and swing it manually back to its swing-out position in order to distribute the grease.
4. Repeat this process with all the other buckets.

7.6.2.3 Maintaining the bayonet lock

Greasing the groove of the bayonet lock

The bayonet lock of the cover of an angle rotor must be greased after every cleaning process to ensure the smooth operation of the lock.

- ▶ The cover has been cleaned as described in chapter 7.3.2 - "Cleaning the rotors and buckets".
 - ▶ The cover has been disinfected as described in chapter 7.4.2 - "Disinfecting the rotors and buckets".
1. Place the cover upside down on a worktop.
 2. Apply a small amount of heavy-duty grease for load-bearing bolts (included in the scope of supply) to the groove of the cover screw (see the following illustration), e.g. by way of a cotton bud.

CAUTION – When greasing the groove, ensure that no grease reaches the seal. The area of the bioseal must be absolutely dry and free from grease.

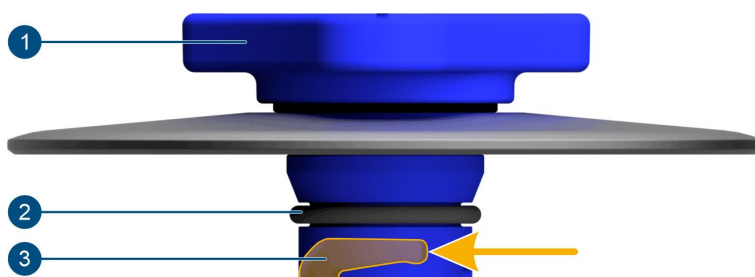


Fig. 60: Cover of an angle rotor with a bayonet lock (example)

- 1 Cover screw
- 2 Seal
- 3 Groove

Adjusting the cover of an angle rotor

- The cover of an angle rotor is difficult to open and close.
- The rotor with cover is located outside of the centrifuge.
- 1. Lay the rotor with its cover down on a firm surface.
- 2. Place both hands (one above the other) on the cover screw and press down from above with your own bodyweight.
 - As a result, the cover can then be opened and closed easily.

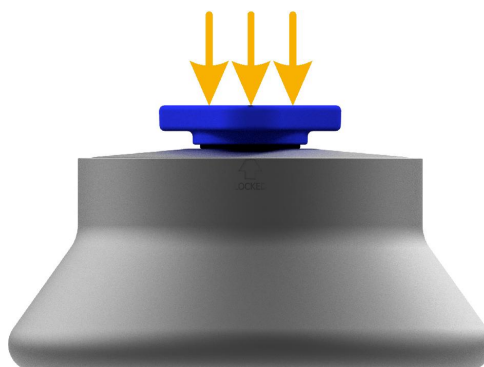


Fig. 61: Measure to be taken when the cover is difficult to open or close.

7.7 Inspection to be performed by the manufacturer

Due to high mechanical stress, wear may occur on the components of the centrifuge in a way that is not 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 FBRCI-025 (November 2023) of the German Berufsgenossenschaft Rohstoffe und chemische Industrie (BG RCI):

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

We recommend the following:

- The motor damping 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.

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.

Maintenance contract

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

Scan QR code

If you have any questions about this topic, kindly contact our service department:



8 Troubleshooting

8.1 Safety



DANGER

Risk of injury from electric shock or sharp-edged components when removing the housing panels

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

- Maintenance tasks requiring the removal of the housing panels must only be carried out by authorised specialists.
- After the completion of maintenance tasks that involved the removal of the housing panels, a final standard-compliant check must be carried out by a qualified electrician.



WARNING

Risk of toxic, pathogenic or radioactive contamination

Toxic, pathogenic or radioactive substances can cause contamination if they are not handled properly.

It may be necessary to clean and/or decontaminate the laboratory centrifuge, rotors and accessories for reasons of safety before they can be maintained, repaired or handed over.

- Disinfect and clean the centrifuge, rotors, buckets, carriers and accessories after a contamination.
- Comply with the relevant safety instructions concerning the handling of toxic, pathogenic or radioactive substances.
- Wear personal protective equipment.
- Document any measures taken (see chapter 8.5 - "Returning the centrifuge to the manufacturer" / Declaration of decontamination)

8.2 Identifying and eliminating faults and malfunctions

When a fault occurs, a dialogue box opens. If audible signals are activated, they sound at the same time as when the error or warning message is displayed.

Every fault is listed in the error log together with the error number and a time stamp. The error log shows the last 200 entries.

Eliminating a fault

► A dialogue box showing an error or warning message is displayed.

1. Eliminate the source of the error (see chapter 8.2.1 - "Table of possible faults" and chapter 8.2.2 - "Table of error messages").
2. Close the dialogue box or open the error log.



If an error message is acknowledged although the source of the error has not been eliminated, the dialogue box will be closed. The error message will not be cleared, but the centrifuge can be used.

3. Contact the service department if the recommended measures are not successful.

Troubleshooting

Opening the error log

The error log can be opened from the status bar via a drop-down menu.

► The status bar displays an error or warning.

1. Open the drop-down menu from the status bar.
2. Select the "Error" menu.
 - The error log will be displayed.

8.2.1 Table of possible faults

Error type	Possible cause	Measures
The display remains dark.	Mains power failure	• Check the on-site fuse.
	The mains power connector is not connected.	• Connect the mains power connector.
	The fuses have tripped.	• Switch the centrifuge off. • Let it cool down for approx. 2 minutes. • Switch the centrifuge back on.
	The mains power switch is switched off.	• Switch the centrifuge on.
The centrifuge cannot be started: The "Start" button is inactive.	Miscellaneous	• Switch the centrifuge off and back on. If the error occurs again, contact the Sigma service department.
	The lid lock has not closed properly.	• Open and close the lid. If the error occurs again, contact the Sigma service department.
The centrifuge decelerates during a centrifugation run.	Brief mains power failure	• Select the <i>Start</i> button to restart the centrifugation run.
	System error	• Switch the centrifuge off and back on. If the error occurs again, contact the Sigma service department.
The centrifuge decelerates during a centrifugation run and an imbalance message is displayed.	Uneven distribution of the load	• Eliminate the imbalance and restart the centrifuge. If the error occurs again, contact the Sigma service department.
	The centrifuge is tilted.	
	Malfunction of the drive	
	The centrifuge has been moved during a centrifugation run.	
The centrifuge decelerates during a centrifugation run and a temperature error is displayed.	Unsuitable location	• Adapt the conditions at the location of use or change the location (see chapter 5.1 - "Setting up the centrifuge"). If the error occurs again, contact the Sigma service department.

Error type	Possible cause	Measures
	Soiled condenser	Clean the condenser. If the error occurs again, contact the Sigma service department.
	Insufficient refrigerant supply	Contact the Sigma service department.
The lid cannot be opened.	The lid locks have not unlocked properly.	Unlock the lid manually and contact the Sigma service department.
	The lid seal is sticky.	Clean the lid seal and apply some talcum powder.
Insufficient sedimentation of the product	Insufficient fastening of the rotor	Fasten the rotor correctly and restart the centrifugation.
	Defective sensor	Contact the Sigma service department.
The error message "Inspection by the manufacturer is recommended" is displayed.	Maintenance interval reached or exceeded	Contact the Sigma service department.

Table 6: Table of possible faults

8.2.2 Table of error messages

The error code displayed consists of the error group code and two additional digits to further categorise the error for authorised service personnel. An imbalance error, for example, is indicated by way of the error code 48.1.4.

Error type	Error group	Measures
Software problems	1	- Let the rotor coast down. - Switch the centrifuge off and back on. - If the error occurs again: Contact the Sigma service department.
	2	
Hardware problems	3	- Switch the centrifuge off and back on. - If the error occurs again: Contact the Sigma service department.
Speed sensor error	10	- Let the rotor coast down. - Switch the centrifuge off and back on. - If the error occurs again: Contact the Sigma service department.
Power supply error	18	- Check the mains power supply and mains power connector. - Check the fuses.
	19	
Drive control error	20	- Let the rotor coast down. - Switch the centrifuge off. - Ensure sufficient ventilation.
Inverter error	22	- Switch the centrifuge off and back on. - If the error occurs again: Contact the Sigma service department.

Troubleshooting

Error type	Error group	Measures
Faulty input signal	30	- Switch the centrifuge off and back on. - If the error occurs again: Contact the Sigma service department.
Data storage error	33	- Let the rotor coast down. - Switch the centrifuge off and back on.
Temperature error	40 41 43 44 46 47 48	- Let the rotor coast down. - Switch the centrifuge off. - Let the centrifuge cool down. - Air-cooled centrifuges: Ensure better ventilation. - Water-cooled centrifuges: Ensure a sufficient water flow rate.
Imbalance error	48	- Let the rotor coast down. - Switch the centrifuge off. - Eliminate the imbalance.
Lid error	50 51 52	- Select the "Lid" button. - Check whether there are any foreign objects in the opening for the lid hook. - Close the lid.
Error of the refrigeration system	53 54	Contact the Sigma service department.
Communication error	71 72 73	- Let the rotor coast down. - Switch the centrifuge off and back on.
Rotor error	80	- Check the rotor. - Check the rotor cycles.

Table 7: Table of error messages

8.3 Opening the lid manually (emergency lid release)



WARNING

Risk of injury due to a spinning rotor

If the emergency lid release is activated during a centrifugation run, the centrifuge will be switched off and then the rotor freely coasts to a standstill. There is a risk of injury due to the spinning rotor when reaching into the rotor chamber.

- Do not activate the emergency lid release until the rotor has come to a standstill.

In the event of a power supply failure, the centrifuge lid can be opened manually in order to withdraw the samples.

► The centrifuge is off and disconnected from the mains voltage.

1. Look through the window in the lid to verify that the rotor has come to a complete standstill.
2. Prise the plug out of the front (see the following illustration, item 1), e.g. by way of a screwdriver.



Fig. 62: Position of the opening for the emergency lid release

1 Plug

3. Push the supplied hexagon key horizontally into the opening as far as it will go.
4. Unlock the motorised lid lock by turning the hexagon key anticlockwise.
5. Remove the key and seal the opening with the plug.
6. Reconnect the mains power connector.
7. Switch the centrifuge back on and acknowledge the error message.

8.4 Service contact

In Germany

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

Outside of Germany

The contact data of our international sales and service partners can be found at
www.sigma-zentrifugen.de → [Sales Partners]

Scan QR code

If you have any questions about this topic, kindly contact our service department:



8.5 Returning the centrifuge to the manufacturer

Complete and comprehensive information concerning the matter is required in order to ensure that all returns of centrifuges, rotors, buckets, adapters, carriers, accessories or spare parts are processed quickly and efficiently.

The necessary forms can be downloaded at
www.sigma-zentrifugen.de → [Service] → [Overhaul and repair].

Completion of the declaration of decontamination

Due to the legal regulations for the protection of our employees and the environment, the manufacturer is obliged to document the harmlessness of all incoming goods.

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

 We will return the part/unit at your expense if no declaration of decontamination is provided.

Completion of the return declaration

Product-specific data are required to ensure that the return can be processed without delay.

- Enclose the completed return declaration, including a detailed error description, with the defective part/unit.
- Fill in a separate form for every defective part even if several parts are returned in one package.

 We will return the part/unit at your expense if no error description is provided.

Cost estimate

Upon request, a cost estimate will be prepared prior to performing the repair.

-  If the cost estimate has still not been confirmed after 4 weeks, the part/unit will be returned at the customer's expense.

Pick-up order

Upon request, we will commission a forwarding agent to collect the unit

- Complete the pick-up order and send it to support@sigma-zentrifugen.de

Returning a product

- Package the part/unit safely for transport, and in its original packaging, if possible. The original packaging can be supplied by the manufacturer for a fee.
- Return the product with the completed forms to
Sigma Laborzentrifugen GmbH
Service laboratory centrifuges
An der Unteren Söse 50
37520 Osterode
Germany

-  If the part/unit is sent to the manufacturer in unsuitable packaging, it will be repackaged for return at your expense.

9 Disposal

9.1 Safety

Disposal regulations vary among the member states of the European Union.

- Comply with the national rules and regulations.

9.2 Disposal of the centrifuge



In accordance with the directive 2012/19/EU about waste electrical and electronic equipment (WEEE), Sigma centrifuges are marked with a symbol showing a crossed-out waste bin. It means:

- that the centrifuge was delivered after 13 August 2005.
- that the centrifuge must not be disposed of via the municipal waste system.

Products whose disposal is subject to the WEEE directive must be properly decontaminated and disposed of via a return scheme that ensures their proper collection, treatment, reuse or recycling.

Sigma Laborzentrifugen GmbH will take back appropriately labelled discarded units free of charge and ensure their proper disposal.

- Prior to returning the discarded unit, the operator must ensure that the unit has been decontaminated. A duly completed decontamination declaration must be enclosed (see chapter 8.5 - "Returning the centrifuge to the manufacturer").

9.3 Disposal of the packaging material

- Use the packaging for returning the centrifuge to the manufacturer.

Or:

- Dispose of the packaging separately by material type.

10 Technical data

Product data		
Manufacturer	Sigma Laborzentrifugen GmbH An der Unteren Söse 50 37520 Osterode (Germany)	
Product designation	Laboratory centrifuge	
Product name	Sigma 3-17KT	Sigma 3-17KT IVD
Part numbers:	100025; 100026; 100027; 100048	100028; 100029; 100030; 100049

Table 8: Product data

Connection data	
Power supply	See the name plate
Protection class	I
IP code	20
Power consumption (W)	1 400

Table 9: Connection data

Performance parameters	
Speed	
– Set speed (min ⁻¹)	100 ... 16 400
– Display range (min ⁻¹)	0 ... 99 999
– Resolution (min ⁻¹)	1
– Measuring accuracy (min ⁻¹)	± 30 (at 16 400)
Max. capacity (ml)	1 600
Max. RCF (x g)	25 559
Max. kinetic energy (Nm)	22 218

Table 10: Performance parameters

Other parameters	
Time	
– Set time (m:s) or (h:m)	10 s ... 99 h 59 min, Short run, continuous run
– Display range (m:s) or (h:m)	00:00 ... 99:59
– Resolution (sec)	1
– Measuring accuracy (‰)	± 1
Program storage locations	99

Table 11: Other parameters

Technical data

Physical data

Height (mm)	337
Height with open lid (mm)	755
Width (mm)	460
Depth (mm)	716
Weight without rotor (kg)	80

Table 12: Physical data

Sound pressure level

Noise level (dB(A))	61 at max. speed
---------------------	------------------

Table 13: Sound pressure level

Operating fluids and quantities

Refrigerant	R452A
Global warming potential (GWP)	2 140
Quantity (kg)	0.180
Max. permissible pressure (bar)	27
CO2 equivalent (t)	0.385

Table 14: Operating fluids and quantities

10.1 Ambient conditions

The information applies to an ambient temperature of +23°C and the rated voltage $\pm 10\%$. For a nominal voltage of 100 V or 200 V, tolerances of +10%/-5% apply.

The minimum temperatures are $\leq +4^\circ\text{C}$ and they depend on the rotor type, speed and ambient temperature.

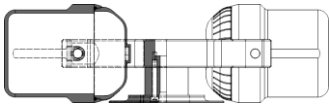
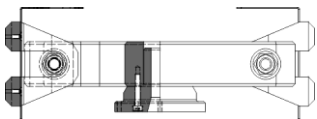
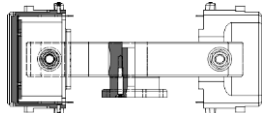
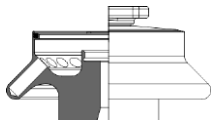
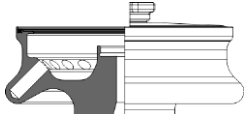
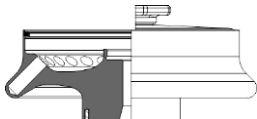
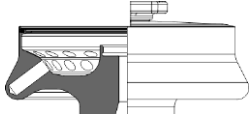
Ambient conditions

Use	Indoor
Altitude above sea level (m)	$\leq 2,000$
Pollution degree	2
Ambient temperature ($^\circ\text{C}$)	+5 ... +32
Humidity (%)	80 at +5°C to 31°C, linearly decreasing to 76.75 at +32°C

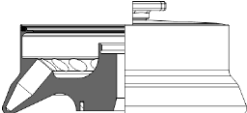
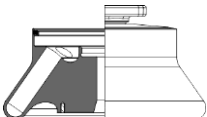
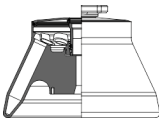
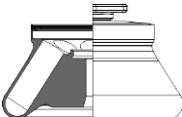
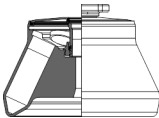
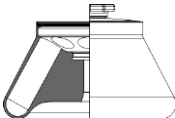
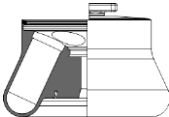
Table 15: Ambient conditions

11 Appendix

11.1 Rotor program

Product	Description	Ref. no.	Max. speed (min ⁻¹)	Max. RCF (x g)	Max. capacity
	SB-4x400 RB400 Swing-out rotor for round buckets (optionally Biosafe with a cap)	11180 / 13190	4,500	3,894	4 x 400 ml
	SP-2x MTP-60 Swing-out rotor, including carriers for microtiter plates	110360 / 130360	4,100	2,387	2 x 60 mm
	SPC-2x MTP-66C55 Swing-out rotor, including carriers for microtiter plates, Biosafe	11241 / 13241	4,500	3,011	2 x 66 mm, incl. cap 2 x 55 mm
	FA-24x2 Angle rotor, Biosafe	120154	16,400	25,559	24 x 2 ml
	FA-24x2 spin column Angle rotor, Biosafe	120324	13,600	20,058	24 x 2 ml spin column
	FA-30x2 Angle rotor, Biosafe	120331	14,700	25,125	30 x 2 ml
	FA-48x2 Angle rotor, Biosafe	120349	15,000	25,155	48 x 2 ml

Appendix

Product	Description	Ref. no.	Max. speed (min ⁻¹)	Max. RCF (x g)	Max. capacity
	FA-20x5-V Angle rotor, Biosafe	120322	13,500	21,191	20 x 5 ml
	FA-10x10-U Angle rotor, Biosafe	120111	16,000	25,186	10 x 10 ml
	FA-12x15-V Angle rotor, Biosafe	120215	12,100	16,205	12 x 15 ml
	FA-8x30-U Angle rotor, Biosafe	120158	15,700	25.353	8 x 30 ml
	FA-6x50-V Angle rotor, Biosafe	120250	12,500	16,421	6 x 50 ml
	FA-8x50-U Angle rotor, Biosafe	120150	11,900	16,149	8 x 50 ml
	FA-6x94-U Angle rotor, Biosafe	120395	12,000	15,777	6 x 94 ml

V = Conical

U = Round bottom

Table 16: Table of available rotors

11.1.1 Spare parts for the rotors and covers

Angle rotor (Biosafe)		Cover	Seal set	Rotor seal	Cover seal	Tool for O-ring removal
Ref. no.	Name	Ref. no.	Ref. no.	Ref. no.	Ref. no.	Ref. no.
120154	FA-24x2	170154	160154	480400	481099	170360
120324	FA-24x2 spin column	170324	160324	480401	481099	170360
120331	FA-30x2	170331	160331	480401	481099	170360
120349	FA-48x2	170349	160349	480401	481099	170360
120322	FA-20x5-V	170322	160322	480401	481099	170360
120111	FA-10x10-U	170111	160111	480400	481099	170360
120215	FA-12x15-V	170215	160215	480400	481099	170360
120158	FA-8x30-U	170158	160158	480400	481099	170360
120250	FA-6x50-V	170250	160250	480400	481099	170360
120150	FA-8x50-U	170150	160150	480400	481099	170360
120395	FA-6x94-U	170395	160395	480402	481099	170360

Table 17: Table indicating the spare parts for the rotors and covers

11.2 Speed, radius and relative centrifugal force (RCF)

The acceleration g that the samples are subjected to can be increased by expanding the radius in the rotor chamber and by increasing the rotational speed. The three parameters are interdependent and linked with one another by the following formula:

$$\text{Relative centrifugal force (RCF)} = 11.18 \times 10^{-6} \times r \times n^2$$

r = radius in cm

n = speed in min^{-1}

RCF is dimensionless

When two values are entered, the third is defined by the specified formula. If the speed or radius is changed thereafter, the resulting relative centrifugal force will be automatically recalculated by the centrifuge control system. If the RCF value is changed, the speed will be adapted accordingly using the specified radius.

11.3 Density

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

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

ρ = density in g/cm^3

11.4 Acceleration and deceleration curves

The curves are numbered in relation to increasing acceleration (from right to left).

With curve 9, the centrifuge accelerates with maximum power. The time required to reach the set speed solely depends on the inertia of the rotor.

The deceleration curves are inverted images of the acceleration curves and are labelled with identical numbers. Curve 0 is an exception. It ensures a free coast-down.

Linear curves

Curve	Type	Gradient
L1	Linear	6 [min ⁻¹ /sec]
L2	Linear	8 [min ⁻¹ /sec]
L3	Linear	17 [min ⁻¹ /sec]
L4	Linear	25 [min ⁻¹ /sec]
L5	Linear	33 [min ⁻¹ /sec]
L6	Linear	50 [min ⁻¹ /sec]
L7	Linear	100 [min ⁻¹ /sec]
L8	Linear	200 [min ⁻¹ /sec]
L9	Linear	1,000 [min ⁻¹ /sec]

Table 18: Table of the gradient of linear acceleration curves

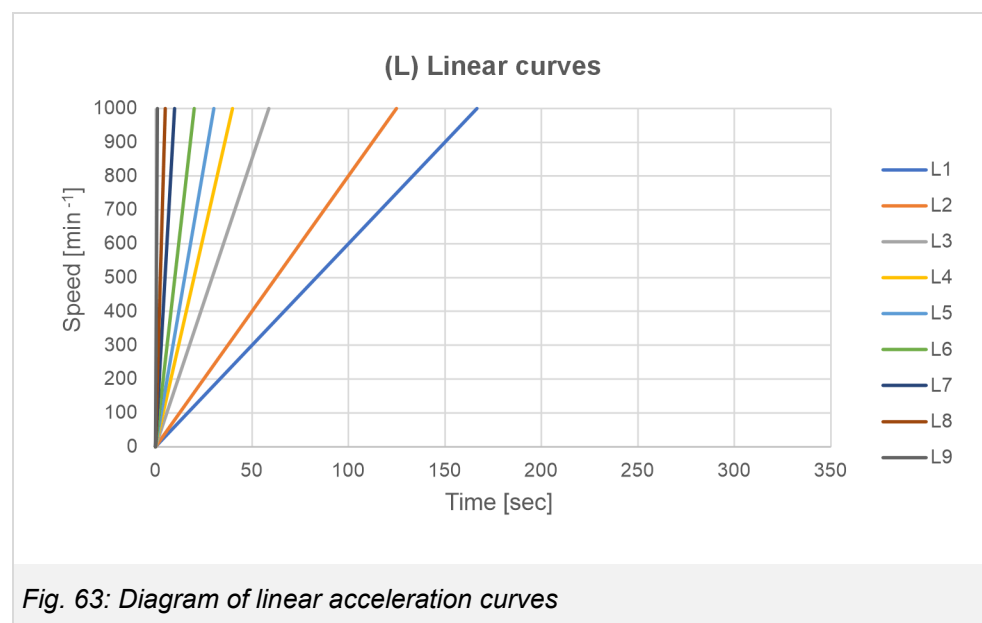


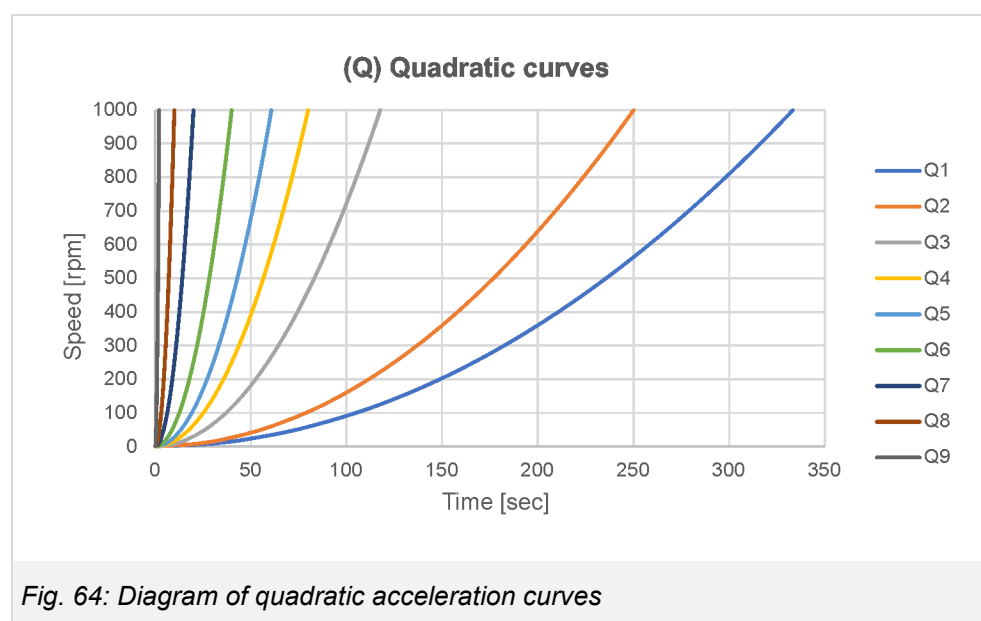
Fig. 63: Diagram of linear acceleration curves

Quadratic curves

i Above 1,000 min⁻¹, square curves will continue linearly.

Curve	Type	Time to 1,000 min ⁻¹	Gradient
Q1	Quadratic	333 [sec]	6 [min ⁻¹ /sec]
Q2	Quadratic	250 [sec]	8 [min ⁻¹ /sec]
Q3	Quadratic	118 [sec]	17 [min ⁻¹ /sec]
Q4	Quadratic	80 [sec]	25 [min ⁻¹ /sec]
Q5	Quadratic	61 [sec]	33 [min ⁻¹ /sec]
Q6	Quadratic	40 [sec]	50 [min ⁻¹ /sec]
Q7	Quadratic	20 [sec]	100 [min ⁻¹ /sec]
Q8	Quadratic	10 [sec]	200 [min ⁻¹ /sec]
Q9	Quadratic	0 [sec]	1,000 [min ⁻¹ /sec]

Table 19: Table of the gradient of quadratic acceleration curves



11.5 Table of symbols

Control bar

Symbol	Description	Symbol	Description
	"Start" button, active		"Start" button, inactive
	"Stop" button, active		"Stop" button, inactive
	"Lid" button, active		"Lid" button, inactive
	Automatic lid opening function activated		<i>RAPID TEMP</i> button, active
	<i>RAPID TEMP</i> button, inactive		<i>RAPID TEMP</i> button, activated

Table 20: Symbols of the control bar

Configuration bar

Symbol	Description	Symbol	Description
	"Rotor & buckets" button, opens an input menu		"Curve" button, opens an input menu
	Generates a QR code for the Sigma Timer app		Opens the previous view without saving
	Confirms the input and closes the current view		Opens a window for creating a new list item
	Deletes the selected files		Starts the program export
	Closes a dialog box		Starts the QC data transfer
	Numeric input field active (example)		Alphanumeric input field active (example)
	Inactive input field (example)		Input error (example)

Table 21: Symbols of the configuration bar

Appendix

Status bar

Symbol	Description	Symbol	Description
	Opens a drop-down menu		Closes a drop-down menu
	Opens the main screen		Opens the "Settings" menu
	Lid lock, inactive		Lid lock, active
	Error message		Warning message
	Sound off function activated		USB stick plugged in and detected
	Opens the program name input menu		

Table 22: Symbols on the status bar

Input area, controls

Symbol	Description	Symbol	Description
	"Set value" button (example), opens an input menu		Minimum (min.) and maximum (max.) permissible value (example)
	Adds 5 or 10 units to the selected value (example)		Subtracts 5 or 10 units from the selected value (example)
	Selects a linear curve (L)		Selects a quadratic curve (Q)
	Selects the brake-free spin-out option (F)		Navigates up and down through a list. Grey arrows cannot be selected.
	Activates one or more list items		List item not selected
	Selects a list item. Multiple selections are not possible.		List item not selected
	Option selected		Option not selected

Symbol	Description	Symbol	Description
	Opens an additional menu		Marks list items as favourites. Favourites are placed at the top of the list.
	Activated function		Deactivated function
After 4 h	Active value input (example)	After 4 h	Inactive value input (example)
	Selects a temperature unit		

Table 23: Symbols of the controls in the input area

Input area, elements of information

Symbol	Description	Symbol	Description
	Runtime		Runtime, Quality Control function activated
	Start timer		Runtime at set speed
	Deceleration time indication		Speed
	Speed, Quality Control function activated		RCF
	RCF, Quality Control function activated		Temperature
	Temperature, Quality Control function activated	RAPID TEMP	RAPID TEMP rapid temperature control function
	Standstill cooling		Rotor library
	Curve selection		Program library
	Error log		Error
	Warning		Settings

Appendix

Symbol	Description	Symbol	Description
	Device settings		Automatic lid opening function
	Display deceleration time		Date and time
	Time		Date
	Time zone		Signals
	Signal at end of run		Signal in case of imbalance
	Signal in case of error		Signal duration
	Volume		Temperature unit
	Display settings		Brightness
	Screen lock		QR code for Sigma Timer
	ECO mode		Language selection
	Info		Centrifuge name
	Service		Service code
	QR code with service information		Operating manual
	Cycles		Cycles current setup
	Rotor cycles		Bucket cycles
	Rotor		Bucket
	Motor		Quality control
	Critical parameter		Abnormal parameter
	System OK		Automatic QC data transfer

Symbol	Description	Symbol	Description
	QC data transfer		Quality control overview
	Program export		Program import
	QC data export		

Table 24: Symbols of the elements of information in the input area

Appendix

11.6 Table of chemical resistance data

i The information refers to the resistance at 20°C.

The information in the following tables applies to accessories with an anodised coating.

– 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 ₂ H ₄ O	40	3	2	4	2	3	4	4	-	1	4	1
Acetamide	C ₂ H ₅ NO	saturated	1	1	4	1	1	4	4	-	1	-	1
Acetic acid	C ₂ H ₄ O ₂	10	1	4	1	1	1	1	1	1	1	2	1
Acetic acid	C ₂ H ₄ O ₂	90	1	4	4	4	1	3	1	4	1	-	1
Acetone	C ₃ H ₆ O	100	1	1	4	1	1	4	4	-	1	4	1
Acrylonitrile	C ₃ H ₃ N	100	1	1	4	3	3	4	4	4	1	4	1
Allyl alcohol	C ₃ H ₆ O	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 sulphate	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 ₂ O	30	1	3	4	1	1	2	1	-	1	-	1
Aniline	C ₆ H ₇ N	100	1	3	4	1	2	4	4	4	1	4	1
Antimony trichloride	SbCl ₃	90	1	4	1	4	1	-	1	-	1	-	4
Benzaldehyde	C ₇ H ₆ O	100	1	3	4	1	1	3	4	4	1	4	1
Benzene	C ₆ H ₆	100	3	2	4	1	3	4	4	-	1	4	1
Boric acid	H ₃ BO ₃	aqueous	1	3	1	2	1	-	-	-	1	1	1
Butyl acrylate	C ₇ H ₁₂ O ₂	100	1	2	4	2	3	4	4	4	1	-	1
Butyl alcohol	C ₄ H 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

– 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
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 x H ₂ O		3	4	4	4	3	-	3	3	1	-	4
Chlorobenzene	C ₆ H ₅ Cl	100	3	4	4	1	3	4	4	4	1	4	1
Chloroform	CHCl ₃	100	3	3	4	4	3	4	4	4	1	4	3
Chromic acid	CrO ₃	10	1	4	2	4	1	4	1	-	1	4	1
Chromic potassium sulphate	KCr(SO ₄) ₂ x 12 H ₂ O	saturated	1	2	1	3	1	-	1	-	1	-	3
Citric acid	C ₆ H ₈ O ₇	10	1	1	1	2	1	1	1	1	1	1	1
Citric acid	C ₆ H ₈ O ₇	50	1	3	1	2	1	-	-	-	1	1	1
Copper sulphate	CuSO ₄ x 5H ₂ O	10	1	1	1	1	1	1	1	1	1	1	4
Cyclohexanol	C ₆ H ₁₂ O	100	1	1	3	1	1	1	1	4	1	2	1
Decane	C ₁₀ H ₂₂	100	-	1	2	1	3	-	-	-	1	2	1
Diaminoethane	C ₂ H ₈ N 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 ₃ D ₇ NO	100	1	1	4	1	1	4	3	-	1	3	1
Dimethyl sulfoxide (DMSO)	C ₂ H ₆ SO	100	1	2	4	1	1	4	4	-	1	-	1
Dimethylaniline	C ₈ H ₁₁ N	100	-	3	4	2	4	-	-	-	1	-	1
Dioxane	C ₄ H ₈ O ₂	100	2	1	4	1	3	2	3	4	1	3	1
Dipropylene glycol monomethyl ether	C ₄ H ₁₀ O	100	3	1	4	1	4	4	4	4	1	-	1
Ethanol	C ₂ H ₆ O	96	1	1	1	1	1	1	1	3	1	-	1
Ethyl acetate	C ₄ H ₈ O ₂	100	1	1	4	1	1	4	4	4	1	4	1

Appendix

– 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
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	2	1
Formic acid	CH ₂ O ₂	100	1	4	3	4	1	3	3	1	1	2	1
Furfural	C ₅ H ₄ O ₂	100	1	3	3	2	4	-	-	-	1	4	1
Gasoline	C ₅ H ₁₂ - C ₁₂ H ₂₆	100	2	1	3	1	3	3	2	-	1	1	1
Glycerol	C ₃ H ₈ O ₃	100	1	1	3	1	1	1	1	2	1	1	1
Heptane, n-	C ₇ H ₁₆	100	2	1	1	1	2	1	2	4	1	1	1
Hexane, n-	C ₆ H ₁₄	100	2	1	2	1	2	1	2	4	1	1	1
Hydrochloric acid	HCl	5	1	4	1	4	1	1	1	-	1	2	4
Hydrochloric acid	HCl	concentrated	1	4	4	4	1	1	2	3	1	4	4
Hydrogen peroxide	H ₂ O ₂	3	1	3	1	1	1	1	1	-	1	3	3
Hydrogen peroxide	H ₂ O ₂	30	1	4	1	4	1	1	1	-	1	3	3
Hydrogen sulphide	H ₂ S	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
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	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
Methanol	CH ₄ O	100	1	2	4	1	1	3	1	3	1	2	1
Methyl acetate	C ₃ H ₆ O ₂	100	1	1	4	2	1	-	4	4	1	-	1
Methyl benzene	C ₇ H ₈ O	100	3	4	4	1	4	4	2	-	1	4	1

– 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
Methyl ethyl ketone (MEK)	C ₄ H ₈ O	100	1	1	4	1	1	4	4	4	1	4	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	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 ₆ H ₅ NO 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 ₂ H ₂ O ₄ x 2H ₂ O	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 ₆ H ₆ O	10	1	4	4	4	1	4	1	3	1	3	1
Phenol	C ₆ H ₆ O	100	2	4	4	4	1	3	4	3	1	3	1
Phosphoric acid	H ₃ PO 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 ₅ H ₅ N	100	1	1	4	1	3	4	4	4	1	4	1
Resorcinol	C ₆ H ₆ O ₂	5	1	4	2	3	1	4	2	-	1	-	2
Silver nitrate	AgNO ₃	100	1	1	1	1	1	1	1	1	1	2	4

Appendix

– 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 ₂ CO 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 sulphate	Na ₂ SO ₄	10	1	1	1	1	1	1	1	1	1	1	1
Styrene	C ₈ H ₈	100	4	1	4	1	3	-	4	4	1	4	1
Sulphuric acid	H ₂ SO ₄	6	1	4	1	4	1	1	1	-	1	2	3
Sulphuric acid	H ₂ SO 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	1
Tetrahydrofuran (THF)	C ₄ H ₈ O	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 ₂ SO	100	4	4	4	2	4	4	4	4	1	-	3
Tin chloride	SnCl ₂	10	1	4	2	2	1	-	-	-	1	1	4
Toluene	C ₇ H ₈	100	3	1	4	1	3	4	4	4	1	4	1
Transformer oil	–	100	1	1	3	3	1	1	1	-	1	1	1
Trichloroethane	C ₂ H ₃ Cl ₃	100	3	3	4	2	4	4	4	4	1	4	4
Urea	CH ₄ N ₂ O	10	1	1	1	1	1	-	-	-	1	1	1
Urine	–	100	1	1	1	1	1	-	1	1	1	-	2
Wax	–	100	-	1	1	-	1	-	-	-	1	-	1
Wines	–	100	1	1	1	2	1	1	1	1	1	-	4
Xylene	C ₈ H ₁₀	100	3	1	4	1	4	4	4	4	1	4	1

Table 25: Table of chemical resistance data

11.7 Declarations of conformity



EC Declaration of Conformity

Product designation	Laboratory centrifuge
Product name	Sigma 3-17KT IVD
Part numbers	100028; 100029; 100030
Manufacturer	Sigma Laborzentrifugen GmbH An der Unteren Söse 50 37520 Osterode Germany
Basic UDI as referred to in Part C of Annex VI	426073439IVD01001JQCJ4
Single Registration Number (SRN)	DE-MF-000009414

As the manufacturer of the unit(s), we assume full responsibility and hereby declare that the product(s) mentioned hereinabove comply with the requirements as set out in the following regulation(s)/directive(s).

Regulations	Regulation on in vitro diagnostica	(EU) 2017/746
	Implementation Regulation for Regulation (EU) 2024/573 (F-gases Regulation)	(EU) 2024/2729
Directives	RoHS Directive	2011/65/EU
	Delegated RoHS Directive	(EU) 2015/863
Risk class in accordance with Annex VIII	class A	

Osterode, 2025-11-04



Dr. Michael Sander, Managing Director

CE_Sigma_3-17KT_IVD_2025-11-04_en

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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 3-17KT
Order number	100025; 100026; 100027
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 regulations, 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.

Regulations	Implementation Regulation for Regulation (EU) 2024/573 (F-gases Regulation)	(EU) 2024/2729
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 61010-2-011:2021 EN IEC 61326-1:2021

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Dr. Michael Sander, Managing Director

CE_Sigma_3-17KT_MRL_2025-11-04_en

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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, 2-16KL, 2-16KHL, 3-16L, 3-16KL, 3-16T, 3-17KT, 3-18KS, 3-18KHS, 3-30KS, 3-30KHS, 4-5L, 4-5KL, 4-5KRL, 4-16S, 4-16KS, 4-16KHS, 6-5KRL, 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 Poly-brominated 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	
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.



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 26572. (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, 2025-12-09



M. Weigoni, Director of Procurement

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