

USER MANUALS FOR:

C0036-HK	Table Top Refrigerated High Speed Centrifuge
C0206-A	Compact Centrifuge
C0216-MK	Refrigerated Microcentrifuge
C0233—M2	High Performance Microcentrifuge
C0300	Table Top Centrifuge
C0306	Universal Centrifuge
C0326	Universal Centrifuge
C0326-K	Refrigerated Centrifuge
C0366	Table Top Centrifuge
C0383	Benchtop Centrifuge
C0383-K	Table Top Centrifuge
C0400	Table Top Centrifuge
C0400-K	Refrigerated Universal Centrifuge
C0300-SIEVA 2	Filtration Centrifuge
C0513 (K)	Table-top Refrigerated Centrifuge





Instruction Manual for High Speed Table Top Refrigerated Centrifuge Z 36 HK

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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 36 HK is a table top refrigerated centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with swing-out and angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

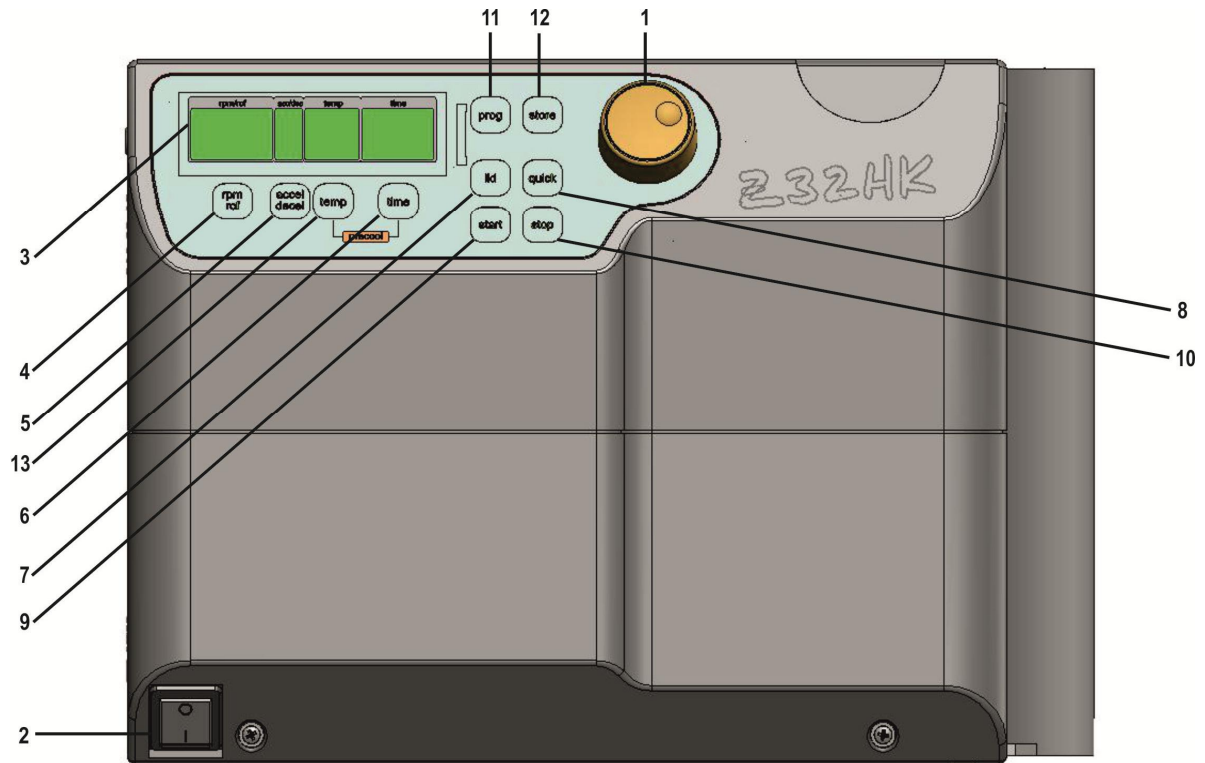
Detailed technical data are in "table 1: Technical data" (see APPENDIX P.V).

1.4 Delivery package

- 1 Centrifuge Z 36 HK
- 1 Operating Manual Z 36 HK
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



- | | |
|----|--|
| 1 | central adjuster run parameters |
| 2 | 0-I power switch |
| 3 | LCD control panel display |
| 4 | rpm/rcf speed/ g-force |
| 5 | accel/decel acceleration- / deceleration intensity |
| 6 | time centrifugation time |
| 7 | lid lid release |
| 8 | quick short running |
| 9 | start start centrifugation |
| 10 | stop stop centrifugation |
| 11 | prog calling stored programs |
| 12 | store program store |
| 13 | temp temperature indication |

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

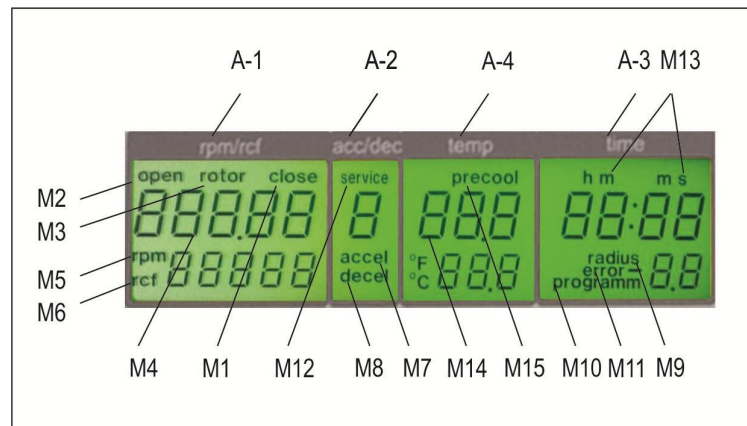


Figure 1

Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/dec“
- A-3 Display field – „time“
- A-4 Display field – „temp“

Messages/logos of the display fields:

M1	„close“	M8	„decel“	M15	„precool“
M2	„open“	M9	„radius“		
M3	„rotor“	M10	„program“		
M4	Rotor-No.	M11	„error“		
M5	„rpm“	M12	„service“		
M6	„rcf“	M13	h m s		
M7	„accel“	M14	„temperature“		

1.6 Signs and indications of the centrifuge

1.6.1 General



Instructions for disposal (see P. 32)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product-nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product

REF: Order no. of the product

SN: Serial number of the product



Date of manufacture

MAX. Drehzahl: max. allowed speed of the unit

KIN. EN.: max. kinetic energy with corresponding rotor

U/I/f: Allowable voltage / max. current / frequency

P: Electrical input power



Before operating, read the operating manual!



Labeling, standards and guidelines that are considered

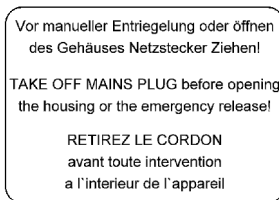
1.6.3 Warning and information signs



Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Z 36 HK is non explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 36 HK is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

(The socket for the power cord must be easy to reach respectively easy to disconnect).

Switching it on using the mains power switch (I).

Open the lid by using the button LID.

- Remove the transport securing device of the motor.

1.8 Basic adjustments

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Temperature indication in °C or °F
- Acoustic signal turn on / off
- Keyboard sound turn on -/ off
- Volume pre-selection of sound signal
- Song selection of sound signal „end of run“

1.8.1 Access to mode "Operating Data"

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 2).

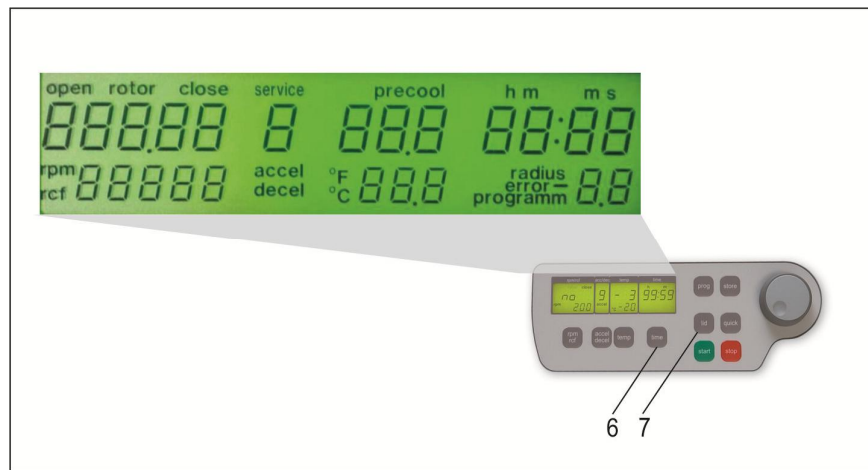


Figure 2



Attention:

- Please notice that you must enter the program as described under point 1.8.1 to change the adjustments of the points 1.8.2 - 1.8.7. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.
- All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“ (A-1) - Only then the pre-selections are valid! (see figure 3)

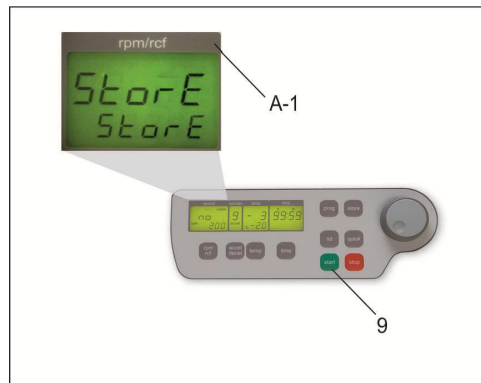


Figure 3

1.8.2 Temperature indication

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) appears the word „service“. Now select the letter „C“ with the adjusting knob (1). As a result in the display „rpm/rcf“ (A-1) appear the words „CELSI/temp“. If you press the key „rpm/rcf“ (4) now, the word „CELSI“ flashes and you can change the display into Fahrenheit „FAREN“ with the adjusting knob (1) (see figure 4).

After you have stored the settings you change to the normal program mode again by switch off the centrifuge for a short while.

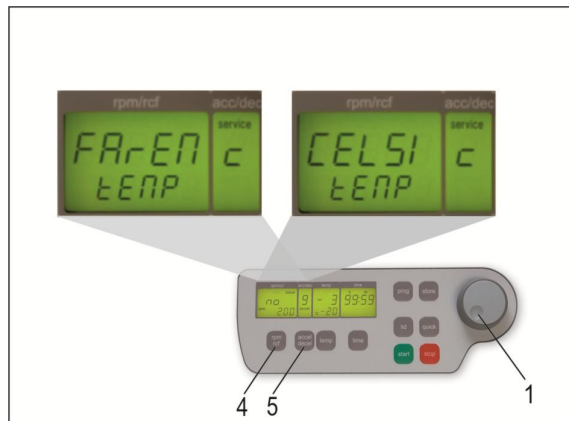


Figure 4

1.8.3 Signal turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 5).

After you have stored the settings you changed to the normal program mode again by switch off the centrifuge for a short while.

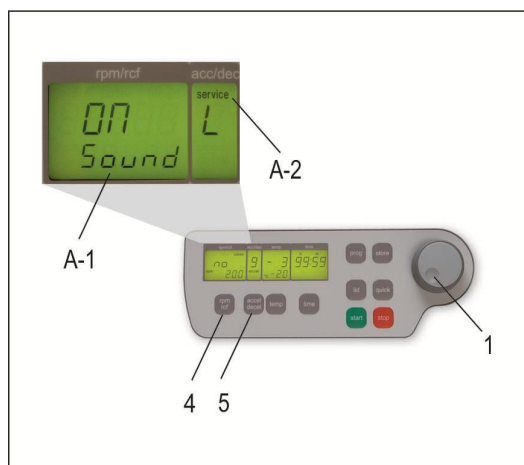


Figure 5

1.8.4 Volume pre-selection of sound signal

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „u“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0- 9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 6).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

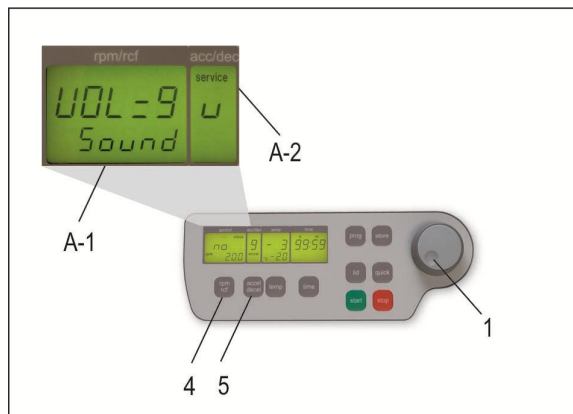


Figure 6

1.8.5 Song selection for sound signal - end of run

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 7).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

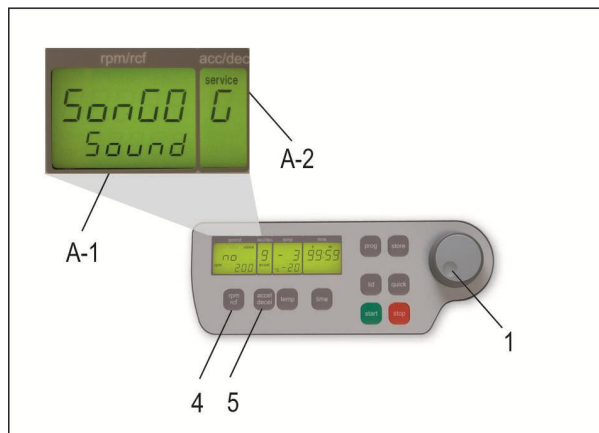


Figure 7

1.8.6 Keyboard sound turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 8).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

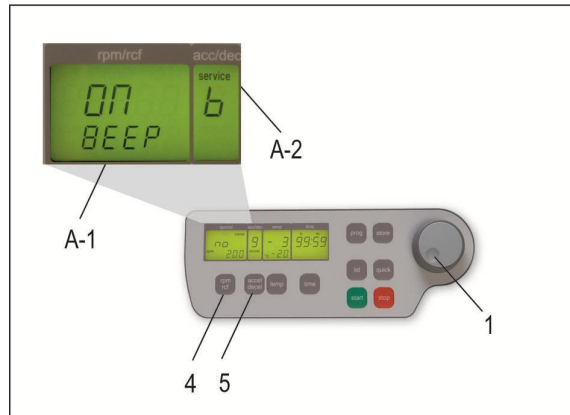


Figure 8

1.8.7 Call up operating data (by skilled or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.1 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- r = converter software
- E = list of previous error message
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 6: error messages“ (see APPENDIX S. VIII).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

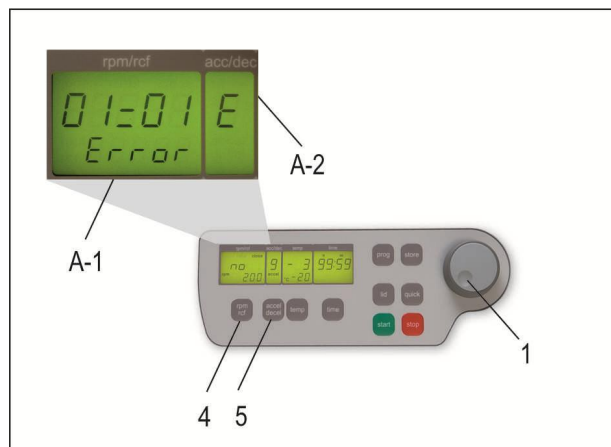


Figure 9

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 10) Take care that the rotor is fully installed onto the motor shaft.



Figure 10



Figure 11

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed allen key (see figure 11)

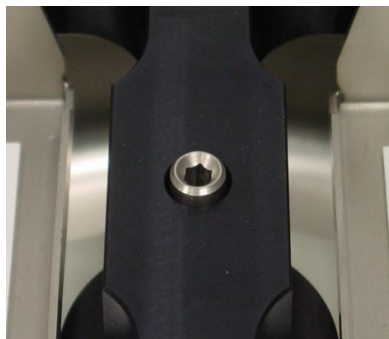


Figure 12

⚠ ATTENTION: For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 11)

2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 13+14). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).



Figure 13: WRONG



Figure 14: CORRECT (4 tubes)

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 16

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see figure 15 and 16).

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High TEF oil (Order No. 34-5147). The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1,0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!!

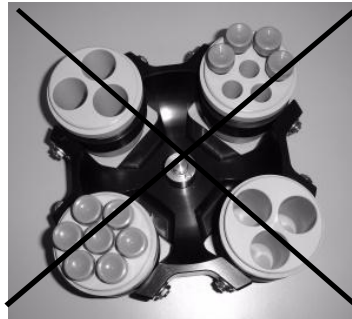


Figure 15: WRONG



Figure 16: CORRECT



ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2: permissible net weight“ (see APPENDIX P. VI).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have a max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

Case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing nut complete (2. screw over the stiff point) and lift the rotor vertical out of the centrifuge. (see figure 10 and 11)

2.2 Lid

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „220.72“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the electromagnetic lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 17

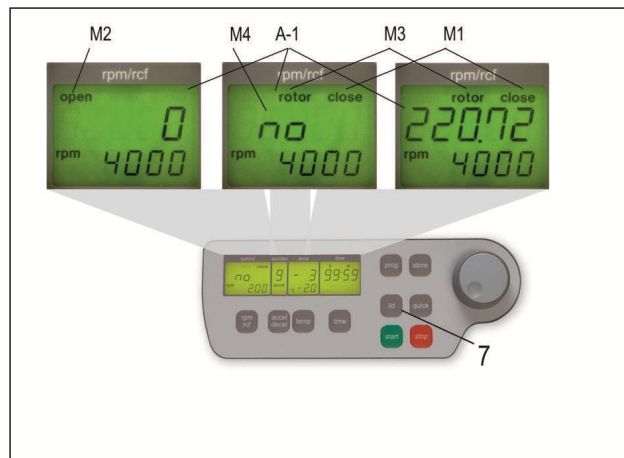


Figure 17

During the run you can call up the rotor type at any time by pressing the key "lid" (7).

2.2.2 Lid lock

The lid must only be lay down slightly. An electromagnetic lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 17



ATTENTION: Don't grip your fingers between lid and device or locking mechanism when closing the lid!

2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 18

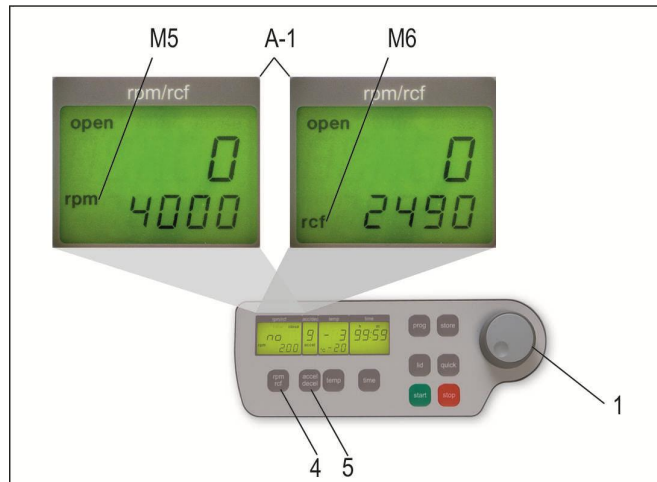


Figure 18

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 4: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. VII). There are listed all important values.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be interrupted by the key „stop“ (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3). That continuous run can only be interrupted by pressing the key „stop“ (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 19)

All with number marked passages refer to figure 19

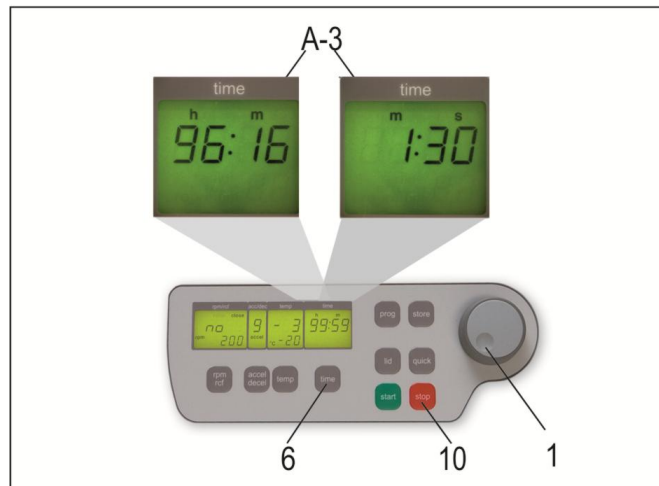


Figure 19

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 20

See „table 5: acceleration and deceleration times“ (APPENDIX P. VII). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

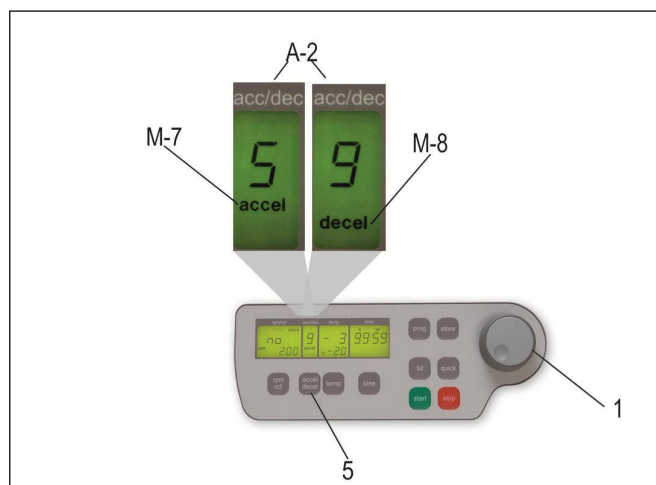


Figure 20

2.3.4 Pre-selection of temperature

This function is activated by the key „temp“ (13). After pressing that key in the display „temp“ flashes the indication „°C“ (A-4). By the adjusting knob (1) the desired test temperature can be pre-selected in steps of 1°C in a range from -20°C up to +40°C.

The value is indicated permanently in the display (figure 21) - before, during and after the run.

Please notice the respective lowest temperatures of the rotors at maximum speed!

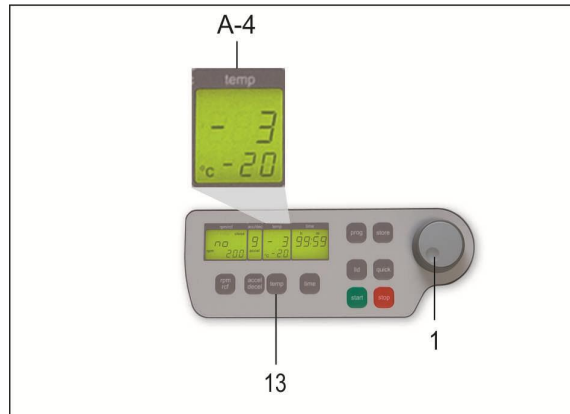


Figure 21

2.3.5 Pre-cooling

If the samples are temperature-sensitive it is useful to pre-cool the centrifuge, the rotor and eventually the buckets to the needed working temperature. Therefore insert the desired rotor and pre-set the respective temperature. By simultaneous pressing of the keys „temp“ (13) and „time“ (6) you start the run. While running the unit chooses automatically a rotational speed that is equivalent to 20 % of the permitted rotational speed of the respective rotor. After the pre-set temperature is reached you can leave the pre-cooling run with the „stop“ key (10).

Depending on the inserted rotor the pre-cooling goes between approx. 10 and 20 min.

All with number marked passages refer to figure 22

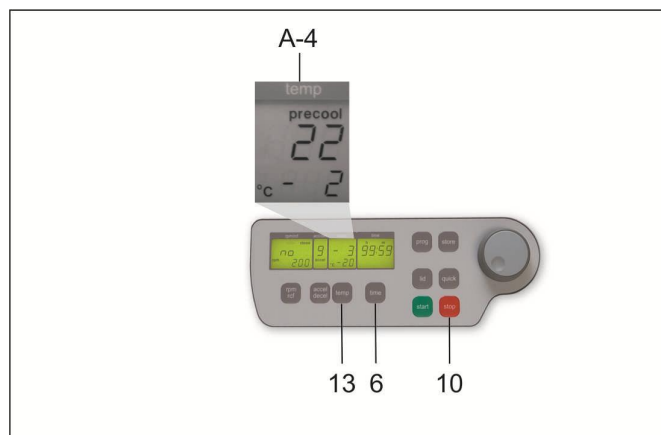


Figure 22

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (6) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can preselect then the respective radius correction (see table 7, APPENDIX P. IX) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 23

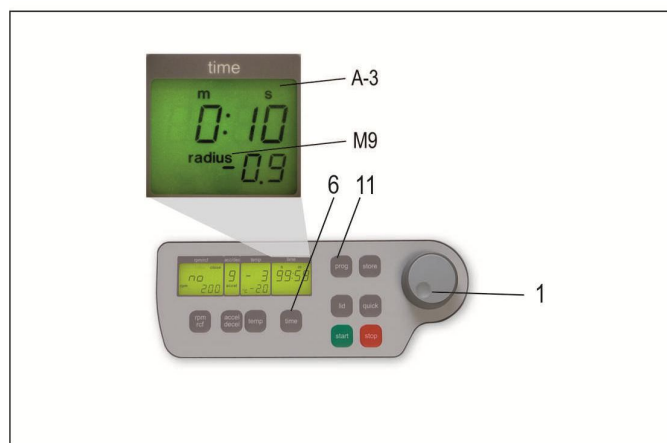


Figure 23

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“ (see figure 24). With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor“ (M3) and „22x.xx“ (M4) (see figure 24). In case of free program numbers it appears 0.

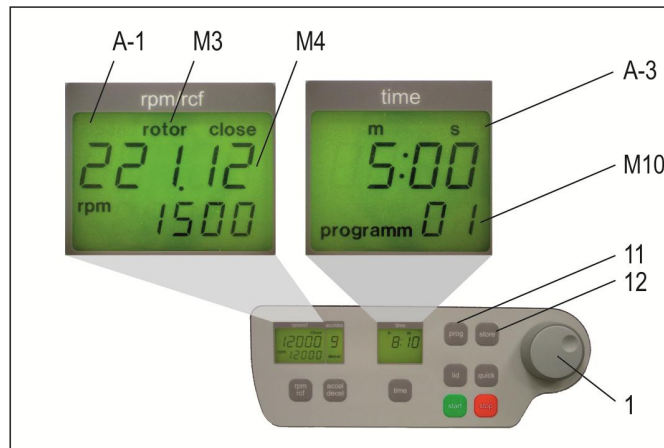


Figure 24

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the programm, in the display "rpm/rcf" (A-1) flashes alternately the word "FirSt" and "CLOSE Lid" (see figure 25). If you want to start the run without storing the programm, in the display "rpm/rcf" (A-1) flashes alternately the word ""First" and "PrESS StoreE" (see figure 26).

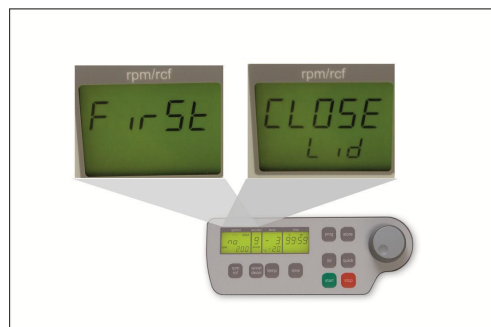


Figure 25

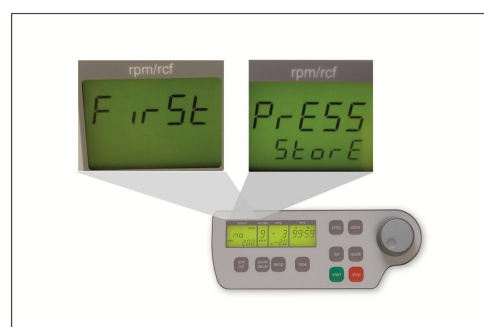


Figure 26

For adaption of data press the key „store“ (12) for approx. 1 second. If the programm is stored correctly, the word StorE appears in the display "rpm/rcf" (A-1). As a result the word „programm“ (M10) disappears. As soon as the key „store“ (12) is no longer anymore, it reappears the word „programm xx“ (M10) – the (xx) stands for the chosen program place.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“ (M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 27.

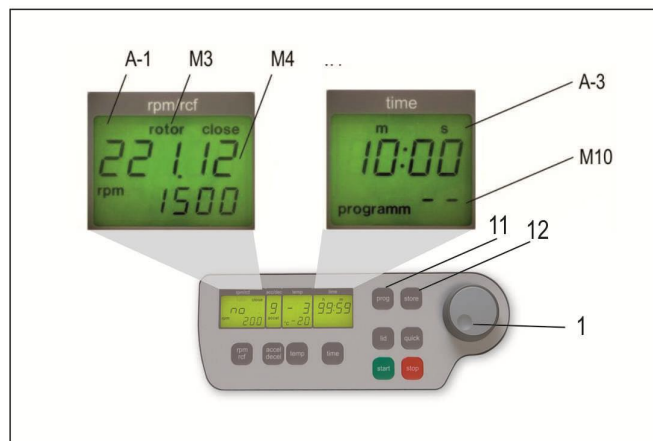


Figure 27

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm“.

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 27.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).

By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended then the centrifuge will stop automatically.

By the „quick“ key (8) you can start runs, which will last just a few seconds.

By pressing the „quick“ key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick“ key (8).

By releasing the „quick“ key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 28

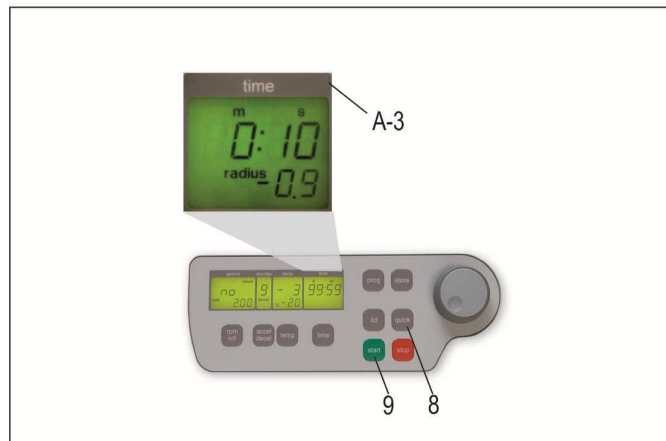


Figure 28

2.6.2 The "STOP" key

By the „stop“ key (10) (see figure 29) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

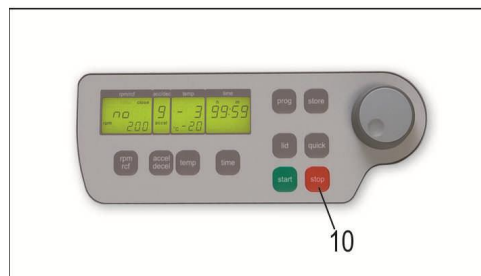


Figure 29

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" appear, the weight difference of the samples is too huge. Weigh out the samples exactly!

Load the rotor as described in chapter 2.1.2 and 2.1.3.

When inside the display "time" (A-3) the word "error" together with the number "02" (see figure 30) appear, there could be following reasons: The imbalance switch is defective.

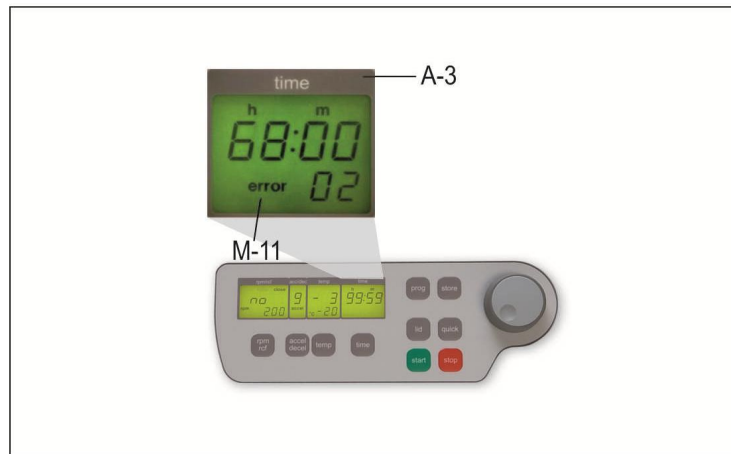


Figure 30

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.



ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.



ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time:

Proper use, damage-free condition, recommended care.

4. TROUBLE SHOOTING

4.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see figure 31):

- ⚠ • Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)
- At the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.
- Take the delivered box spanner, put him in the hole and lock the box spanner with hexagon nut (see figure 31).
- Now turn the box spanner to the right side (clockwise) up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Switch the centrifuge on again, for go on working.



Figure 31

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 32). Detailed information about possible error messages are in „table 6: error messages“ (see Appendix P.VIII).

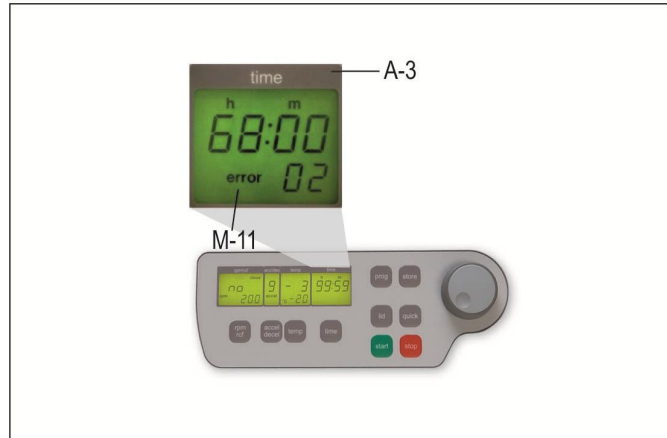


Figure 32

5. RECEIPT OF CENTRIFUGES TO REPAIR



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. XIII)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

7. APPENDIX

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EG - Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to "IVD (other device)"

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012

Konformitätserklärung Geräte IVD 03-2012

HERMLE
LABORTECHNIK

Geschäftsführer, Managing Director

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH		
Type		Z 36 HK		
Dimensions				
Width		71,5 cm		
Depth		51 cm		
Height		42 cm		
Weight without rotor		91 kg		
max. speed		30000 min ⁻¹		
max. volume		6 x 250 ml		
max. RCF		65390 x g		
allowable density		1,2 kg/dm ³		
allowable kinetic energy		43319 Nm (221.20 V01)		
Mains power connection AC		230 V / 50-60 Hz 1 ph	120 V / 60-50 Hz 1 ph	
Voltage fluctuation		± 10 %	± 10 %	
Current consumption		5,9 A	10,5 A	
Power consumption		1,2 kW	1,1 kW	
Radio interference		IEC 61326-1		
Audit requirement (BGR 500)		yes		
Ambient conditions (EN/IEC 61010-1)				
- Environment		for indoor use only		
- High		Use up to an altitude of 2000 m above MSL		
- Ambient temperature		2°C up to 35 °C		
- Max. relative humidity		Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.		
- Overvoltage category (IEC 60364-4-443)		II		
- Degree of contamination		2		
Class of protection		I		
Not suitable for use in hazardous environments.				
EMV		EN / IEC	FCC Class B	EN / IEC
Interference emission , noise		61326-1		61326-1
		Category B		Category B
Noise level (depending on the rotor)		≤ 60 dB(A)		
Write from operator				
Inventory-No.:				
Monitoring-No.:				
Environment:				
Maintenance contract:				
responsible service office		HERMLE Labortechnik GmbH		or dealer service office
		Siemensstrasse 25		
		78564 Wehingen		
		Tel.: (49)7426 / 96 22-17		
		Fax: (49)7426 / 96 22-49		
responsible dealer				

Table 2: Permissible net weight

Rotor-number	Max. speed	Permissible net weight
221.15 V01	4000 min-1	720 g
221.16 V02	4500 min-1	440 g
221.19 V01	4500 min-1	960 g
221.21 V01	10000 min-1	2130 g
221.18 V01	12000 min-1	840 g
221.20 V01	20000 min-1	560 g
221.22 V01	21000 min-1	564 g
221.28 V01	16000 min-1	360 g
221.17 V01	20000 min-1	102 g
221.23 V01	30000 min-1	41 g

Table 3: Lowest temperatures at max. speed

Rotor-number	Max. speed	n-max
221.15 V01	4000 min-1	-20 °C
221.16 V02	4500 min-1	-15 °C
221.19 V01	4500 min-1	-20 °C
221.21 V01	10000 min-1	1 °C
221.18 V01	12000 min-1	-10 °C
221.20 V01	20000 min-1	18 °C
221.22 V01	21000 min-1	10 °C
221.28 V01	16000 min-1	6 °C
221.17 V01	20000 min-1	8 °C
221.23 V01	30000 min-1	6 °C

All temperature indications refer to a room temperature of 23°C. By exceeding this value or direct solar radiation to the centrifuge, these values can't be kept up.

Table 4: Max. speed and RCF-values for permissible rotors

Rotor-number	Max. speed	RCF value
221.15 V01	4000 min ⁻¹	2990
221.16 V02	4500 min ⁻¹	2720
221.19 V01	4500 min ⁻¹	2830
221.21 V01	10000 min ⁻¹	15650
221.18 V01	12000 min ⁻¹	18510
221.20 V01	20000 min ⁻¹	41140
221.22 V01	21000 min ⁻¹	41410
221.28 V01	16000 min ⁻¹	28040
221.17 V01	20000 min ⁻¹	42030
221.23 V01	30000 min ⁻¹	65390

Table 5: Accelerations and deceleration times

Rotor-number	Acceleration values		Deceleration values	
	level 0	level 9	level 0	level 9
221.15 V01	160	18	383	22
221.16 V02	180	20	530	23
221.19 V01	110	14	610	22
221.21 V01	709	148	2010	132
221.18 V01	500	60	1374	67
221.20 V01	508	115	1046	124
221.22 V01	760	85	870	78
221.28 V01	406	56	868	78
221.17 V01	674	69	515	72
221.23 V01	438	45	328	70
in seconds				
Acceleration time from 0 min ⁻¹ -> U _{max}			Deceleration time from U _{max} -> 0 min ⁻¹	

Table 6: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
11	Temperature sensor is defective
12	Chamber over temperature
14	Leap of speed is too big between two measurements
CLOSE lid	
33	Open lid while motor is running
34	Lid contact defective
38	Lid motor is blocked
40	Communication with frequency converter disturbed during start
41	Communication with frequency converter disturbed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
70	Timeout between controller and RS232 interface
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the program
rotor no	Rotor is not detected

Table 7 (part 1): Radius correction

Rotor No.	Adapter/Tube-rack Order.No..	Correction (cm)
Angle rotor 221.18		0
	707.000	-1,5 -0,1
	707.001	-0,6
	707.002	-0,8
	707.003	-0,3
	707.004	-0,6
	707.014	-0,8
	707.015	-0,8
Angle rotor 221.19		0
	701.000	-4,5
	701.010	-1,2
	701.011	-0,3
	701.012	-2,0
Angle rotor 221.20		0
	707.001	-0,7
	707.002	-0,8
	707.003	-0,3
	707.004	-0,6
	707.014	-0,9
	707.000	-1,7 -0,1
Angle rotor 221.22		0
	708.003	-0,5
	708.004	-0,4
	708.017	-0,7
	708.019	-0,2
Angle rotor 221.28		0

Table 7 (part 2): Radius correction

Rotor No.	Adapter/Tube-rack Order No.	Correction (cm)
Swing out rotor 221.15	221.15.05	0
	221.15.19	-0,7
	221.15.10	-0,3
	221.15.13	-0,1
	221.15.05	0,0
	221.15.11	-0,3
	221.15.33	-0,6
	221.15.16	-0,3
	221.15.12	-0,9
	221.15.23	-0,1
	221.15.06	0,0
	221.15.14	-0,3
	221.15.17	-0,1
	221.15.22	-0,5
	221.15.18	-0,5
	221.15.24	-0,1
	221.15.21	-0,7
Swing out rotor 221.16		0
	706.000	0
Angle rotor 221.17		0
	704.004	-0,4
	704.005	-1,1
Angle rotor 221.21		0
	713.015	-4,2
		-0,6
	713.020	-4,1
		-0,8
	713.025	-4,1
		-1,0
	713.028	-4,2
		-1,6
	713.030	-2,1
	713.042	-2,4
Angle rotor 221.23		0
	704.004	-0,2
	704.005	-0,9

Table 8: Abbreviations used

Symbol/Abbreviations	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block
capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis: ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α .. ☐ β .. ☐ γ .. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 206 A is a non refrigerated universal centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with swing-out and angle rotors.

All parameters are accessible via buttons and selected with the potentiometer. All pre-selected and current values will be shown permanently on the LCD-display.

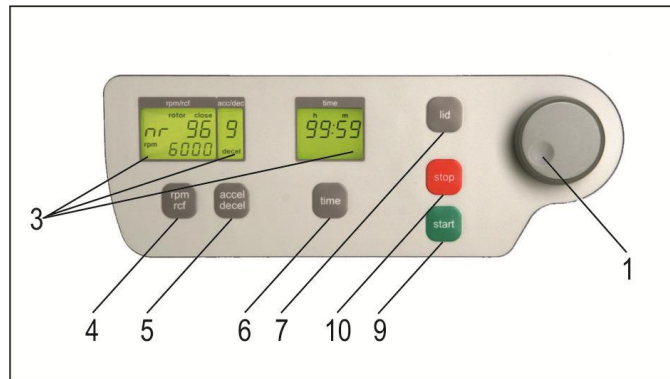
The centrifuge is powered by a maintenance-free brush motor.

Detailed technical data are in "table 1 Technical data" (see APPENDIX S.IV).

1.4 Delivery package

- 1 Centrifuge Z 206 A
- 1 Instruction Manual Z 206 A

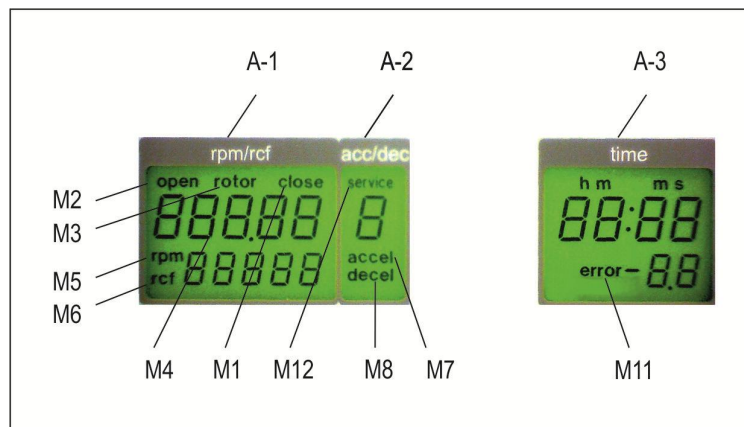
1.5 Operating and display elements



1	potentiometer	run parameters
3	LCD	control panel display
4	rpm/rcf	speed/ g-force
5	accel/decel	acceleration- / deceleration intensity
6	time	centrifugation time
7	lid	lid release
9	start	start centrifugation
10	stop	stop centrifugation

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.



Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/decel“
- A-3 Display field– „time“

Messages/Logo of the display field:

M1	„close“	M6	„rcf“
M2	„open“	M7	„accel“
M3	„rotor“	M8	„decel“
M4	Rotor-No.	M11	„error“
M5	„rpm“	M12	„service“

1.6 Signs and Indication of the centrifuge

1.6.1 General



Instructions for disposal (see chapter 6, S. 23)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product



REF: Order no. of the product

SN: Serial number of the product

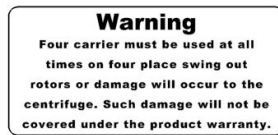


Date of manufacture

MAX. SPEED: max. allowed speed of the unit

KIN. EN.:	max. kinetic energy with corresponding rotor
U/I/f:	Allowable voltage / max. current / frequency
P:	Electrical input power
	Before operating, read the operating manual!
	Labeling, standards and guidelines that are considered

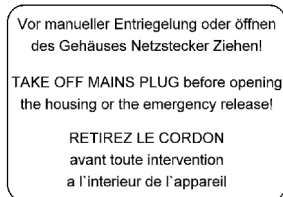
1.6.3 Warning and information signs



Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

1.6.4 Declaration of ATEX (94/9/EG)

The HERMLE Z 206 A is not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. During centrifugation, it is prohibited to stay within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area. Centrifugation of flammable, explosive and radioactive substances or substances, which chemically react with high energy, is strictly prohibited! The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.

- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of $> 2\text{m/s}$



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

1.6.5 Following rules

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 206 A is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements



The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.
(The socket for the power cord must be easy to reach respectively easy to disconnect).
- Switching it on using the mains power switch (2.2).
- Open the lid by using the button LID.
- Remove the transport securing device of the motor.

1.8 Basic adjustment

1.8.1 Adjustment of the rotortype

Before the first operation resp. after each rotor change, you have to settle the respective rotor type. You find each rotor type in the printed order number on the rotor.

Example:

Angle rotor 220.96 V01 \triangleq rotortype „96“

Swing-out rotor 220.68 V04 \triangleq rotortype „68“

Switch on the unit and open the lid. Now press simultaneously the keys "lid " (7) and "stop" (10). In the display "rpm/rcf" (A-1) then appears the old settled rotor type, i. e. "96". With the potentiometer (1) you can settle the used rotor now. (see figure 1) To adopt the data in the unit please press the "start" (9) key.

Now all important rotor parameters for the centrifuge are stored.

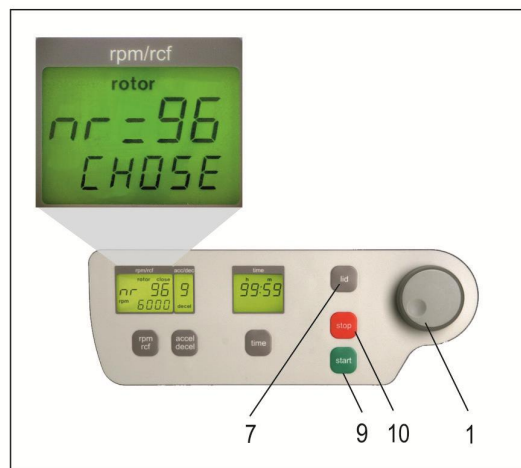


Figure 1



Attention: Set rotor must always match with the used rotor, otherwise you might damage the unit.

The rotor type can be checked during the run by pressing the key "lid" (7).

1.8.2 Access to the mode "operating data"

In this model you can check the following points:

- Number of starts
- Operating hours of centrifuge
- Operating hours of motor
- Software-version
- Error list
- Function of the imbalance switch
- Operation of keyboard
- Display tests

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 2).

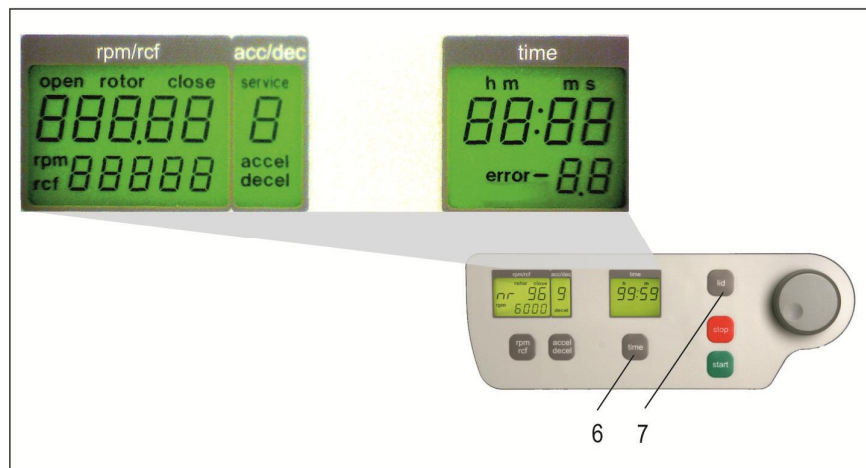


Figure 2



Attention: After you have stored the settings you change to the normal program mode again by switch off the centrifuge for a short while!

1.8.3 Call up of operating data

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.2 to enter this program mode.

Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. With the potentiometer(1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- E = list of previous error messages
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and leaf through it by the potentiometer(1). The respective error codes appear in the display „rpm/rcf“ (A-1) (see figure 3). The first two numbers indicate the appeared errors ongoing from 00 to 99, the last two numbers indicate the error code. Please look up in "table 5: error messages" (See APPENDIX VI). Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

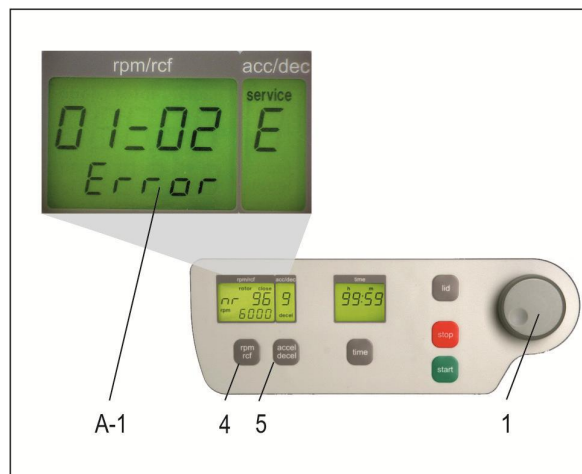


Figure 3

2. OPERATION

2.1 Mounting and loading rotor

2.1.1 Installation of rotor

Clean the drive shaft as well as the location hole of the rotor with a clean, grease-free piece of cloth.
Place the rotor onto the drive shaft. (see figure 4)
Take care that the motor shaft is plugged completely in the rotor slot (see figure 5).



Figure 4

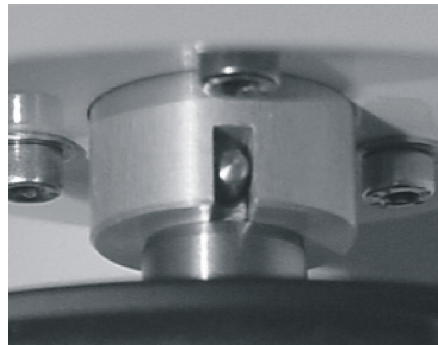


Figure 5



Figure 6

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing screw clockwise. (see figure 6).



ATTENTION:

For reasons of safety you should check the fixing screw before each run.

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor, buckets and materials.

In case of any questions, please contact the manufacturer!

2.1.2 Loading angle rotors

It is allowed to operate e.g. a 12-place-rotor with 2, 4 or 8 loaded tubes only. But the loaded borings must be opposite each other (see figure 8)



Figure 7: WRONG



Figure 8: CORRECT

Rotors must be load symetrically and with equal weight (see figure 7+8). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels should be kept as low as possible. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 10

It is allowed to operate e.g. a 6-place swing out rotor with 4 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor.

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High EF oil (Order No. 34-5147).



ATTENTION:

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!



Figure 9: WRONG



Figure 10: CORRECT

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2: permissible net weight“ (see APPENDIX P.V).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have a max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing screw complete and lift the rotor vertical out of the centrifuge. (see figure 6).

2.2 Power switch

The power switch is located on the left side in ground plate of the unit (see figure 11).

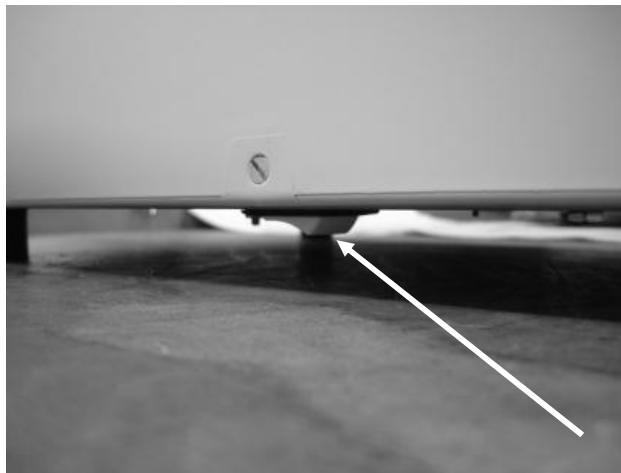


Figure 11: Power switch



ATTENTION:

After turn on the power switch you have to open the lid of the unit first, before starting the centrifuge.

2.3 Lid

2.3.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“ (A-1) the word „close“ (M1). At the same time the pre-selected rotor type is indicated, too, i. e. „nr 96“ (11). During the run you can call up the rotor type at any time by pressing the key „lid“ (7). During a standstill of the rotor you can release the lid by pressing the key „lid“ (7) of the centrifuge. As soon as the lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 12.

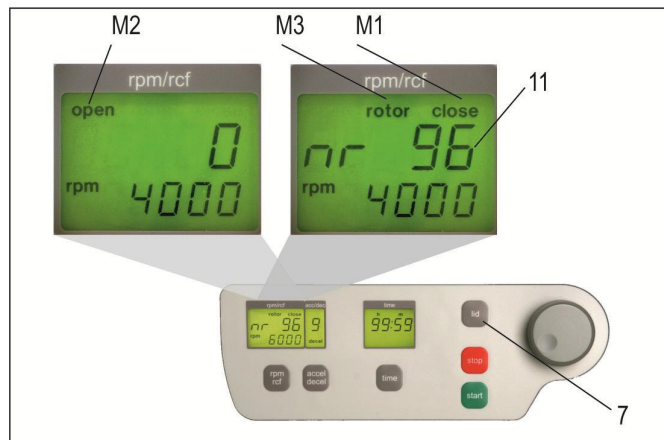


Figure 12

2.3.2 Lid lock

The lid must only be pressed slightly to its lock. After the lock is closed, at the same time disappears the word „open“ (M2) in the display. As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“ (A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 96“ (11). With that all rotor specifically datas, like e. g. max. speed, acceleration etc., are adopted (see figure 12).



ATTENTION

Before closing the lid please check if the rotor is tighten, and all 6 buckets have put in the swing out rotor.

2.4 Pre-selection

2.4.1 Pre-selection of speed and RCF

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6).

You can set the desired values with the potentiometer(1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

This pre-selected value will be stored as long as a new pre-selection is made.

All with number marked passages refer to figure 13.

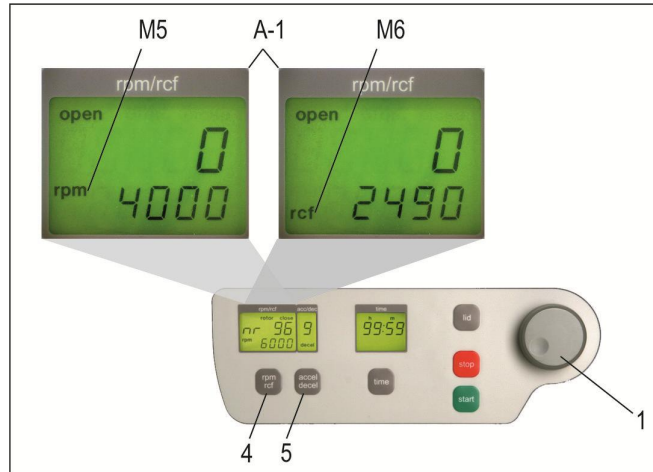


Figure 13

The speed is adjustable between 200 rpm and maximum revolution of the centrifuge resp. the maximum permissible revolution of the pre-selected rotor.

It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

The maximum speed of the Z 206 A is 6000 rpm resp. 4427 xg.

Please look up in "table 3: max. speed and RCF" (See APPENDIX V). There are shown the approved rotors with their max. permitted speed and RCF values.



ATTENTION:

Please notice the maximum permissible revolutions of your test tubes!! (Producer Indication). See therefore also chapter 3.1.6

2.4.2 Pre-selection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be only interrupted by the key „stop“ (10).

The running time can be pre-selected whether with open or closed lid of the centrifuge.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the potentiometer(1). After exceeding of 59 min 50 sec the indication (15) changes automatically in „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3).

The display shows always the remaining running time.

All with number marked passages refer to figure 14.

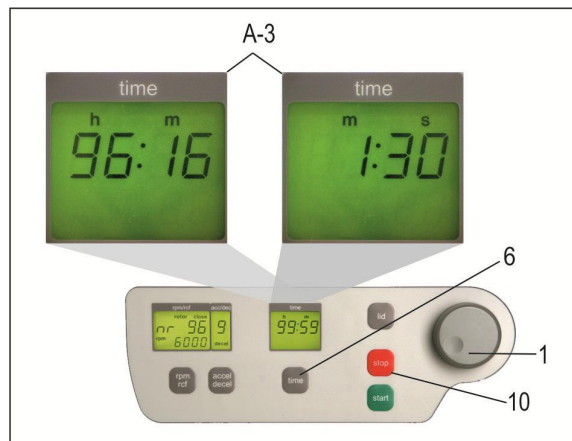


Figure 14

2.4.3 Pre-selection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (A-2) flashes in the display „acc/dec“ (M7). The desired acceleration can be pre-selected by the potentiometer(1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „acc/dec“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the potentiometer(1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

Please look up in "table 4: acceleration and deceleration times" (See APPENDIX V). There are shown the acceleration and deceleration times for the steps 0-9 for each rotor.

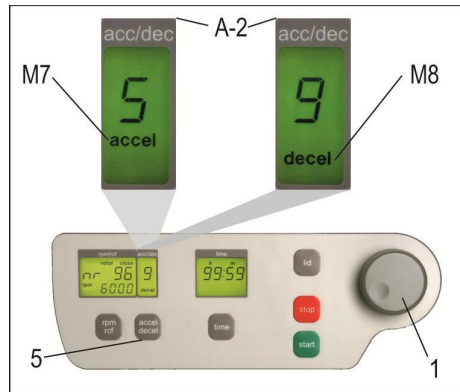


Figure 15

2.5 Starting and stopping the centrifuge

2.5.1 Starting the centrifuge

After closing the lid you can start the centrifuge with the key „start“ (9). By the key „start“ (9) you can start runs with manually pre-selected parameters. When the respective pre-selected running time has ended then the centrifuge will stop automatically or you can interrupt each run with the key „stop“ (10).

All with number marked passages refer to figure 16.

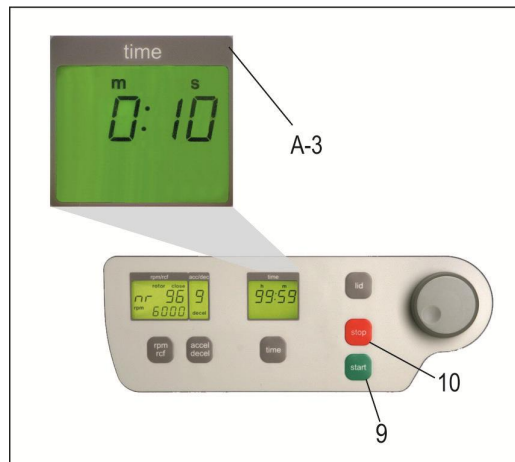


Figure 16

2.5.2 The „STOP“ Key

By the „stop“ key (10) (see figure 17) you can interrupt each run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

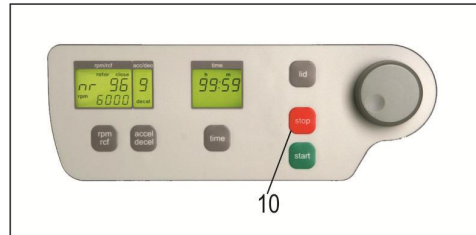


Figure 17

2.6 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" (figure 18) appear, the weight difference of the samples is too huge. Weight out the samples exactly.

Load the rotor as described in chapter 2.1.2 and 2.1.3.

When in the display "time" (A-3) the word "error" (M11) together with the number "02" (see figure 18) appear, there could be following reasons:

The imbalance sensor is defective.

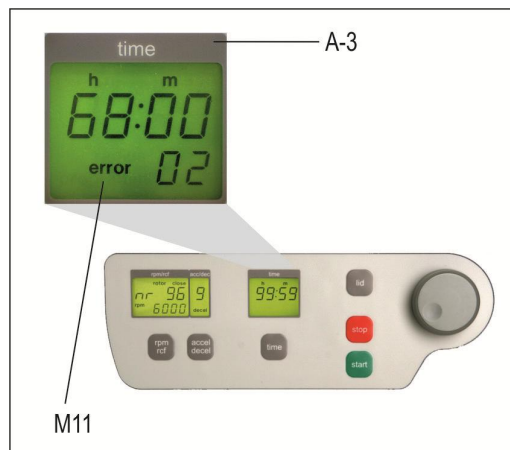


Figure 18

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons



Cleaning – unit, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once at week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and can not be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.

4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner (see chapter 3.1.1).
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush. Turn off the centrifuge and pull the plug before doing that

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the mentioned cleaner in chapter 3.1.1).
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotorlid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminium - rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization move often will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gassterilization

Adapters, bottles and rotors may be gassterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.



ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed.

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.



ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Service life of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminium or stainless steel, have a operating life of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum service life up to 3 years from first use.

Condition for the operating life:

Proper use, damage-free condition, recommended care.

4. TROUBLE SHOOTING

4.1 Error messages: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing there is a plastic stopper (see figure 19). Remove this stopper, fastened to it there is a string which is connected to the electronic lid lock.
- If you pull the string slightly the lid will open.



ATTENTION: Don't put your hands in the rotor chamber as long as the rotor is still spinning!

- Push the plastic stopper back in the unit again, for go on working



Figure 19

4.2.2 Description of the error message system

The error message is shown in the "time" (A-3) display through a two-digit number. At the same time the word "error" (M11) is indicated in the display (see figure 18, chapter 2.6 Imbalance). More details see "table 5: error messages" (see APPENDIX S.VI).

5. REPAIR



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. VIII)

We reserve the right to accept contaminated centrifuges. Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

6. TRANSPORT, STORAGE; DISPOSAL

6.1 Transport

- Before transporting, take out the rotor.
- Only transport the unit in the original packaging.
- Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

APPENDIX

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EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to "IVD (other device)"

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012



Alexander Hermle
Geschäftsführer, Managing Director

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH		
Type		Z 206 A		
Dimensions				
Width		28 cm		
Depth		37 cm		
Height		26 cm		
Weight without rotor		15 kg		
max. speed		6000 min ⁻¹		
max. volume		6 x 50 ml		
max. RCF		4185 x g		
allowable density		1,2 kg/dm ³		
allowable kinetic energy		1694 Nm		
Mains power connection AC		230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph	
Voltage fluctuation		± 10 %	± 10 %	
Current consumption		0,55 A	1,1 A	
Power consumption		100 W	100 W	
Radio interference		IEC 61326-1		
Audit requirement (BGR 500)		no		
Ambient conditions (EN/IEC 61010-1)				
Environement		for indoor use only		
High		Use up to an altitude of 2000 m above MSL		
Ambient temperature		2°C up to 35 °C		
Max. relative humidity		Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50% relative humidity up to 35°C		
Overvoltage category (IEC 60364-4-443)		II		
Degree of contamination		2		
Class of protection		I		
Not suitable for use in hazardous environments				
EMV		EN / IEC	FCC Class B	EN / IEC
Interference emission, noise immunity		61326-1		61326-1
		Category B		Category B
Noise level (depending on the rotor)		60 +2 dB(A)		
Write from operator				
Inventory-No.:				
Monitoring-No.:				
Environement:				
Maintenance contract:				
responsible service office		HERMLE Labortechnik GmbH		or dealer service office
		Siemensstrasse 25		
		78564 Wehingen		
		Tel.: (49)7426 / 96 22-17		
		Fax: (49)7426 / 96 22-49		
responsible dealer				

Table 2: Permissible net weight

Rotor-number	Max. speed	Permissible net weight
220.68 V04	4000 min ⁻¹	240 g
220.95 V06	6000 min ⁻¹	43,2 g
221.54 V01	6000 min ⁻¹	300 g
221.55 V01	6000 min ⁻¹	432 g

Table 3: Max. speed and RCF-values for permissible rotors

Rotor-number	Max. speed	value
220.68 V04	4000 min ⁻¹	1860 x g
220.95 V06	6000 min ⁻¹	2930 x g
221.54 V01	6000 min ⁻¹	4427 x g
221.55 V01	6000 min ⁻¹	4427 x g

Table 4: Acceleration and deceleration times

Rotor-number	Acceleration values		Deceleration values	
	level 0	level 9	level 0	level 9
220.68 V04	35	8	25	7
220.95 V06	60	11	30	10
221.54 V01	95	33	257	51
221.55 V01	91	41	247	52
in seconds				
acceleration time von 0 min ⁻¹ -> n _{max}			deceleration time von n _{max} -> 0 min ⁻¹	

Table 5: Error messages

Error-no.:	Description
1	Imbalance
2	Imbalance sensor is defective
14	Leap of speed is to big between two measurments
30	Motor is blocked or detective
33	Open lid during the rotor is running
55	Overspeed
60	Undervoltage in the intermediate circuit
70	sticking relay

Table 6: Symbol- /Abbreviations

Symbol / Abbreviation	Unit	Description
n (=rpm)	[min ⁻¹]	Umdrehungen pro Minute (=revolutions per minute)
RZB(=rcf)	[x g]	Relative-Zentrifugalbeschleunigung (=relative centrifugal force)
PP	-	Polypropylene
PC	-	Polycarbonate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis:..... ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α .. ☐ β .. ☐ γ .. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____

[illegible]



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Instruction Manual
for
Refrigerated Microcentrifuge
Z 216 MK

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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 216 MK is a refrigerated microlitre centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

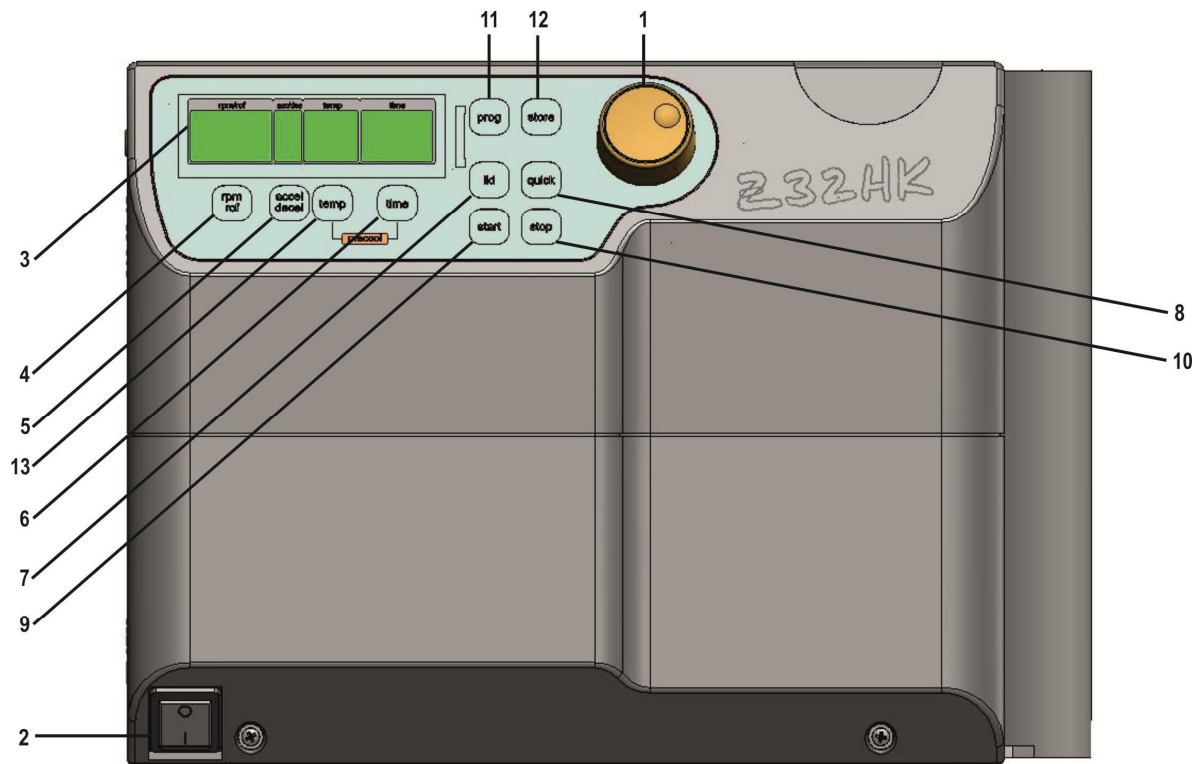
Detailed technical data are in "table 1: Technical data" (see APPENDIX P.III).

1.4 Delivery package

- 1 Centrifuge Z 216 MK
- 1 Operating Manual Z 216 MK
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



- | | |
|----|--|
| 1 | central adjuster run parameters |
| 2 | 0-I power switch |
| 3 | LCD control panel display |
| 4 | rpm/rcf speed/ g-force |
| 5 | accel/decel acceleration- / deceleration intensity |
| 6 | time centrifugation time |
| 7 | lid lid release |
| 8 | quick short running |
| 9 | start start centrifugation |
| 10 | stop stop centrifugation |
| 11 | prog calling stored programs |
| 12 | store program store |
| 13 | temp temperature indication |

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

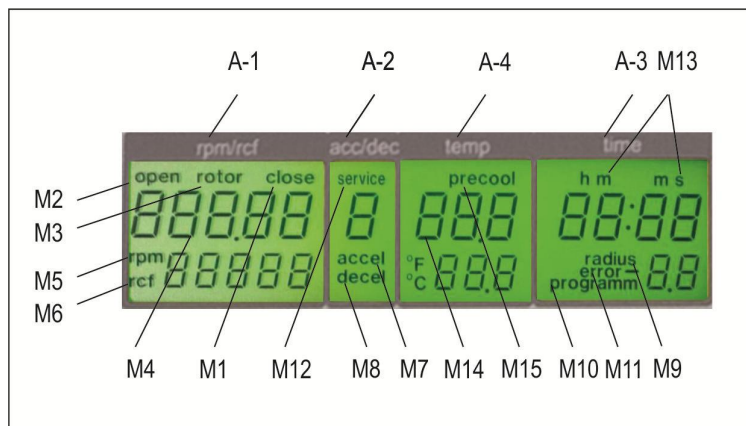


Figure 1

Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/dec“
- A-3 Display field – „time“
- A-4 Display field – „temp“

Messages/logos of the display fields:

M1	„close“	M8	„decel“	M15	„precool“
M2	„open“	M9	„radius“		
M3	„rotor“	M10	„program“		
M4	Rotor-No.	M11	„error“		
M5	„rpm“	M12	„service“		
M6	„rcf“	M13	h m s		
M7	„accel“	M14	„temperature“		

1.6 Signs and indications of the centrifuge

1.6.1 General



Instructions for disposal (see P. 34)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product-nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product

REF: Order no. of the product

SN: Serial number of the product



Date of manufacture

MAX. Drehzahl: max. allowed speed of the unit

KIN. EN.: max. kinetic energy with corresponding rotor

U/I/f: Allowable voltage / max. current / frequency

P: Electrical input power



Before operating, read the operating manual!



Labeling, standards and guidelines that are considered

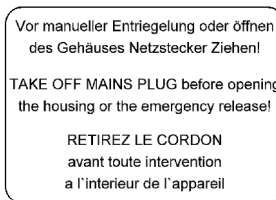
1.6.3 Warning and information signs



Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Z 216 MK is explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 216 MK is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

(The socket for the power cord must be easy to reach respectively easy to disconnect).

Switching it on using the mains power switch (I).

Open the lid by using the button LID.

- Remove the transport securing device of the motor.

1.8 Basic adjustments

1.8.1 Adjustment of the rotortype

Before the first operation resp. after each rotor change, you have to settle the respective rotor type. You find each rotor type in the printed order number on the rotor.

Example:

angle rotor 220.87 V11 \triangle rotortype „87“

Switch on the unit and open the lid. Now press simultaneously the keys "lid " (7) and "stop" (10). In the display "rpm/rcf" (A-1) then appears the old settled rotor type, i. e. "87". With the potentiometer (1) you can settle the used rotor now. (see figure 2) To adopt the data in the unit please press the "start" (9) key. Inside the display (A-1) the stroke "store" appears to the confirmation.

Now all important rotor parameters for the centrifuge are stored.

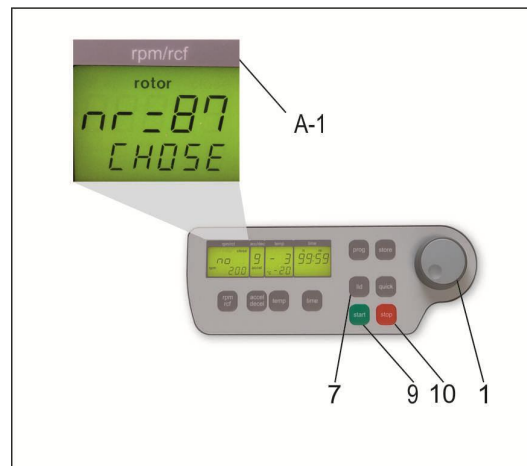


Figure 2



Attention: Set rotor must always match with the used rotor, otherwise you might damage the unit.

The rotor type can be checked during the run by pressing the key "lid" (7).

1.8.2 Access to mode "Operating Data"

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Temperature indication °C or °F
- Acoustic signal turn on/off
- Keyboard sound turn on/off
- Volume pre-selection of sound signal
- Song selection of sound signal "end of run"

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 3).

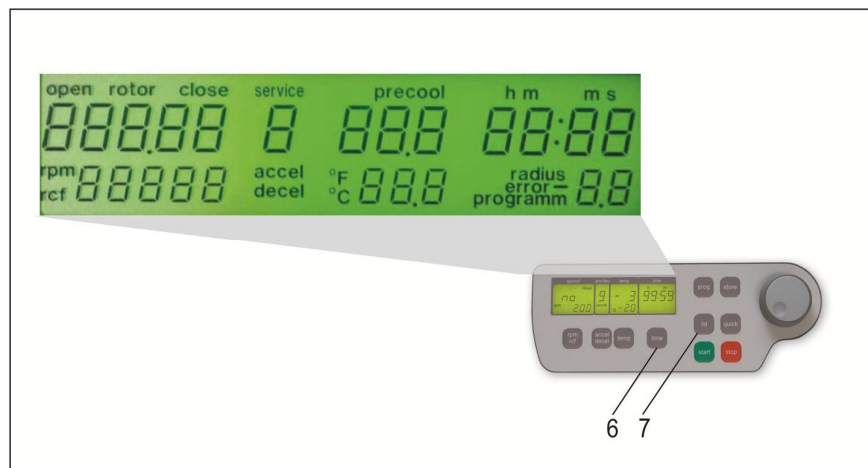


Figure 3



ATTENTION:

- Please notice that you must enter the program as described under point 1.8.2 to change the adjustments of the points 1.8.3 - 1.8.8. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.
- All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“ (A-1) - Only then the pre-selections are valid! (see figure 4)

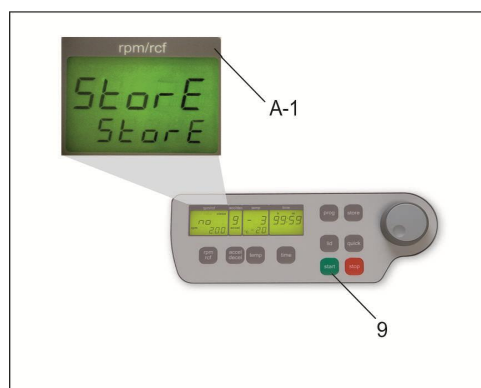


Figure 4

1.8.3 Temperature indication

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) appears the word „service“. Now select the letter „C“ with the adjusting knob (1). As a result in the display „rpm/rcf“ (A-1) appear the words „CELSI/temp“. If you press the key „rpm/rcf“ (4) now, the word „CELSI“ flashes and you can change the display into Fahrenheit „FAREN“ with the adjusting knob (1) (see figure 5).

After you have stored the settings (see 1.8.2) you change to the normal program mode again by switch off the centrifuge for a short while.

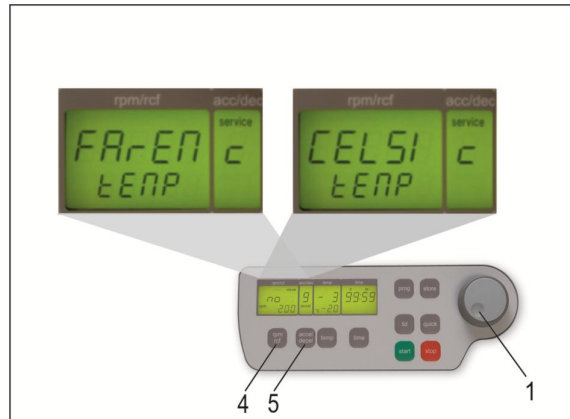


Figure 5

1.8.4 Signal turn on / off

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 6).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

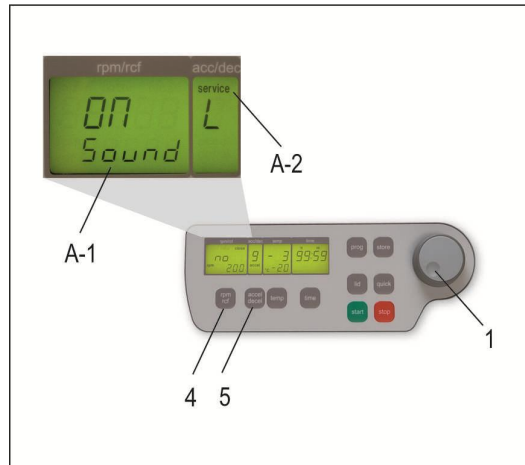


Figure 6

1.8.5 Volume pre-selection of sound signal

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „U“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0- 9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 7).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

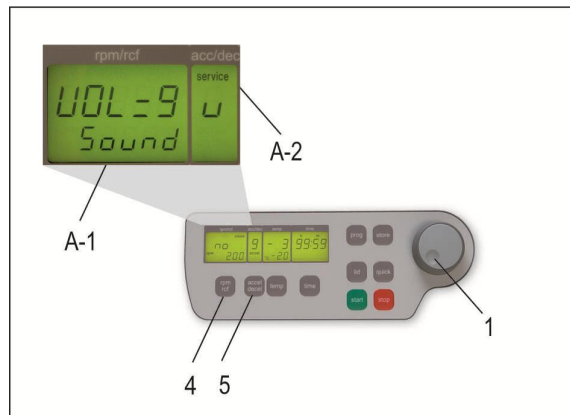


Figure 7

1.8.6 Song selection for sound signal - end of run

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 8).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

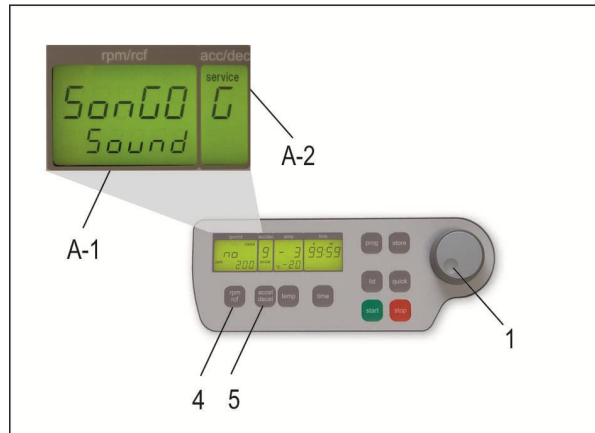


Figure 8

1.8.7 Keyboard sound turn on / off

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 9).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

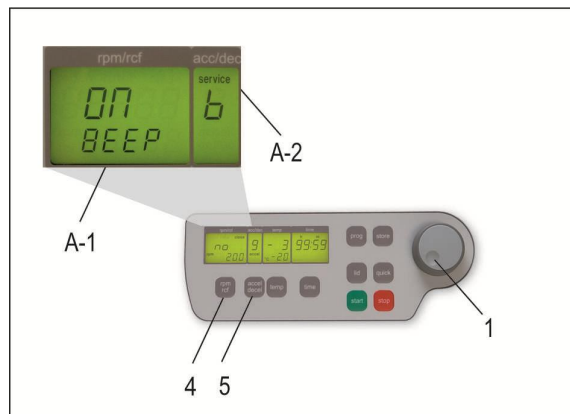


Figure 9

1.8.8 Call up operating data (by skilled or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.2 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- r = converter software
- E = list of previous error message
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 6: error messages“ (see APPENDIX S. VI).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

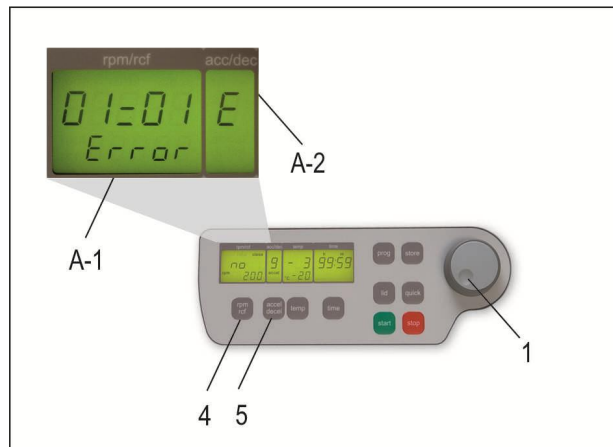


Figure 10

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 11) Take care that the rotor is fully installed onto the motor shaft.



Figure 11



Figure 12

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed allen key (see figure 12)

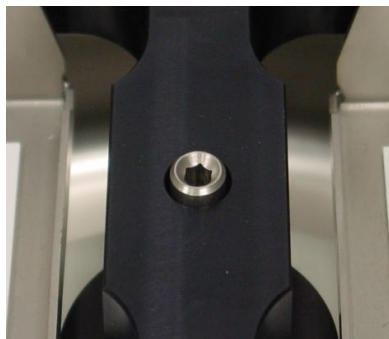



Figure 13

 **ATTENTION:** For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 12)

2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 15+17). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).



Figure 14: WRONG



Figure 15: CORRECT (4 tubes)

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 17

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see figure 17).

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High TEF oil (Order No. 34-5147). The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1,0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!!

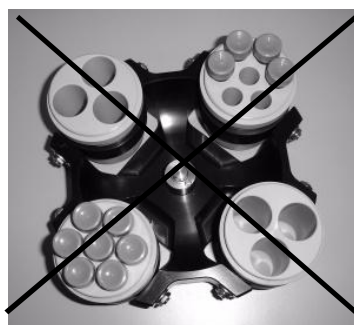


Figure 16: WRONG



Figure 17: CORRECT



ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2 permissible net weight“ (see APPENDIX P. IV).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have an max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing nut complete (2. screw over the stiff point) and lift the rotor vertical out of the centrifuge. (see figure 12 and 13)

2.2 Lid

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „220.72“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the electromagnetic lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 18

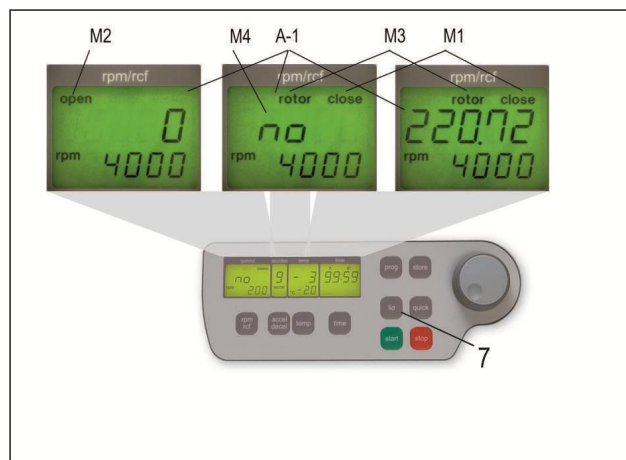


Figure 18

During the run you can call up the rotor type at any time by pressing the key "lid" (7).

2.2.2 Lid lock

The lid must only be lay down slightly. An electromagnetic lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 18



ATTENTION: Don't grip your fingers between lid and device or locking mechanism when closing the lid!

2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 19

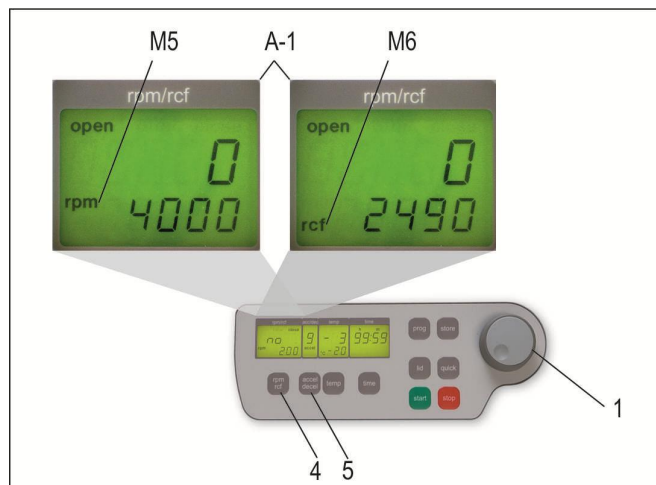


Figure 19

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 4: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. V). There are listed all important values.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be interrupted by the key „stop“ (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3). That continuous run can only be interrupted by pressing the key „stop“ (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 20)

All with number marked passages refer to figure 20

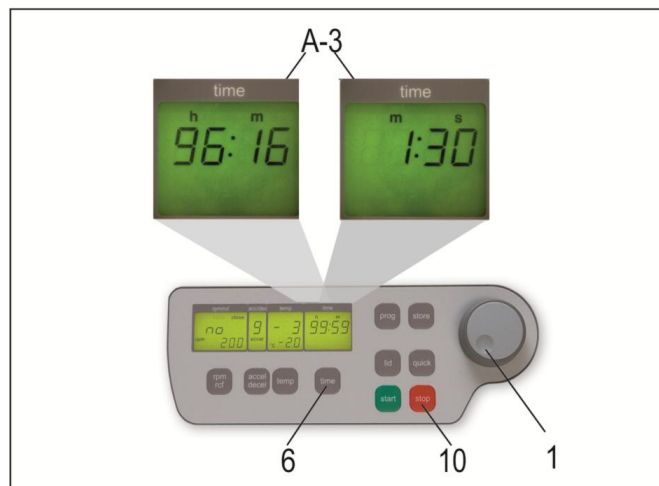


Figure 20

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 21

See „table 5: acceleration and deceleration times“ (APPENDIX P. V). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

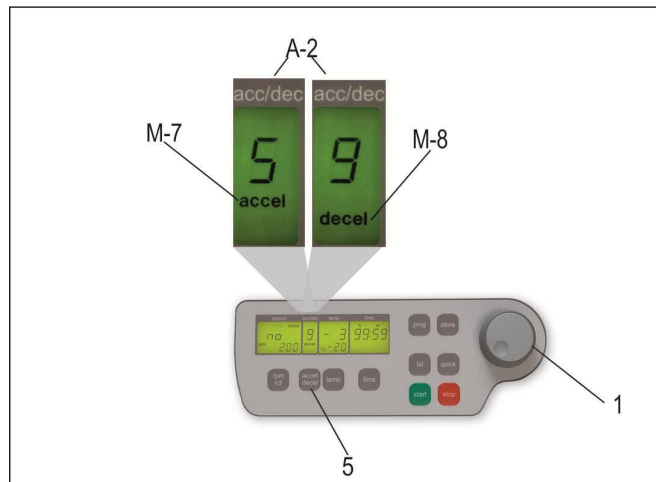


Figure 21

2.3.4 Pre-selection of temperature

This function is activated by the key „temp“ (13). After pressing that key in the display „temp“ flashes the indication „°C“ (A-4). By the adjusting knob (1) the desired test temperature can be pre-selected in steps of 1°C in a range from -20°C up to +40°C.

The value is indicated permanently in the display (figure 22) - before, during and after the run.

Please notice the respective lowest temperatures of the rotors at maximum speed!

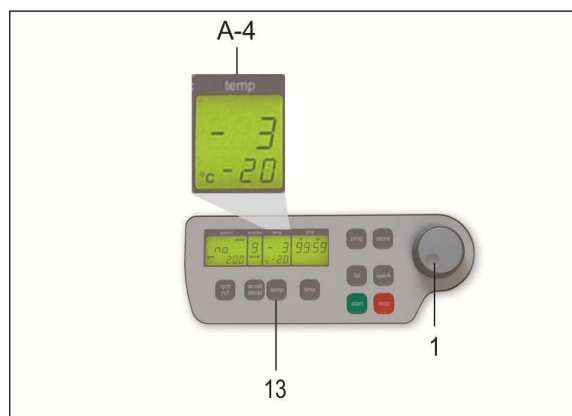


Figure 22

2.3.5 Pre-cooling

If the samples are temperature-sensitive it is useful to pre-cool the centrifuge, the rotor and eventually the buckets to the needed working temperature. Therefore insert the desired rotor and pre-set the respective temperature. By simultaneous pressing of the keys „temp“ (13) and „time“ (6) you start the run. While running the unit chooses automatically a rotational speed that is equivalent to 20 % of the permitted rotational speed of the respective rotor. After the pre-set temperature is reached you can leave the pre-cooling run with the „stop“ key (10).

Depending on the inserted rotor the pre-cooling goes between approx. 10 and 20 min.

All with number marked passages refer to figure 23

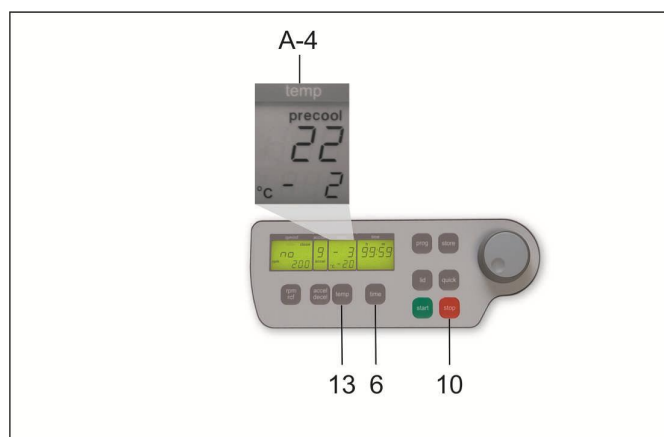


Figure 23

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (6) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can preselect then the respective radius correction (see table 7, APPENDIX P. VII) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 24

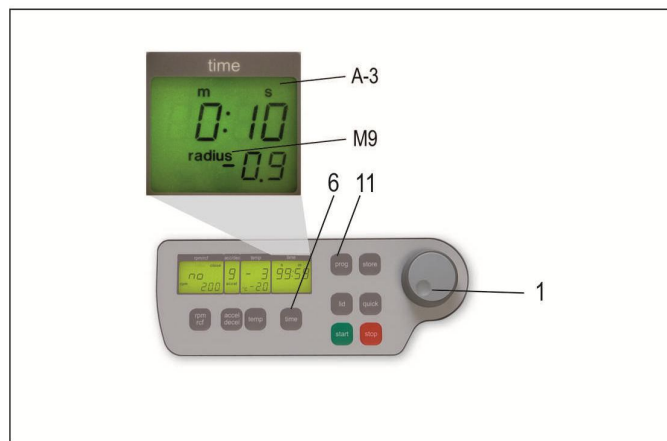


Figure 24

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“. With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor“ (M3) and „22x.xx“ (M4). In case of free program numbers it appears 0.

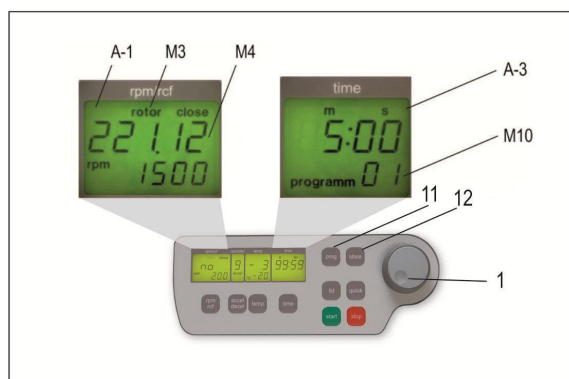


Figure 25

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the program, in the display „rpm/rcf“ (A-1) flashes alternately the word „FirSt“ and „CLOSE Lid“ (see figure 26).). If you want to start the run without storing the programm, in the display "rpm/rcf" (A-1) flashes alternately the word ""First" and "PrESS StoreE" (see figure 27).

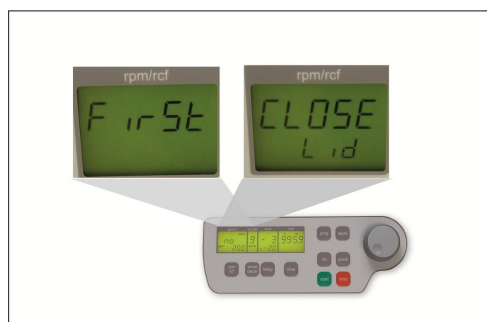


Abbildung 26

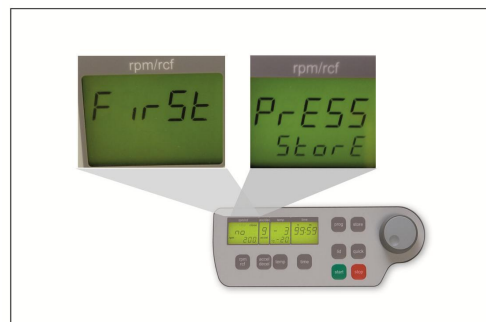


Abbildung 27

For adaption of data press the key „store“ (12) for approx. 1 second. If the program is store correctly, the word StorE appears in the display „rpm/rcf“ (A-1). As a result the word „program“ (M10) disappears. As soon as the key „store“ (12) is no longer anymore, it reappears the word „programm xx“ (M10) – the (xx) stands for the chosen program place.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

All with number marked passages refer to figure 26 and 27.

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“ (M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 28.

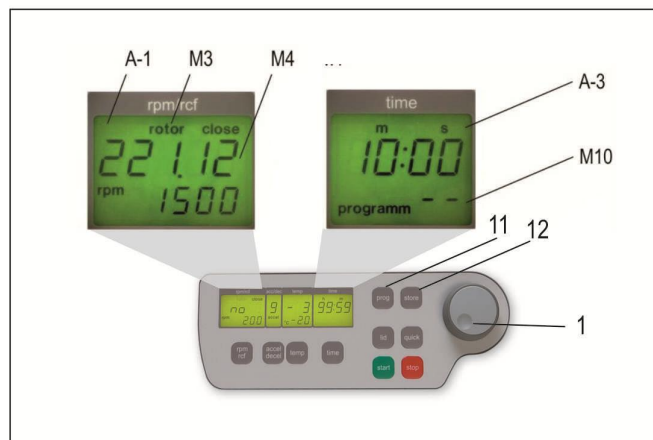


Figure 28

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm“.

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 28.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).

By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended then the centrifuge will stop automatically.

By the „quick“ key (8) you can start runs, which will last just a few seconds.

By pressing the „quick“ key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick“ key (8).

By releasing the „quick“ key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 29

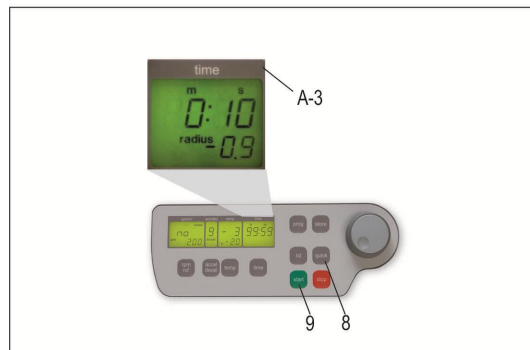


Figure 29

2.6.2 The "STOP" key

By the „stop“ key (10) (see figure 30) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

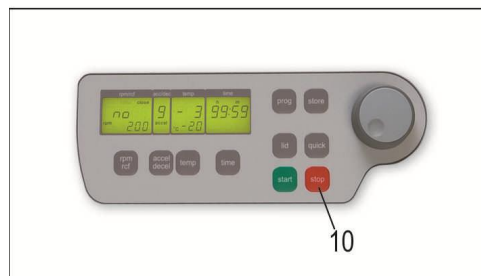


Figure 30

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" appear, the weight difference of the samples is too huge. Weigh out the samples exactly!

Load the rotor as described in chapter 2.1.2 and 2.1.3.

When inside the display "time" (A-3) the word "error" together with the number "02" (see figure 31) appear, there could be following reasons: The imbalance switch is defective.

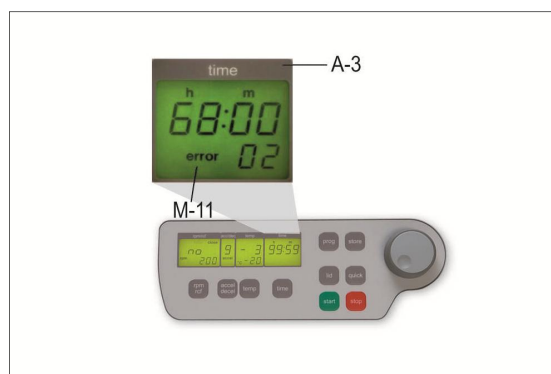


Figure 31

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.



ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.



ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time: Proper use damage-free condition, recommended care.

4. TROUBLE SHOOTING

4.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see figure 32):

- ⚠ • Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)
- At the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.
- Take the delivered box spanner, put him in the hole and lock the box spanner with hexagon nut (see figure 32).
- Now turn the box spanner to the right side (clockwise) up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Switch the centrifuge on again, for go on working.



Figure 32

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 33). Detailed information about possible error messages are in „table 6: error messages“ (see Appendix P.VI).

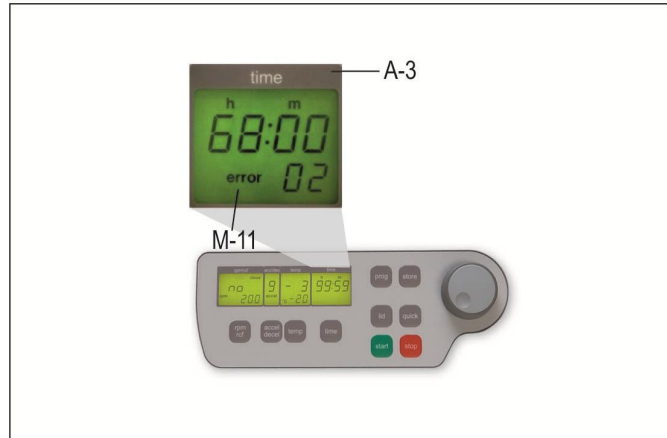


Figure 33

5. RECEIPT OF CENTRIFUGES TO REPAIR



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. IX)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

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EG - Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to "IVD (other device)"

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012

Konformitätserklärung Geräte IVD 03-2012

HERMLE
LABORTECHNIK

Geschäftsführer, Managing Director

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH			
Type		Z 216 MK			
Dimensions					
Width		28 cm			
Depth		55 cm			
Height		29 cm			
Weight without rotor		35 kg			
max. speed		15000 min ⁻¹			
max. volume		4 x 100 ml			
max. RCF		23545 x g			
allowable density		1,2 kg/dm ³			
allowable kinetic energy		7060 Nm			
Mains power connection AC		230 V / 50-60 Hz 1 ph		120 V / 60-50 Hz 1 ph	
Voltage fluctuation		± 10 %		± 10 %	
Current consumption		2,4 A		5,1 A	
Power consumption		500 W		560 W	
Radio interference		IEC 61326-1			
Audit requirement (BGR 500)		no			
Ambient conditions (EN/IEC 61010-1)					
- Environment		for indoor use only Use up to an altitude of 2000 m above MSL 2°C up to 35 °C Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.			
- High					
- Ambient temperature					
- Max. relative humidity					
- Overvoltage category (IEC 60364-4-443)					
- Degree of contamination		II			
Class of protection		2			
		I			
Not suitable for use in hazardous environments.					
EMV		EN / IEC	FCC Class B	EN / IEC	FCC Class B
Interference emission , noise		61326-1		61326-1	
		Category B		Category B	
Noise level (depending on the rotor)		≤ 60 +2 dB(A)			
Write from operator					
Inventory-No.:					
Monitoring-No.:					
Environment:					
Maintenance contract:					
responsible service office		HERMLE Labortechnik GmbH		or dealer service office	
		Siemensstrasse 25			
		78564 Wehingen			
		Tel.: (49)7426 / 96 22-17			
		Fax: (49)7426 / 96 22-49			
responsible dealer					

Table 2: Permissible net weight

Rotor-Number	max speed	permissible weight
220.87 V11	15000 min ⁻¹	82 g
220.87 V08	15000 min ⁻¹	82 g
221.17 V05	13500 min ⁻¹	102 g
220.88 V06	13500 min ⁻¹	150 g
220.92 V05	13500 min ⁻¹	71 g
221.38 V02	15000 min ⁻¹	14 g
221.35 V01	14500 min ⁻¹	165 g

Table 3: Lowest temperatures at max. speed

Rotor-Number	max speed	n-max
220.87 V11	15000 min ⁻¹	+5 °C
220.87 V08	15000 min ⁻¹	+5 °C
221.17 V05	13500 min ⁻¹	+6 °C
220.88 V06	13500 min ⁻¹	+6 °C
220.92 V05	13500 min ⁻¹	+6 °C
221.38 V02	15000 min ⁻¹	+5 °C
221.35 V01	14500 min ⁻¹	+4 °C

All temperature indications refer to a room temperature of 23°C. By exceeding this value or direct solar radiation to the centrifuge, these values can't be kept up.

Table 4: Max. speed and RCF-values for permissible rotors

Rotor-Number	max speed	RCF value
220.87 V11	15000 min ⁻¹	21380xg
220.87 V08	15000 min ⁻¹	21380xg
221.17 V05	13500 min ⁻¹	19153xg
220.88 V06	13500 min ⁻¹	17625xg
220.92 V05	13500 min ⁻¹	16708xg
221.38 V02	15000 min ⁻¹	15342xg
221.35 V01	14500 min ⁻¹	19974xg

Table 5: Acceleration and deceleration times

Rotor-Number	Acceleration values		Deceleration	
	level 0	level 9	level 0	level 9
220.87 V11	150	20	210	17
220.87 V08	150	20	210	17
221.17 V05	230	27	180	24
220.88 V06	140	17	140	17
220.92 V05	150	19	150	19
221.38 V02	153	17	93	17
221.35 V01	148	24	325	17
in seconds				
Acceleration time from 0 min ⁻¹ -> U _{max}		Deceleration time from U _{max} -> 0 min ⁻¹		

Table 6: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
11	Temperature sensor is defective
12	Chamber over temperature
14	Leap of speed is too big between two measurements
CLOSE lid	
33	Open lid while motor is running
34	Lid contact defective
38	Lid motor is blocked
40	Communication with frequency converter disturbed during start
41	Communication with frequency converter disturbed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
70	Timeout between controller and RS232 interface
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the program
rotor no	Rotor is not detected

Table 7 (part 1): Radius correction

Rotor No.	Adapter/Tuberack Order-no.	Radius (cm)	Correction (cm)
Angle rotor 220.87		8,6	0
	704.004	8,2	-0,4
	704.005	7,5	-1,1
Angle rotor 221.17		9,5	0
	704.004	9,1	-0,4
	704.005	8,4	-1,1
Angle rotor 220.88			0
	704.004	7,1	
		8,3	
	704.005	6,4	
		7,6	
	375.055	7,2	
		8,4	
Angle rotor 220.92			0
	375.047	8,1	
		7,8	
Angle rotor 221.38		6,2	0
Angle rotor 221.35			0
	701.015	7	-1,5
	701.016	7,3	-1,2
	701.017	7,5	-1,0

Table 8: Abbreviations used

Symbol/Abbreviations	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____ **place:** _____

Telephone: _____ **fax:** _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis: ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α.. ☐ β.. ☐ γ.. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____

[illegible]



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QC -TEAR OFF AND PLACE IN BOWL

IMPORTANT!

Before operating your Z233 M-2 Centrifuge you **MUST** program into memory the correct rotor code for the rotor you are using.

The following are the correct rotor codes:

Rotor	Description	Rotor code
C0230-2A	24 x 1.5ml (Hollow, 2-piece)	59
C0230-2A	24 x 1.5ml (Solid Aluminum)	87
C0230-2AH	24 x 1.5ml Hermetic (Solid Aluminum)	87
C0200-95	18 x 1.5ml (Hollow, 2-piece)	95
C0230-9A	44 x 1.5ml (Hollow, 2-piece)	88
C0230-43A	64 x 0.5ml (Hollow, 2-piece)	92
C0230-55A	48 (24 x 1.5ml + 24 x 0.5ml)	88
C0230-TSA	0.2ml Strip Tube, 4 x 8 (Hollow, 2-piece)	09
C0230-HLA-RA	12 x 1.5ml Horizontal	27

Refer to section 2.1.2 in the manual for the simple rotor code programming procedure.



Instruction Manual for Microliter Centrifuge Z 233 M-2

**ATTENTION:
ROTOR MUST BE
PROGRAMMED.
REFER TO
SECTION 2.1.2.**

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1 PRODUCT DESCRIPTION

1.1 Usage in accordance with safety standards

1.1.1 General information

1.1.1.1 Hazards and precautions

Before operating the centrifuge, please read this instruction manual carefully!

This centrifuge must not be operated by unqualified personnel not familiar with the correct use of the unit.

- Use the original accessories only!
- The centrifuge is not explosion-proof and therefore must not be operated in areas where there is a risk of explosion. During centrifugation, it is prohibited to stay or place hands within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area.
- Centrifugation of flammable, explosive and radioactive substances or substances which chemically react with high energy is strictly prohibited!
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obligated to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and / or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than those listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2 m/s.

The following rules must strictly be adhered to:

- Do not operate the centrifuge if it is not installed correctly.
- Do not operate the centrifuge when disassembled (e.g. without metal cover).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with by unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by the manufacturer, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may damage the centrifuge and rotors and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

1 PRODUCT DESCRIPTION

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by factory-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.1.1.2 Brief description

This centrifuge is an ambient microliter centrifuge. Various rotors are available for this unit. Speed and running time can easily be set with turning knobs and are displayed on large LED's.

The preset run parameters are stored after the end of each run.

The lid is latched and released with an electromagnetic lid lock.

The centrifuge has a maintenance-free, low noise, brushless induction motor.

1.1.1.3 Safety standards

The centrifuge corresponds with the General Requirements for Medical Units Regulations (MedGV) (group 3).

The following standards have been considered for the production of our centrifuges:

- Accident Prevention Regulation for electrical units and installations UVV VBG 4
- Accident Prevention Regulation for centrifuges as per UVV VBG 7 z
- DIN 58970 part 1, 2 and 4 for centrifuges and tubes
- Electrical Interference Suppression according to interference degree B as per VDE 0871
- Electrical Safety as per IEC 1010-1 and IEC 1010-2-D
- European Standard PR EN 61 010-1 and PR EN 61 010-2-2

1 PRODUCT DESCRIPTION

1.1.1.4 Included items

Following parts are supplied as accessories with each centrifuge:

- 2 fine-wire fuses 10 AT (230 V)
- 2 fine-wire fuses 15 AT (120 V)
- 1 instruction manual
- 1 T-wrench for removing rotors

Spare fuses are located at the rear of the centrifuge

1.1.1.5 Warranty

The centrifuge has been subjected to thorough testing and quality controls.

In the unlikely case of any manufacturing defects, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery.

This warranty becomes invalid in case of mishandling, damage and negligence and further in the case of the use of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer with respect to technical improvement.

1.2 Installation

1.2.1 Installation of the centrifuge

1.2.1.1 Unpacking the centrifuge

The centrifuge is supplied in a carton.

Open the carton, remove the cover carton and the centrifuge. The instruction manual must always be kept with the centrifuge.

1.2.1.2 Space requirements

The centrifuge should be installed on an even and solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface. In order to enable a safe and smooth operation, level the centrifuge with a spirit level. The centrifuge must be located with a minimum space of 30 cm on each side of the unit in order to ensure necessary heat dissipation. Do not place the centrifuge next to a window or a heater, where it could be exposed to excessive heat as the performance of the unit is based on an ambient temperature of 23°C.

Safety regulations require that the safety area of 30 cm around the unit is marked in order to indicate that neither hazardous substances nor persons should be within this area during centrifugation.

1 PRODUCT DESCRIPTION

1.2.1.3 Installation

Be sure to check the following before installation:

- Check that the power supply corresponds the the information on the manufacturer's rating label which is mounted on the rear panel.
- The line voltage circuit breaker is 16A (type K) slow release.
- An emergency switch off is installed outside the room in order to disconnect the power supply of the unit.
- The wooden motor shaft transport brace block has been removed.

The socket for the power cord must be easy to reach and respectively easy to disconnect!

1.3 Technical Data

Manufacturer	HERMLE Labortechnik GmbH	
Type / Model	Z 233 M-2	
Dimensions		
Width	28 cm	
Depth	37 cm	
Height	36 cm	
Weight	15 kg	
Noise level (max.)	60 +2.0 dB (A)	
Max. speed	15,000 rpm	
Max. volume	88 ml	
Max. RCF	21,380 x g	
Admissible density	1.2 kg/dm ³	
Admissible kinetic energy	9.361 Nm	
Electrical connection AC	120 V / 50/60 Hz 1 ph	230 V / 50/60 Hz 1 ph
Current	10 Amps	8 Amps
Connected load	900 Watts	800 Watts
Interference suppression	VDE 0871, Interference degree B	
Test obligations	none	
To be filled in by purchaser:		
Inventory-No.:	<hr/>	
Check-No.:	<hr/>	
Location:	<hr/>	
Maintenance contract:	<hr/>	
Your service department	Labnet International PO Box 841, Woodbridge, NJ 07095 Phone 732 417-0700, fax 732-417-1750 Email: labnet@labnetlink.com	
Your agent	<hr/>	

Manufacturer reserves the right to alter product specifications without notice.

1 PRODUCT DESCRIPTION

1.4 Conformity declaration

as per annex II A of the European Authorities' Standards for machines (89/392/EWG)

We, the company

HERMLE Labortechnik GmbH
Gosheimer Str. 56
78564 Wehingen

declare in mere responsibility, that our product

centrifuges

of models

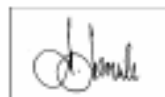
Z 160 M
Z 200 A
Z 233 M-2; Z 233 MK-2
Z 300; Z 300 K; Sieva -2
Z 323; Z 323 K; Z 383; Z 3838 K
Z 400; Z 400 K; Z 513; Z 513 K
ZK 404

as from month / year of construction 08 / 00

to which this declaration refers to, have been manufactured according to the following standards or normative documents:

- **DIN EN 61 010-1; DIN EN 61 010-2-020**
- **IEC 66 E (CO) 11; IEC 335-1**
- **EN 55022**
- **89/392/EWG; 91/368/EWG; 92/31/EWG**
- **93/42/EWG; 89/336/EWG; 73/23/EWG**
- **VDE 0871 (B)**

Wehingen, 1. November 1998



Harald Hermle
General Manager

2 OPERATION

2.1 Installation of rotors

2.1.1 Mounting and loading angle rotors

Clean the motor shaft as well as the rotor mounting boring with a clean, grease-free piece of cloth. Place the rotor onto the motor shaft, ensuring that the cross pin or cross bar aligns correctly with the rotor slot (see photos 1 and 2).



Photo 1: Correct

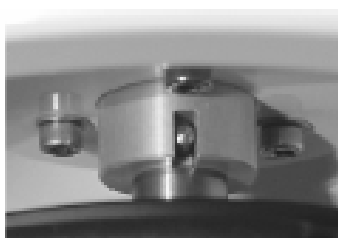
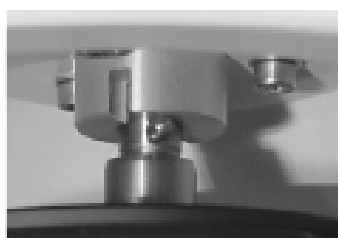


Photo 2: Incorrect



Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counterclockwise. Tighten rotor nut with enclosed T-wrench (see photo 3).



Photo 3

A partially loaded rotor may be used (ie an 8 place rotor with 2 or 4 tubes loaded). The load must be balanced and the tubes must be opposite each other. See image below.



Photo 4: Incorrect




Photo 5: Correct

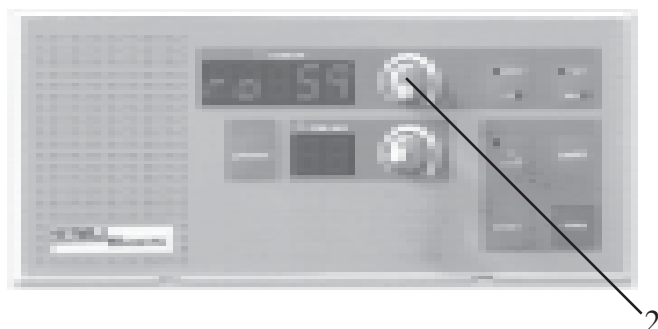
2 OPERATION

NOTE: Before operation, secure the rotor lid to the rotor by pressing the snap connector lightly onto the rotor unit. Take care the lid is correctly placed into the guide.

2.1.2 Setting the rotor code

Before using the centrifuge, the rotor code must be set. To set the rotor code: Open the lid and turn the unit off. Press and hold the lid key  while turning the centrifuge on. The speed display will show the number of the set rotor type and the letters "ro". Turn the speed knob (2) until the appropriate code appears (see codes below). Turn the unit off and on again to store the new code. The rotor code can be checked by pressing the "QUICK" key while the rotor is spinning.

Rotor	Description	Rotor Code
C0230-2A	24 x 1.5ml (hollow, 2 piece)	59
C0230-2A	24 x 1.5 ml (solid aluminum)	87
C0230-2AH	24 x 1.5ml Hermetic (solid aluminum)	87
C0200-95	18 x 1.5ml (hollow, 2 piece)	95
C0230-9A	44 x 1.5ml (hollow, 2 piece)	88
C0230-43A	64 x 0.5ml (hollow, 2 piece)	92
C0230-55A	48 (24 x 1.5ml + 24 x 0.5ml)	88
C0230-TSA	0.2ml strip tube 4 x 8 (hollow, 2 piece)	09
C0230-HLA-RA	12 x 1.5ml Horizontal	27



2.1.3 Overloading of rotors:

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. Liquids to be centrifuged should have an average homogeneous density of 1.2 g/ml or less when the rotor is spinning at maximum speed. In order to centrifuge liquids with a higher density, the speed must be reduced according to the following formula:

$$\text{Reduced speed } n = \sqrt{\frac{1.2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example

$$n_{\text{red}} = \sqrt{\frac{1.2}{1.7}} \times 4,000 = 3,360\text{rpm}$$

If in doubt, contact the manufacturer!

2 OPERATION

2.1.4 Removing the rotor

Take off the lid of the rotor. Hold the rotor with one hand. Loosen the rotor nut with the included T-wrench by turning it clockwise.

ATTENTION:



Do not operate the centrifuge with rotors which show any signs of corrosion or mechanical damage. Do not centrifuge extremely corrosive substances which could damage the rotor.

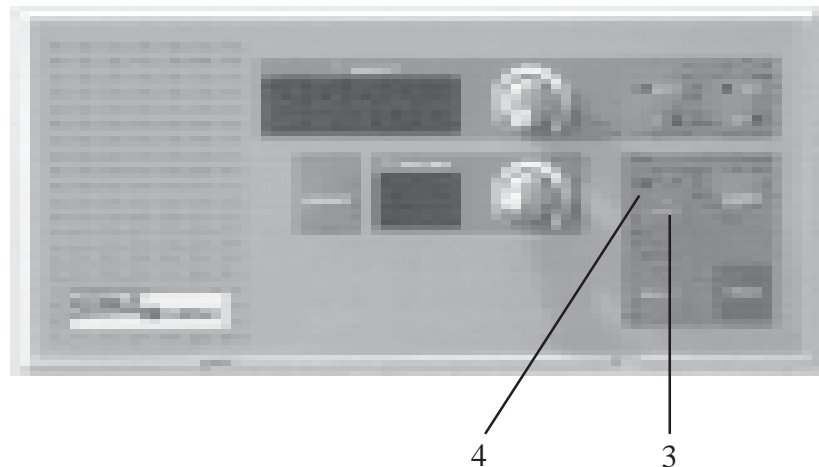
2.2 Operation

2.2.1 Power

The centrifuge has a power switch that is used to connect and disconnect the power. The switch is located on the back panel of the centrifuge.

2.2.2 Lid release

When the green control lamp (4) on the  key is on, the rotor is standing still and the lid of the centrifuge is ready to open. Press the  key (3), in order to open the lid. The green control lamp (4) turns off, as soon as the lid opens or the centrifuge starts.



2.2.3 Lid lock

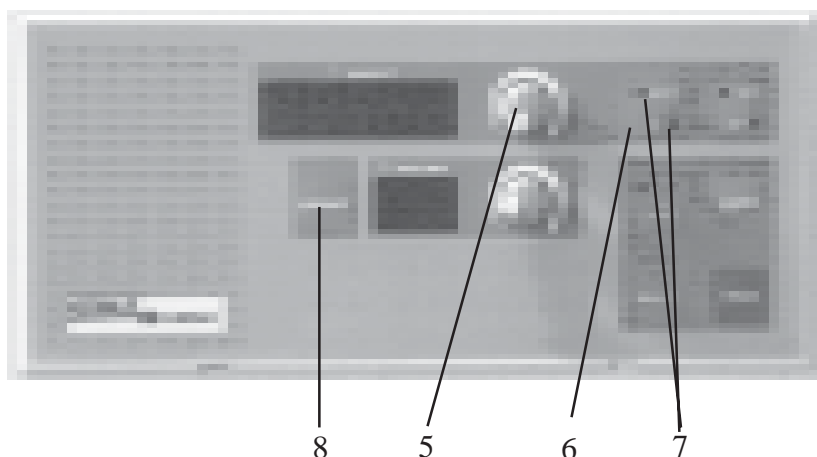
After mounting and loading the rotor correctly, the lid of the centrifuge can be closed. The centrifuge can only be started when the lid is closed correctly. The green control lamp on the lid key will come on as soon as the lid is closed correctly.

When the rotor begins accelerating, the control lamp will turn off and the lid will be impossible to open. In case the green control lamp is still on or flashing after pressing the "START" key, the lid must be opened and closed again. This safety feature also shows that a run is already finished. When the lid of the centrifuge is closed, the display will switch from **preset** to **actual** value. In order to check preset speed / RCF-value and running time press the "PRESET" key

2 OPERATION

2.2.4 Pre-selection of speed/RCF

When the lid of the centrifuge is open, you can preset the requested speed or RCF by turning the speed potentiometer (5). With the “SPEED/RCF” (6) you can switch between speed and RCF value to be shown in the display. The green control lamps (7) indicate which mode is activated. When the lid of the centrifuge is closed or during a run, speed can be changed as follows: Press the “PRESET” key (8), hold it and at the same time turn the speed potentiometer (5) to change the value. Maximum speed of this unit is 15,000 rpm.



Maximum RPM of valid rotors

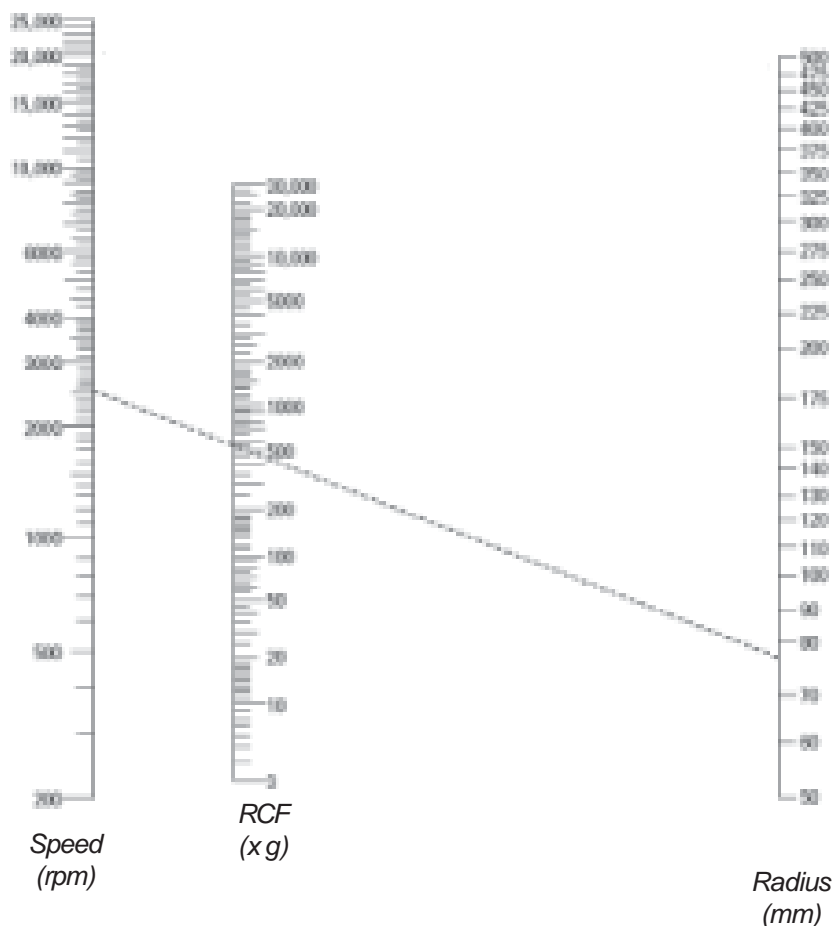
Rotor	Max. Speed
C0230-2A or -2AH	15,000 rpm
C0200-95	14000 rpm
C0230-9A	14,000 rpm
C0230-43A	14,000 rpm
C0230-55A	14,000 rpm
C0230-TSA	14,000 rpm
C0230-30AH	14,000 rpm

2 OPERATION

2.2.5 Nomogram – to convert Speed into RCF-value

CHART

to determine the relative centrifugal force (RCF-value).
This value is the multiplier to the gravitational pull of earth (g).



Example:

Measure the distance in mm from the center of the rotor (radius) to the most outer part (bottom of the tube) in the used bucket, tube rack or rotor. Set your ruler in the "radius" column to the corresponding radius. Position the left part of your ruler to the desired speed and read off the according RCF-values. When you know the required RCF-value, you can determine the correct speed.

The correct value is based on the following formula:

$$RCF = 11.18 \times r \times \left(\frac{n}{1000} \right)^2$$

RCF = Relative centrifugal force (multiplier to the gravitational pull of the earth)

r = radius in cm

n = speed (rpm)

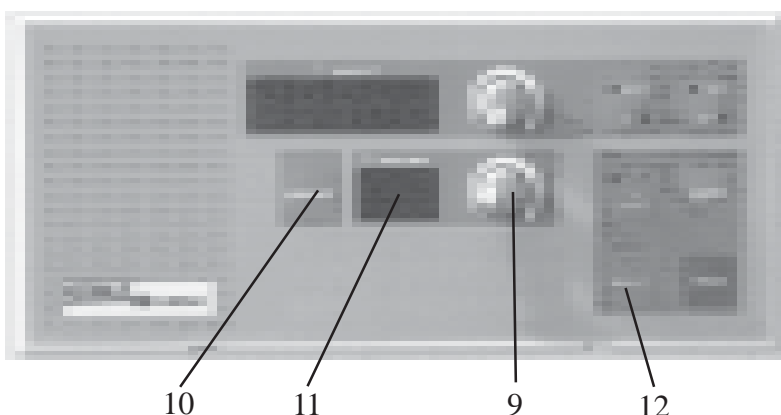
2 OPERATION

2.2.6 Pre-selection of running time

Running time is adjustable from 1 to 60 min. or continuous.

When the lid of the centrifuge is open, running time can be preset with the "TIME" potentiometer (9) in increments of 1 minute. During the run or when the lid is closed you have to additionally press the key "PRESET" (10) in order to change running time values.

The preset running time will be shown in the display (11) in minutes. The preset running time will be stored after the run. When the lid of the centrifuge is closed, the running time display will switch from preset to actual value.



For continuous run, turn the time potentiometer (9) clockwise to the limit stop. The display (11) indicates **continuous run** with two dashes " - -".

During continuous run, the running time passed can be read off as follows:

- Press "START" key (12).

Afterwards, running time is shown in display (11) as follows:

- First, there is symbol "h" for hours, and then the number of hours will be shown. Afterwards, there is symbol "m" for minutes, and then the number of minutes will be shown.

Example: 1 hour 47 minutes running time passed

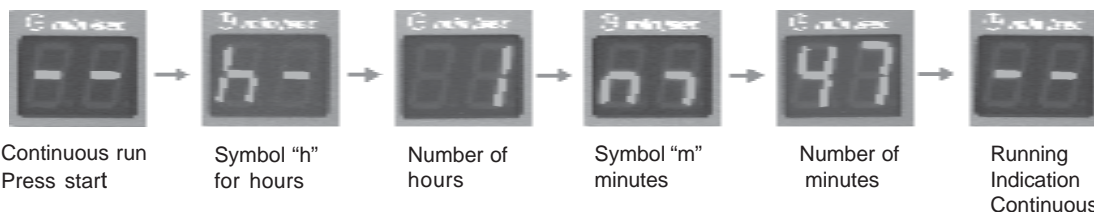


Photo 12

ATTENTION:

In order to check the running time passed the unit must already be running for at least one minute.

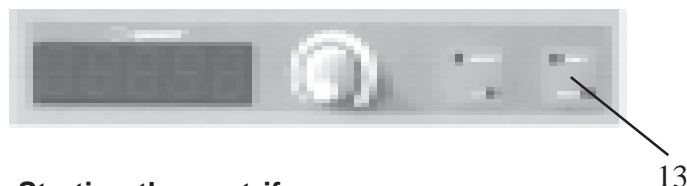
A run in continuous mode can only be finished by pressing the "STOP" key.

2 OPERATION

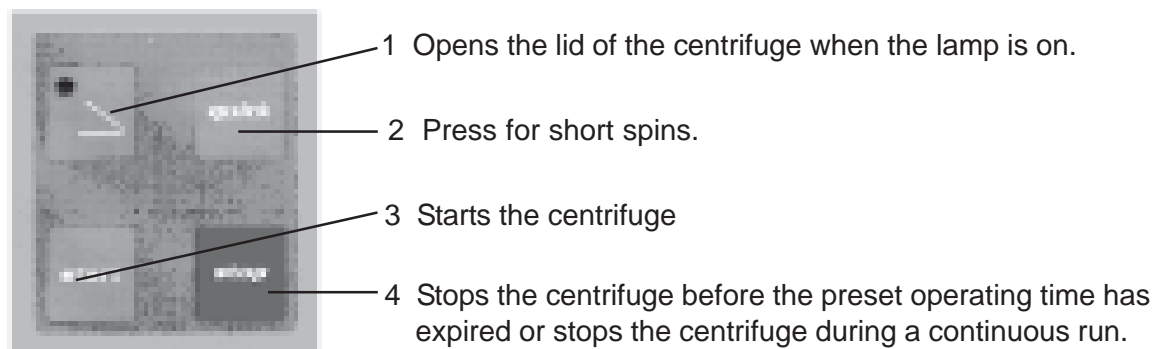
2.2.7 Preselection of brake intensity and acceleration

With the “FAST/SLOW” (13) key, two different braking and acceleration intensity profiles can be chosen.

When the “FAST” lamp is flashing, the unit accelerates and brakes quickly. When the “SLOW” lamp is flashing, the unit accelerates and brakes slowly and gently below 2,000rpm.



2.2.8 Keyboard – Starting the centrifuge



Starting the centrifuge

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. As soon as the lamp on the lid key is lit, the centrifuge run can be started. Press “START” key.

ATTENTION: The rotor must to be checked and rotor nut tightened prior to each run!

“QUICK” key - short runs

Short runs can be accomplished by pressing and holding the “QUICK” key. The centrifuge will start and run as long as the key is pressed. The running time is shown in seconds in the time display.

2.3 Safety features

2.3.1 Imbalance detection

If a rotor is not properly loaded or balanced (see chapter 2.1.1 and 2.1.2), the drive will turn off during acceleration and the rotor will decelerate to stand still.

When error message “1” appears in the “SPEED” display, the weight difference of the samples is too large. Weigh out the samples exactly. Load the rotor as described in chapter 2.1.1.

2 OPERATION

When error message “2” appears in the “SPEED” display, the cause is usually one of the following::

- The imbalance switch is not correctly adjusted.
- The imbalance switch is defective.
-

3 MAINTENANCE

3.1 Service and maintenance

3.1.1 Maintenance and cleaning

Maintenance:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available). Vaseline, readily available, is the most suitable lubricant. The Vaseline must be free of resin and acids. Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by the slightest damage.

If rotors, buckets or tube racks come in contact with corrosive substances, they must be cleaned carefully and immediately. Corrosive substances include:

- Alkalies
- Alkaline soap solutions
- Alkaline amines
- Concentrated acids
- Solutions containing heavy metals
- Water-free chlorinated solvents
- Saline solutions, e.g. salt water

Cleaning:

Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion.

In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.

After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. temperature + 50°C).

Due to humidity and not hermetically sealed samples, condensate may be formed. The condensate must to be removed regularly from the rotor chamber with a soft cloth.

3. MAINTENANCE

The maintenance cleaning procedure must be repeated every 10 to 15 runs or at least once a week.

3.1.2 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor.

If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will contaminate the rotor chamber, the rotor, the buckets and the samples.

3.1.3 Disinfection

Should infectious material be spilled in the centrifuge, the rotor and rotor chamber must be disinfected immediately after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

The rotor and rotor chamber should be cleaned with a universal, neutral disinfection agent, e.g. with a formalin base. A disinfection spray is most suitable in order to easily reach all locations.

ATTENTION:

Before applying any cleaning or decontamination method other than those recommended by the manufacturer, contact the manufacturer to ensure that the cleaning method will not damage the unit or the rotor.

4. TROUBLE SHOOTING

4.1 Error messages: cause / solution

Preface:

The error messages are listed to help identify possible errors. The diagnosis referred to in this chapter may not always be the right one, but is the most common cause of the error.

4.2 Lid release and the error message system

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to retrieve your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing there is a plastic plug attached to a cord.

4 TROUBLE SHOOTING

- Pull the plastic plug out of the housing and pull the cord to open the lid of the centrifuge (see photo 16).



Photo 16

4.2.2 Description of the error message system

Error messages are shown in the “SPEED” display (see photo 17).

There are two different kinds of errors.

- **Errors No. 1 – 49 (forced stop)**

If one of these errors occur, the rotor decelerates from preset speed down to 0. As soon as the rotor stops, the error message can be reset by opening and closing the lid of the centrifuge.

- **Errors No. 50 – 99 (emergency stop)**

If one of these errors occur, the frequency converter switches off. The rotor will stop without the brakes being applied. To reset the error, the centrifuge must be unplugged and then plugged in again.

In case the unit stops due to an error indication, you should restart the unit to check whether the error occurs again.

The error message figures not listed in this chapter are currently not in use. They are reserved for future use in completing the error message recognition program.

Example: figures are flashing



Photo 17

4.2.3 Error messages

- **Error No. 1: Imbalance**

- Cause: Incorrect loading of the rotor (see chapter 2.1.1 and 2.1.2)
- Solution: Balance your samples

4 TROUBLE SHOOTING

- Cause: Incorrect adjustment of the imbalance sensor
- Solution: Imbalance sensor has to be readjusted (call service department)

Error No. 2: Permanent imbalance signal

- Cause: Incorrect positioning of imbalance sensor
- Solution: Imbalance sensor needs to be readjusted (call service department)
- Cause: Imbalance sensor is defective
- Solution: Imbalance sensor needs to be replaced (call service department)

Error No. 25: Power failure

- Cause: Power failure while rotor was in motion
- Solution: Open and close the lid of the centrifuge, restart the unit; check tightness of plug (loose contact)

Error No. 36: Relay of the frequency converter cannot be released / lid cannot be opened

- Cause: Power board malfunction
- Solution: Call service department
- Cause: Lid of the centrifuge is jammed
- Solution: With the rotor stopped, open the lid of the centrifuge manually. Lightly grease the lid lock. If the error occurs again, call for service.
- Cause: Lid lock is defective
- Solution: Call service department, replace lid lock

Error No. 50 / 51: Memory failure

- Cause: Internal or external memory failure
- Solution: Restart the unit. If this error occurs again, call service department; replace control panel

Error No. 54: Wrong configuration

- Cause: Jumper is placed at the wrong position on control panel
- Solution: Replace jumper

Error No. 55: Over speed

- Cause: Speed sensor is defective
- Solution: Restart the unit. In case this error occurs again, call service department. Possibly a loose speed magnet, fix with super glue

4 TROUBLE SHOOTING

Error No. 60: Motor speed sensor signal is missing

- Cause: Speed sensor is defective or cable is broken at speed sensor, possibly loose magnet
- Solution: Call service department; check speed magnet, fix with super glue

Error No. 82: Cut off power board – frequency converter

- Cause: Over current or under voltage due to power supply fluctuations
- Solution: Restart the unit, take care the power supply is stable

Error No. 83: Preset speed cannot be reached

- Cause: Preset speed cannot be reached
- Solution: Call service department

Error No. 84: Over temperature frequency converter

- Cause: Frequency converter cut off due to over temperature
- Solution: Be sure the centrifuge is properly ventilated.

Error No. 85: Over temperature motor

- Cause: Temperature protection switch of motor turns off
- Solution: Be sure the centrifuge is properly ventilated.
Motor mounting is defective, replace motor

Error No. 90: Emergency switch off lid lock

- Cause: The lid of the centrifuge has been opened while centrifuge was running
- Solution: Close the lid of the centrifuge immediately. The lid should never be opened while the rotor is in motion.
- Cause: Control switch of lid lock is defective
- Solution: Call service department

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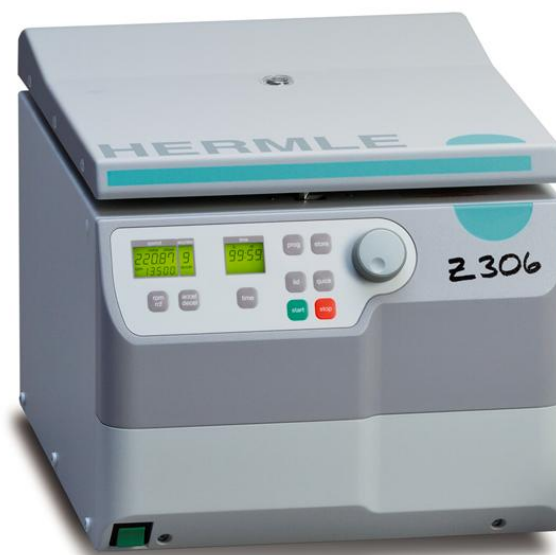
Fax 732 417-1750

Email labnet@labnet.com

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Labnet
Labnet International, Inc.



Operating manual for universal centrifuge Z 306

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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 306 is a non refrigerated universal centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with swing-out and angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

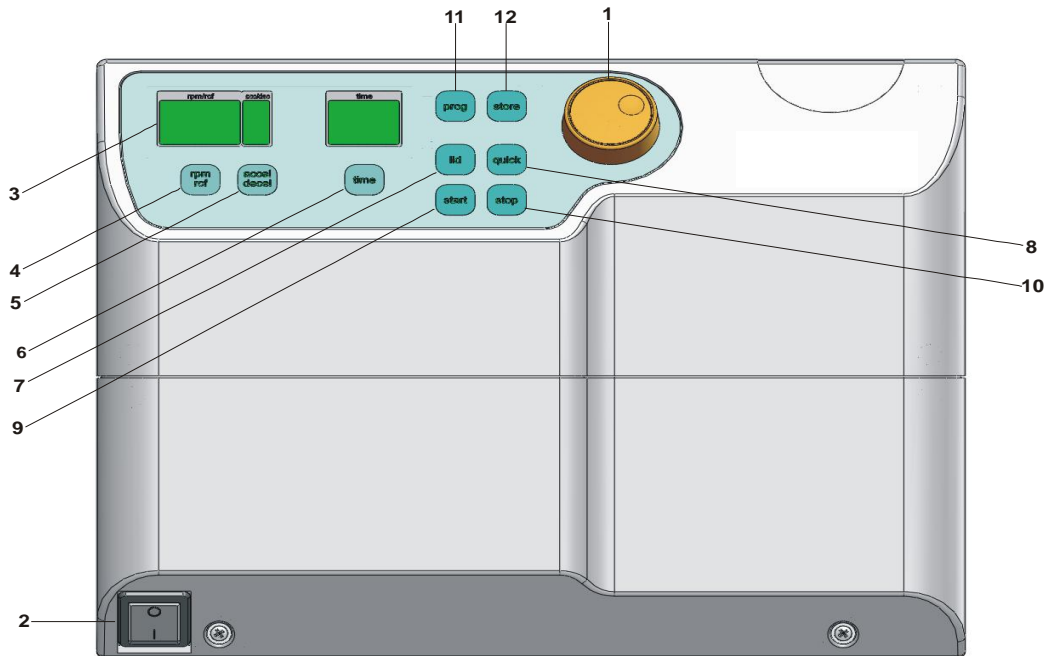
Detailed technical data are in "table 1 Technical data" (see APPENDIX P.V).

1.4 Delivery package

- 1 Centrifuge Z 306
- 1 Operating Manual Z 306
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



- | | |
|----|--|
| 1 | central adjuster run parameters |
| 2 | 0-I power switch |
| 3 | LCD control panel display |
| 4 | rpm/rcf speed/ g-force |
| 5 | accel/decel acceleration- / Deceleration intensity |
| 6 | time centrifugation time |
| 7 | lid lid release |
| 8 | quick short running |
| 9 | start start centrifugation |
| 10 | stop stop centrifugation |
| 11 | prog calling stored programs |
| 12 | store program store |

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

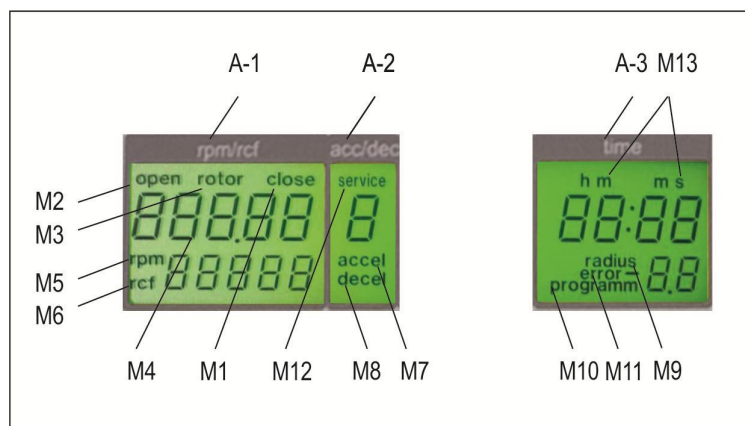


Figure 1

Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/dec“
- A-3 Display field – „time“

Messages/logos of the display fields:

- | | |
|--------------|---------------|
| M1 „close“ | M8 „decel“ |
| M2 „open“ | M9 „radius“ |
| M3 „rotor“ | M10 „program“ |
| M4 Rotor-No. | M11 „error“ |
| M5 „rpm“ | M12 „service“ |
| M6 „rcf“ | M13 h m s |
| M7 „accel“ | |

1.6 Signs and indications of the centrifuge

1.6.1 General



Instructions for disposal (see chapter 6, P. 28)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product-nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product

REF: Order no. of the product

SN: Serial number of the product



Date of manufacture

MAX. Drehzahl: max. allowed speed of the unit

KIN. EN.: max. kinetic energy with corresponding rotor

U/I/f: Allowable voltage / max. current / frequency

P: Electrical input power



Before operating, read the operating manual!



Labeling, standards and guidelines that are considered

1.6.3 Warning and information signs

Warning
Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.

Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.

Attention!!
Check the fastening of the rotor nut before each run.
Achtung!!
Vor jedem Lauf Befestigungsschraube auf festen Sitz prüfen.

Attention! Check the fastening of the rotor nut before each run.

Vor manueller Entriegelung oder öffnen des Gehäuses Netzstecker Ziehen!
TAKE OFF MAINS PLUG before opening the housing or the emergency release!
RETIREZ LE CORDON avant toute intervention a l'intérieur de l'appareil

Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Z 306 is non explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 306 is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements



The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

(The socket for the power cord must be easy to reach respectively easy to disconnect).

Switching it on using the mains power switch (I).

Open the lid by using the button LID.

- Remove the transport securing device of the motor.

1.8 Basic adjustments

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Acoustic signal turn on / off
- Keyboard sound turn on -/ off
- Volume pre-selection of sound signal
- Song selection of sound signal „end of run“

1.8.1 Access to mode „Operating Data“

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see Figure 2).

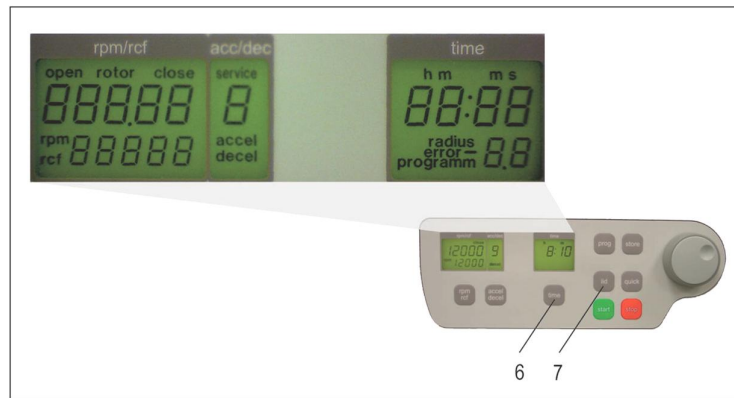


Figure 2

Attention:

- Please notice that you must enter the program as described under point 1.8.1 to change the adjustments of the points 1.8.2 - 1.8.6. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.
- All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“ (A-1) - Only then the pre-selections are valid! (see figure 3)

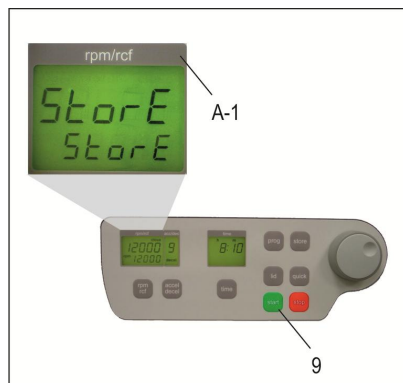


Figure 3

1.8.2 Sound signal turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 4).

After you have stored the settings you changed to the normal program mode again by switch off the centrifuge for a short while.

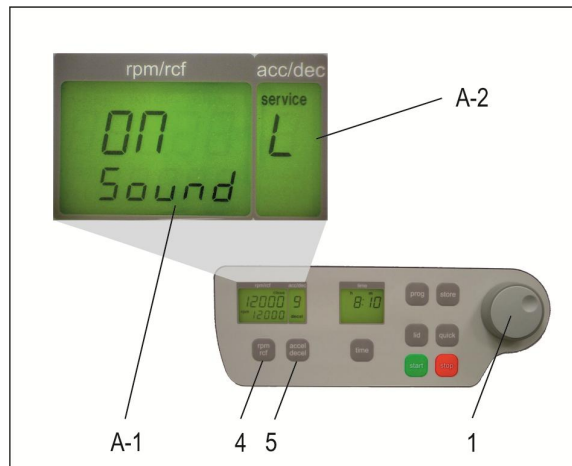


Figure 4

1.8.3 Volume pre-selection of sound signal

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „U“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0-9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 5).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

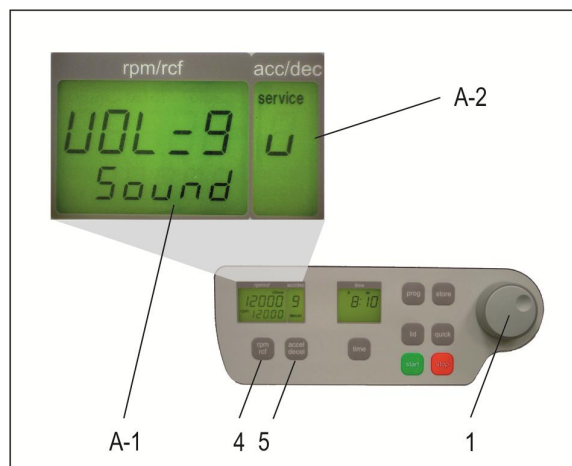


Figure 5

1.8.4 Song selection for sound signal - end of run

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 6).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

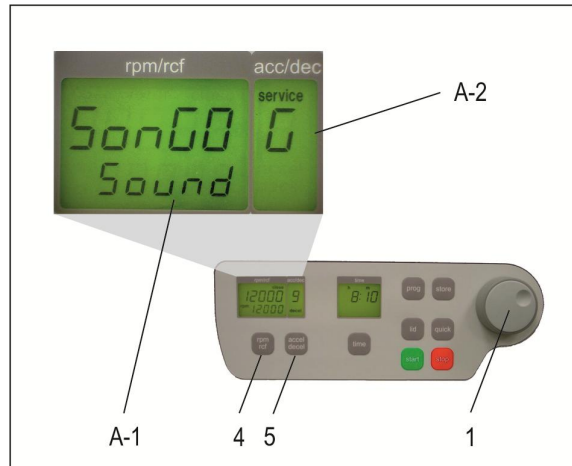


Figure 6

1.8.5 Keyboard sound turn on- / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 7).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

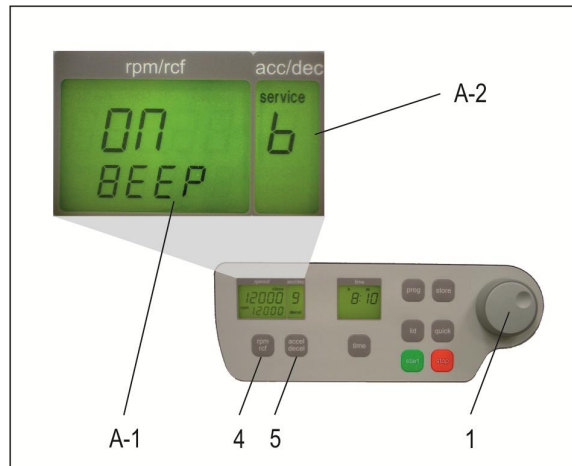


Figure 7

1.8.6 Call up operating data (by skilled personnel or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.1 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- r = converter software
- E = list of previous error message
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 5: error messages“ (see APPENDIX S. IX).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

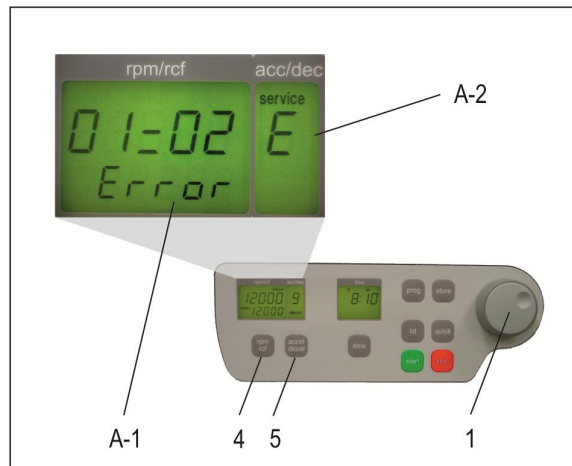


Figure 8

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 9) Take care that the rotor is fully installed onto the motor shaft.



Figure 9

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed Allen key (see figure 10)



Figure 10



Figure 11



ATTENTION: For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 10)

2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 12+13). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).



Figure 12: wrong



Figure 13: correct (4 tubes)

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 15

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see figure 14 and 15).

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High EF oil (Order No. 34-5147). The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1,0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!!

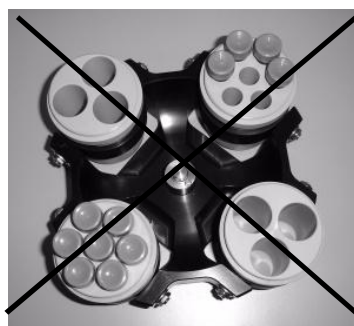


Figure 14: wrong



Figure 15: correct



ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2: permissible net weight“ (see APPENDIX P. VI).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have an max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing nut complete (2. screw over the stiff point) and lift the rotor vertical out of the centrifuge. (See figure 10 and 11)

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „221.28“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4).). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the electromagnetic lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

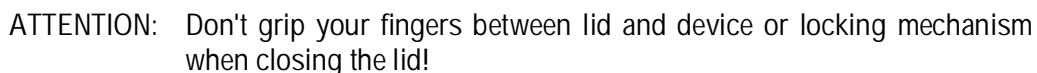
The diagram illustrates the three digital displays and the control unit of the M2000. The top row shows three displays: M2 (open, 0 rpm), M4 (rotor close, no rpm), and M3 (rotor close, 220.72 rpm). The bottom display is the control unit (7) showing 12000, 8:10, and various buttons.

During the run you can call up the rotor type at any time by pressing the key "lid" (7).

The lid must be pressed down. An electromagnetic lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 16



2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 17

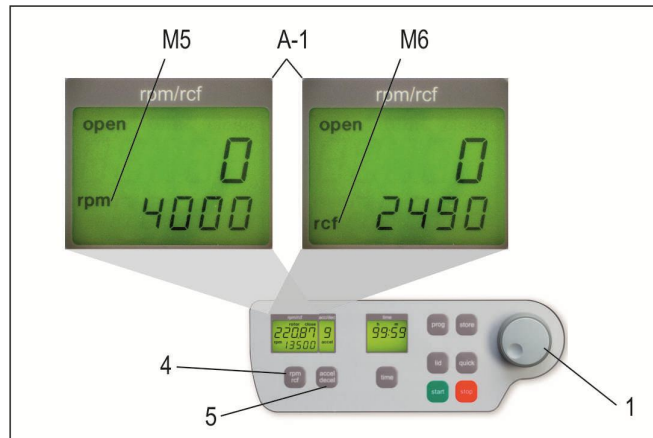


Figure 17

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 3: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. VII). There are listed all important values.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be interrupted by the key „stop“ (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3). That continuous run can only be interrupted by pressing the key „stop“ (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 18)

All with number marked passages refer to figure 18

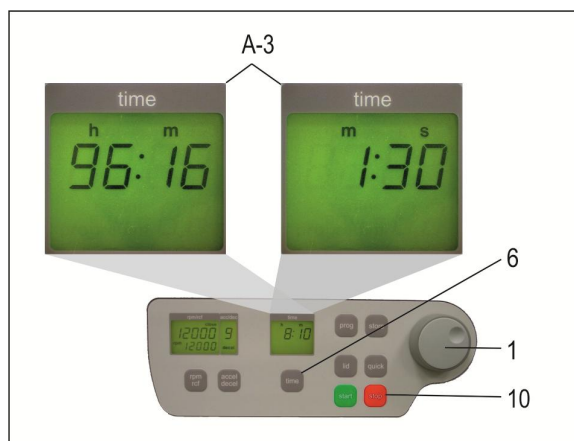


Figure 18

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 19

See „table 4: acceleration and deceleration times“ (APPENDIX P. VIII). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

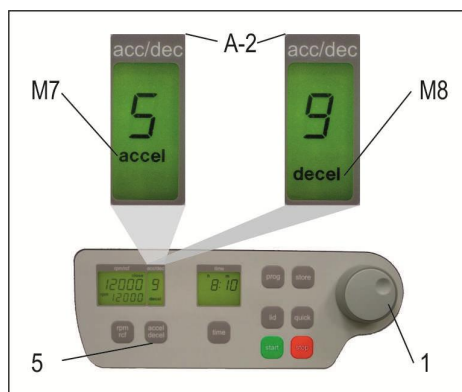


Figure 19

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (9) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can pre-select then the respective radius correction (see table 6, APPENDIX P. X) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 20

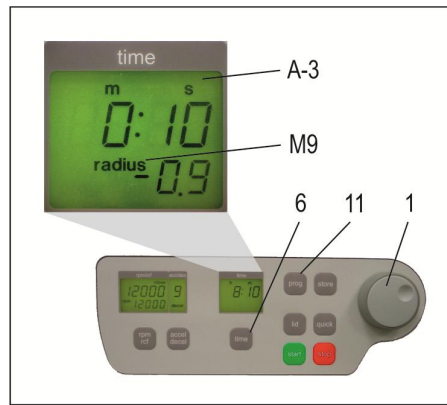


Figure 20

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“ (see figure 21). With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor“ (M3) and „22x.xx“ (M4) (see figure 21). In case of free program numbers it appears 0.

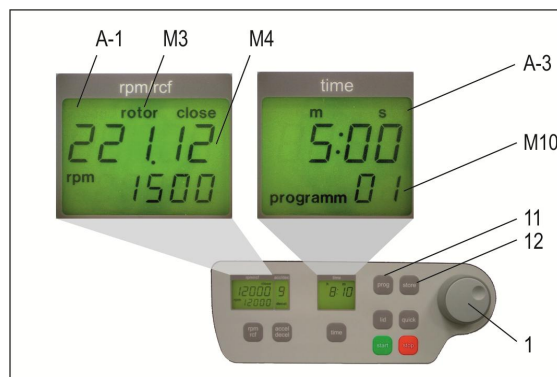


Figure 21

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the program, in the display "rpm/rcf" (A-1) flashes alternately the word "FirSt" and "CLOSE Lid" (see figure 22). If you want to start the run without storing the program, in the display "rpm/rcf" (A-1) flashes alternately the word "FirSt" and "PrESS StoreE" (see figure 23).

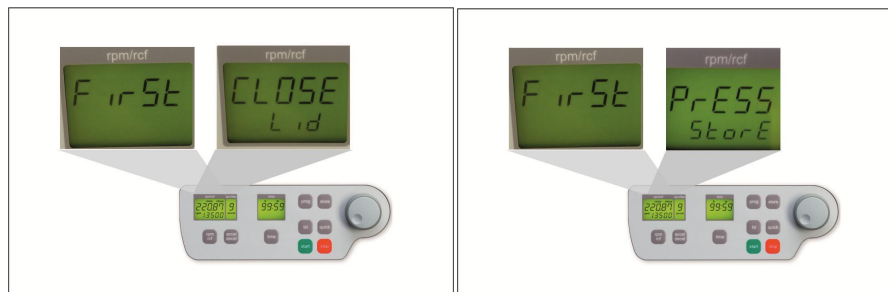


Figure 22

Figure 23

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“ (M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 24.

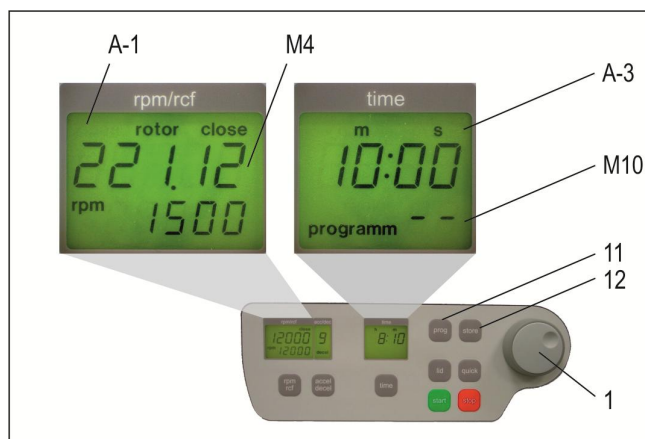


Figure 24

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm“.

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 24.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).

By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended then the centrifuge will stop automatically.

By the „quick“ key (8) you can start runs, which will last just a few seconds.

By pressing the „quick“ key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick“ key (8).

By releasing the „quick“ key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 25

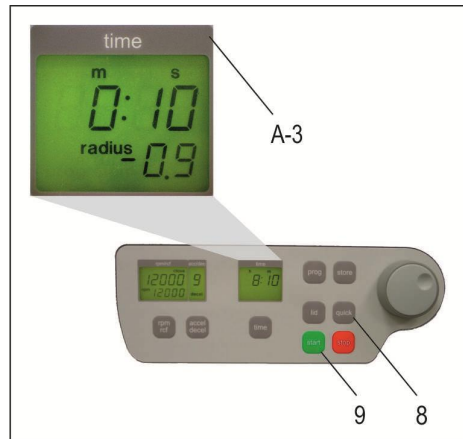


Figure 25

2.6.2 The „STOP“ key

By the „stop“ key (10) (see figure 26) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

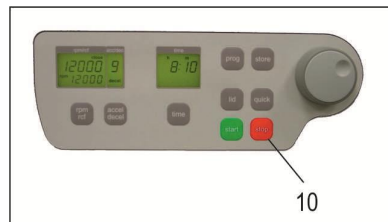


Figure 26

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" appear, the weight difference of the samples is too huge. Weigh out the samples exactly!

Load the rotor as described in chapter 2.1.1 and 2.1.2.

When inside the display "time" (A-3) the word "error" together with the number "02" (see figure 27) appear, there could be following reasons: The imbalance switch is defective.

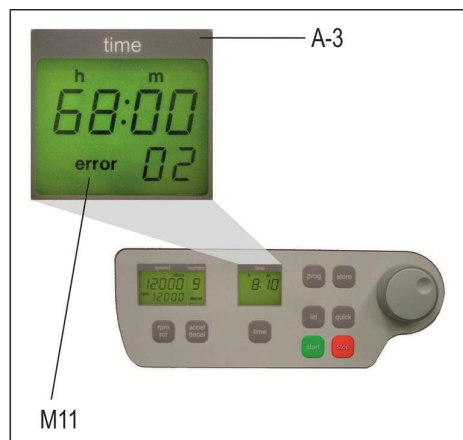


Figure 27

3. Maintenance

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum-rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)




ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.


Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.

 **ATTENTION:** Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization


Bottles, adapters and rotors may be treated with the usual liquid disinfectants.

 **ATTENTION:** Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.

 **ATTENTION:** Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time:

Proper use, damage-free condition, recommended care.

4. Trouble Shooting

4.1 Error messages: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see Figure 28):

- ⚠ • Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)
At the right side of the centrifuge there is a plastic stopper (Figure 26). Remove this stopper, which is connected to the lid lock, horizontally from the housing until the centrifuge lid opens.
- Now open the lid of the centrifuge.



Figure 28

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 29). Detailed information about possible error messages are in „table 5: error messages“ (see Appendix P.IX).

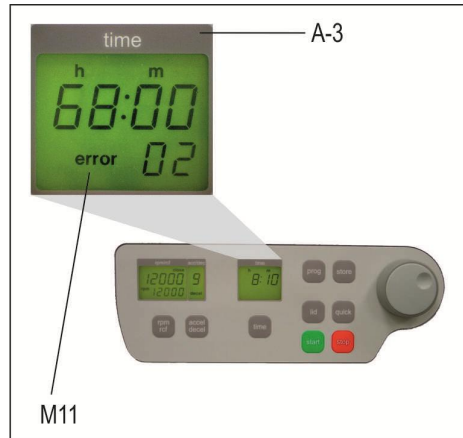


Figure 29

5. Receipt of centrifuges to repair



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. XIV)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

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EC - Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to “IVD (other device)”

Typenbezeichnung
Type designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012

Konformitätserklärung Geräte IVD 03-2012

HERMLE
LABORTECHNIK

Alexander Hermle
Geschäftsführer, Managing Director

Table 1: Technical Data

Weight without rotor	30 kg			
max. speed	14000 min ⁻¹			
max. volume	4 x 100 ml			
max. RCF	18626 x g			
allowable density	1,2 kg/dm ³			
allowable kinetic energy	5595 Nm (Rotor 221.17 V03)			
Mains power connection AC	230 V / 50 Hz 1 ph		120 V / 60 Hz 1 ph	
Voltage fluctuation	± 10 %		± 10 %	
Current consumption	1,3 A		2,4 A	
Power consumption	0,24 KW		0,3 KW	
Radio interference	IEC 61326-1			
Audit requirement (BGR 500)	no			
Ambient conditions (EN/IEC 61010-1)				
Environement	for indoor use only			
High	Use up to an altitude of 2000 m above MSL			
Ambient temperature	2°C up to 35 °C			
Max. relative humidity	Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50% relative humidity up to 35°C			
Overvoltage category (IEC 60364-4-443)	II			
Degree of contamination	2			
Class of protection	I			
Not suitable for use in hazardous environements				
EMV	EN / IEC	FCC Class B	EN / IEC	FCC Class B
Interference emission, noise immunity	61326-1 Category B		61326-1 Category B	
Noise level (depending on the rotor)	≤ 63dB(A)			
Write from operator				
Inventory-No.:				
Monitoring-Nr.:				
Environement				
Maintenance contract:				
responsible service office	HERMLE Labortechnik GmbH		or dealer service office	
	Siemensstrasse 25			
	78564 Wehingen			
	Tel.: (49)7426 / 96 22-17			
	Fax: (49)7426 / 96 22-49			
responsible dealer				

Table 2: Permissible net weight

Rotor number	Max. speed	Permissible net weight
220.50 V08	3500 min-1	4 x 200 g
220.72 V06	4000 min-1	4 x 465 g
220.87 V09	14000 min-1	24 x 3,4 g
220.87 V10	14000 min-1	24 x 3,4 g
221.54 V02	6000 min-1	300 g
221.55 V02	6000 min-1	432 g
221.12 V03	4500 min-1	4 x 340 g
221.16 V03	4500 min-1	2 x 400 g
221.17 V03	12000 min-1	30 x 3,4 g
221.19 V02	4500 min-1	30 x 32 g
221.24 V02	3250 min-1	2 x 70 g
221.25 V03	5000 min-1	6 x 110 g

Table 3: Max. speed and RCF-values for permissible rotors

Rotor number	Max. speed	RCF value
220.50 V08	3500 min-1	1424 xg
220.72 V06	4000 min-1	3885 xg
220.87 V09	14000 min-1	18626 xg
220.87 V10	14000 min-1	18626 xg
221.54 V02	6000 min-1	4427 xg
221.55 V02	6000 min-1	4427 xg
221.12 V03	4500 min-1	3350 xg
221.16 V03	4500 min-1	2716 xg
221.17 V03	12000 min-1	15133 xg
221.19 V02	4500 min-1	2830 xg
221.24 V02	3250 min-1	1700 xg
221.25 V03	5000 min-1	3801 xg

Table 4: Acceleration and deceleration times

Rotor number	Acceleration values		Deceleration values	
	level 0	level 9	level 0	level 9
220.50 V08	110	14	250	19
220.72 V06	110	14	170	17
220.87 V09	200	22	230	35
220.87 V10	200	25	230	35
221.54 V02	102	11	167	14
221.55 V02	101	11	206	14
221.12 V03	110	14	170	19
221.16 V03	230	25	340	26
221.17 V03	250	27	280	34
221.19 V02	157	19	370	20
221.24 V02	95	12	230	15
221.25 V03	206	24	870	30
in seconds				
Accelertaion time from $0 \text{ min}^{-1} \rightarrow U_{\max}$		Decelertaion time from $U_{\max} \rightarrow 0 \text{ min}^{-1}$		

Table 5: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
14	Leap of speed is too big between two measurements
CLOSE lid	
33	Open lid while motor is running
40	Communication with frequency converter disturbed during start
41	Communication with frequency converter disturbed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the program
rotor no	Rotor is not detected

Tabelle 6: Radius correction

<i>Rotor no.</i>	<i>Adapter/Tube-rack Order no.</i>	<i>Radius (cm)</i>	<i>Correction (cm)</i>
Swing out rotor 220.72 V04	605.004	14,6	0
	605.005	14,6	0,0
	605.000/001	14,2	-0,4
	705.002	14,0	-0,6
	705.003	14,0	-0,6
	705.005	13,7	-0,9
	705.007	14,0	-0,6
	705.008	14,0	-0,6
	705.009	14,6	0
	705.010	14,0	-0,6
	705.012	14,0	-0,6
	705.013	13,9	-0,7
	705.014	13,1	-1,5
	705.015	14,0	-0,6
	705.016	14,0	-0,6
		13,9	-0,7
Angle rotor 220.87 V09 220.87 V10		8,6	0
	704.004	8,2	-0,4
	704.005	7,5	-1,1
Anglerotor 221.54 V02		11	0
	701.011	10,6	0,4
	701.012	9,1	1,9
	701.015	7,7	3,4
Anglerotor 221.55 V02		11	
	708.019	10,7	0,3
	708.003	10,3	0,7
	708.004	10,6	0,4
	701.011	10,2	0,8
	701.012	8,3	2,7
	701.015	6,7	4,3
Swing out rotor 220.50 V08		10,2	0

Table 6 (part 2): Radius correction

Rotor no.	Adapter/Tube-rack Order no.	Radius (cm)	Correction (cm)
Swing out rotor 221.12.01.02	626.003	14,8	0
	626.000	14,1	-0,7
	626.001	14,1	-0,7
	626.002	14,6	-0,2
	626.004	14,5	-0,3
	626.005	14,2	-0,6
	626.006	14,2	-0,6
	626.007	14,0	-0,8
	626.008	14,2	-0,6
	626.009	14,2	-0,6
	626.010	14,3	-0,5
	626.011	13,8	-1,0
	626.012	14,4	-0,4
	626.013	14,5	-0,3
	626.014	9,9	-4,9
	626.015	11,6	-3,2
Swing out rotor 221.16.01.02		10,2	0
	706.000	10,2	0
Angle rotor 221.17.01		9,5	0
	704.004	9,1	-0,4
	704.005	8,4	-1,1
Angle rotor 221.19.01		12,5 10,9	0
	701.000	8 6,4	-4,5
	701.010	11,3 9,7	-1,2
	701.011	12,2 10,6	-0,3
	701.012	10,5 8,9	-2,0
Swing out rotor 221.24.01		14,36	0
Angle rotor 221.25.01		13,6	0
		13,3	-0,3

Table 7: Abbreviations used

Symbol / Abbreviation	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis: ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α.. ☐ β.. ☐ γ.. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____



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Table Top Centrifuge
Z 326

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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 326 is a non refrigerated universal centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with swing-out and angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

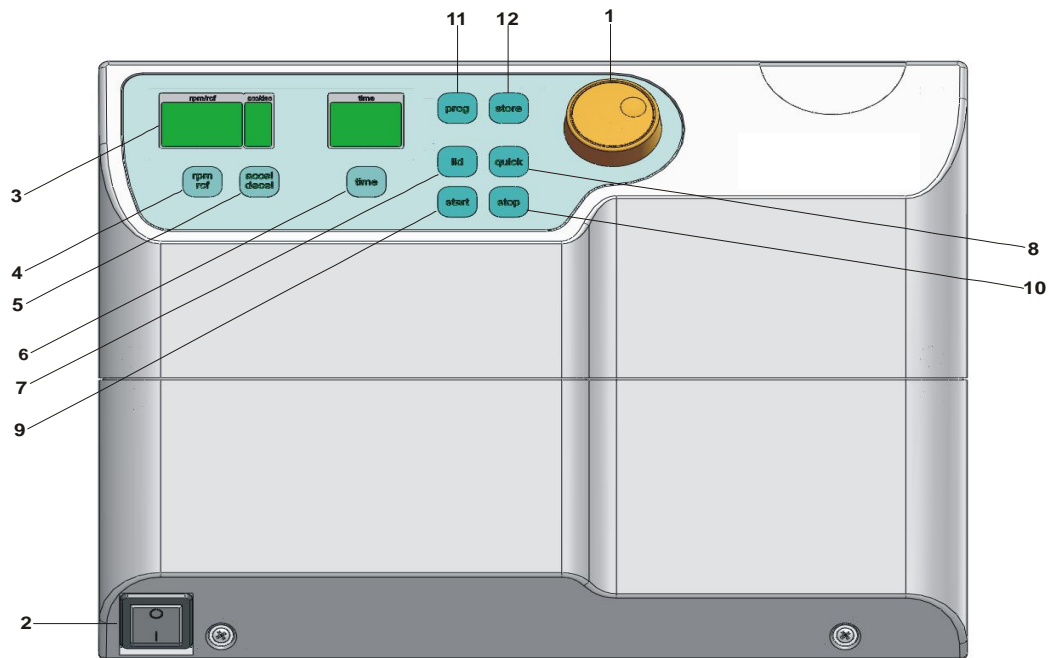
Detailed technical data are in "table 1 Technical data" (see APPENDIX P.V).

1.4 Delivery package

- 1 Centrifuge Z 326
- 1 Operating Manual Z 326
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



- | | |
|----|--|
| 1 | central adjuster run parameters |
| 2 | 0-I power switch |
| 3 | LCD control panel display |
| 4 | rpm/rcf speed/ g-force |
| 5 | accel/decel acceleration- / deceleration intensity |
| 6 | time centrifugation time |
| 7 | lid lid release |
| 8 | quick short running |
| 9 | start start centrifugation |
| 10 | stop stop centrifugation |
| 11 | prog calling stored programs |
| 12 | store program store |

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

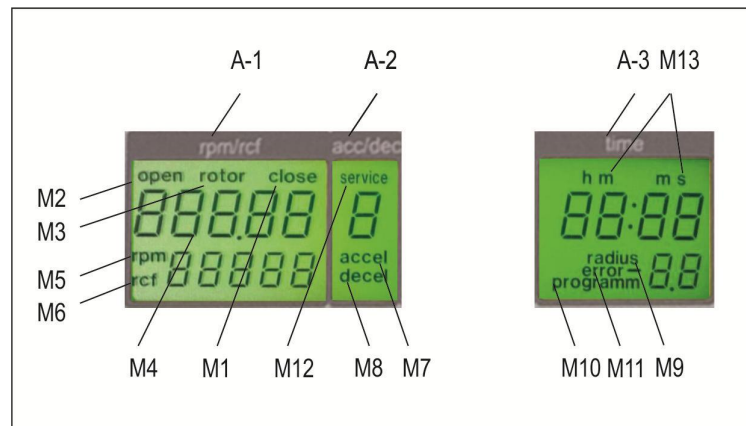


Figure 1

Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/dec“
- A-3 Display field – „time“

Messages/logos of the display fields:

M1	„close“	M8	„decel“
M2	„open“	M9	„radius“
M3	„rotor“	M10	„program“
M4	Rotor-No.	M11	„error“
M5	„rpm“	M12	„service“
M6	„rcf“	M13	h m s
M7	„accel“		

1.6 Signs and indications of the centrifuge

1.6.1 General



Instructions for disposal (see P. 28)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product-nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product

REF: Order no. of the product

SN: Serial number of the product



Date of manufacture

MAX. Drehzahl: max. allowed speed of the unit

KIN. EN.: max. kinetic energy with corresponding rotor

U/I/f: Allowable voltage / max. current / frequency

P: Electrical input power



Before operating, read the operating manual!



Labeling, standards and guidelines that are considered

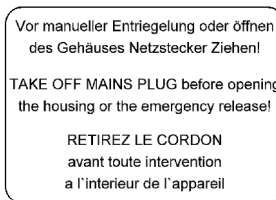
1.6.3 Warning and information signs



Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Z 326 is non explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismounted (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 326 is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

(The socket for the power cord must be easy to reach respectively easy to disconnect).

Switching it on using the mains power switch (I).

Open the lid by using the button LID.

- Remove the transport securing device of the motor.

1.8 Basic adjustments

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Acoustic signal turn on / off
- Keyboard sound turn on -/ off
- Volume pre-selection of sound signal
- Song selection of sound signal „end of run“

1.8.1 Access to mode "Operating Data"

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 2).

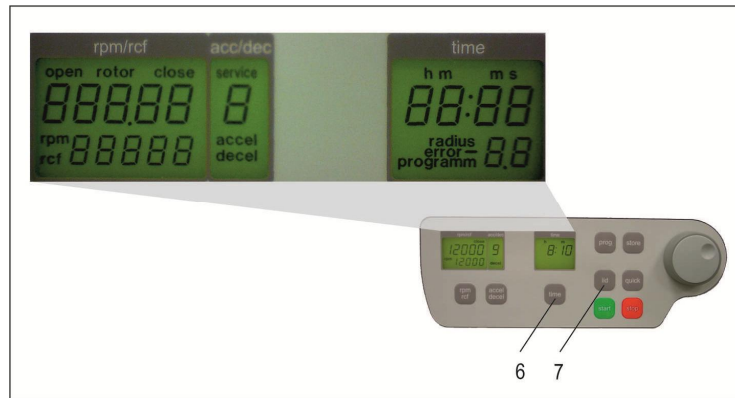


Figure 2



Attention:

- Please notice that you must enter the program as described under point 1.8.1 to change the adjustments of the points 1.8.2 - 1.8.6. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.
- All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“(A-1) - Only then the pre-selections are valid! (see figure 3)

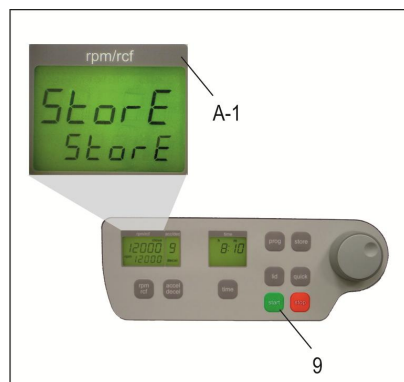


Figure 3

1.8.2 Sound signal turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 4).

After you have stored the settings you changed to the normal program mode again by switch off the centrifuge for a short while.

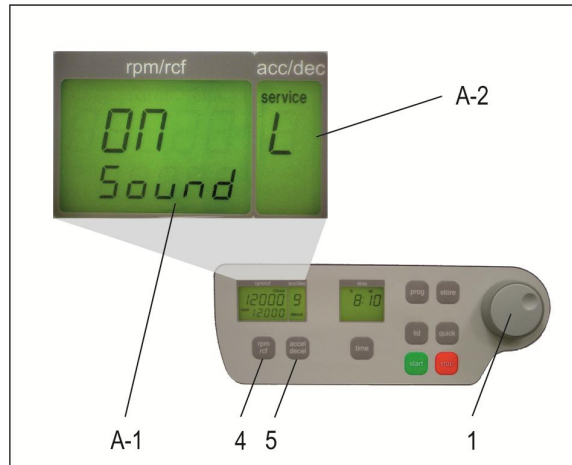


Figure 4

1.8.3 Volume pre-selection of sound signal

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „U“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0-9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 5).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

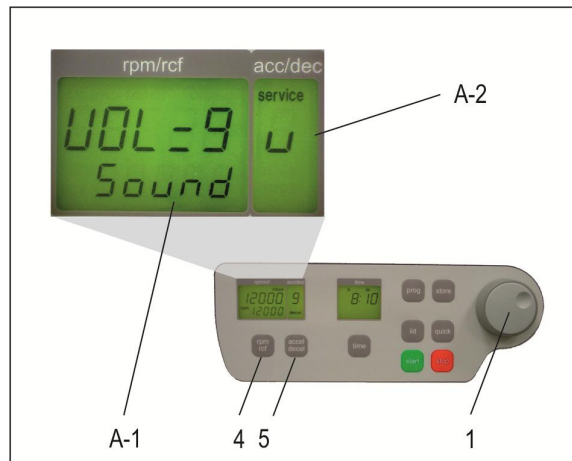


Figure 5

1.8.4 Song selection for sound signal - end of run

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 6).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

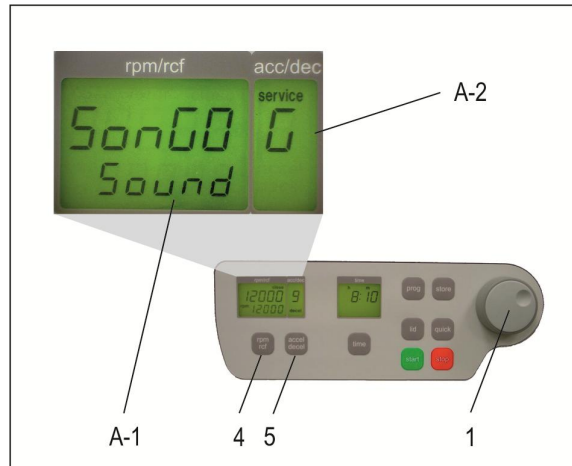


Figure 6

1.8.5 Keyboard sound turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 7).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

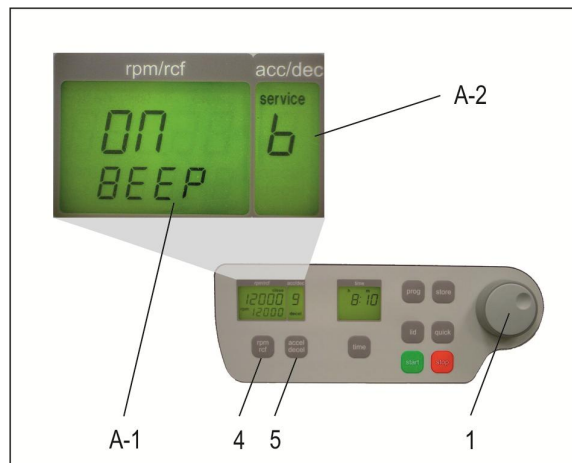


Figure 7

1.8.6 Call up operating data (by skilled or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.1 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- r = converter software
- E = list of previous error message
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 5: error messages“ (see APPENDIX S. IX).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

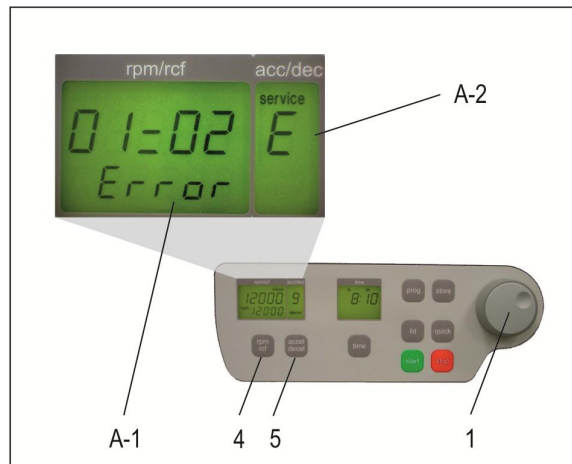


Figure 8

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 9) Take care that the rotor is fully installed onto the motor shaft.



Figure 9



Figure 10

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed allen key (see figure 10)

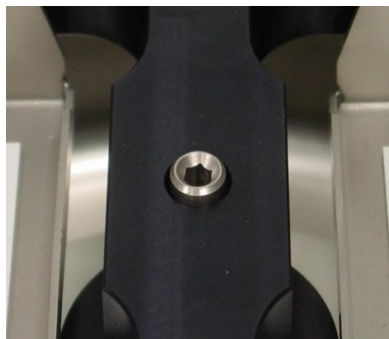


Figure 11



ATTENTION: For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 10)

2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 12+13). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).



Figure 12: WRONG



Figure 13: CORRECT (4 tubes)

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 15

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see figure 14 and 15).

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High TEF oil (Order No. 34-5147). The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1,0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!!

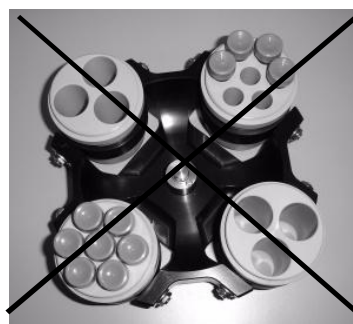


Figure 14: WRONG



Figure 15: CORRECT



ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2: permissible net weight“ (see APPENDIX P. VI).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have an max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing nut complete and lift the rotor vertical out of the centrifuge.
(see figure 9 and 10)

2.2 Lid

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „220.72“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the electromagnetic lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 16

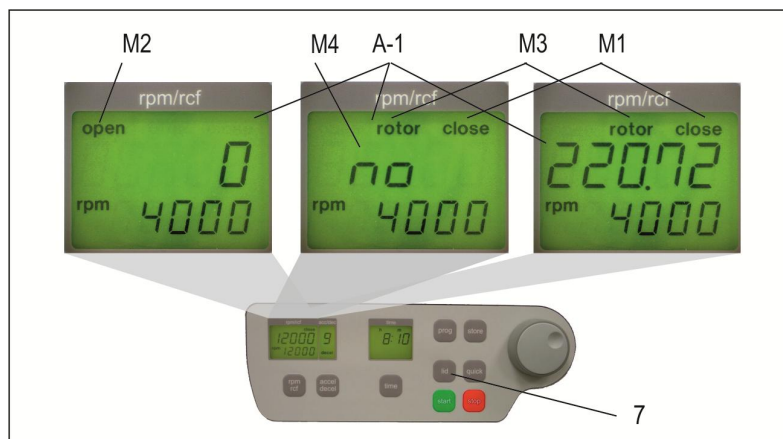


Figure 16

During the run you can call up the rotor type at any time by pressing the key „lid“ (7).

2.2.2 Lid lock

The lid must only be lay down slightly. An electromagnetic lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 16



ATTENTION: Don't grip your fingers between lid and device or locking mechanism when closing the lid!

2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 17

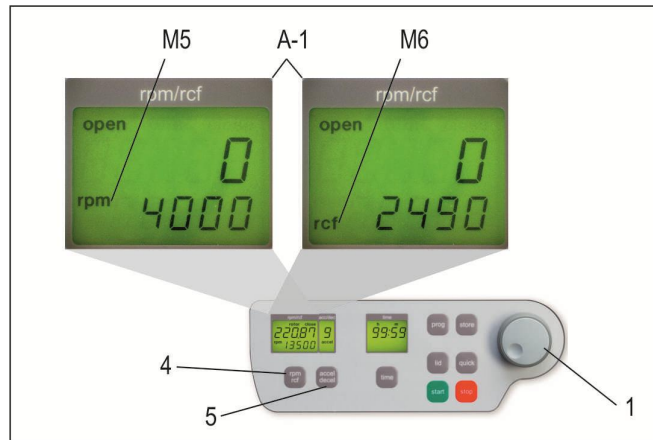


Figure 17

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 3: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. VII). There are listed all important values.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be interrupted by the key „stop“ (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3). That continuous run can only be interrupted by pressing the key „stop“ (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 18)

All with number marked passages refer to figure 18

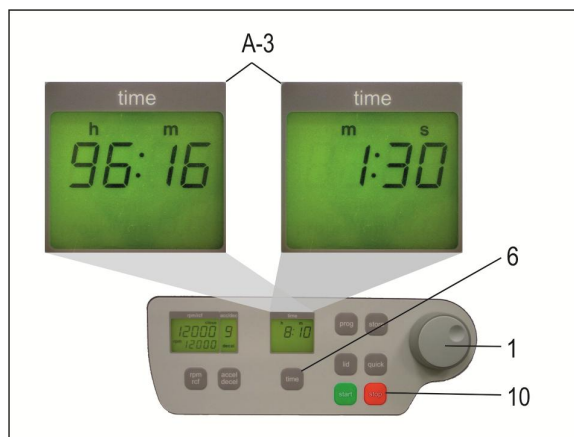


Figure 18

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 19

See „table 4: acceleration and deceleration times“ (APPENDIX P. VIII). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

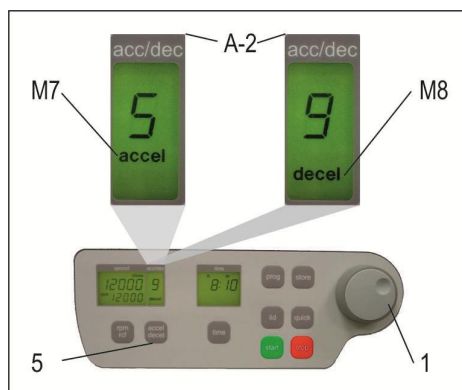


Figure 19

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (6) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can preselect then the respective radius correction (see table 6, APPENDIX P. X) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 20

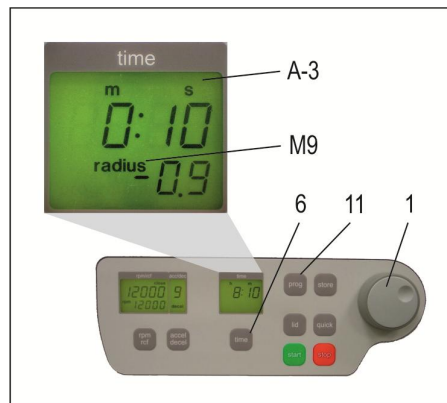


Figure 20

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“ (see figure 21). With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor“ (M3) and „22x.xx“ (M4) (see figure 21). In case of free program numbers it appears 0.

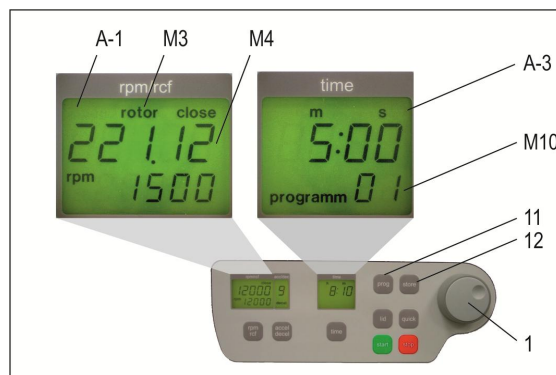


Figure 21

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the program, in the display "rpm/rcf" (A-1) flashes alternately the word "FirSt" and "CLOSE Lid" (see figure 22). If you want to start the run without storing the program, in the display "rpm/rcf" (A-1) flashes alternately the word "First" and "PrESS StoreE" (see figure 23).

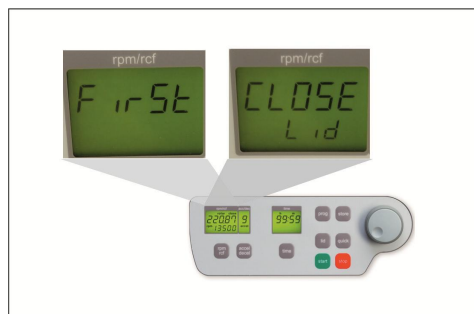


Figure 22

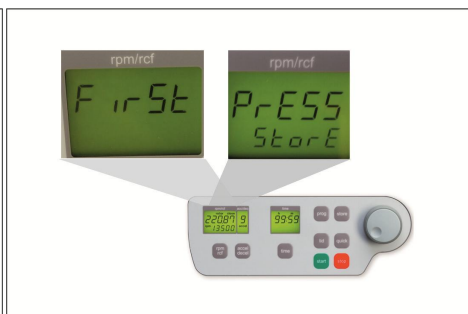


Figure 23

For adaption of data press the key „store“ (12) for approx. 1 second. If the program is stored correctly, the word StorE appears in the display "rpm/rcf" (A-1). As a result the word „program“ (M10) disappears. As soon as the key „store“ (12) is no longer anymore, it reappears the word „programm xx“ (M10) – the (xx) stands for the chosen program place.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“ (M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 24.

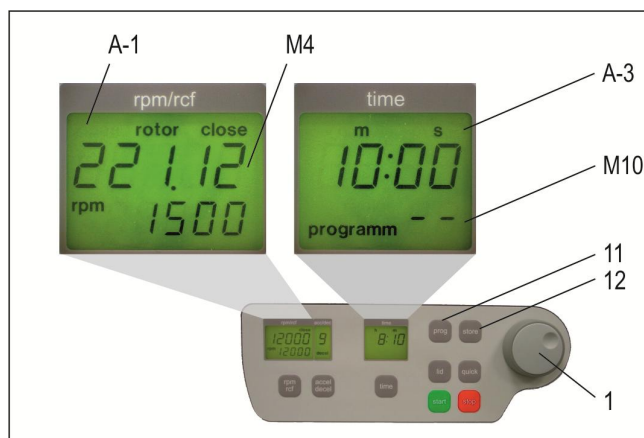


Figure 24

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm“.

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 23.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).

By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended then the centrifuge will stop automatically.

By the „quick“ key (8) you can start runs, which will last just a few seconds.

By pressing the „quick“ key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick“ key (8).

By releasing the „quick“ key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 25

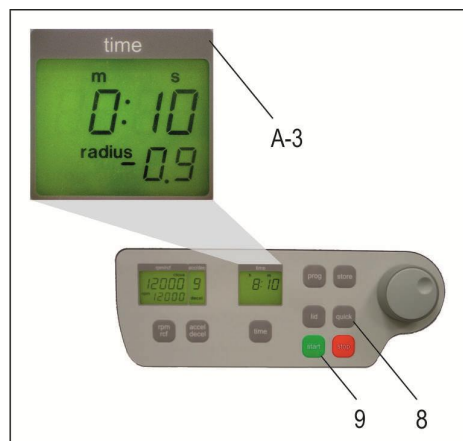


Figure 25

2.6.2 The "STOP" key

By the „stop“ key (10) (see figure 26) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

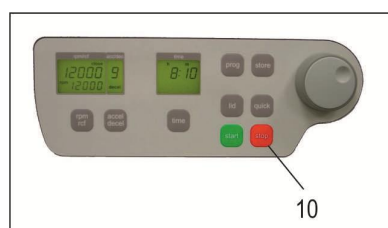


Figure 26

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" appear, the weight difference of the samples is too huge. Weigh out the samples exactly!

Load the rotor as described in chapter 2.1.2 and 2.1.3.

When inside the display "time" (A-3) the word "error" together with the number "02" (see figure 27) appear, there could be following reasons: The imbalance switch is defective.

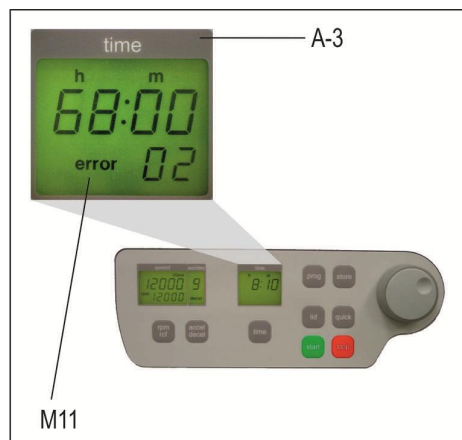


Figure 27

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.



ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.



ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time:

Proper use, damage-free condition, recommended care.

4. TROUBLE SHOOTING

4.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see figure 28):

- ⚠ • Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)
- At the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.
- Take the delivered box spanner, put him in the hole and lock the box spanner with hexagon nut (see figure 28).
- Now turn the box spanner to the right side (clockwise) up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Switch the centrifuge on again, for go on working.



Figure 28

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 29). Detailed information about possible error messages are in „table 5: error messages“ (see Appendix P.IX).

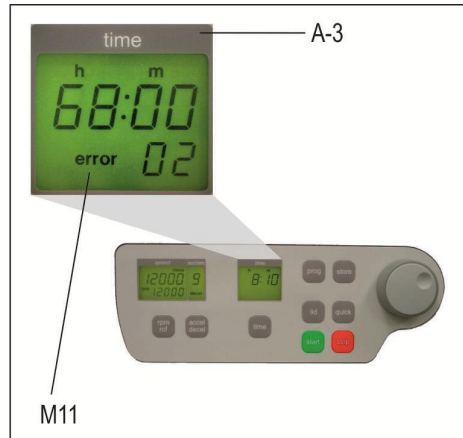


Figure 29

5. RECEIPT OF CENTRIFUGES TO REPAIR



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. XV)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

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EG - Conformity Declaration

EG Konformitätserklärung EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to “IVD (other device)”

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012

HERMLE
LABORTECHNIK


Geschäftsführer, Managing Director

Konformitätserklärung Geräte IVD 03-2012

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH		
Type		Z 326		
Dimensions				
Width		40 cm		
Depth		48 cm		
Height		36 cm		
Weight without rotor		43 kg		
max. speed		18000 min ⁻¹		
max. volume		4 x 100 ml		
max. RCF		23545 x g		
allowable density		1,2 kg/dm ³		
allowable kinetic energy		16672 Nm		
Mains power connection AC		230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph	
Voltage fluctuation		± 10 %	± 10 %	
Current consumption		2,0 A	4,0 A	
Power consumption		455 W	475 W	
Radio interference		IEC 61326-1		
Audit requirement (BGR 500)		yes		
Ambient conditions (EN/IEC 61010-1)				
- Environment		for indoor use only		
- High		Use up to an altitude of 2000 m above MSL		
- Ambient temperature		2°C up to 35 °C		
- Max. relative humidity		Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.		
- Overvoltage category (IEC 60364-4-443)		II		
- Degree of contamination		2		
Class of protection		I		
Not suitable for use in hazardous environments.				
EMV		EN / IEC	FCC Class B	EN / IEC
Interference emission , noise		61326-1		61326-1
		Category B		Category B
Noise level (depending on the rotor)		≤ 60 +2 dB(A)		
Write from operator				
Inventory-No.:				
Monitoring-No.:				
Environment:				
Maintenance contract:				
responsible service office		HERMLE Labortechnik GmbH	or dealer service office	
		Siemensstrasse 25		
		78564 Wehingen		
		Tel.: (49)7426 / 96 22-17		
		Fax: (49)7426 / 96 22-49		
responsible dealer				

Table 2: Permissible net weight

Rotor-Number	Max. Speed	Permissible net weight
220.72 V06	5000 min-1	1860 g
220.78 V05	11000 min-1	840 g
221.54 V02	6000 min-1	300 g
221.55 V02	6000 min-1	432 g
221.12 V03	4500 min-1	1360 g
221.16 V03	4500 min-1	440 g
221.17 V03	13000 min-1	102 g
221.19 V02	4500 min-1	960 g
221.18 V02	9000 min-1	840 g
221.20 V02	12000 min-1	560 g
221.22 V02	12000 min-1	564 g
221.28 V02	12000 min-1	360 g
220.87 V09	14000 min-1	81,6 g
220.87 V10	14000 min-1	81,6 g
221.23 V02	18000 min-1	40,8 g
220.88 V07	13500 min-1	149,6 g
220.92 V06	13500 min-1	70,4 g
221.38 V01	15000 min-1	14 g

Table 3: Max. speed and RCF-values for permissible rotors

Rotor- Number	Max. Speed	RCF value
220.72 V06	5000 min-1	3885xg
220.78 V05	11000 min-1	13933xg
221.54 V02	6000 min-1	4427xg
221.55 V02	6000 min-1	4427xg
221.12 V03	4500 min-1	3350xg
221.16 V03	4500 min-1	2739xg
221.17 V03	13000 min-1	17760xg
221.19 V02	4500 min-1	2829xg
221.18 V02	9000 min-1	10414xg
221.20 V02	12000 min-1	14811xg
221.22 V02	12000 min-1	13523xg
221.28 V02	12000 min-1	15938xg
220.87 V09	14000 min-1	18625xg
220.87 V10	14000 min-1	18625xg
221.23 V02	18000 min-1	23545xg
220.88 V07	13500 min-1	17115xg
220.92 V06	13500 min-1	16708xg
221.38 V01	15000 min-1	15344xg

Table 4: Accelerations and deceleration times

Rotor-Number	Acceleration values		Deceleration values	
	level 0	level 9	level 0	level 9
220.72 V06	100	15	150	15
220.78 V05	400	40	960	40
221.54 V02	88	13	222	11
221.55 V02	89	13	239	11
221.12 V03	100	15	150	15
221.16 V03	160	20	360	15
221.17 V03	200	25	360	25
221.19 V02	160	15	380	10
221.18 V02	360	40	1050	40
221.20 V02	300	60	820	40
221.22 V02	360	40	570	30
221.28 V02	360	40	570	30
220.87 V09	210	23	240	16
220.87 V10	240	23	240	16
221.23 V02	240	25	210	20
220.88 V07	150	17	140	12
220.92 V06	150	17	170	12
221.38 V01	130	16	130	12
in seconds				
Acceleration time from 0 min ⁻¹ -> U _{max}			Deceleration time from U _{max} -> 0 min ⁻¹	

Table 5: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
11	Temperature sensor is defective
12	Chamber over temperature
14	Leap of speed is too big between two measurements
CLOSE lid	
33	Open lid while motor is running
34	Lid contact defective
38	Lid motor is blocked
40	Communication with frequency converter distrubed during start
41	Communication with frequency converter distrubed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
70	Timeout between controler and RS232 interface
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the programm
rotor no	Rotor is not detected

Table 6 (part 1): Radius correction

<i>Rotor No.</i>	<i>Adapter/Tube-rack Order no.</i>	<i>Radius (cm)</i>	<i>Correction (cm)</i>
Swing out rotor 220.72	605.004	14,6	0
	605.005	14,6	0,0
	605.000/001	14,2	-0,4
	705.002	14,0	-0,6
	705.003	14,0	-0,6
	705.005	13,7	-0,9
	705.007	14,0	-0,6
	705.008	14,0	-0,6
	705.009	14,6	0
	705.010	14,0	-0,6
	705.012	14,0	-0,6
	705.013	13,9	-0,7
	705.014	13,1	-1,5
	705.015	14,0	-0,6
	705.016	14,0	-0,6
		13,9	-0,7
Angle rotor 220.87		8,6	0
	704.004	8,2	-0,4
	704.005	7,5	-1,1
Angle rotor 221.54 V02		11	0
	701.011	10,6	0,4
	701.012	9,1	1,9
	701.015	7,7	3,4
Angle rotor 221.55 V02		11	
	708.019	10,7	0,3
	708.003	10,3	0,7
	708.004	10,6	0,4
	701.011	10,2	0,8
	701.012	8,3	2,7
	701.015	6,7	4,3

Table 7 (part 2): Radius correction

Rotor No.	Adapter/Tube-rack Order no.	Radius (cm)	Correction (cm)
Angle rotor 220.78		10,3	0
	707.000	8,6	-1,7
		10,3	0,0
	707.001	9,6	-0,7
	707.002	9,6	-0,7
	707.003	10,0	-0,3
	707.004	9,8	-0,5
	707.014	9,3	-1,0
	707.015	9,5	-0,8
	708.000	9,5	-0,8
	708.001	9,8	-0,5
Swing out rotor 221.12	626.003	14,8	0
	626.000	14,1	-0,7
	626.001	14,1	-0,7
	626.002	14,6	-0,2
	626.004	14,5	-0,3
	626.005	14,2	-0,6
	626.006	14,2	-0,6
	626.007	14,0	-0,8
	626.008	14,2	-0,6
	626.009	14,2	-0,6
	626.010	14,3	-0,5
	626.011	13,8	-1,0
	626.012	14,4	-0,4
	626.013	14,5	-0,3
	626.014	9,9	-4,9
	626.015	11,6	-3,2
Swing out rotor 221.16		10,2	0
	706.000	10,2	0
Angle rotor 221.17		9,5	0
	704.004	9,1	-0,4
	704.005	8,4	-1,1
Angle rotor 221.20		9,2	0
	707.001	8,5	-0,7
	707.002	8,4	-0,8
	707.003	8,9	-0,3
	707.004	8,6	-0,6
	707.014	8,3	-0,9
	707.000	7,5	-1,7
		9,1	-0,1

Table 8 (part 3): Radius correction

Rotor No.	Adapter/Tube-rack Order no.	Radius (cm)	Correction (cm)
Angle rotor 221.22		8,4	0
	708.003	7,9	-0,5
	708.004	8	-0,4
	708.017	7,7	-0,7
	708.019	8,2	-0,2
Angle rotor 221.23		6,5	0
	704.004	6,3	-0,2
	704.005	5,6	-0,9
Angle rotor 221.38		6,2	0
Angle rotor 220.92			0
	375.047	8,1	
		7,8	
Angle rotor 220.88			0
	704.004	7,1	
		8,3	
	704.005	6,4	
		7,6	
	375.055	7,2	
		8,4	
Angle rotor 221.28		9,9	0
Angle rotor 221.18		11,2	0
	707.000	9,7	-1,5
		11,1	-0,1
	707.001	10,6	-0,6
	707.002	10,4	-0,8
	707.003	10,9	-0,3
	707.004	10,6	-0,6
	707.014	10,4	-0,8
	707.015	10,4	-0,8
Angle rotor 221.19		12,5	0
		10,9	
	701.000	8	-4,5
		6,4	
	701.010	11,3	-1,2
		9,7	
	701.011	12,2	-0,3
		10,6	
	701.012	10,5	-2,0
		8,9	

Table 9: Abbreviations used

Symbol / Abbreviation	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis: ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α.. ☐ β.. ☐ γ.. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____

[illegible]



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Operating manual for Table Top Centrifuge Z 326 K

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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 326 K is a non refrigerated universal centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with swing-out and angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

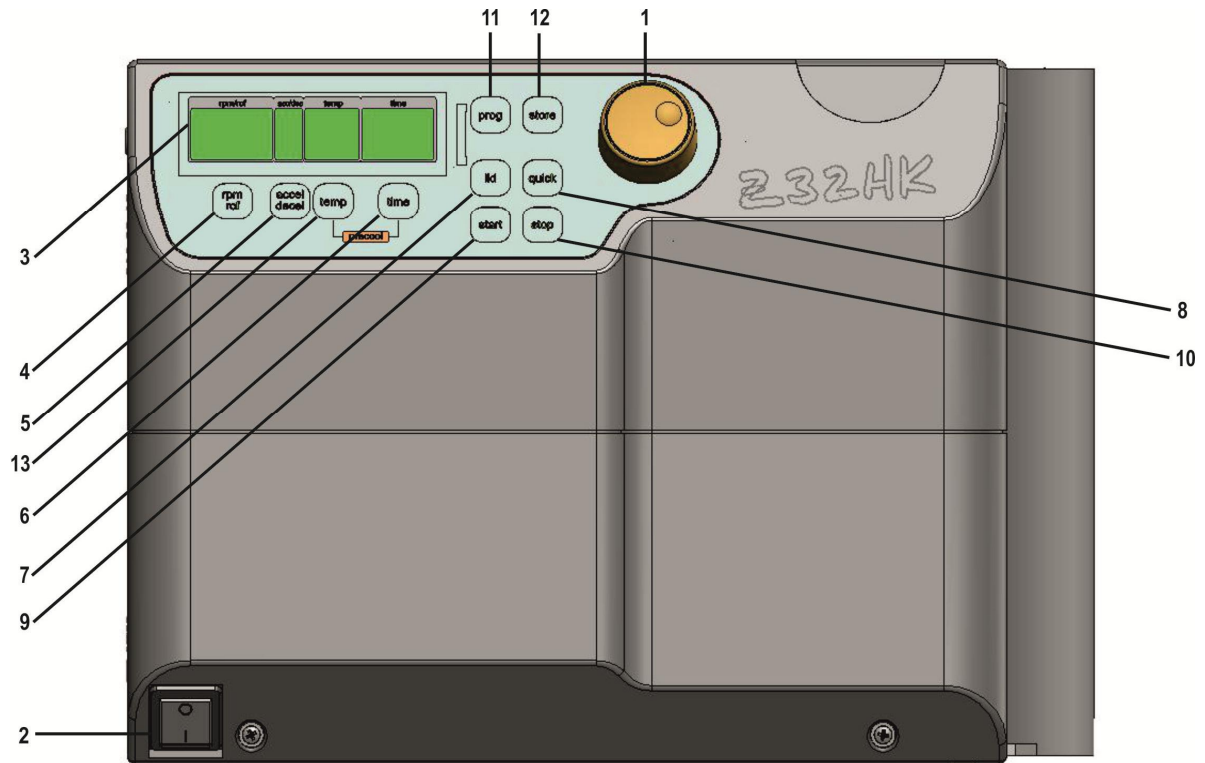
Detailed technical data are in "table 1: Technical data" (see APPENDIX P.V).

1.4 Delivery package

- 1 Centrifuge Z 326 K
- 1 Operating Manual Z 326 K
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



- | | |
|----|--|
| 1 | central adjuster run parameters |
| 2 | 0-I power switch |
| 3 | LCD control panel display |
| 4 | rpm/rcf speed/ g-force |
| 5 | accel/decel acceleration- / deceleration intensity |
| 6 | time centrifugation time |
| 7 | lid lid release |
| 8 | quick short running |
| 9 | start start centrifugation |
| 10 | stop stop centrifugation |
| 11 | prog calling stored programs |
| 12 | store program store |
| 13 | temp temperature indication |

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

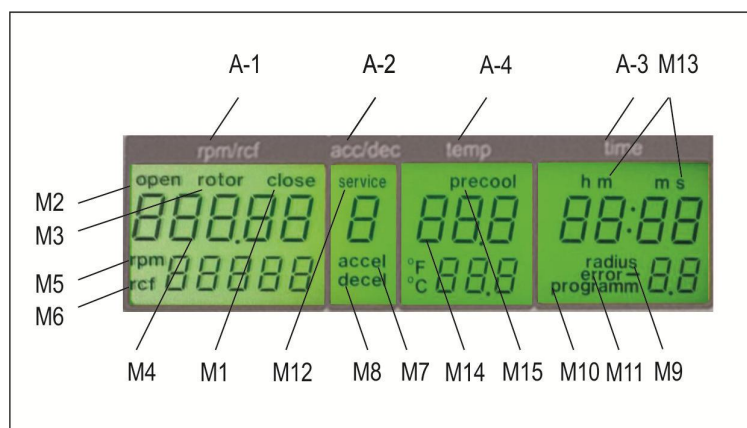


Figure 1

Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/dec“
- A-3 Display field – „time“
- A-4 Display field – „temp“

Messages/logos of the display fields:

M1	„close“	M8	„decel“	M15	„precool“
M2	„open“	M9	„radius“		
M3	„rotor“	M10	„program“		
M4	Rotor-No.	M11	„error“		
M5	„rpm“	M12	„service“		
M6	„rcf“	M13	h m s		
M7	„accel“	M14	„temperature“		

1.6 Signs and indications of the centrifuge

1.6.1 General



Instructions for disposal (see P. 34)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product-nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product

REF: Order no. of the product

SN: Serial number of the product



Date of manufacture

MAX. Drehzahl: max. allowed speed of the unit

KIN. EN.: max. kinetic energy with corresponding rotor

U/I/f: Allowable voltage / max. current / frequency

P: Electrical input power

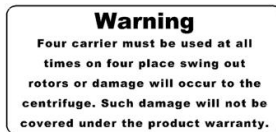


Before operating, read the operating manual!



Labeling, standards and guidelines that are considered

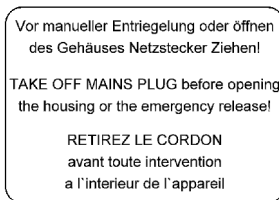
1.6.3 Warning and information signs



Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Z 326 K is explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 326 K is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

(The socket for the power cord must be easy to reach respectively easy to disconnect).

Switching it on using the mains power switch (I).

Open the lid by using the button LID.

- Remove the transport securing device of the motor.

1.8 Basic adjustments

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Temperature indication in °C or °F
- Acoustic signal turn on / off
- Keyboard sound turn on -/ off
- Volume pre-selection of sound signal
- Song selection of sound signal „end of run“

1.8.1 Access to mode "Operating Data"

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 2).

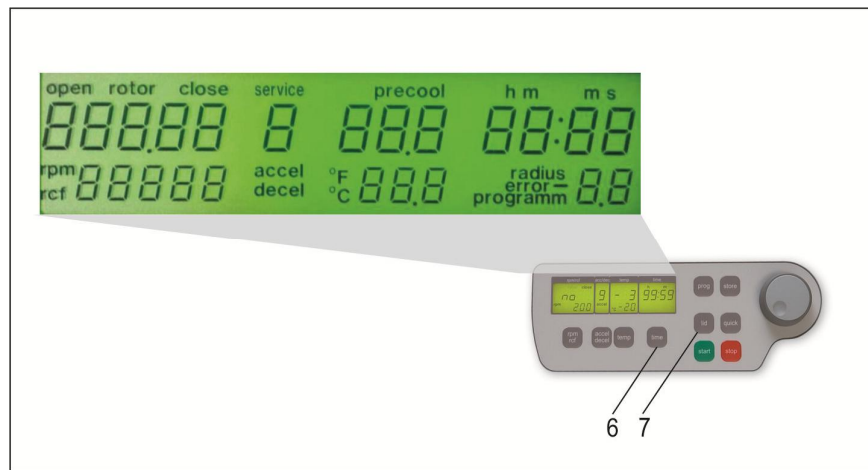


Figure 2



ATTENTION:

- Please notice that you must enter the program as described under point 1.8.1 to change the adjustments of the points 1.8.2 - 1.8.6. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.
- All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“ (A-1) - Only then the pre-selections are valid! (see figure 3)

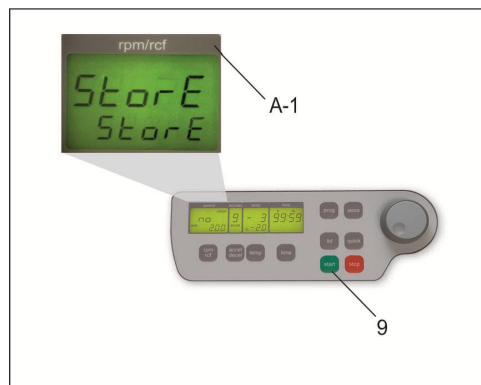


Figure 3

1.8.2 Temperature indication

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) appears the word „service“. Now select the letter „C“ with the adjusting knob (1). As a result in the display „rpm/rcf“ (A-1) appear the words „CELSI/temp“. If you press the key „rpm/rcf“ (4) now, the word „CELSI“ flashes and you can change the display into Fahrenheit „FAREN“ with the adjusting knob (1) (see figure 4).

After you have stored the settings you change to the normal program mode again by switch off the centrifuge for a short while.

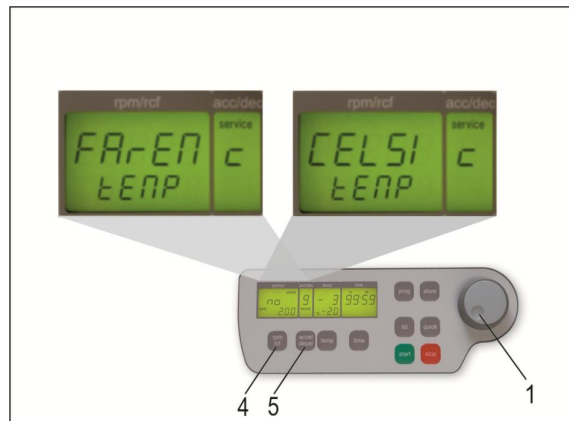


Figure 4

1.8.3 Signal turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 5).

After you have stored the settings you changed to the normal program mode again by switch off the centrifuge for a short while.

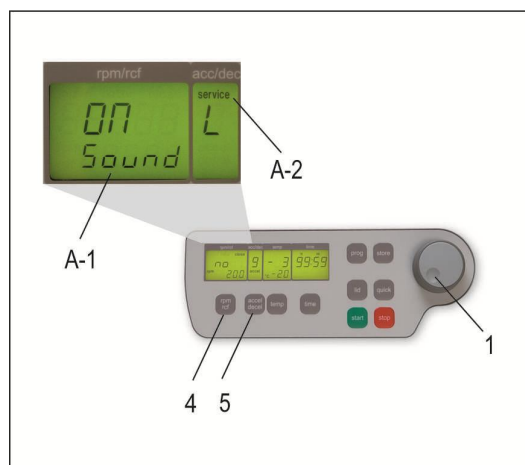


Figure 5

1.8.4 Volume pre-selection of sound signal

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „U“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0- 9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 6).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

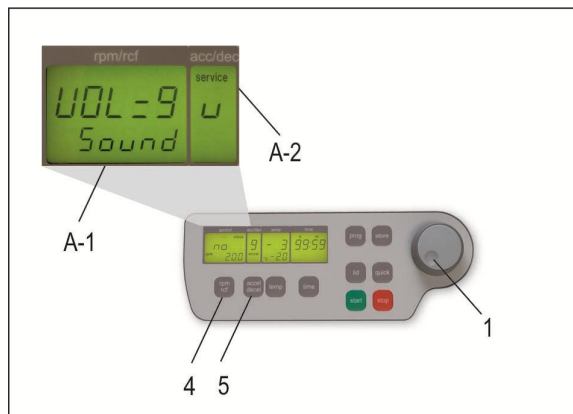


Figure 6

1.8.5 Song selection for sound signal - end of run

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 7).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

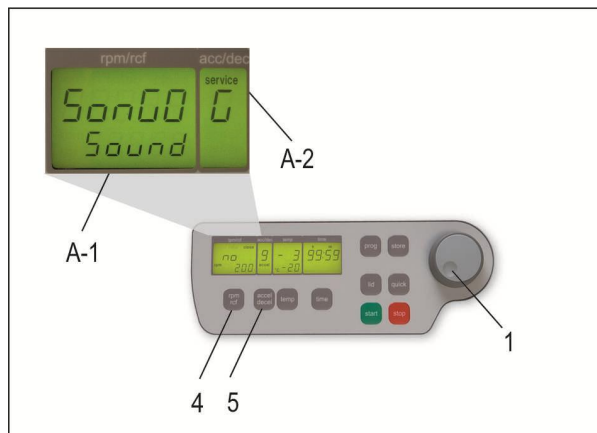


Figure 7

1.8.6 Keyboard sound turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 8).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

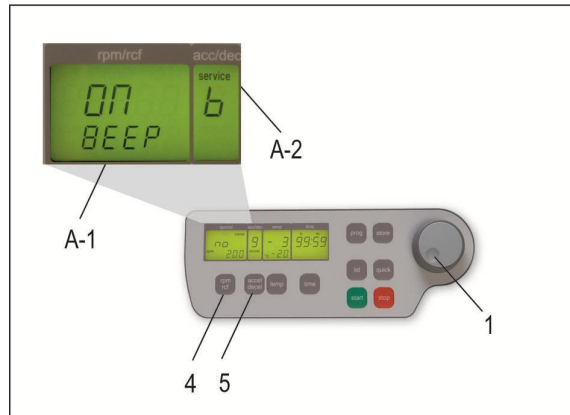


Figure 8

1.8.7 Call up operating data (by skilled or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.1 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- r = converter software
- E = list of previous error message
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 6: error messages“ (see APPENDIX S. X).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

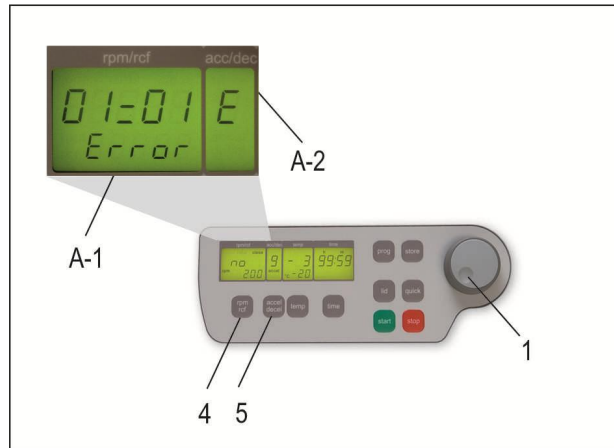


Figure 9

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 10) Take care that the rotor is fully installed onto the motor shaft.



Figure 10



Figure 11

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed allen key (see figure 11)

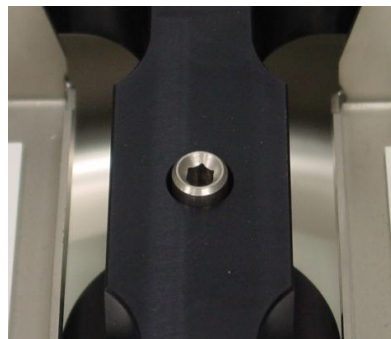


Figure 12



ATTENTION: For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 11)

2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 13+14). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).



Figure 13: WRONG



Figure 14: CORRECT (4 tubes)

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 16

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see figure 15 and 16).

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High TEF oil (Order No. 34-5147). The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1,0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!!

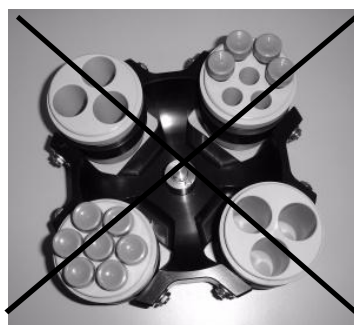


Figure 15: WRONG



Figure 16: CORRECT

**ATTENTION!**

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2: permissible net weight“ (see APPENDIX P. VI).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have an max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing nut complete (2. screw over the stiff point) and lift the rotor vertical out of the centrifuge. (see figure 10 and 11)

2.2 Lid

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „220.72“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the electromagnetic lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 17

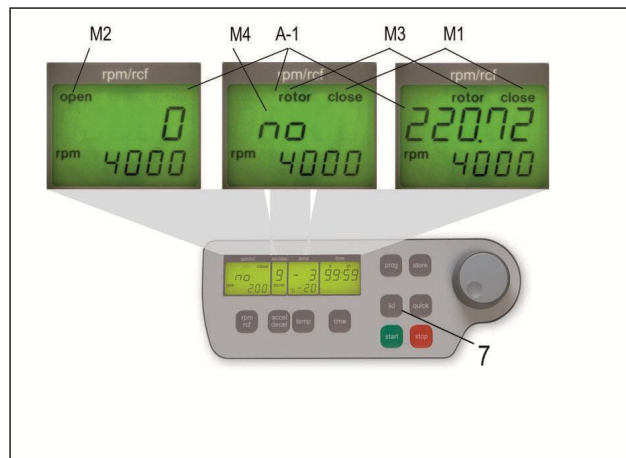


Figure 17

During the run you can call up the rotor type at any time by pressing the key "lid" (7).

2.2.2 Lid lock

The lid must only be lay down slightly. An electromagnetic lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 17



ATTENTION: Don't grip your fingers between lid and device or locking mechanism when closing the lid!

2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 18

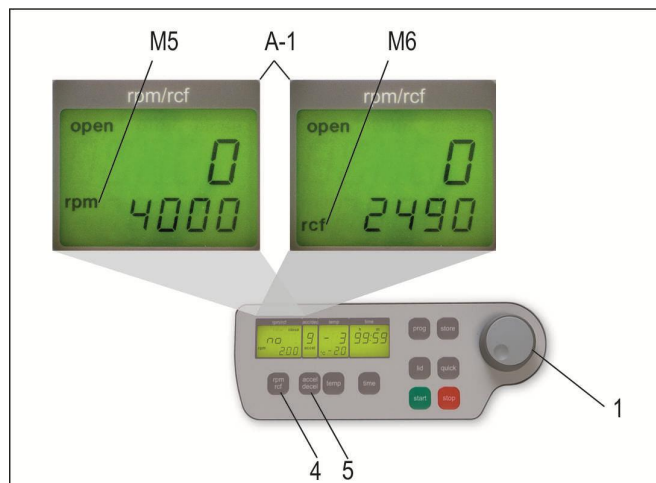


Figure 18

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 4: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. VIII). There are listed all important values.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be interrupted by the key „stop“ (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3). That continuous run can only be interrupted by pressing the key „stop“ (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 19)

All with number marked passages refer to figure 19

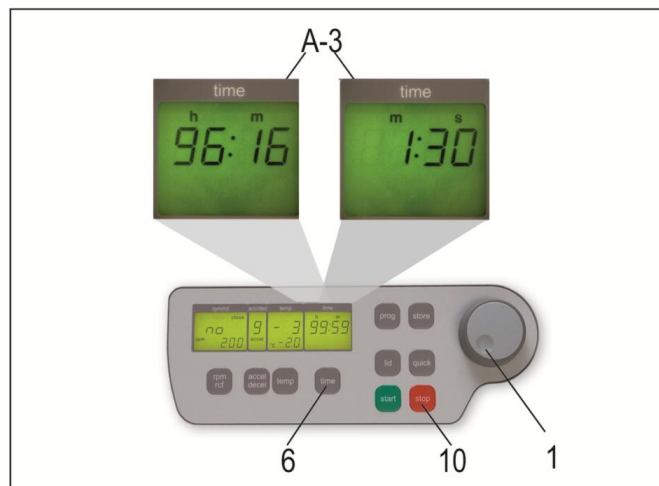


Figure 19

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 20

See „table 5: acceleration and deceleration times“ (APPENDIX P. IX). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

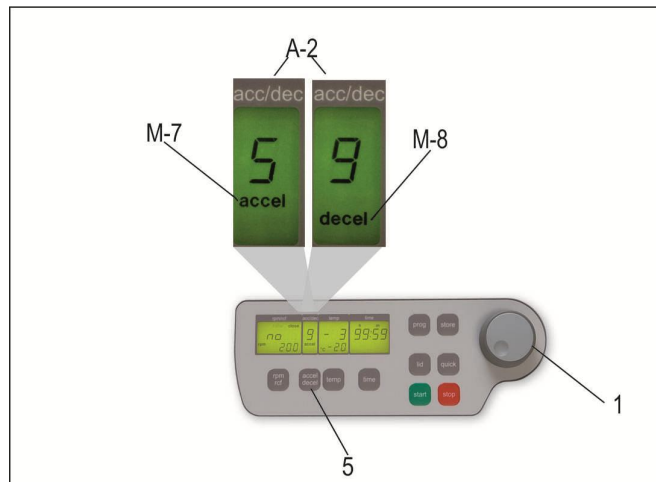


Figure 20

2.3.4 Pre-selection of temperature

This function is activated by the key „temp“ (13). After pressing that key in the display „temp“ flashes the indication „°C“ (A-4). By the adjusting knob (1) the desired test temperature can be pre-selected in steps of 1°C in a range from -20°C up to +40°C.

The value is indicated permanently in the display (figure 21) - before, during and after the run.

Please notice the respective lowest temperatures of the rotors at maximum speed!

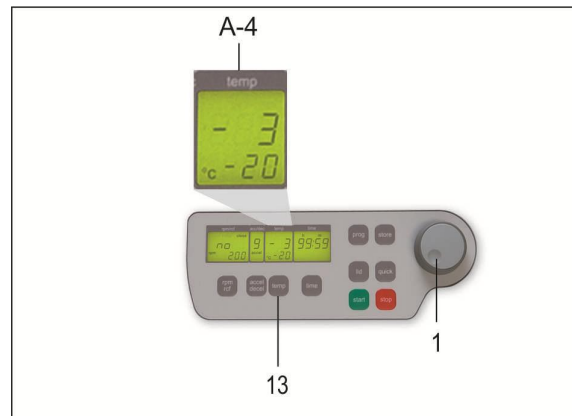


Figure 21

2.3.5 Pre-cooling

If the samples are temperature-sensitive it is useful to pre-cool the centrifuge, the rotor and eventually the buckets to the needed working temperature. Therefore insert the desired rotor and pre-set the respective temperature. By simultaneous pressing of the keys „temp“ (13) and „time“ (6) you start the run. While running the unit chooses automatically a rotational speed that is equivalent to 20 % of the permitted rotational speed of the respective rotor. After the pre-set temperature is reached you can leave the pre-cooling run with the „stop“ key (10).

Depending on the inserted rotor the pre-cooling goes between approx. 10 and 20 min.

All with number marked passages refer to figure 22

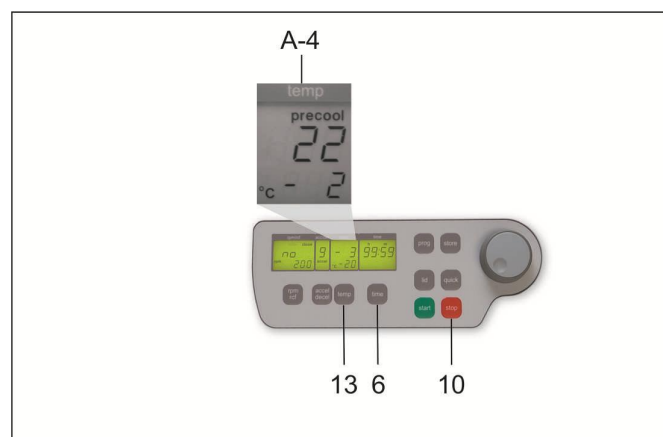


Figure 22

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (6) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can preselect then the respective radius correction (see table 7, APPENDIX P. XI) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 23

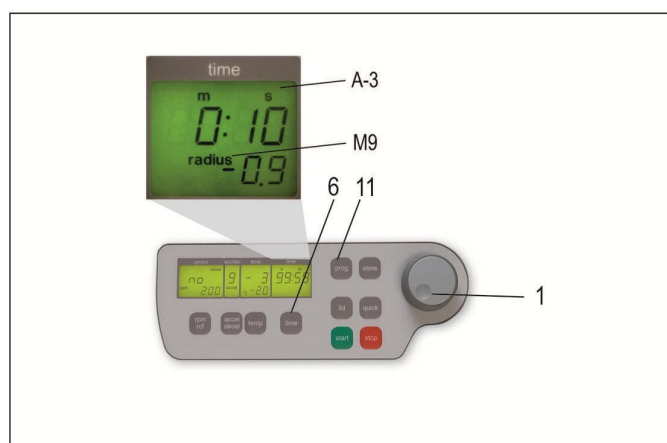


Figure 23

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“ (see figure 24). With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor“ (M3) and „22x.xx“ (M4) (see figure 24). In case of free program numbers it appears 0.

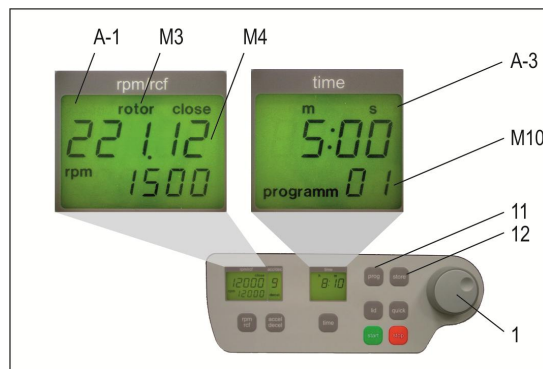


Figure 24

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the programm, in the display "rpm/rcf" (A-1) flashes alternately the word "FirSt" and "CLOSE Lid" (see figure 25). If you want to start the run without storing the programm, in the display "rpm/rcf" (A-1) flashes alternately the word "First" and "PrESS StoreE" (see figure 26).

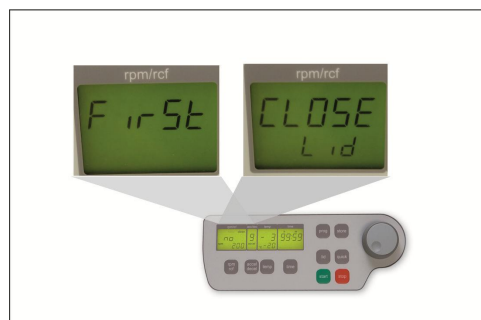


Figure 25

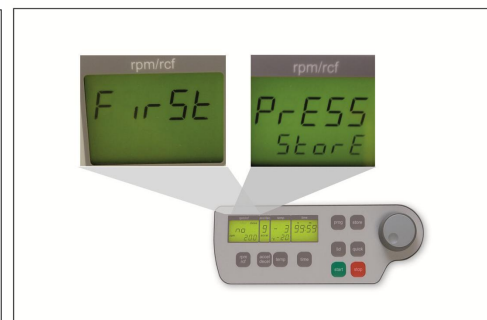


Figure 26

For adaption of data press the key „store“ (12) for approx. 1 second. If the programm is stored correctly, the word StorE appears in the display „rpm/rcf“ (A-1). As a result the word „program“ (M10) disappears. As soon as the key „store“ (12) is no longer anymore, it reappears the word „programm xx“ (M10) – the (xx) stands for the chosen program place.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“(M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 27.

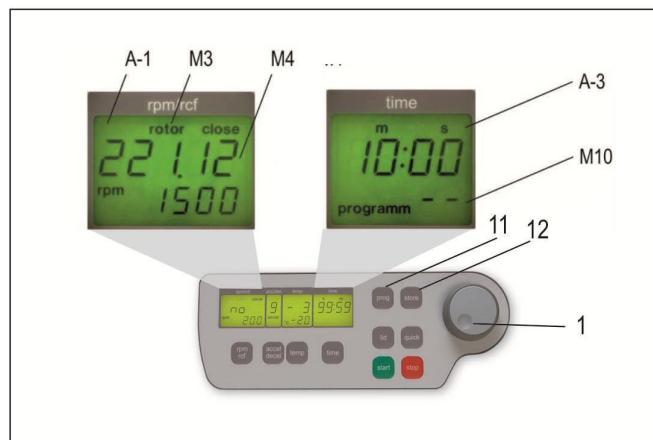


Figure 27

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm“.

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 27.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).

By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended then the centrifuge will stop automatically.

By the „quick“ key (8) you can start runs, which will last just a few seconds.

By pressing the „quick“ key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick“ key (8).

By releasing the „quick“ key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 28

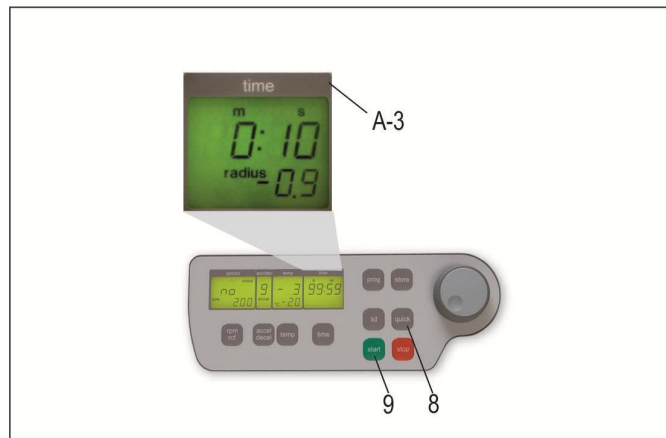


Figure 28

2.6.2 The "STOP" key

By the „stop“ key (10) (see figure 29) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

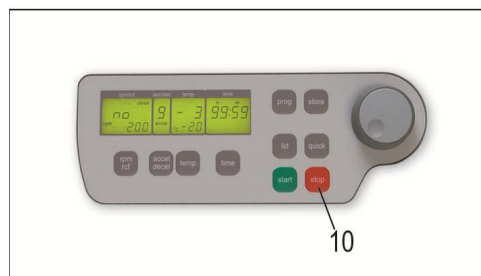


Figure 29

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" appear, the weight difference of the samples is too huge. Weigh out the samples exactly!

Load the rotor as described in chapter 2.1.2 and 2.1.3.

When inside the display "time" (A-3) the word "error" together with the number "02" (see figure 30) appear, there could be following reasons: The imbalance switch is defective.

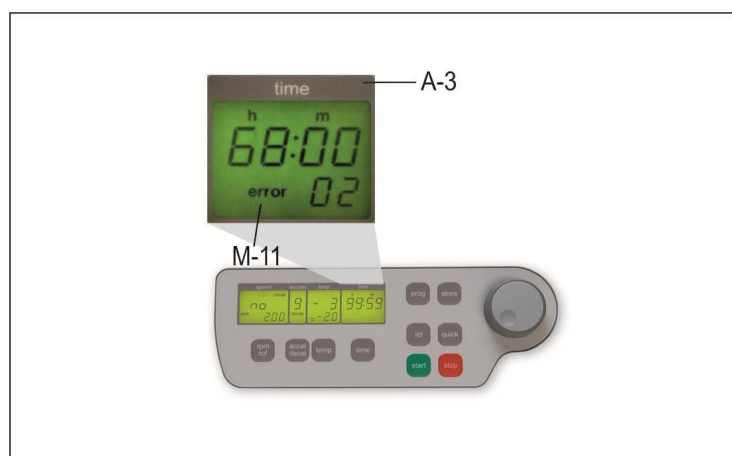


Figure 30

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.



ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.



ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time:

Proper use damage-free condition, recommended care.

4. TROUBLE SHOOTING

4.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see figure 31):

- ⚠ • Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)
- At the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.
- Take the delivered box spanner, put him in the hole and lock the box spanner with hexagon nut (see figure 31).
- Now turn the box spanner to the right side (clockwise) up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Switch the centrifuge on again, for go on working.



Figure 31

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 32). Detailed information about possible error messages are in „table 6: error messages“ (see Appendix P.X).

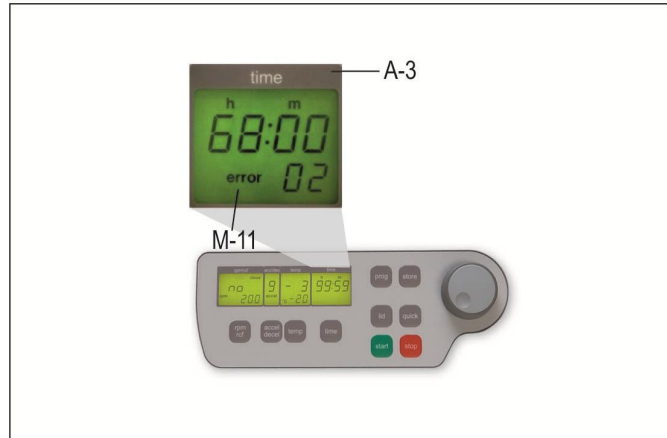


Figure 32

5. RECEIPT OF CENTRIFUGES TO REPAIR



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. XVI)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

7. APPENDIX

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EG - Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to "IVD (other device)"

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012

Konformitätserklärung Geräte IVD 03-2012

HERMLE
LABORTECHNIK

Geschäftsführer, Managing Director

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH			
Type		Z 326 K			
Dimensions					
Width		40 cm			
Depth		70 cm			
Height		36 cm			
Weight without rotor		60 kg			
max. speed		18000 min ⁻¹			
max. volume		4 x 100 ml			
max. RCF		23545 x g			
allowable density		1,2 kg/dm ³			
allowable kinetic energy		25111 Nm			
Mains power connection AC		230 V / 50 Hz 1 ph		120 V / 60 Hz 1 ph	
Voltage fluctuation		± 10 %		± 10 %	
Current consumption		3,0 A		6,0 A	
Power consumption		660 W		660 W	
Radio interference		IEC 61326-1			
Audit requirement (BGR 500)		yes			
Ambient conditions (EN/IEC 61010-1)					
- Environment		for indoor use only Use up to an altitude of 2000 m above MSL 2°C up to 35 °C Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.			
- High					
- Ambient temperature					
- Max. relative humidity					
- Overvoltage category (IEC 60364-4-443)					
- Degree of contamination		II			
Class of protection		2			
		I			
Not suitable for use in hazardous environments.					
EMV		EN / IEC		FCC Class B	
Interference emission , noise		61326-1		61326-1	
		Category B		Category B	
Noise level (depending on the rotor)		≤ 60 +2 dB(A)			
Write from operator					
Inventory-No.:					
Monitoring-No.:					
Environment:					
Maintenance contract:					
responsible service office		HERMLE Labortechnik GmbH		or dealer service office	
		Siemensstrasse 25			
		78564 Wehingen			
		Tel.: (49)7426 / 96 22-17			
		Fax: (49)7426 / 96 22-49			
responsible dealer					

Table 2: Permissible net weight

rotor-number	max. speed	permissible net weight
220.72 V06	5000 min-1	1860 g
220.78 V05	13500 min-1	840 g
221.54 V02	6000 min-1	300 g
221.55 V02	6000 min-1	432 g
221.12 V03	4500 min-1	1360 g
221.16 V03	4500 min-1	440 g
221.17 V03	14000 min-1	102 g
221.19 V02	4500 min-1	960 g
221.18 V02	9000 min-1	840 g
221.20 V02	12000 min-1	560 g
221.22 V02	12000 min-1	564 g
221.28 V02	12000 min-1	360 g
220.87 V09	15000 min-1	81,6 g
220.87 V10	15000 min-1	81,6 g
221.23 V02	18000 min-1	40,8 g
220.88 V07	13500 min-1	149,6 g
220.92 V06	13500 min-1	70,4 g
221.38 V01	15000 min-1	14 g

Table 3: Lowest temperatures at max. speed

rotor-number	max. speed	n-max
220.72 V06	5000 min-1	-3 °C
220.78 V05	13500 min-1	17 °C
221.54 V02	6000 min-1	-11,5 °C
221.55 V02	6000 min-1	-11 °C
221.12 V03	4500 min-1	-7 °C
221.16 V03	4500 min-1	-6 °C
221.17 V03	14000 min-1	9 °C
221.19 V02	4500 min-1	-9 °C
221.18 V02	9000 min-1	-5 °C
221.20 V02	12000 min-1	5 °C
221.22 V02	12000 min-1	-5 °C
221.28 V02	12000 min-1	2 °C
220.87 V09	15000 min-1	6 °C
220.87 V10	15000 min-1	6 °C
221.23 V02	18000 min-1	-2 °C
220.88 V07	13500 min-1	6 °C
220.92 V06	13500 min-1	2 °C
221.38 V01	15000 min-1	-1 °C

All temperature indications refer to a room temperature of 23°C. By exceeding this value or direct solar radiation to the centrifuge, these values can't be kept up.

Table 4: Max. speed and RCF-values for permissible rotors

rotor-number	max. speed	RCF value
220.72 V06	5000 min-1	3885xg
220.78 V05	13500 min-1	20986xg
221.54 V02	6000 min-1	4427xg
221.55 V02	6000 min-1	4427xg
221.12 V03	4500 min-1	3350xg
221.16 V03	4500 min-1	2739xg
221.17 V03	14000 min-1	20598xg
221.19 V02	4500 min-1	2829xg
221.18 V02	9000 min-1	10414xg
221.20 V02	12000 min-1	14811xg
221.22 V02	12000 min-1	13523xg
221.28 V02	12000 min-1	15938xg
220.87 V09	15000 min-1	21381xg
220.87 V10	15000 min-1	21381xg
221.23 V02	18000 min-1	23545xg
220.88 V07	13500 min-1	17115xg
220.92 V06	13500 min-1	16708xg
221.38 V01	15000 min-1	15344xg

Table 5: Accelerations and deceleration times

rotor-number	Acceleration values		Deceleration values	
	level 0	level 9	level 0	level 9
220.72 V06	100	15	150	15
220.78 V05	500	60	1260	50
221.54 V02	88	12	433	11
221.55 V02	90	12	463	11
221.12 V03	100	15	150	15
221.16 V03	160	20	360	15
221.17 V03	210	25	360	30
221.19 V02	160	15	380	10
221.18 V02	360	40	1050	40
221.20 V02	300	60	820	40
221.22 V02	360	40	570	30
221.28 V02	360	40	570	30
220.87 V09	230	25	420	17
220.87 V10	230	25	420	17
221.23 V02	240	25	210	20
220.88 V07	150	17	140	12
220.92 V06	150	17	170	12
221.38 V01	130	16	130	12
in seconds				
Acceleration time from 0 min ⁻¹ -> U _{max}		Deceleration time from U _{max} -> 0 min ⁻¹		

Table 6: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
11	Temperature sensor is defective
12	Chamber over temperature
14	Leap of speed is too big between two measurements
CLOSE lid	
33	Open lid while motor is running
34	Lid contact defective
38	Lid motor is blocked
40	Communication with frequency converter disturbed during start
41	Communication with frequency converter disturbed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
70	Timeout between controller and RS232 interface
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the program
rotor no	Rotor is not detected

Table 7 (part 1): Radius correction

Rotor no.	Adapter/Tuberack Order no.	Radius (cm)	Correction (cm)
Swing out rotor 220.72	605.004	14,6	0
	605.005	14,6	0,0
	605.000/001	14,2	-0,4
	705.002	14,0	-0,6
	705.003	14,0	-0,6
	705.005	13,7	-0,9
	705.007	14,0	-0,6
	705.008	14,0	-0,6
	705.009	14,6	0
	705.010	14,0	-0,6
	705.012	14,0	-0,6
	705.013	13,9	-0,7
	705.014	13,1	-1,5
	705.015	14,0	-0,6
	705.016	14,0	-0,6
		13,9	-0,7
Angle rotor 220.87		8,6	0
	704.004	8,2	-0,4
	704.005	7,5	-1,1
Festwinkelrotor 221.54 V02		11	0
	701.011	10,6	0,4
	701.012	9,1	1,9
	701.015	7,7	3,4
Festwinkelrotor 221.55 V02		11	
	708.019	10,7	0,3
	708.003	10,3	0,7
	708.004	10,6	0,4
	701.011	10,2	0,8
	701.012	8,3	2,7
	701.015	6,7	4,3

Table 8 (part 2): Radius correction

Rotor no.	Adapter/Tuberack Order no.	Radius (cm)	Correction (cm)
Angle rotor 220.78		10,3	0
	707.000	8,6	-1,7
		10,3	0,0
	707.001	9,6	-0,7
	707.002	9,6	-0,7
	707.003	10,0	-0,3
	707.004	9,8	-0,5
	707.014	9,3	-1,0
	707.015	9,5	-0,8
	708.000	9,5	-0,8
	708.001	9,8	-0,5
Swing out rotor 221.12	626.003	14,8	0
	626.000	14,1	-0,7
	626.001	14,1	-0,7
	626.002	14,6	-0,2
	626.004	14,5	-0,3
	626.005	14,2	-0,6
	626.006	14,2	-0,6
	626.007	14,0	-0,8
	626.008	14,2	-0,6
	626.009	14,2	-0,6
	626.010	14,3	-0,5
	626.011	13,8	-1,0
	626.012	14,4	-0,4
	626.013	14,5	-0,3
	626.014	9,9	-4,9
	626.015	11,6	-3,2
Swing out rotor 221.16		10,2	0
	706.000	10,2	0
Angle rotor 221.17		9,5	0
	704.004	9,1	-0,4
	704.005	8,4	-1,1
Angle rotor 221.20		9,2	0
	707.001	8,5	-0,7
	707.002	8,4	-0,8
	707.003	8,9	-0,3
	707.004	8,6	-0,6
	707.014	8,3	-0,9
	707.000	7,5	-1,7
		9,1	-0,1

Table 9 (part 3): Radius correction

Angle rotor 221.22		8,4	0
	708.003	7,9	-0,5
	708.004	8	-0,4
	708.017	7,7	-0,7
	708.019	8,2	-0,2
Angle rotor 221.23		6,5	0
	704.004	6,3	-0,2
	704.005	5,6	-0,9
Angle rotor 221.38		6,2	0
Angle rotor 220.92			0
	375.047	8,1	
		7,8	
Angle rotor 220.88			0
	704.004	7,1	
		8,3	
	704.005	6,4	
		7,6	
	375.055	7,2	
		8,4	
Angle rotor 221.28		9,9	0
Angle rotor 221.18		11,2	0
	707.000	9,7	-1,5
		11,1	-0,1
	707.001	10,6	-0,6
	707.002	10,4	-0,8
	707.003	10,9	-0,3
	707.004	10,6	-0,6
	707.014	10,4	-0,8
	707.015	10,4	-0,8
Angle rotor 221.19		12,5	0
		10,9	
	701.000	8	-4,5
		6,4	
	701.010	11,3	-1,2
		9,7	
	701.011	12,2	-0,3
		10,6	
	701.012	10,5	-2,0
		8,9	

Table 10: Abbreviations used

Symbol/Abbreviations	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis:..... ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α.. ☐ β.. ☐ γ.. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____



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Operating manual for
universal
Table Top Centrifuge
Z 366

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1. PRODUCT DESCRIPTION

1.1 Safety instructions



This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury and property damage.

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief description

The unit type Z 366 is a non refrigerated universal centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with swing-out and angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

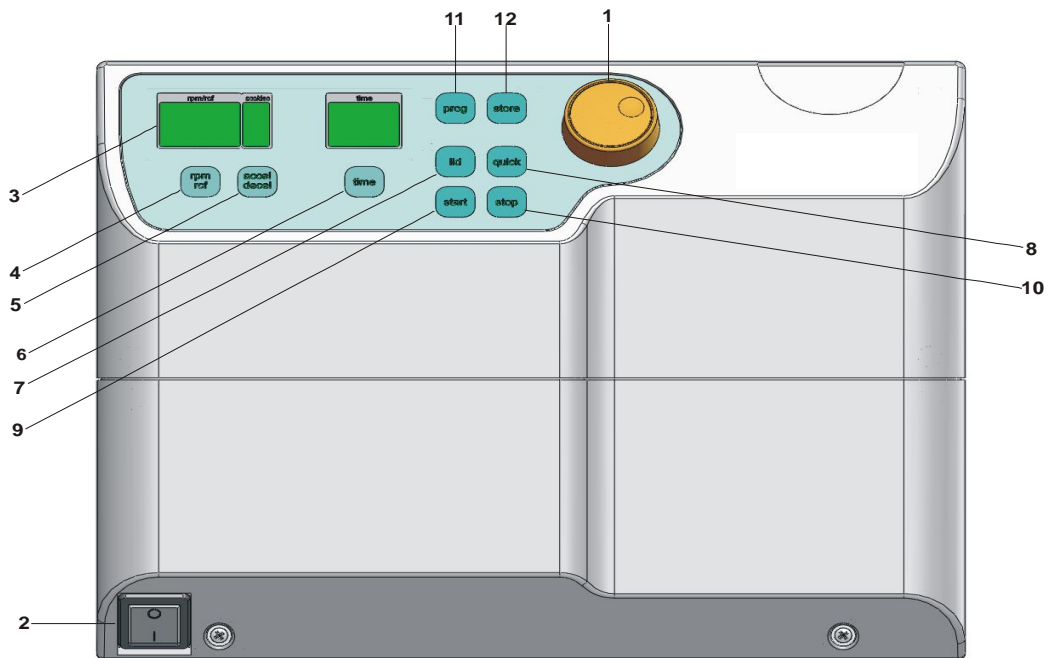
Detailed technical data are in "table 1 Technical data" (see APPENDIX P.V).

1.4 Delivery package

- 1 Centrifuge Z 366
- 1 Operating Manual Z 366
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



- | | |
|----|--|
| 1 | central adjuster run parameters |
| 2 | 0-I power switch |
| 3 | LCD control panel display |
| 4 | rpm/rcf speed/ g-force |
| 5 | accel/decel acceleration- / deceleration intensity |
| 6 | time centrifugation time |
| 7 | lid lid release |
| 8 | quick short running |
| 9 | start start centrifugation |
| 10 | stop stop centrifugation |
| 11 | prog calling stored programs |
| 12 | store program store |

1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

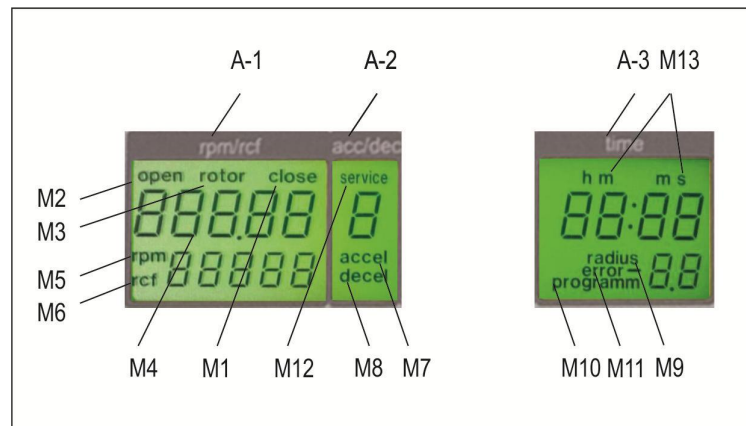


Figure 1

Display fields:

- A-1 Display field – „rpm/rcf“
- A-2 Display field – „acc/dec“
- A-3 Display field – „time“

Messages/logos of the display fields:

M1	„close“	M8	„decel“
M2	„open“	M9	„radius“
M3	„rotor“	M10	„program“
M4	Rotor-No.	M11	„error“
M5	„rpm“	M12	„service“
M6	„rcf“	M13	h m s
M7	„accel“		

1.6 Signs and indications of the centrifuge

1.6.1 General



Instructions for disposal (see P. 28)



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.6.2 Product-nameplate (Example)



Company address: Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen

TYPE: Type designation of the product

REF: Order no. of the product

SN: Serial number of the product



Date of manufacture

MAX. Drehzahl: max. allowed speed of the unit

KIN. EN.: max. kinetic energy with corresponding rotor

U/I/f: Allowable voltage / max. current / frequency

P: Electrical input power



Before operating, read the operating manual!



Labeling, standards and guidelines that are considered

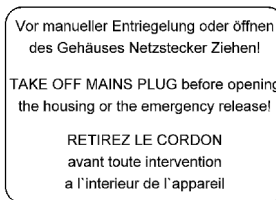
1.6.3 Warning and information signs



Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Z 366 is non explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model Z 366 is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The line voltage circuit breaker is max. 10 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

(The socket for the power cord must be easy to reach respectively easy to disconnect).

Switching it on using the mains power switch (I).

Open the lid by using the button LID.

- Remove the transport securing device of the motor.

1.8 Basic adjustments

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Acoustic signal turn on / off
- Keyboard sound turn on -/ off
- Volume pre-selection of sound signal
- Song selection of sound signal „end of run“

1.8.1 Access to mode "Operating Data"

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 2).

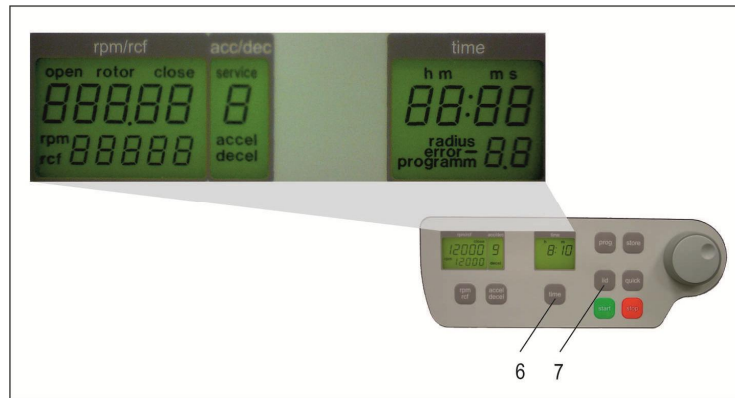


Figure 2



Attention:

- Please notice that you must enter the program as described under point 1.8.1 to change the adjustments of the points 1.8.2 - 1.8.6. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.
- All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“(A-1) - Only then the pre-selections are valid! (see figure 3)

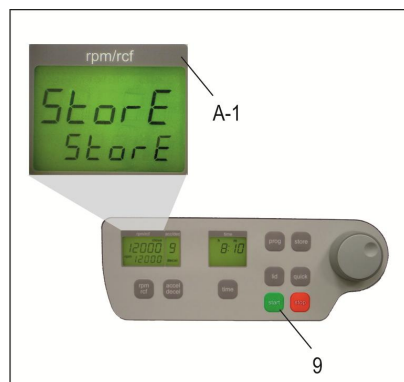


Figure 3

1.8.2 Sound signal turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 4).

After you have stored the settings you changed to the normal program mode again by switch off the centrifuge for a short while.

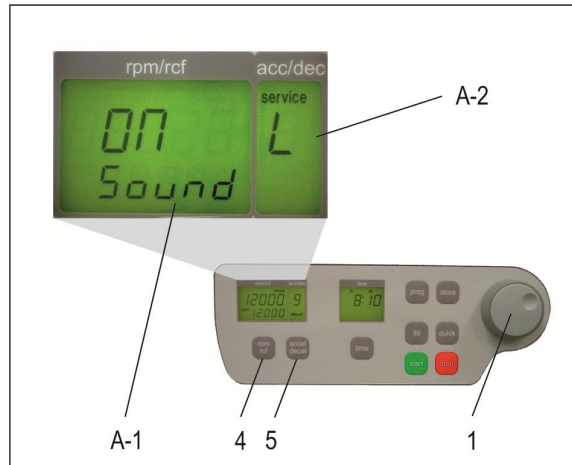


Figure 4

1.8.3 Volume pre-selection of sound signal

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „U“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0-9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 5).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

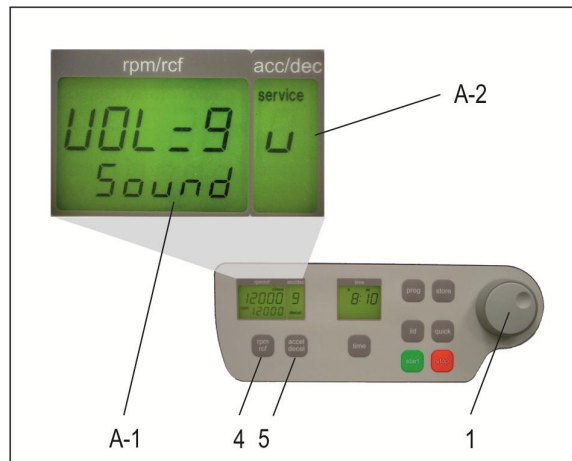


Figure 5

1.8.4 Song selection for sound signal - end of run

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 6).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

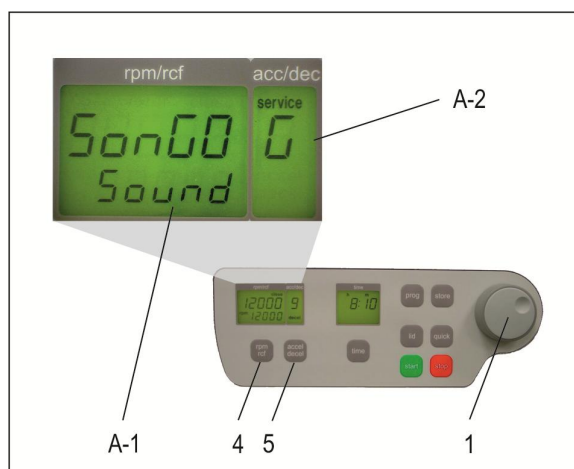


Figure 6

1.8.5 Keyboard sound turn on / off

Proceed as described under point 1.8.1 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“ with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 7).

After you have stored the settings (see 1.8.1) you changed to the normal program mode again by switch off the centrifuge for a short while.

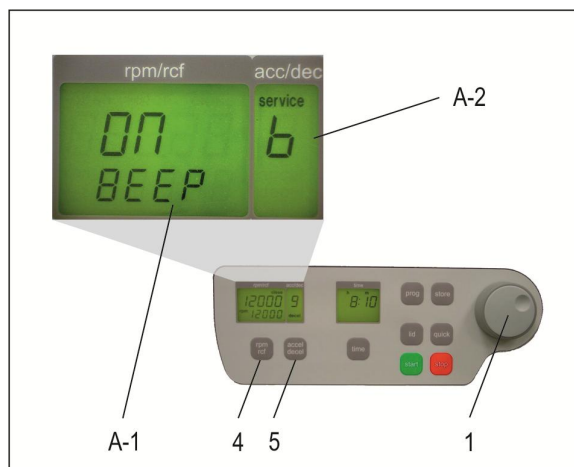


Figure 7

1.8.6 Call up operating data (by skilled or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.1 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

- A = previous starts of the centrifuge
- H = previous operating hours
- S = software version
- r = converter software
- E = list of previous error message
- h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 6: error messages“ (see APPENDIX S. VIII).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

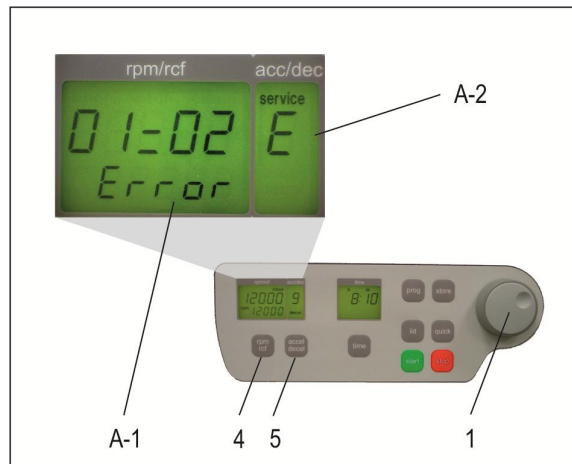


Figure 8

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 9) Take care that the rotor is fully installed onto the motor shaft.



Figure 9



Figure 10

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed allen key (see figure 10)

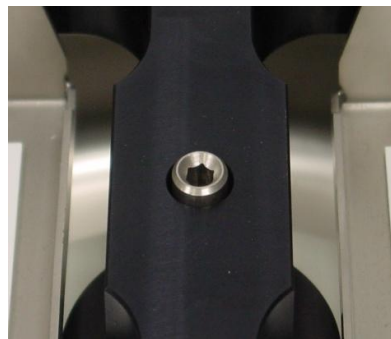


Figure 11



ATTENTION: For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 10)

2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 12+13). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).



Figure 12: WRONG



Figure 13: CORRECT (4 tubes)

2.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to figure 15

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see figure 14 and 15).

In principle swing out rotors may not be taken in operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the HERMLE High TEF oil (Order No. 34-5147). The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1,0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers up!!

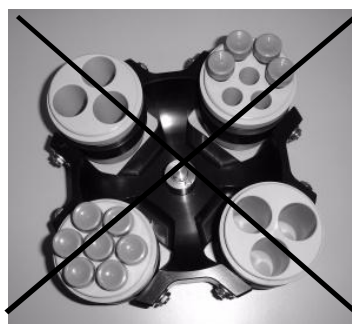


Figure 14: WRONG



Figure 15: CORRECT



ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2: permissible net weight“ (see APPENDIX P. VI).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have an max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.5 Removing the rotor

Untighten the rotor fixing nut complete and lift the rotor vertical out of the centrifuge.
(see figure 9 and 10)

2.2 Lid

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „220.72“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the electromagnetic lid is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 16

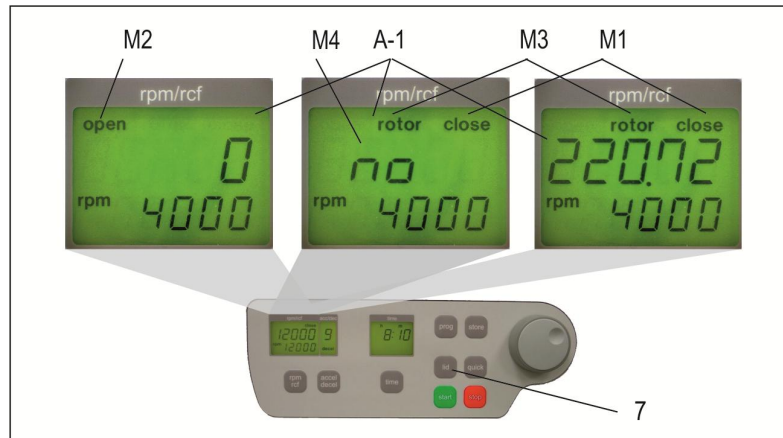


Figure 16

During the run you can call up the rotor type at any time by pressing the key „lid“ (7).

2.2.2 Lid lock

The lid must only be lay down slightly. An electromagnetic lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 16



ATTENTION: Don't grip your fingers between lid and device or locking mechanism when closing the lid!

2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 17

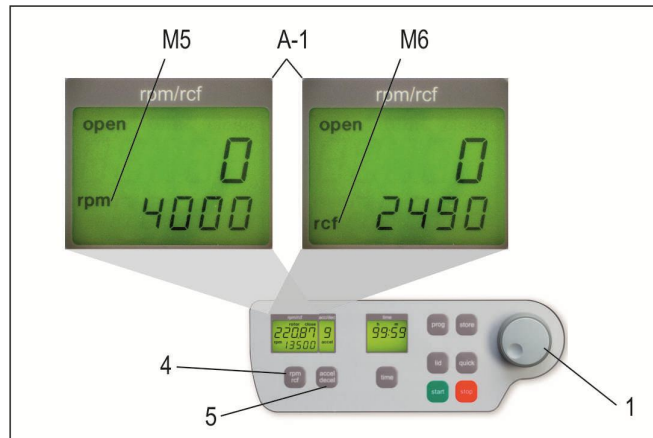


Figure 17

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 3: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. VI). There are listed all important values.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont“, which can be interrupted by the key „stop“ (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time“ (6).

In the display „time“ (A-3) flashes the indication „m : s“ or „h : m“, depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m“. After exceeding of 99 hours 59 min the word „cont“ appears in the display „time“ (A-3). That continuous run can only be interrupted by pressing the key „stop“ (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 18)

All with number marked passages refer to figure 18

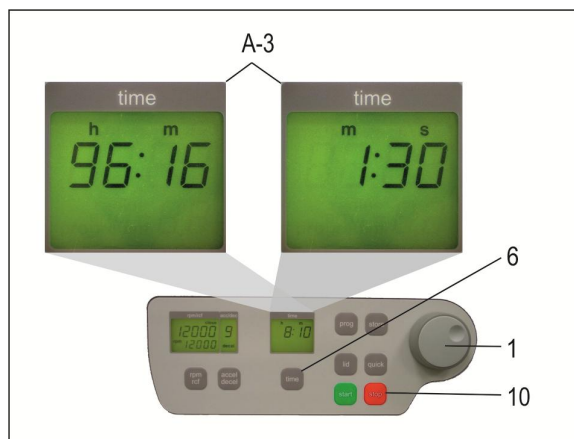


Figure 18

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 19

See „table 4: acceleration and deceleration times“ (APPENDIX P. VII). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

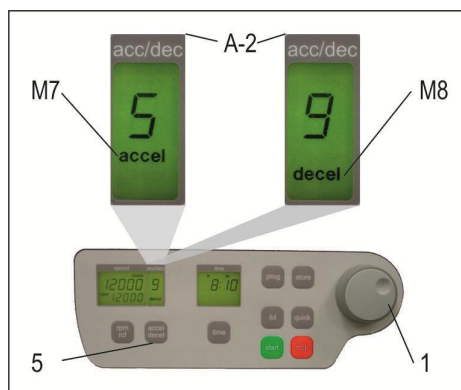


Figure 19

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (6) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can preselect then the respective radius correction (see table 6, APPENDIX P. IX) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 20

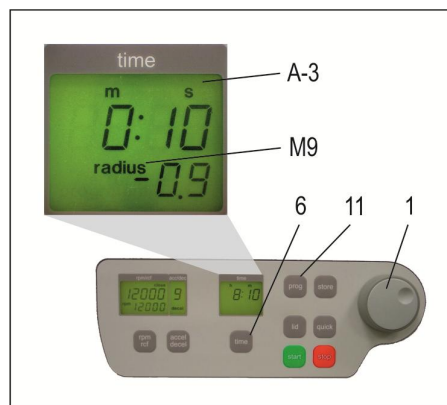


Figure 20

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“ (see figure 21). With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor“ (M3) and „22x.xx“ (M4) (see figure 21). In case of free program numbers it appears 0.

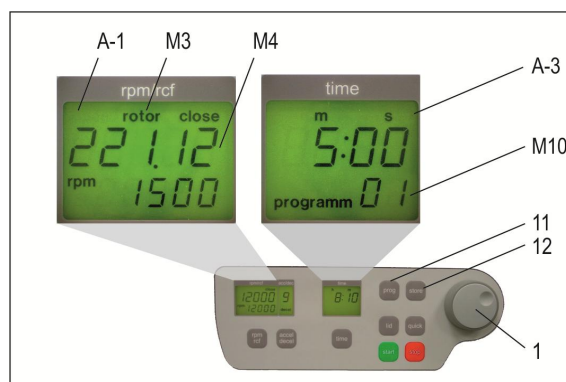


Figure 21

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the program, in the display "rpm/rcf" (A-1) flashes alternately the word "FirSt" and "CLOSE Lid" (see figure 22). If you want to start the run without storing the program, in the display "rpm/rcf" (A-1) flashes alternately the word "First" and "PrESS StoreE" (see figure 23).

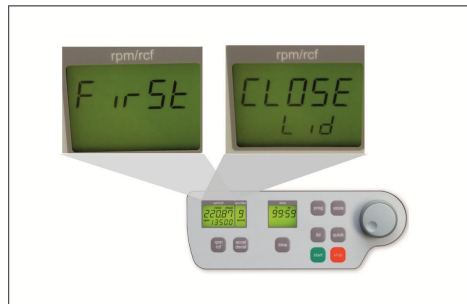


Figure 22

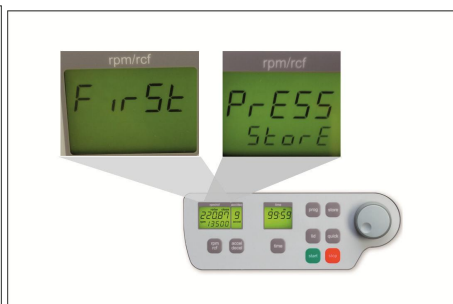


Figure 23

For adaption of data press the key „store“ (12) for approx. 1 second. If the program is stored correctly, the word StorE appears in the display "rpm/rcf" (A-1). As a result the word „program“ (M10) disappears. As soon as the key „store“ (12) is no longer anymore, it reappears the word „programm xx“ (M10) – the (xx) stands for the chosen program place.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“ (M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 24.

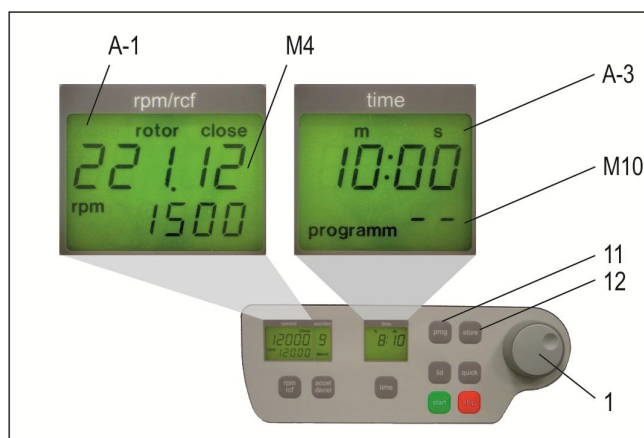


Figure 24

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm“.

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 23.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).

By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended then the centrifuge will stop automatically.

By the „quick“ key (8) you can start runs, which will last just a few seconds.

By pressing the „quick“ key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick“ key (8).

By releasing the „quick“ key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 25

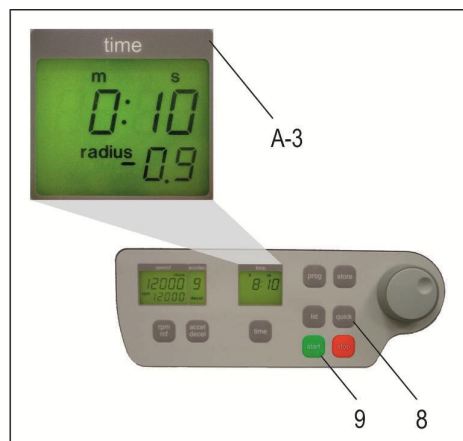


Figure 25

2.6.2 The "STOP" key

By the „stop“ key (10) (see figure 26) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

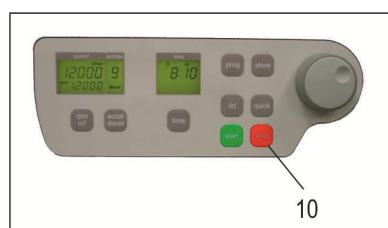


Figure 26

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display "time" (A-3) the word "error" (M11) together with the number "01" appear, the weight difference of the samples is too huge. Weigh out the samples exactly!

Load the rotor as described in chapter 2.1.2 and 2.1.3.

When inside the display "time" (A-3) the word "error" together with the number "02" (see figure 27) appear, there could be following reasons: The imbalance switch is defective.

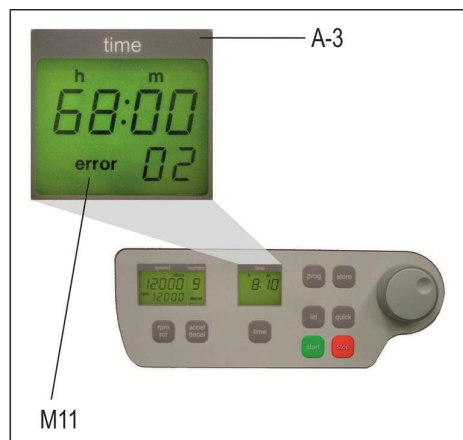


Figure 27

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.



ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.



ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time:

Proper use, damage-free condition, recommended care.

4. TROUBLE SHOOTING

4.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see figure 28):



- Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)
- At the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.
- Take the delivered box spanner, put him in the hole and lock the box spanner with hexagon nut (see figure 28).
- Now turn the box spanner to the right side (clockwise) up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Switch the centrifuge on again, for go on working.



Figure 28

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 29). Detailed information about possible error messages are in „table 6: error messages“ (see Appendix P.IX).

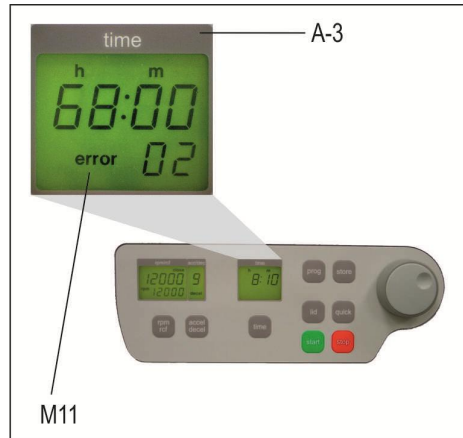


Figure 29

5. RECEIPT OF CENTRIFUGES TO REPAIR



Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. XIII)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

7. APPENDIX

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EG - Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to “IVD (other device)”

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06

Wehingen, den 01.10.2012

Konformitätserklärung Geräte IVD 03-2012

HERMLE
LABORTECHNIK


Geschäftsführer, Managing Director

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH			
Type		Z 366			
Dimensions					
Width		43 cm			
Depth		51 cm			
Height		38 cm			
Weight without rotor		52 kg			
max. speed		20000 min ⁻¹			
max. volume		6 x 250 ml			
max. RCF		29068 x g			
allowable density		1,2 kg/dm ³			
allowable kinetic energy		16672 Nm			
Mains power connection AC		230 V / 50-60 Hz 1 ph		120 V / 50-60 Hz 1 ph	
Voltage fluctuation		± 10 %		± 10 %	
Current consumption		2,1 A		4,0 A	
Power consumption		480 W		480 W	
Radio interference		IEC 61326-1			
Audit requirement (BGR 500)		yes			
Ambient conditions (EN/IEC 61010-1)					
- Environment		for indoor use only Use up to an altitude of 2000 m above MSL 2°C up to 35 °C Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.			
- High					
- Ambient temperature					
- Max. relative humidity					
- Overvoltage category (IEC 60364-4-443)					
- Degree of contamination		II			
Class of protection		2			
		I			
Not suitable for use in hazardous environments.					
EMV		EN / IEC		FCC Class B	
Interference emission , noise		61326-1		EN / IEC	
		Category B		61326-1	
				Category B	
Noise level (depending on the rotor)		≤ 61 +2 dB(A)			
Write from operator					
Inventory-No.:					
Monitoring-No.:					
Environment:					
Maintenance contract:					
responsible service office		HERMLE Labortechnik GmbH		or dealer service office	
		Siemensstrasse 25			
		78564 Wehingen			
		Tel.: (49)7426 / 96 22-17			
		Fax: (49)7426 / 96 22-49			
responsible dealer					

Table 2: Permissible net weight

Rotor-Number	Max. Speed	Permissible net weight
221.15 V02	4500 min-1	4 x 180 g
221.16 V03	4500 min-1	2 x 310 g
221.19 V02	4500 min-1	30 x 32 g
221.21 V02	8000 min-1	6 x 355 g
221.18 V02	11000 min-1	6 x 140 g
221.20 V02	12000 min-1	4 x 140 g
221.22 V02	13000 min-1	6 x 94 g
221.28 V02	12000 min-1	20 x 18 g
221.17 V03	15000 min-1	30 x 3,4 g
221.23 V02	20000 min-1	12 x 3,4 g

Table 3: Max. speed and RCF-values for permissible rotors

Rotor-Number	Max. Speed	RCF value
221.15 V02	4500 min-1	3780xg
221.16 V03	4500 min-1	2720xg
221.19 V02	4500 min-1	2830xg / 2467xg
221.21 V02	8000 min-1	10017xg
221.18 V02	11000 min-1	15557xg
221.20 V02	12000 min-1	14811xg
221.22 V02	13000 min-1	15871xg
221.28 V02	12000 min-1	15777xg
221.17 V03	15000 min-1	23645xg
221.23 V02	20000 min-1	29068xg

Table 4: Accelerations and deceleration times

Rotor-Number	Acceleration values		Deceleration values	
	level 0	level 9	level 0	level 9
221.15 V02	185	20	300	25
221.16 V03	180	20	390	25
221.19 V02	110	15	450	20
221.21 V02	570	70	520	85
221.18 V02	500	60	1080	70
221.20 V02	400	42	800	52
221.22 V02	440	50	520	50
221.28 V02	400	40	630	40
221.17 V03	510	55	340	55
221.23 V02	300	30	230	45
in seconds				
Acceleration time from 0 min^{-1} -> U_{\max}			Deceleration time from U_{\max} -> 0 min^{-1}	

Table 5: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
14	Leap of speed is too big between two measurements
CLOSE lid	
33	Open lid while motor is running
34	Lid contact defective
38	Lid motor is blocked
40	Communication with frequency converter distrubed during start
41	Communication with frequency converter distrubed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
70	Timeout between controler and RS232 interface
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the programm
rotor no	Rotor is not detected

Table 6 (part 1): Radius correction

<i>Rotor No.</i>	<i>Adapter/Bucket Order. No.</i>	<i>Radius (cm)</i>	<i>Correction (cm)</i>
Swing out rotor 221.15	221.15.05	16,5	0
	221.15.19	15,75	-0,7
	221.15.10	16,15	-0,3
	221.15.13	16,35	-0,1
	221.15.05	16,45	0,0
	221.15.11	16,15	-0,3
	221.15.33	15,85	-0,6
	221.15.16	16,15	-0,3
	221.15.12	15,55	-0,9
	221.15.23	16,35	-0,1
	221.15.06	16,45	0,0
	221.15.14	16,15	-0,3
	221.15.17	16,35	-0,1
	221.15.22	15,95	-0,5
	221.15.18	15,95	-0,5
	221.15.24	16,35	-0,1
	221.15.21	15,75	-0,7
Swing out rotor 221.16.		10,2	0
	706.000	10,2	0
Angle rotor 221.19.		12,5 10,9	0
	701.000	8 6,4	-4,5
	701.010	11,3 9,7	-1,2
	701.011	12,2 10,6	-0,3
	701.012	10,5 8,9	-2,0
Angle rotor 221.21.		14,1	0
	713.015	9,9 13,5	-4,2 -0,6
	713.020	10 13,3	-4,1 -0,8
	713.025	10 13	-4,1 -1,0
	713.028	9,9 12,5	-4,2 -1,6
	713.030	12	-2,1
	713.042	11,7	-2,4

Table 6 (part 2): Radius correction

Rotor No.	Adapter/Bucket Order. No.	Radius (cm)	Correction (cm)
Angle rotor 221.18.		11,2	0
	707.000	9,7	-1,5
		11,1	-0,1
	707.001	10,6	-0,6
	707.002	10,4	-0,8
	707.003	10,9	-0,3
	707.004	10,6	-0,6
	707.014	10,4	-0,8
	707.015	10,4	-0,8
Angle rotor 221.20.		9,2	0
	707.001	8,5	-0,7
	707.002	8,4	-0,8
	707.003	8,9	-0,3
	707.004	8,6	-0,6
	707.014	8,3	-0,9
	707.000	7,5	-1,7
		9,1	-0,1
Angle rotor 221.22.		8,4	0
	708.003	7,9	-0,5
	708.004	8	-0,4
	708.017	7,7	-0,7
	708.019	8,2	-0,2
Angle rotor 221.28.		9,9	0
Angle rotor 221.17.		9,5	0
	704.004	9,1	-0,4
	704.005	8,4	-1,1
Angle rotor 221.23.		6,5	0
	704.004	6,3	-0,2
	704.005	5,6	-0,9

Table 7: Abbreviations used

Symbol / Abbreviation	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis: ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α .. ☐ β .. ☐ γ .. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes: _____

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____

[illegible]



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Instruction Manual for Table Top Centrifuge Z 383

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1 PRODUCT DESCRIPTION

1.1 Usage in accordance with safety standards

1.1.1 General information

1.1.1.1 Hazards and precautions

Before setting the centrifuge into operation, please read this instruction manual carefully!

This centrifuge must not be operated by unqualified personnel not being familiar with the correct use of the unit.

Always, use the original accessories only!

For your personal safety, please pay attention to following precautions:

- The HERMLE Z 383 is not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. During centrifugation, it is prohibited to stay within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area.
- Centrifugation of flammable, explosive and radioactive substances or substances, which chemically react with high energy, is strictly prohibited!
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited.
The user is obligated to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and / or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2 m/s.

Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without metal cover).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with by unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

1 PRODUCT DESCRIPTION

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.1.1.2 Brief description

Model Z 383 is a table top centrifuge. Various rotors are available for this unit. Speed / RCF-value and running time can easily be set with turning knobs and are displayed on large LED's.

The pre-set run parameters are stored after the end of each run.

The lid is latched and released with an electric motor driven lid lock.

The centrifuge has a maintenance-free brushless induction drive with a low noise level.

1.1.1.3 Safety standards

The centrifuge corresponds with the General Requirements for Medical Units Regulations (MedGV) (group 3).

Following standards have been considered for the production of our centrifuges:

- Accident Prevention Regulation for electrical units and installations UVV VBG 4
- Accident Prevention Regulation for centrifuges as per BGR 500; Chapter 2.11; Part 3
- DIN 58970 part 1, 2 and 4 for centrifuges and tubes
- Electrical Interference Suppression according to interference degree B as per VDE 0871
- Electrical Safety as per IEC 1010-1 and IEC 1010-2-D
- European Standard PR EN 61 010-1 and PR EN 61 010-2-2

1 PRODUCT DESCRIPTION

1.1.1.4 Extent of supply

Following parts are supplied as accessories with each centrifuge:

- 2 fine-wire fuses 16 AT (230 V)
- 2 fine-wire fuses 15 AT (120 V)
- 1 instruction manual
- 1 Allan key for removing rotors

Spare fuses are at the rear side of the centrifuge.

1.1.1.5 Warranty

The centrifuge has been subjected to thorough testing and quality controls.

In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of one year from date of delivery.

This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement.

1.2 Installation

1.2.1 Installation of the centrifuge

1.2.1.1 Unpacking the centrifuge

Model Z 383 is supplied in a palletcarton.

Remove the strap retainer, open the carton, remove the cover carton and the centrifuge. The instruction manual must always be kept with the centrifuge.

1.2.1.2 Space requirements

The centrifuge should be installed on an even and solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

In order to enable a safe and smooth operation, level the table of the centrifuge with a spirit level.

The centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit in order to ensure necessary heat dissipation.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, because of the obtainable chamber temperature is referenced of a average room heat of 23°C.

Safety regulations require that the safety area of 30 cm around the unit is marked in order to indicate that neither hazardous substances nor persons should be within this area during centrifugation.

1 PRODUCT DESCRIPTION

1.2.1.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label which is mounted on the rear panel.
- The line voltage circuit breaker is max. 16 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Remove the transport spacer blocks from the motor shaft (see chapter 2.2.2).

The socket for the power cord must be easy to reach respectively easy to disconnect!

1.3 Technische Daten

Manufacturer	HERMLE Labortechnik GmbH	
Type / Model	Z 383	
Dimensions		
Width	50 cm	
Depth	59 cm	
Height	38 cm	
Weight	69 kg	
Noise level (max.)	67 +2,0 dB (A)	
Max. speed	17.000 rpm	
Max. volume	4 x 500 ml	
Max. RCF	27.464 x g	
Admissible density	1,2 kg/dm³	
Admissible kinetic energy	31.000 Nm	
Electrical connection AC	230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph
Current	8 A	12 A
Connected load	1340 Watt	840 Watt
Interference suppression	VDE 0871, Funkentstörgrad B	
Test obligations	yes	
To be filled in by purchaser:		
Inventory-No.:	<div></div>	
Check-No.:	<div></div>	
Location:	<div></div>	
Maintenance contract:	<div></div>	
Your service department	HERMLE Labortechnik GmbH Siemensstrasse 25 78564 Wehingen Phone: +49-7426 / 96 22-17	
Your agent	<div></div>	

1 PRODUCT DESCRIPTION

1.4 Conformity declaration

We, the company

Hermle Labortechnik GmbH
Siemensstrasse 25
78564 Wehingen

declare in mere responsibility that our product

Centrifuges

of models

Z 100 M; Z 160 M
Z 206 A
Z 233 M-2; Z 216 MK
Z 300; Z 300 K; SIEVA-2; Z 323; Z 323 K;
Z 366; Z 36 HK; Z 383; Z 383 K
Z 400; Z 400 K; Z 513; Z 513 K
SETA Oil test centrifuge

as from month/year of construction 06 / 07

to which this declaration refers to, have been manufactured according to the following standards or according to normative documents.

DIN EN 61 010-1; EN 61 010-2-020;
EN 61000-6-1 ; EN61000-6-2 ;
EN 61000-3-2 ; EN 61000-3-3;
EN 55011
89/336/EWG ; 92/31/EWG ; 93/68/EWG ;
93/42/EG ; 98/37/EG; 98/79/EG;
DIN EN ISO 12100-1; DIN EN ISO 12100-2



Wehingen/Germany, 13th July 2007

Harald Hermle
President

2 OPERATION

2.1 Installation of rotors

2.2.1 Mounting and loading angle rotors

Clean the motor shaft as well as the rotor mounting boring with a clean, grease-free piece of cloth. Place the rotor onto the motor shaft, ensuring that the pin aligns correctly with the rotor slot (see photos 1 and 2).

For reasons of safety you should check the correct position of the rotor before each run!!

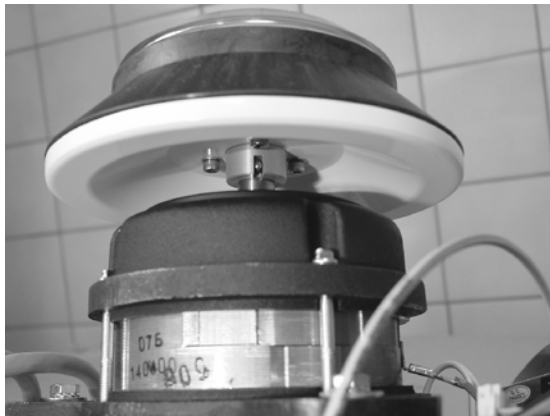


Photo 1: correct

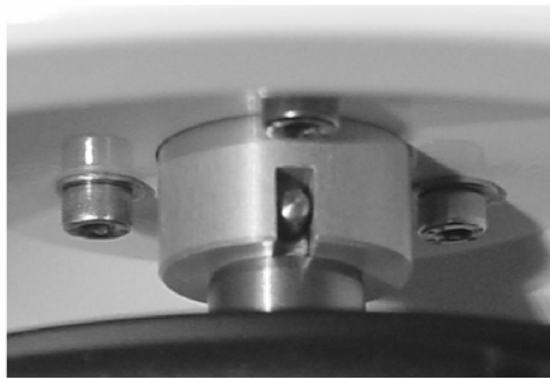
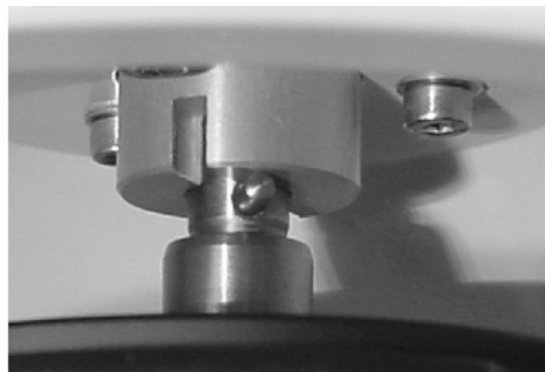


Photo 2: wrong



2 OPERATION

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see photo 3).



Photo 3

It is allowed to operate e.g. a 8-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other.

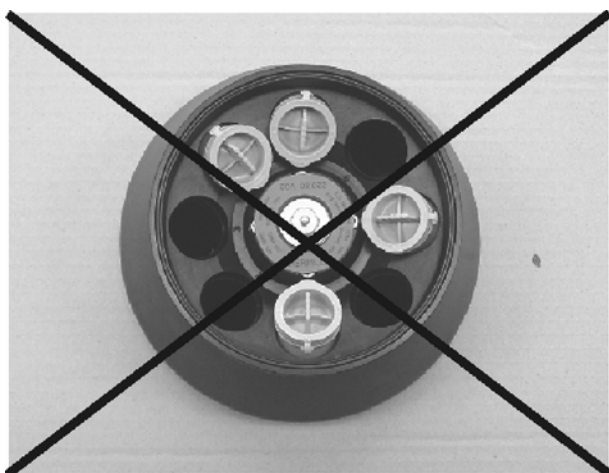


Photo 4: wrong

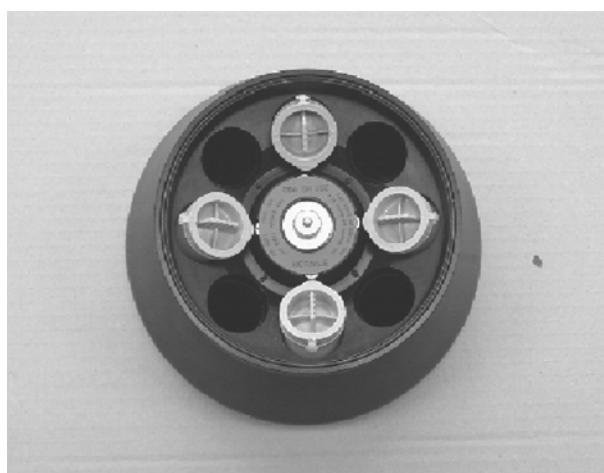


Photo 5: correct

2 OPERATION

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector lightly onto the rotor nut. Take care the lid is correctly placed into the guide.



Photo 6

2.1.2 Mounting and loading swing out rotors

Clean the motor shaft, as well as the device hole of the rotor with a clean and fat free cloth. Put the rotor to the motor shaft (take care that the cross pin is sitting right to the driving disk of the rotor) (s. photo 1 and photo 2).

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see photo 3).

The charging of the buckets and the adapters must be done appropriately figure 7 and figure 8.

In principle swing out rotors may be taken in operation first if all buckets or racks are put into the rotor.

The bolts at the rotor must be easily greased with silicone grease.

The glasses have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 6 gramme.

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded borings must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see Figure 7 and 8).

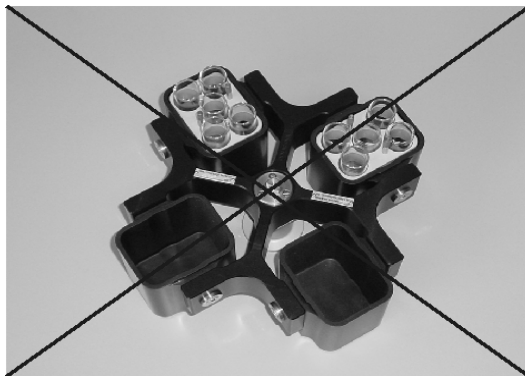


Photo 7: wrong



Photo 8: correct

2 OPERATION

2.1.3 Overloading of rotors

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded.

The liquids the rotors are loaded with, should have an average homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

In case of any questions, please contact the manufacturer!

2.1.4 Removing the rotor

Take off the lid of the rotor. Hold the rotor with one hand. Loosen the rotor nut with the included allen key by turning it clockwise.

ATTENTION:

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances which could damage the rotor and buckets.

2.2 Operation

2.2.1 Power switch / Main fuse

The power switch is down below on the left side of the unit. The main fuse of the centrifuge is on the backside at the power inlet. After switch on the centrifuge the displays on the control panel will flash up. The disconnection from the network just happens by unplugging the main plug.

2.2.2 Lid release

When the green control lamp on the key „LID“ (4) is flashing, the rotor is standing still and the lid of the centrifuge is ready to open.

Press the key „LID“ (3) (see photo 9), and the lid will open automatically. While the lid is opening itself it appears the word „OPEN“ in the actual value display (see photo 9).

After approx. 6 seconds the word disappears in the actual value display and the lid can be opened.

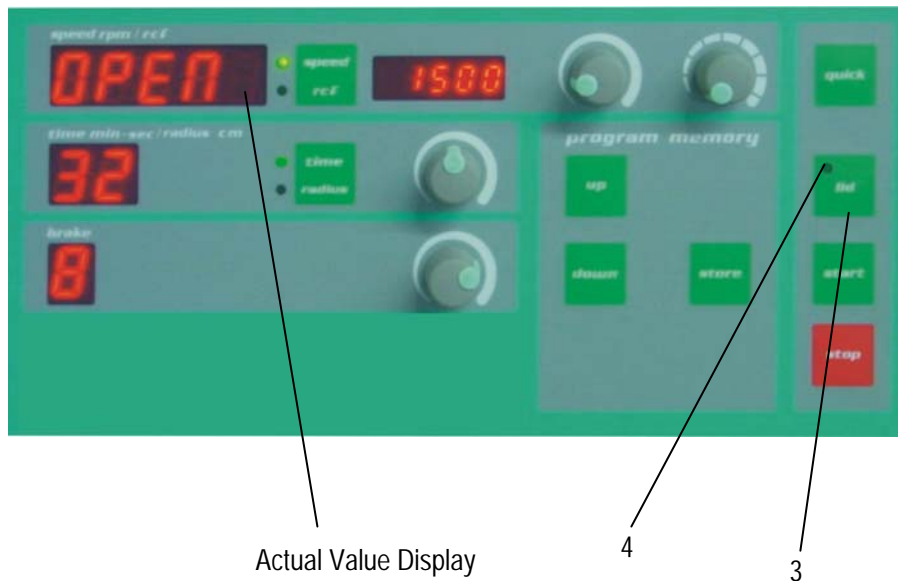


Photo 9

2.2.3 Lid lock

After mounting and loading the rotor correctly as described, the lid may be closed.

Please proceed as follows:

- The lid must only be lay down slightly until you feel that the lid will be tightened.
- Afterwards the lid will close automatically within 6 seconds.
While the closing of the lid it appears the word „CLOSE“ in the actual value display.
(see photo 9)
- As soon as the lid is closed correctly the word „CLOSE“ disappears in the actual value display.
- When the control lamp (4) on the key „LID“ flashed up, the centrifuge can be started.

The centrifuge may only be started with closed lid (Lid lock according to BGR 500; Chapter 2.11; Part 3).

As soon as the rotor starts, the control lamp (4) on the key „LID“ turns off and an opening of the lid is impossible.

If the control lamp (4) on the key „LID“ flashes after pressing the "START" - key, you have to open the lid once again. This safty precaution shows the end of the run.

2.2.4 Pre-selection of speed / RCF-value

With the key "SPEED/RCF" (7) you can switch between speed and RCF-value to be shown in the display. The green control lamps (8) indicate, which mode is activated.

Select the desired mode. With the speed potentiometer (4) you can pre-select the speed/RCF-value in steps of 500 or you can change the values during the run.

With the speed potentiometer (5) you can pre-select the speed/RCF-value in steps of 10 or you can change the values during the run.

The pre-selected value is indicated in the nominal value display (1). The actual speed is indicated in the actual value display (2).

2 OPERATION

The pre-selected speed should not be higher than the max. speed of the rotor. If the pre-selected speed is too high the nominal value display (1) flashed after approx. 200 rpm. (see photo 10). However the centrifuges accelerates only up to the maximum speed of the placed rotor.
The maximum speed of the Z 383 is 17.000 rpm.

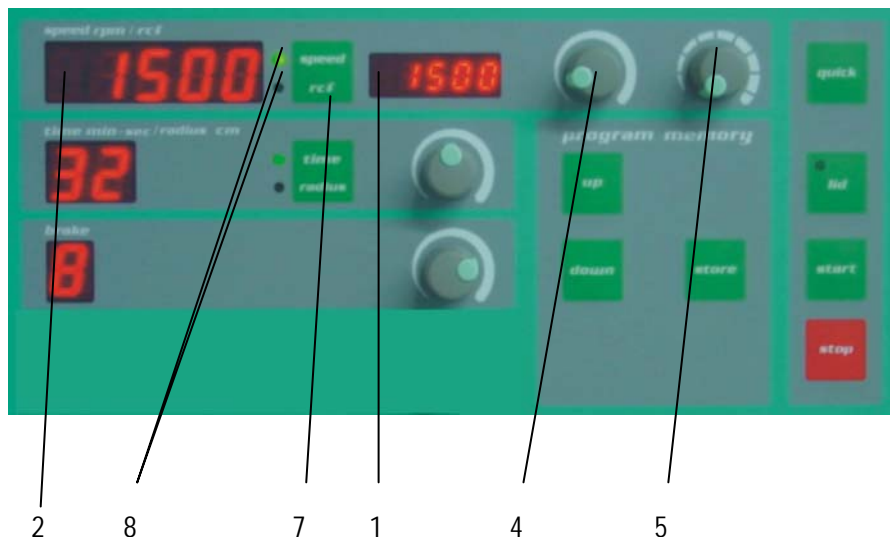


Photo 10

Max. Revolution per minutes of the valid rotors Z 383 and Z 383 K

Rotor Number	Max. Speed
220.86 V01	5.000 rpm
221.08 V01	4.500 rpm
221.02 V01	5.000 rpm
221.03 V01	4.250 rpm
220.34 V04	9.200 rpm
220.78 V02/V03	15.000 rpm
220.80 V02/V03	15.000 rpm
220.87 V03/V04	17.000 rpm
220.97 V02	6.000 rpm
220.85 V01	15.000 rpm
220.96 V02	6.000 rpm
221.16 V01	4.500 rpm
220.50 V06	3.500 rpm
220.88 V01	13.500 rpm
220.92 V01	13.500 rpm
220.81 V06	3.500 rpm
220.73 V02	8.000 rpm

2.2.5 Pre-selection of running time

Running time is adjustable from 1 to 60 min. with the time potentiometer (12) or continuous. The running time is indicated in the display (10). The preset running time will be stored after the run. For continuous run, turn the time potentiometer (12) clockwise to the limit stop. The display (10) indicates continuous run with two dashes "- -". You can stop the run by pressing the „stop“ key.

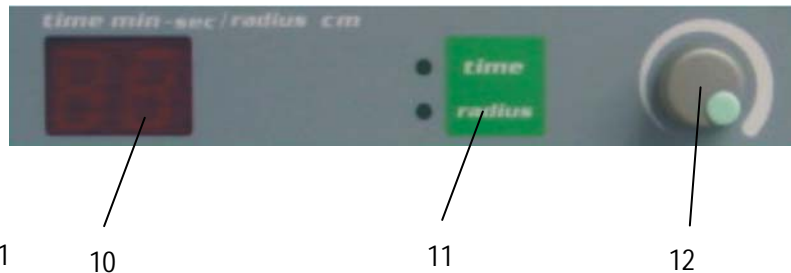


Photo 11

2.2.6 Pre-selection of radius correction (IMPORTANT FOR THE RCF-VALUE DISPLAY)

Explanation:

The Z 383 has an automatic rotor identification therefore the control system of the centrifuge knows the maximum centrifugal radius of the respective rotors to indicate the correct RCF-Values. If you use adapters it could change the centrifugal radius of the respective rotors. That the control system of the centrifuge is supposed to calculate the right RCF-Value, the respective radius must be corrected.

Pre-selection:

Please look up the correction value in the following table under the respective rotor and adapter.

While pressing the key "time/radius" (11) you can adjust your value with the potentiometer (12) (see photo 11). If you press the key "time/radius" (11) this value is indicated during the run, too. After release the key "time/radius" (11), the display (10) indicates the running time again.

ATTENTION:

After the key is released the adjusted value is stored and must be readjusted for an other adapter or rotor.

2 OPERATION

Radius correction values of the usable rotors

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; Rectangular bucket; 4 x 250 ml, R-max.: 16,6 cm				
220.86 V01	610.000	710.000	0,3	
		710.001	0,4	
		710.002	0,6	
		710.003	0,4	
		710.004	0,6	
		710.005	0,6	
		710.006	0,4	
		710.007	0,4	
		710.009	0,6	
		710.010	0,7	
		710.011	0,3	
		710.013	0,6	
		710.014	0,6	
		710.015	0,4	
		710.016	0,4	
		710.017	0,4	
		710.018	0,4	
		710.019	0,4	
		710.020	0,4	
		710.021	0,4	
		710.022	0,6	
Swing out rotor; Round bucket; 4 x 250 ml, R-max.: 16,8 cm				
	611.000	711.003	0,7	
		711.004	0,7	
		711.005	0,2	
		711.006	0,3	
		711.007	0,5	
		711.008	0,5	
		711.009	0,1	
		711.010	0,5	
		711.011	0,5	
		713.001	0,2	
		713.002	0,2	
		713.003	0,2	
		713.004	0,5	
		713.005	0,7	
		713.006	0,5	
		713.007	0,2	
		713.008	0,2	
		713.009	0,2	
		713.010	0,2	
		713.011	0,2	
		without	0	

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; Round bucket; 4 x 500 ml, R-max.: 18,6 cm				
221.08 V01	625.000	without	0,2	
	625.001	without	0,5	
	625.002	without	0,2	
	625.003	without	0,8	
	625.004	without	0,9	
	625.005	without	0,3	
	625.006	without	0,3	
	625.007	without	0,5	
	625.008	without	0,3	
	625.009	without	4,0	
	625.010	without	1,7	
	625.013	without	5,8	
Swing out rotor; Mikrotitre carrier for 4 x 2 Plates				
	625.020	without	4,3	
Swing out rotor; 20 x 15 ml, R-max.: 18,6 cm				
221.02 V01		701.010	2,2	
		701.011	2,2	
		701.012	4,7	
Swing out rotor; 12 x 50 ml, R-max.: 17,7 cm				
221.03 V01	603.000	without	0	
	603.001	without	0,7	
		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Drum rotor; 8 Places, R-max.: 11,0 cm				
220.34 V04		715.000	0,4	
		715.001	0,6	
		715.002	0,4	
		715.003	0,4	
		715.004	0,4	
		715.005	1,9/1,2/0,4	
		715.006	0,4	
		715.007	0,4	
		715.008	0,2	220.34.35.04
		715.009	1,1/0,3	220.34.37.04
		715.010	0,4	220.34.38.04
		715.011	0,2	220.34.90.04

2 OPERATION

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Angle rotor; 6 x 85 ml, R-max.: 10,3 cm				
220.78 V02 / V03		707.000	0,1	
		707.001	0,6	
		707.002	0,8	
		707.003	0,3	
		707.004	0,6	
		707.003 with 708.001	0,6	
		707.003 with 708.008	1,6	
Angle rotor; 8 x 50 ml, R-max.: 9,6 cm				
220.80 V02 / V03		708.000	0,6	
		708.001	0,3	
		708.002	0,7	
		708.003	0,5	225.50.50.04
		708.004	0,5	
Angle rotor; 24 x 1,5 / 2,0 ml, R-max.: 8,5 cm				
220.87 V03 / V04		704.004		Dep. on Manufacturer
		704.005		Dep. on Manufacturer
Angle rotor; 6 x 50 ml, R-max.: 9,7 cm				
220.97 V01 / V02	603.000	without	0	
		without	0	
		708.002	0,7	
		708.003	0,5	
		708.004	0,5	
	603.001	without	0,7	
		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Angle rotor; 12 x 12 ml, R-max.: 9,9 cm				
220.85 V01 / V02		701.003	0,5	
Angle rotor; 12 x 15 ml, R-max.: 10,4 cm				
220.96 V01 / V02		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Swing out rotor; Mikrotitre carrier for 2 x 3 Plates, R-max.: 12,2 cm				
221.16 V01		706.000	0,2	
Swing out rotor; Mikrotitre carrier for 2 x 3 Plates, R-max.: 10,4 cm				
220.50 V06		706.000	0,2	

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Angle rotor; 44 x 1,5 / 2,0 ml, R-max.: 7,1 / 8,6 cm				
220.88 V01		704.004		Dep. on Manufacturer
		704.005		Dep. on Manufacturer
Angle rotor; 64 x 0,4 ml, R-max.: 6,9 / 8,2 cm				
220.92 V01		704.004		Dep. on Manufacturer
Angle rotor; 24 x 15 ml, R-max.: 14,4 cm				
220.81 V06		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Swing out rotor; 4 x 15 ml, R-max.: 14,4 cm				
220.73 V02		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Swing out rotor; 4 x 15 ml, R-max.: 14,4 cm				
221.06 V02		without	0	
Angle rotor; 8 x 30 ml, R-max.: 9,5 cm				
220.76 V02 / V03		709.000	0,3	
		709.001	0,3	
		without	0	

2.2.7 Pre-selection of brake intensity and acceleration

With the potentiometer (13) (see photo 12) you can choose different brake levels from 0 to 9. With the level 0 the unit accelerates and brakes slowly and gently. With the level 9 the unit accelerates and brakes as fast as possible.



Photo 12

13

2 OPERATION

Acceleration- and deceleration times Z 383 and Z 383 K (120 V / 230 V) in seconds

Rotor - Number	Acceleration values	Deceleration values	
		Brake level 0	Brake level 9
220.86 V01	37	169	50
221.08 V01	50	240	40
221.02 V01	30	47	10
221.03 V01	15	37	8
220.34 V04	37 to 320	210	37
220.78 V02/V03	83	550	83
220.80 V02/V03	66	390	50
220.87 V03/V04	30	320	39
220.97 V02	18	160	21
220.85 V01	54	330	41
220.96 V02	22	125	18
221.16 V01	20	89	15
220.50 V06	20	89	15
220.88 V01	17	153	22
220.92 V01	13	154	16
220.81 V06	22	105	16
220.73 V02	36	225	36

2.2.8 Keyboard – Starting the centrifuge – "QUICK"-key



- 1 Key "QUICK": For short spins
Centrifuge is running as long as you hold the key.
- 2 Key "LID": To open the lid of the centrifuge.
Control lamp indicates the correctly closed lid.
- 3 Key "START": To start the pre-set run of the centrifuge.
- 4 Key "STOP": To stop the centrifuge before the pre-set operating time has expired or to stop the centrifuge at continuous run.

Photo 13

Starting the centrifuge

Insert a correctly and fully loaded rotor and tighten it to the motor shaft (see chapter 2.1.2). Close the lid of the centrifuge. As soon as the control lamp at the key "LID" is flashing, the centrifuge run can be started. Therefore press key "START".

ATTENTION: The rotor has to be checked and / or tightened previous to each run!

"QUICK" -Key – Short runs

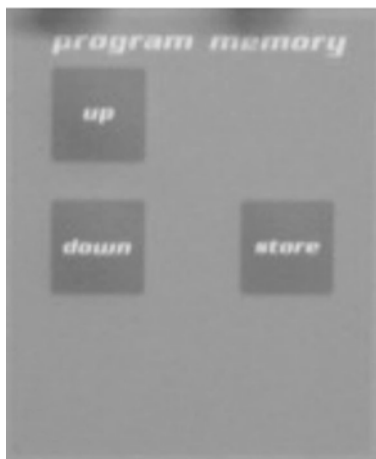
For short centrifuge runs you can start the run with key "QUICK". Press the key "QUICK". The centrifuge starts and runs as long as you hold the key "QUICK". The running time is shown in the display "TIME" in seconds.

"STOP" -Key

Press the key „STOP“, to break off the centrifuge run.

The unit decelerates then with the adjusted brake intensity. The brake intensity can also be changed during the deceleration.

2.2.9 Storage of programs



- 1 Key „up“: to call up and count forward the storage numbers
- 2 Key „store“: to store and leave the program mode
- 3 Key „down“: to call up and count backwards the storage numbers

Photo 14

Storage of runs:

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. Pre-select the desired run parameters, as i.e. speed and running time.

Press the key „START“

As soon as the actual speed display indicates more than 200 rpm the run can be stored.

Press the key „UP“ or „DOWN“. The storage number is indicated with the numbers 0 to 9 in the actual value speed display.

Press the key „UP“ or „DOWN“ that long until the desired storage number is indicated and then press the key „STORE“.

Now the actual speed display indicates on the right side the rotor type of the indicated program. (see photo 15)

If the display indicates the rotor type 0, this storage number is free.

To store the run press the key „STORE“ and hold on for 3 seconds. The actual value display flashes as long as the storage lasted.

2 OPERATION

Recall of stored programs:

Press the key „UP“ or „DOWN“. The actual value display indicated on the left side the program number and on the right side the rotor number.



Photo 15

Select with the key „UP“ or „DOWN“ the desired and stored program number.

The display indicates a rotor number. Place this rotor in the centrifuge. (see. point 2.1). Close the lid of the unit and press the key „start“.

The centrifuge is in the program mode.

You can stop the run at any time by pressing the key „Stop“.

While running in the program mode the potentiometers are out of function.

Leave the program mode:

The centrifuge is in the program mode and indicates the program number as well as the rotor number on the actual value display. Open the lid and press the key „STORE“ for 3 seconds. If the program number and the rotor number have disappeared, the centrifuge can be operated as usual.

Overwrite of a program:

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge.

Pre-select the desired run parameters, as i.e. speed and running time.

Press the key „START“

As soon as the actual speed display indicates more than 200 rpm the run can be stored.

Press the key „UP“ or „DOWN“. The storage number is indicated with the numbers 0 to 9 in the actual speed display.

Press the key „UP“ or „DOWN“ that long until the desired storage number is indicated and then press the key „STORE“.

Now the actual speed display indicates on the right side the new rotor type of the indicated program. (see photo 15)

If the display indicates the rotor type 0, this storage number is free.

To store the run press the key „STORE“ and hold on for 3 seconds. The actual value display flashes as long as the storage lasted.

You can not erase a program but just overwrite.

2.3 Safety features

2.3.1 Imbalance detection

In case of the rotor not being equally loaded (see chapter 2.1.1), the drive will turn off during acceleration. The rotor decelerates to stand still. The actual "SPEED" display indicates "ERROR".

When error message "1" appears in the actual "SPEED" display, the weight difference of the samples is too huge. Weigh out the samples exactly.
Load the rotor as described in chapter 2.1.1.

When error message "2" appears in the actual "SPEED" display, there could be following reasons:

- The imbalance switch is not correctly adjusted.
- The imbalance switch is defective.

3.1 Service and maintenance

3.1.1 Maintenance and cleaning

Maintenance:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

Vaseline, available in nearly each store, is the most suitable lubricant. The Vaseline must be free of resin and acids. Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance:

- Alkalies
- Alkaline soap solutions
- Alkaline amines
- Concentrated acids
- Solutions containing heavy metals
- Water-free chlorinated solvents
- Saline solutions, e.g. salt water

Cleaning:

Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.

In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.

After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. temperature + 50°C).

It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.

Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.

The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week.

3.1.2 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor.

If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

3.1.3 Disinfection

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C, except rotor 220.58 V08, which must not be autoclaved.

The rotor and rotor chamber should be cleaned with a universal, neutral disinfection agent, e.g. on formalin base. A disinfection spray is most suitable in order to easily reach all difficult to access spots.

ATTENTION:

Before applying any other cleaning resp. decontamination method than recommended by the manufacturer, contact the manufacturer to ensure yourself, you would not damage the unit or the rotor by applying the designated method!

4 TROUBLE SHOOTING

4.1 Error messages: cause / solution

Preface:

The error messages are listed to help localize possible errors faster.

The diagnose referred to in this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this instruction manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing find to be a plastic stopper.
- Remove this plastic stopper.
Behind this stopper there is a hexagon nut.
- Take the delivered box spanner , put him into the hole and lock the box spanner with the hexagon nut.
- Now turn the box spanner to the left side up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Turn the hexagon nut back to the start position up to the limit.
- Switch the centrifuge on again, for go on working.



Photo 16

4 TROUBLE SHOOTING

4.2.2 Description of the error message system

The error message is shown in the "SPEED" display through particular figures (see photo 17).

There is a distinction between two different kinds of errors.

The digits in the "SPEED" display have the following meaning:

- Error No. 1 – 49 (forced stop)

In case of one of these errors occurring, the rotor decelerates from pre-set speed down to 0. As soon as the rotor stops, the error message can be reset by opening and closing the lid of the centrifuge.

- Error No. 50 – 99 (emergency stop)

In case one of these errors occurring, the frequency converter switches off. This means, the rotor stops without applying the brakes. To reset the error message you have to switch off the unit and turn it on again (power switch).

In case the unit stops due to an error indication, you should restart the unit to check whether the error occurs again.

The error message figures not listed in this chapter are currently not in use. They are reserved for future use in completing the error message recognition program.

Example: figures are flashing



Photo 17

4.2.3 Error messages

Error No. 1: Imbalance

- Cause: Incorrect loading of the rotor (see chapter 2.2.1)
- Solution: Balance your samples
- Cause: Incorrect adjustment of the imbalance sensor
- Solution: Imbalance sensor has to be re-adjusted (call service department)

Error No. 2: Permanent imbalance signal

- Cause: Incorrect position of the imbalance sensor
- Solution: Imbalance sensor has to be readjusted (call service department)
- Cause: Imbalance sensor is defective
- Solution: Imbalance sensor has to be replaced (call service department)

4 TROUBLE SHOOTING

Error No. 25: Power failure

- Cause: Power failure while rotor was in motion
- Solution: Open and close the lid of the centrifuge, restart the unit;
check contact of plug in (loose contact)

Error No. 36: Relay of the frequency converter cannot be released / lid cannot be opened

- Cause: Power board malfunction
- Solution: Call service department
- Cause: Lid of the centrifuge is jammed
- Solution: Open the lid of the centrifuge manually when rotor is at stand still. Grease the lid lock slightly. In case this error occurs again, call service department;
check coil of lid lock
- Cause: Lid lock is defective
- Solution: Call service department, replace lid lock

Error No. 50 / 51: Memory failure

- Cause: Internal or external memory failure
- Solution: Restart the unit. In case this error occurs again, call service department;
replace control panel

Error No. 55: Over speed

- Cause: Speed sensor is defective
- Solution: Restart the unit. In case this error occurs again, call service department.
possibly loose speed magnet, fix with super glue

Error No. 60: Engine speed sensor signal is missing

- Cause: Speed sensor is defective or cable breakage at speed sensor, possibly lose magnet
- Solution: Call service department;
check speed magnet, fix with super glue

Error No. 70: Converter interface

- Cause: Communication of regulator, power board, interface cable and converter failed.
- Solution: Call service department

Error No. 82: Cut off power board – frequency converter

- Cause: Over current or under voltage due to power supply fluctuations
- Solution: Restart the unit, take care the power supply is stable

4 TROUBLE SHOOTING

Error No. 83: Preset speed cannot be reached

- Cause: Preset speed cannot be reached
- Solution: Call service department

Error No. 84: Over temperature frequency converter

- Cause: Frequency converter cut off due to over temperature
- Solution: Take care, there is enough space around the centrifuge for heat dissipation

Error No. 85: Over temperature motor

- Cause: Temperature protection switch of motor turns off
- Solution: Take care, there is enough space around the centrifuge for heat dissipation.
Motor mounting is defective, replace motor

Fehler Nr. 87: Converter Release

- Cause: Converter don't drive the motor.
- Solution: Check cable, internal conduction error
Check configuration of the control panel
Converter is defective. Call service department

Error No. 90: Emergency switch off lid lock

- Cause: The lid of the centrifuge has been opened while centrifuge was running
- Solution: Close the lid of the centrifuge. DANGER OF ACCIDENT!
- Cause: Control switch of lid lock is defective
- Solution: Call service department

Error No. 94: Voltage drop during the run

- Cause: The voltage supply drops under the limit for a little time
- Solution: Wait until the stand still of the rotor.
If the green control lamp „LID“ flashes, open the lid of the centrifuge.
Restart the centrifuge.



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Instruction Manual for Table Top Centrifuge Z 383 K

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1 PRODUCT DESCRIPTION

1.1 Usage in accordance with safety standards

1.1.1 General information

1.1.1.1 Hazards and precautions

Before setting the centrifuge into operation, please read this instruction manual carefully!

This centrifuge must not be operated by unqualified personnel not being familiar with the correct use of the unit.

Always, use the original accessories only!

For your personal safety, please pay attention to following precautions:

- The HERMLE Z 383 K is not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. During centrifugation, it is prohibited to stay within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area.
- Centrifugation of flammable, explosive and radioactive substances or substances, which chemically react with high energy, is strictly prohibited!
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited.
The user is obligated to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and / or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2 m/s.

Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without metal cover).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with by unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

1 PRODUCT DESCRIPTION

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.1.1.2 Brief description

Model Z 383 K is a refrigerated table top centrifuge. Various rotors are available for this unit. Speed / RCF-value, running time and temperature can easily be set with turning knobs and are displayed on large LED's.

The pre-set run parameters are stored after the end of each run.

The lid is latched and released with an electric motor driven lid lock.

The centrifuge has a maintenance-free brushless induction drive with a low noise level.

It also has an CFC-free hermetically sealed refrigeration system (refrigerant type R 404 a).

1.1.1.3 Safety standards

The centrifuge corresponds with the General Requirements for Medical Units Regulations (MedGV) (group 3).

Following standards have been considered for the production of our centrifuges:

- Accident Prevention Regulation for electrical units and installations UVV VBG 4
- Accident Prevention Regulation for centrifuges as per BGR 500; Chapter 2.11; Part 3
- DIN 58970 part 1, 2 and 4 for centrifuges and tubes
- Electrical Interference Suppression according to interference degree B as per VDE 0871
- Electrical Safety as per IEC 1010-1 and IEC 1010-2-D
- European Standard PR EN 61 010-1 and PR EN 61 010-2-2

1 PRODUCT DESCRIPTION

1.1.1.4 Extent of supply

Following parts are supplied as accessories with each centrifuge:

- 2 fine-wire fuses 16 AT (230 V)
- 2 fine-wire fuses 15 AT (120 V)
- 1 instruction manual
- 1 Allan key for removing rotors

Spare fuses are at the rear side of the centrifuge.

1.1.1.5 Warranty

The centrifuge has been subjected to thorough testing and quality controls.

In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of one year from date of delivery.

This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement.

1.2 Installation

1.2.1 Installation of the centrifuge

1.2.1.1 Unpacking the centrifuge

Model Z 383 K is supplied in a palletcarton.

Remove the strap retainer, open the carton, remove the cover carton and the centrifuge. The instruction manual must always be kept with the centrifuge.

1.2.1.2 Space requirements

The centrifuge should be installed on an even and solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

In order to enable a safe and smooth operation, level the table of the centrifuge with a spirit level.

The centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit in order to ensure necessary heat dissipation.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, because of the obtainable chamber temperature is referenced of a average room heat of 23° C.

Safety regulations require that the safety area of 30 cm around the unit is marked in order to indicate that neither hazardous substances nor persons should be within this area during centrifugation.

1 PRODUCT DESCRIPTION

1.2.1.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label which is mounted on the rear panel.
- The line voltage circuit breaker is max. 16 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Remove the transport spacer blocks from the motor shaft (see chapter 2.2.2).

The socket for the power cord must be easy to reach respectively easy to disconnect!

1.3 Technische Daten

Manufacturer	HERMLE Labortechnik GmbH	
Type / Model	Z 383 K	
Dimensions		
Width	76 cm	
Depth	60 cm	
Height	38 cm	
Weight	107 kg	
Noise level (max.)	67 +2,0 dB (A)	
Max. speed	17.000 rpm	
Max. volume	4 x 500 ml	
Max. RCF	27.464 x g	
Admissible density	1,2 kg/dm³	
Admissible kinetic energy	31.000 Nm	
Electrical connection AC	230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph
Current	9 A	15 A
Connected load	1980 Watt	1800 Watt
Interference suppression	VDE 0871, Funkentstörgrad B	
Test obligations	yes	
To be filled in by purchaser:		
Inventory-No.:	<div></div>	
Check-No.:	<div></div>	
Location:	<div></div>	
Maintenance contract:	<div></div>	
Your service department	HERMLE Labortechnik GmbH Siemensstrasse 25 78564 Wehingen Phone: +49-7426 / 96 22-17	
Your agent	<div></div>	

1 PRODUCT DESCRIPTION

1.4 Conformity declaration

We, the company

Hermle Labortechnik GmbH
Siemensstrasse 25
78564 Wehingen

declare in mere responsibility that our product

of models
Centrifuges

Z 100 M; Z 160 M
Z 206 A
Z 233 M-2; Z 216 MK
Z 300; Z 300 K; SIEVA-2; Z 32 HK
Z 323; Z 323 K; Z 326 ; Z 326 K
Z 366; Z 36 HK; Z 383; Z 383 K
Z 400; Z 400 K; Z 513; Z 513 K
SETA Oil test centrifuge

as from month/year of construction 06 / 07

to which this declaration refers to, have been manufactured according to the following standards or according to normative documents.

DIN EN 61 010-1; EN 61 010-2-020;
EN 61000-6-1 ; EN61000-6-2 ;
EN 61000-3-2 ; EN 61000-3-3;
EN 55011
89/336/EWG ; 92/31/EWG ; 93/68/EWG ;
93/42/EG ; 98/37/EG; 98/79/EG;
DIN EN ISO 12100-1; DIN EN ISO 12100-2

Wehingen/Germany, 13th July 2009



Harald Hermle
President

2 OPERATION

2.1 Installation of rotors

2.2.1 Mounting and loading angle rotors

Clean the motor shaft as well as the rotor mounting boring with a clean, grease-free piece of cloth. Place the rotor onto the motor shaft, ensuring that the pin aligns correctly with the rotor slot (see photos 1 and 2).

For reasons of safety you should check the correct position of the rotor before each run!!



Photo 1: correct



Photo 2: wrong



2 OPERATION

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see photo 3).



Photo 3

It is allowed to operate e.g. a 8-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other.

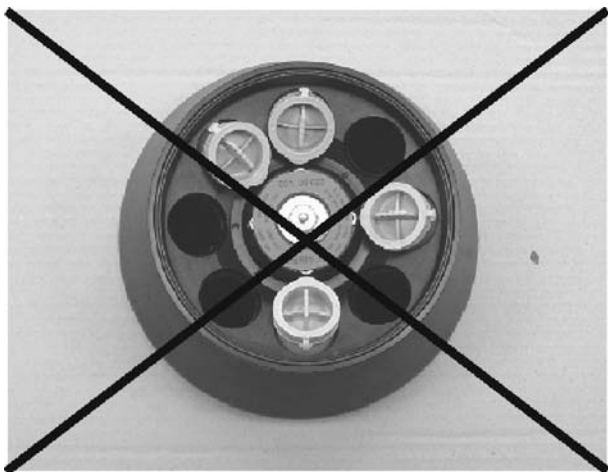


Photo 4: wrong

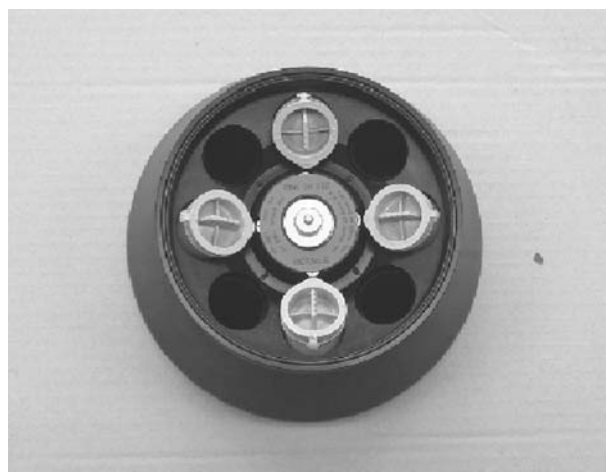


Photo 5: correct

2 OPERATION

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector lightly onto the rotor nut. Take care the lid is correctly placed into the guide.



Photo 6

2.1.2 Mounting and loading swing out rotors

Clean the motor shaft, as well as the device hole of the rotor with a clean and fat free cloth. Put the rotor to the motor shaft (take care that the cross pin is sitting right to the driving disk of the rotor) (s. photo 1 and photo 2).

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see photo 3).

The charging of the buckets and the adapters must be done appropriately figure 7 and figure 8.

In principle swing out rotors may be taken in operation first if all buckets or racks are put into the rotor.

The bolts at the rotor must be easily greased with silicone grease.

The glasses have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 6 gramme.

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded borings must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see Figure 7 and 8).



Photo 7: wrong



Photo 8: correct

2.1.3 Overloading of rotors

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded.

The liquids the rotors are loaded with, should have an average homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

In case of any questions, please contact the manufacturer!

2.1.4 Removing the rotor

Take off the lid of the rotor. Hold the rotor with one hand. Release the rotor nut with the included allen key by turning it clockwise.

ATTENTION:

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances which could damage the rotor and buckets.

2.2 Operation

2.2.1 Power switch / Main fuses

The power switch is down below on the left side of the unit. The main fuse of the centrifuge is on the backside at the power inlet.

After switch on the centrifuge the displays on the control panel will flash up.

The disconnection from the network just happens by unplugging the main plug.

2.2.2 Lid release

When the green control lamp on the key „LID“ (4) is flashing, the rotor is standing still and the lid of the centrifuge is ready to open.

Press the key „LID“(3) (see photo 9), and the lid will open automatically. While the lid is opening itself it appears the word “OPEN” in the actual value display (see photo 9).

After approx. 6 seconds the word disappears in the actual value display and the lid can be opened.



Photo 9

Actual Value Display

4

3

2.2.3 Lid lock

After mounting and loading the rotor correctly as described, the lid may be closed.

Please proceed as follows:

- The lid must only be lay down slightly until you feel that the lid will be tightened.
- Afterwards the lid will close automatically within 6 seconds.
While the closing of the lid it appears the word „CLOSE“ in the actual value display. (see photo 9)

- As soon as the lid is closed correctly the word „CLOSE“ disappears in the actual value display.
- When the control lamp (4) on the key „LID“ flashed up, the centrifuge can be started.

The centrifuge may only be started with closed lid (Lid lock according to BGR 500; Chapter 2.11; Part 3). As soon as the rotor starts, the control lamp (4) on the key „LID“ turns off and an opening of the lid is impossible.

If the control lamp (4) on the key „LID“ flashes after pressing the "START" - key, you have to open the lid once again. This safty precaution shows the end of the run.

2.2.4 Pre-selection of speed / RCF-value

With the key "SPEED/RCF" (7) you can switch between speed and RCF-value to be shown in the display. The green control lamps (8) indicate, which mode is activated.

Select the desired mode. With the speed potentiometer (4) you can pre-select the speed/RCF-value in steps of 500 or you can change the values during the run.

With the speed potentiometer (5) you can pre-select the speed/RCF-value in steps of 10 or you can change the values during the run.

The pre-selected value is indicated in the nominal value display (1). The actual speed is indicated in the actual value display (2).

2 OPERATION

The pre-selected speed should not be higher than the max. speed of the rotor. If the pre-selected speed is too high the nominal value display (1) flashed after approx. 200 rpm. (see photo 10). However the centrifuges accelerates only up to the maximum speed of the placed rotor.
The maximum speed of the Z 383 K is 17.000 rpm.

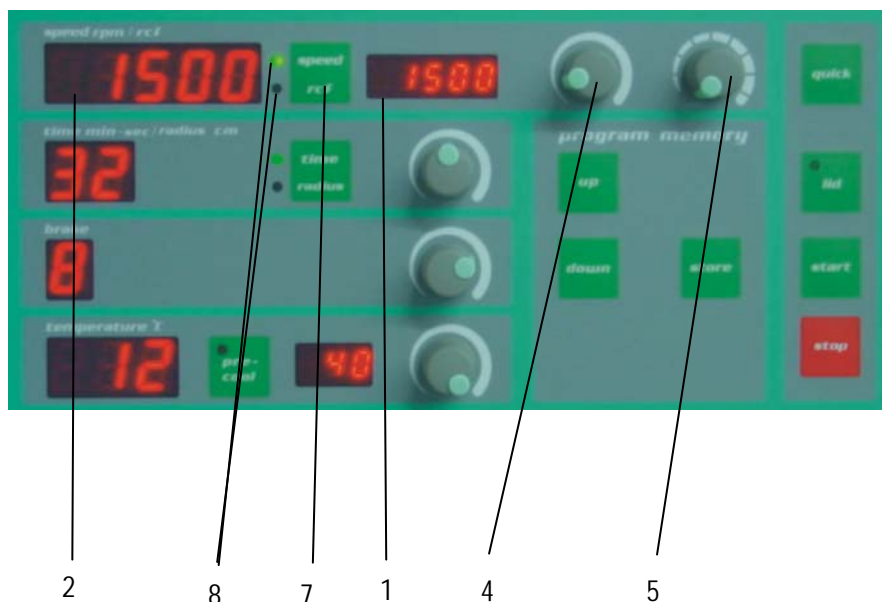


Photo 10

Max. Revolution per minutes of the valid rotors Z 383 and Z 383 K

Rotor Number	Max. Speed
220.86 V01	5.000 rpm
221.08 V01	4.500 rpm
221.02 V01	5.000 rpm
221.03 V01	4.250 rpm
220.34 V04	9.200 rpm
220.78 V02/V04	15.000 rpm
220.80 V02/V04	15.000 rpm
220.87 V03/V04	17.000 rpm
220.97 V02	6.000 rpm
220.85 V01/V02	15.000 rpm
220.96 V02	6.000 rpm
221.16 V01	4.500 rpm
220.50 V06	3.500 rpm
220.88 V01	13.500 rpm
220.92 V01	13.500 rpm
220.81 V06	3.500 rpm
220.73 V02	8.000 rpm

2.2.5 Pre-selection of running time

Running time is adjustable from 1 to 60 min. with the time potentiometer (12) or continuous. The running time is indicated in the display (10). The preset running time will be stored after the run. For continuous run, turn the time potentiometer (12) clockwise to the limit stop. The display (10) indicates continuous run with two dashes "- -". You can stop the run by pressing the „stop“ key.

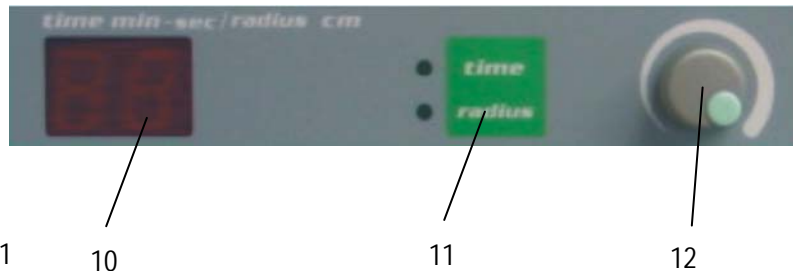


Photo 11

2.2.6 Pre-selection of radius correction (IMPORTANT FOR THE RCF-VALUE DISPLAY)

Explanation:

The Z 383 K has an automatic rotor identification. Therefore the control system of the centrifuge knows the maximum centrifugal radius of the respective rotors to indicate the correct RCF-Values. If you use adapters it could change the centrifugal radius of the respective rotors. That the control system of the centrifuge is supposed to calculate the right RCF-Value, the respective radius must be corrected.

Pre-selection:

Please look up the correction value in the following table under the respective rotor and adapter.

While pressing the key "time/radius" (11) you can adjust your value with the potentiometer (12) (see photo 11). If you press the key "time/radius" (11) this value is indicated during the run, too. After release the key "time/radius" (11), the display (10) indicates the running time again.

ATTENTION:

After the key is released the adjusted value is stored and must be readjusted for an other adapter or rotor.

2 OPERATION

Radius correction values of the usable rotors

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; Rectangular bucket; 4 x 250 ml, R-max.: 16,6 cm				
220.86 V01	610.000	710.000	0,3	
		710.001	0,4	
		710.002	0,6	
		710.003	0,4	
		710.004	0,6	
		710.005	0,6	
		710.006	0,4	
		710.007	0,4	
		710.009	0,6	
		710.010	0,7	
		710.011	0,3	
		710.013	0,6	
		710.014	0,6	
		710.015	0,4	
		710.016	0,4	
		710.017	0,4	
		710.018	0,4	
		710.019	0,4	
		710.020	0,4	
		710.021	0,4	
		710.022	0,6	
Swing out rotor; Round bucket; 4 x 250 ml, R-max.: 16,8 cm				
	611.000	711.003	0,7	
		711.004	0,7	
		711.005	0,2	
		711.006	0,3	
		711.007	0,5	
		711.008	0,5	
		711.009	0,1	
		711.010	0,5	
		711.011	0,5	
		713.001	0,2	
		713.002	0,2	
		713.003	0,2	
		713.004	0,5	
		713.005	0,7	
		713.006	0,5	
		713.007	0,2	
		713.008	0,2	
		713.009	0,2	
		713.010	0,2	
		713.011	0,2	
		without	0	

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; Round bucket; 4 x 500 ml, R-max.: 18,6 cm				
221.08 V01	625.000	without	0,2	
	625.001	without	0,5	
	625.002	without	0,2	
	625.003	without	0,8	
	625.004	without	0,9	
	625.005	without	0,3	
	625.006	without	0,3	
	625.007	without	0,5	
	625.008	without	0,3	
	625.009	without	4,0	
	625.010	without	1,7	
	625.013	without	5,8	
Swing out rotor; Mikrotitre carrier for 4 x 2 Plates				
	625.020	without	4,3	
Swing out rotor; 20 x 15 ml, R-max.: 18,6 cm				
221.02 V01		701.010	2,2	
		701.011	2,2	
		701.012	4,7	
Swing out rotor; 12 x 50 ml, R-max.: 17,7 cm				
221.03 V01	603.000	without	0	
	603.001	without	0,7	
		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Drum rotor; 8 Places, R-max.: 11,0 cm				
220.34 V04		715.000	0,4	
		715.001	0,6	
		715.002	0,4	
		715.003	0,4	
		715.004	0,4	
		715.005	1,9/1,2/0,4	
		715.006	0,4	
		715.007	0,4	
		715.008	0,2	220.34.35.04
		715.009	1,1/0,3	220.34.37.04
		715.010	0,4	220.34.38.04
		715.011	0,2	220.34.90.04

2 OPERATION

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Angle rotor; 6 x 85 ml, R-max.: 10,3 cm				
220.78 V02 / V04		707.000	0,1	
		707.001	0,6	
		707.002	0,8	
		707.003	0,3	
		707.004	0,6	
		707.003 with 708.001	0,6	
		707.003 with 708.008	1,6	
Angle rotor; 8 x 50 ml, R-max.: 9,6 cm				
220.80 V02 / V04		708.000	0,6	
		708.001	0,3	
		708.002	0,7	
		708.003	0,5	225.50.50.04
		708.004	0,5	
Angle rotor; 24 x 1,5 / 2,0 ml, R-max.: 8,5 cm				
220.87 V03 / V04		704.004		dep. on Manufacturer
		704.005		dep. on Manufacturer
Angle rotor; 6 x 50 ml, R-max.: 9,7 cm				
220.97 V01 / V02	603.000	without	0	
		without	0	
		708.002	0,7	
		708.003	0,5	
		708.004	0,5	
	603.001	without	0,7	
		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Angle rotor; 12 x 12 ml, R-max.: 9,9 cm				
220.85 V01 / V02		701.003	0,5	
Angle rotor; 12 x 15 ml, R-max.: 10,4 cm				
220.96 V01 / V02		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Swing out rotor; Mikrotitre carrier for 2 x 3 Plates, R-max.: 12,2 cm				
221.16 V01		706.000	0,2	
Swing out rotor; Mikrotitre carrier for 2 x 3 Plates, R-max.: 10,4 cm				
220.50 V06		706.000	0,2	

Z 383 and Z 383 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Angle rotor; 44 x 1,5 / 2,0 ml, R-max.: 7,1 / 8,6 cm				
220.88 V01		704.004		Dep. on Manufacturer
		704.005		Dep. on Manufacturer
Angle rotor; 64 x 0,4 ml, R-max.: 6,9 / 8,2 cm				
220.92 V01		704.004		Dep. on Manufacturer
Angle rotor; 24 x 15 ml, R-max.: 14,4 cm				
220.81 V06		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Swing out rotor; 4 x 15 ml, R-max.: 14,4 cm				
220.73 V02		701.010	0,9	
		701.011	0,9	
		701.012	2,0	
Swing out rotor; 4 x 15 ml, R-max.: 14,4 cm				
221.06 V02		without	0	
Angle rotor; 8 x 30 ml, R-max.: 9,5 cm				
220.76 V02 / V03		709.000	0,3	
		709.001	0,3	
		without	0	

2.2.7 Pre-selection of brake intensity and acceleration

With the potentiometer (13) (see photo 12) you can choose different brake levels from 0 to 9. With the level 0 the unit accelerates and brakes slowly and gently. With the level 9 the unit accelerates and brakes fast.



Photo 12

13

2 OPERATION

Acceleration- and deceleration times Z 383 and Z 383 K (120 V / 230 V) in seconds

Rotor - Number	Acceleration values	Deceleration values	
		Brake level 0	Brake level 9
220.86 V01	37	169	50
221.08 V01	50	240	40
221.02 V01	30	47	10
221.03 V01	15	37	8
220.34 V04	37 to 320	210	37
220.78 V02/V04	83	550	83
220.80 V02/V04	66	390	50
220.87 V03/V04	30	320	39
220.97 V02	18	160	21
220.85 V01/V02	54	330	41
220.96 V02	22	125	18
221.16 V01	20	89	15
220.50 V06	20	89	15
220.88 V01	17	153	22
220.92 V01	13	154	16
220.81 V06	22	105	16
220.73 V02	36	225	36

2.2.8 Pre-selection of temperature and pre-cooling

The requested sample temperature can be pre-selected in 1°C increments in a range from -10°C to +40°C. (see photo 13)

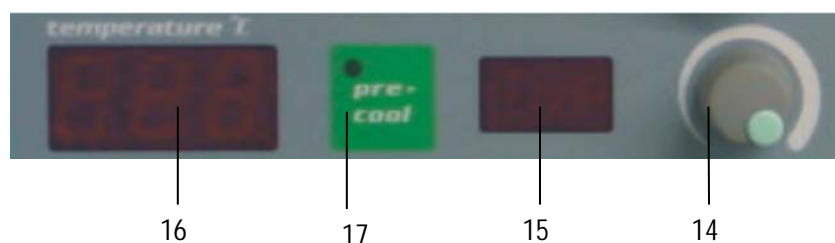


Photo 13

Pre-selection of temperature:

The temperature can be pre-selected with the potentiometer (14).

The pre-selected temperature is indicated in °C in the nominal value display (15).

During the run the actual test temperature is indicated in the actual value display (16).

Lowest temperatures Z 383 K (120 V / 230 V)

Rotor Number	at max. Speed
220.86 V01	+ 2 °C
221.08 V01	+ 10 °C
221.02 V01	- 8 °C
221.03 V01	- 8 °C
220.34 V04	- 2 °C
220.78 V02/V04	+ 10 °C
220.80 V02/V04	+ 1 °C
220.87 V03/V04	+ 2 °C
220.97 V02	- 10 °C
220.85 V01/V02	+ 4 °C
220.96 V02	- 10 °C
221.16 V01	- 7 °C
220.50 V06	- 7 °C
220.88 V01	- 9 °C
220.92 V01	- 8 °C
220.81 V06	- 10 °C
220.73 V02	+ 3 °C

Air temperatur: 23°C

The absolute end temperatures know due to be subject to fluctuations of ± 2 degrees C of performance tolerances of the cooling circuit.

The deepest test temperatures are dependent on the room temperature. If the room temperature rises, then the deepest test temperature to be reached also rises.

Pre-cooling:

In order to avoid considerable temperature deviations at the beginning of a run, you should pre-cool the centrifuge together with the rotor, the buckets, etc.

For pre-cooling, please proceed as follows:

- Insert rotor, buckets and adapters correctly (see chapter 2.1).
- Pre-set the requested temperature and close the lid of the centrifuge.
- By pressing the key „precool“ (17) (see photo 13) the centrifuge starts. The unit spins up to 20 % of the adjusted speed in order to shorten the pre-cooling process. Within 10-15 minutes the centrifuge should reach the pre-selected temperature. Now you can insert the samples and start your actual run.

2.2.9 Keyboard – Starting the centrifuge – "QUICK"-key



- 1 Key "QUICK": For short spins
Centrifuge is running as long as you hold the key.
- 2 Key "LID": To open the lid of the centrifuge.
Control lamp indicates the correctly closed lid.
- 3 Key "START": To start the pre-set run of the centrifuge.
- 4 Key "STOP": To stop the centrifuge before the pre-set operating time has expired or to stop the centrifuge at continuous run.

Photo 14

Starting the centrifuge

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. As soon as the control lamp at the key "LID" is flashing, the centrifuge run can be started. Therefore press key "START".

ATTENTION: The rotor has to be checked and / or tightened previous to each run!

"QUICK" -Key – Short runs

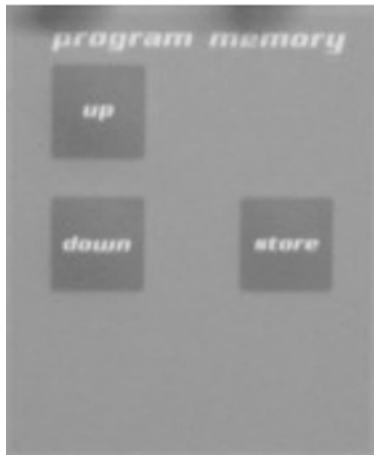
For short centrifuge runs you can start the run with key "QUICK". Press the key "QUICK". The centrifuge starts and runs as long as you hold the key "QUICK". The running time is shown in the display "TIME" in seconds.

"STOP" -Key

Press the key „STOP“, to break off the centrifuge run.

The unit decelerates then with the adjusted brake intensity. The brake intensity can also be changed during the deceleration.

2.2.10 Storage of programs



- 1 Key „up“: to call up and count forward the storage numbers
- 2 Key „store“: to store and leave the program mode
- 3 Key „down“: to call up and count backwards the storage numbers

Photo 15

Storage of runs:

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. Pre-select the desired run parameters, as i.e. speed and running time.

Press the key „START“

As soon as the actual speed display indicates more than 200 rpm the run can be stored.

Press the key „UP“ or „DOWN“. The storage number is indicated with the numbers 0 to 9 in the actual value speed display.

Press the key „UP“ or „DOWN“ that long until the desired storage number is indicated and then press the key „STORE“.

Now the actual speed display indicates on the right side the rotor type of the indicated program. (see photo 16)

If the display indicates the rotor type 0, this storage number is free.

To store the run press the key „STORE“ and hold on for 3 seconds. The actual value display flashes as long as the storage lasted.

Recall of stored programs:

Press the key „UP“ or „DOWN“. The actual value display indicated on the left side the program number and on the right side the rotor number.



Photo 16

Select with the key „UP“ or „DOWN“ the desired and stored program number.

The display indicates a rotor number. Place this rotor in the centrifuge. (see. point 2.1). Close the lid of the unit and press the key „start“.

The centrifuge is in the program mode.

You can stop the run at any time by pressing the key „Stop“.

While running in the program mode the potentiometers are out of function.

2 OPERATION

Leave the program mode:

The centrifuge is in the program mode and indicates the program number as well as the rotor number on the actual value display. Open the lid and press the key „STORE“ for 3 seconds. If the program number and the rotor number have disappeared, the centrifuge can be operated as usual.

Overwrite of a program:

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. Pre-select the desired run parameters, as i.e. speed and running time.

Press the key „START“

As soon as the actual speed display indicates more than 200 rpm the run can be stored.

Press the key „UP“ or „DOWN“. The storage number is indicated with the numbers 0 to 9 in the actual speed display.

Press the key „UP“ or „DOWN“ that long until the desired storage number is indicated and then press the key „STORE“.

Now the actual speed display indicates on the right side the new rotor type of the indicated program. (see photo 16)

If the display indicates the rotor type 0, this storage number is free.

To store the run press the key „STORE“ and hold on for 3 seconds. The actual value display flashes as long as the storage lasted.

You can not erase a program but just overwrite.

2.3 Thermal behaviour

2.3.1 Temperature adjustment

The temperature adjustment with sensor, refrigeration system and processor control is designed that way, that the set temperature is reached within the shortest time possible. During this adjustment period it is possible, that the temperature varies above or below the set temperature (see figure 17).

These variations depend on rotor, temperature and speed.

In case you want to process samples which are very temperature sensitive, you have to pre-cool the rotor, buckets and tube racks to the requested temperature (see chapter 2.2.8).

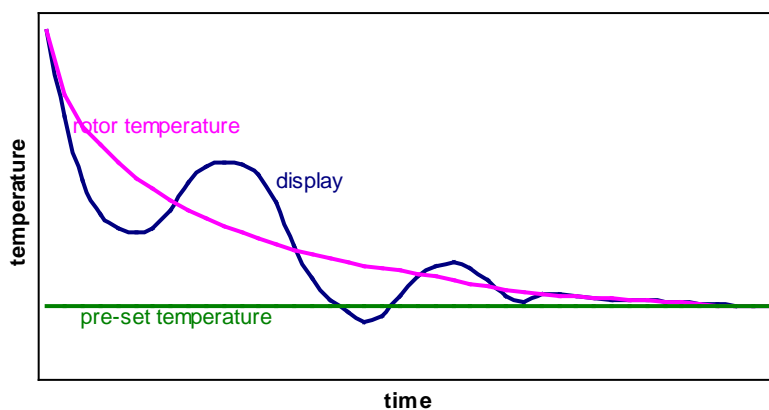


Photo 17

2.4 Safety features

2.4.1 Imbalance detection

In case of the rotor not being equally loaded (see chapter 2.1.1), the drive will turn off during acceleration. The rotor decelerates to stand still. The actual "SPEED" display indicates "ERROR".

When error message "1" appears in the actual "SPEED" display, the weight difference of the samples is too huge. Weigh out the samples exactly.
Load the rotor as described in chapter 2.1.1.

When error message "2" appears in the actual "SPEED" display, there could be following reasons:

- The imbalance switch is not correctly adjusted.
- The imbalance switch is defective.

3.1 Service and maintenance

3.1.1 Maintenance and cleaning

Maintenance:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

Vaseline, available in nearly each store, is the most suitable lubricant. The Vaseline must be free of resin and acids. Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance:

- Alkalis
- Alkaline soap solutions
- Alkaline amines
- Concentrated acids
- Solutions containing heavy metals
- Water-free chlorinated solvents
- Saline solutions, e.g. salt water

Cleaning:

Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.

In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.

After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. temperature + 50°C).

It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.

Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.

The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week.

3.1.2 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor.

If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

3.1.3 Disinfection

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C, except rotor 220.58 V08, which must not be autoclaved.

The rotor and rotor chamber should be cleaned with a universal, neutral disinfection agent, e.g. on formalin base. A disinfection spray is most suitable in order to easily reach all difficult to access spots.

ATTENTION:

Before applying any other cleaning resp. decontamination method than recommended by the manufacturer, contact the manufacturer to ensure yourself, you would not damage the unit or the rotor by applying the designated method!

3.1.4 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)

ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material.

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Boxes, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.

ATTENTION: Because the temperature may rise during the sterilization, rotors, boxes and bottles must not be closed respectively must be totally unscrewed.

Chemical sterilization

Bottles, boxes and rotors may be treated with the usual liquid disinfectants.

4.1 Error messages: cause / solution

Preface:

The error messages are listed to help localize possible errors faster.

The diagnose referred to in this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this instruction manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing find to be a plastic stopper.
- Remove this plastic stopper.
Behind this stopper there is a hexagon nut.
- Take the delivered box spanner , put him into the hole and lock the box spanner with the hexagon nut.
- Now turn the box spanner to the left side up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Turn the hexagon nut back to the start position up to the limit.
- Switch the centrifuge on again, for go on working.



Photo 18

4.2.2 Description of the error message system

The error message is shown in the "SPEED" display through particular figures (see photo 19).

There is a distinction between two different kinds of errors.

The digits in the "SPEED" display have the following meaning:

- Error No. 1 – 49 (forced stop)

In case of one of these errors occurring, the rotor decelerates from pre-set speed down to 0. As soon as the rotor stops, the error message can be reset by opening and closing the lid of the centrifuge.

- Error No. 50 – 99 (emergency stop)

In case one of these errors occurring, the frequency converter switches off. This means, the rotor stops without applying the brakes. To reset the error message you have to switch off the unit and turn it on again (power switch).

In case the unit stops due to an error indication, you should restart the unit to check whether the error occurs again.

The error message figures not listed in this chapter are currently not in use. They are reserved for future use in completing the error message recognition program.

Example: figures are flashing



Photo 19

4.2.3 Error messages

Error No. 1: Imbalance

- Cause: Incorrect loading of the rotor (see chapter 2.2.1)
- Solution: Balance your samples
- Cause: Incorrect adjustment of the imbalance sensor
- Solution: Imbalance sensor has to be re-adjusted (call service department)

Error No. 2: Permanent imbalance signal

- Cause: Incorrect position of the imbalance sensor
- Solution: Imbalance sensor has to be readjusted (call service department)
- Cause: Imbalance sensor is defective
- Solution: Imbalance sensor has to be replaced (call service department)

Error No. 11 Temperature sensor

- Cause: Heating system failure
- Solution: Call service department
- Cause: Temperature sensor is defective
- Solution: Call service department. Temperature sensor has to be changed.

Error No. 25: Power failure

- Cause: Power failure while rotor was in motion
- Solution: Open and close the lid of the centrifuge, restart the unit; check contact of plug in (loose contact)

Error No. 36: Relay of the frequency converter cannot be released / lid cannot be opened

- Cause: Power board malfunction
- Solution: Call service department
- Cause: Lid of the centrifuge is jammed
- Solution: Open the lid of the centrifuge manually when rotor is at stand still. Grease the lid lock slightly. In case this error occurs again, call service department; check coil of lid lock
- Cause: Lid lock is defective
- Solution: Call service department, replace lid lock

Error No. 50 / 51: Memory failure

- Cause: Internal or external memory failure
- Solution: Restart the unit. In case this error occurs again, call service department; replace control panel

Error No. 55: Over speed

- Cause: Speed sensor is defective
- Solution: Restart the unit. In case this error occurs again, call service department. possibly loose speed magnet, fix with super glue

Error No. 60: Engine speed sensor signal is missing

- Cause: Speed sensor is defective or cable breakage at speed sensor, possibly lose magnet
- Solution: Call service department; check speed magnet, fix with super glue

Error No. 70: Converter interface

- Cause: Communication of regulator, power board, interface cable and converter failed.
- Solution: Call service department

4 TROUBLE SHOOTING

Error No. 82: Cut off power board – frequency converter

- Cause: Over current or under voltage due to power supply fluctuations
- Solution: Restart the unit, take care the power supply is stable

Error No. 83: Preset speed cannot be reached

- Cause: Preset speed cannot be reached
- Solution: Call service department

Error No. 84: Over temperature frequency converter

- Cause: Frequency converter cut off due to over temperature
- Solution: Take care, there is enough space around the centrifuge for heat dissipation

Error No. 85: Over temperature motor

- Cause: Temperature protection switch of motor turns off
- Solution: Take care, there is enough space around the centrifuge for heat dissipation.
Motor mounting is defective, replace motor

Fehler Nr. 87: Converter Release

- Cause: Converter don't drive the motor.
- Solution: Check cable, internal conduction error
Check configuration of the control panel
Converter is defective. Call service department

Error No. 90: Emergency switch off lid lock

- Cause: The lid of the centrifuge has been opened while centrifuge was running
- Solution: Close the lid of the centrifuge. DANGER OF ACCIDENT!
- Cause: Control switch of lid lock is defective
- Solution: Call service department

Error No. 94: Voltage drop during the run

- Cause: The voltage supply drops under the limit for a little time
- Solution: Wait until the stand still of the rotor.
If the green control lamp „LID“ flashes open the lid of the centrifuge.
Restart the centrifuge.

5 RECEIPT OF CENTRIFUGES TO REPAIR AND DISPOSAL

5.1 Receipt of centrifuges to repair

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:
The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

Thank you for your cooperation!

Enclosure: Retraction form (see page 32)

5.2 Disposal

Please take care that you comply to the respective legal regulations when you dispose of the unit.
According to the directive 2002/96/EG (WEEE) all units delivered after the 13.08.2005 must not be disposed of with the domestic waste. This unit belongs to group 8 (Medical Units) and is ranged in the Business-to-Business-Field.



This symbol of the crossed out garbage bin points out that the unit must not be disposed of with the domestic waste.

Please also note that the disposal regulations may be different in the particular EU-Countries.

Should occur any questions about this matter please contact your distributor.



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Instruction Manual for Table Top Centrifuge Z 400

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1 PRODUCT DESCRIPTION

1.1 Usage in accordance with safety standards

1.1.1 General information

1.1.1.1 Hazards and precautions

Before setting the centrifuge into operation, please read this instruction manual carefully!

This centrifuge must not be operated by unqualified personnel not being familiar with the correct use of the unit.

Always, use the original accessories only!

For your personal safety, please pay attention to following precautions:

- The HERMLE Z 400 is not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. During centrifugation, it is prohibited to stay within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area.
- Centrifugation of flammable, explosive and radioactive substances or substances, which chemically react with high energy, is strictly prohibited!
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited.
The user is obligated to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and / or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2 m/s.

Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without metal cover).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with by unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

1 PRODUCT DESCRIPTION

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.1.1.2 Brief description

Model Z 400 is a table top centrifuge. Various rotors are available for this unit. Speed / RCF-value and running time can easily be set with turning knobs and are displayed on large LED's.

The pre-set run parameters are stored after the end of each run.

The lid is latched and released with an electromagnetic lid lock.

The centrifuge has a maintenance-free brushless induction drive with a low noise level.

1.1.1.3 Safety standards

The centrifuge corresponds with the General Requirements for Medical Units Regulations (MedGV) (group 3).

Following standards have been considered for the production of our centrifuges:

- Accident Prevention Regulation for electrical units and installations UVV VBG 4
- Accident Prevention Regulation for centrifuges as per BGR 500; Chapter 2.11; Part 3
- DIN 58970 part 1, 2 and 4 for centrifuges and tubes
- Electrical Interference Suppression according to interference degree B as per VDE 0871
- Electrical Safety as per IEC 1010-1 and IEC 1010-2-D
- European Standard PR EN 61 010-1 and PR EN 61 010-2-2

1 PRODUCT DESCRIPTION

1.1.1.4 Extent of supply

Following parts are supplied as accessories with each centrifuge:

- 2 fine-wire fuses 4,0 AT (230 V)
- 2 fine-wire fuses 6,3 AT (120 V)
- 1 instruction manual
- 1 Allan key for removing rotors

Spare fuses are behind the control panel inside of the centrifuge.

1.1.1.5 Warranty

The centrifuge has been subjected to thorough testing and quality controls.

In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of one year from date of delivery.

This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement.

1.2 Installation

1.2.1 Installation of the centrifuge

1.2.1.1 Unpacking the centrifuge

Model Z 400 is supplied in a carton.

Remove the strap retainer, open the carton, remove the cover carton and the centrifuge. The instruction manual must always be kept with the centrifuge.

1.2.1.2 Space requirements

The centrifuge should be installed on an even and solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

In order to enable a safe and smooth operation, level the centrifuge with a spirit level.

The centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit in order to ensure necessary heat dissipation.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat.

Safety regulations require that the safety area of 30 cm around the unit is marked in order to indicate that neither hazardous substances nor persons should be within this area during centrifugation.

1 PRODUCT DESCRIPTION

1.2.1.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label which is mounted on the rear panel.
- The line voltage circuit breaker is max. 16 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Remove the transport spacer blocks from the motor shaft (see chapter 2.2.2).

The socket for the power cord must be easy to reach respectively easy to disconnect!

1.3 Technische Daten

Manufacturer	HERMLE Labortechnik GmbH	
Type / Model	Z 400	
Dimensions		
Width	43 cm	
Depth	54 cm	
Height	36,5 cm	
Weight	39 kg	
Noise level (max.)	60 +2,0 dB (A)	
Max. speed	13.500 min ⁻¹	
Max. volume	4 x 250 ml	
Max. RCF	17.523 x g	
Admissible density	1,2 kg/dm ³	
Admissible kinetic energy	4.000 Nm	
Electrical connection AC	230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph
Current	3,8 A	4,0 A
Connected load	650 Watt	480 Watt
Interference suppression	VDE 0871, Funkentstörgrad B	
Test obligations	yes	
To be filled in by purchaser:		
Inventory-No.:	<div></div>	
Check-No.:	<div></div>	
Location:	<div></div>	
Maintenance contract:	<div></div>	
Your service department	HERMLE Labortechnik GmbH Siemensstrasse 25 78564 Wehingen Phone: +49-7426 / 96 22-17	
Your agent	<div></div>	

1 PRODUCT DESCRIPTION

1.4 Conformity declaration

We, the company

Hermle Labortechnik GmbH
Siemensstrasse 25
78564 Wehingen

declare in mere responsibility that our product

Centrifuges

of models

Z 100 M; Z 160 M
Z 206 A
Z 233 M-2; Z 216 MK
Z 300; Z 300 K; SIEVA-2; Z 323; Z 323 K;
Z 366; Z 36 HK; Z 383; Z 383 K
Z 400; Z 400 K; Z 513; Z 513 K
SETA Oil test centrifuge

as from month/year of construction 06 / 07

to which this declaration refers to, have been manufactured according to the following standards or according to normative documents.

DIN EN 61 010-1; EN 61 010-2-020;
EN 61000-6-1 ; EN61000-6-2 ;
EN 61000-3-2 ; EN 61000-3-3;
EN 55011
89/336/EWG ; 92/31/EWG ; 93/68/EWG ;
93/42/EG ; 98/37/EG; 98/79/EG;
DIN EN ISO 12100-1; DIN EN ISO 12100-2



Wehingen/Germany, 13th July 2007

Harald Hermle
President

2.1 Installation of rotors

2.2.1 Mounting and loading angle rotors

Clean the motor shaft as well as the rotor mounting boring with a clean, grease-free piece of cloth. Place the rotor onto the motor shaft, ensuring that the pin aligns correctly with the rotor slot (see Figures 1 and 2).

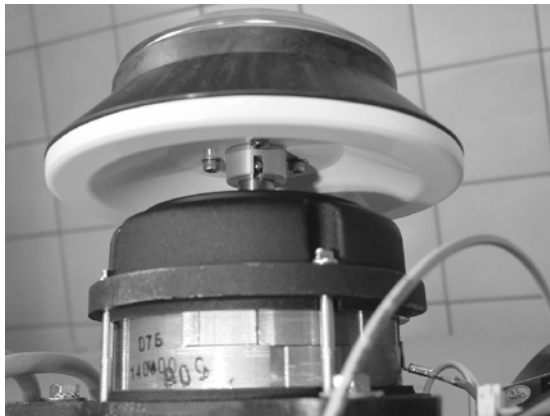


Figure 1: correct

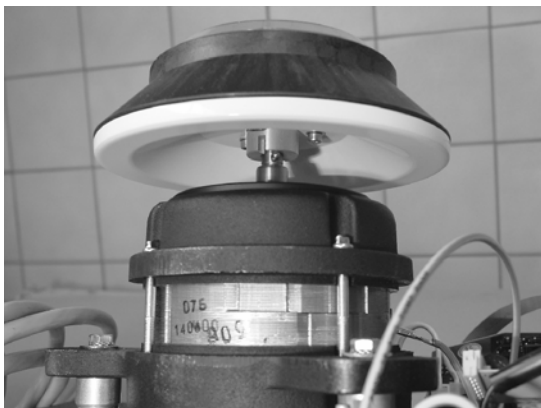
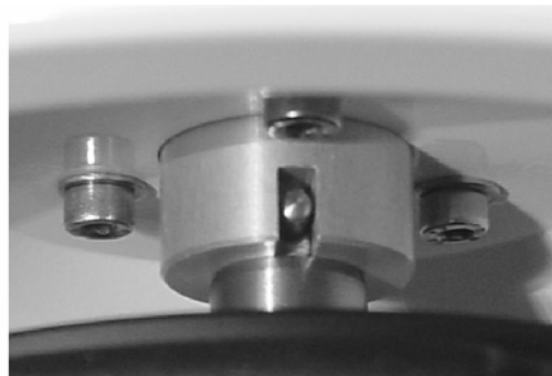


Figure 2: wrong

2 OPERATION

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see Figure 3).



Figure 3

It is allowed to operate e.g. a 8-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other.

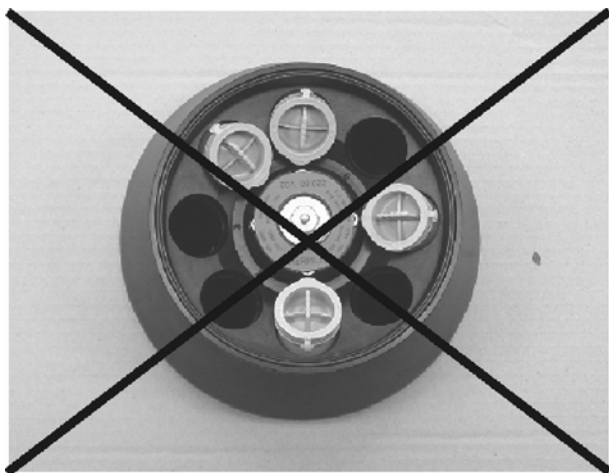


Figure 4: wrong

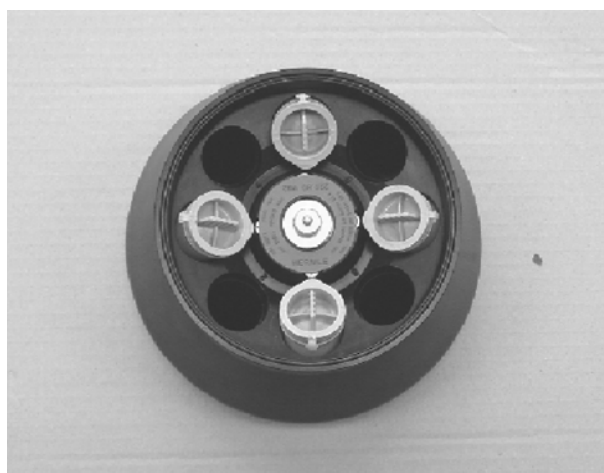


Figure 5: correct

2 OPERATION

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector lightly onto the rotor nut. Take care the lid is correctly placed into the guide.



Figure 6

2.1.2 Mounting and loading swing out rotors

Clean the motor shaft, as well as the device hole of the rotor with a clean and fat free cloth. Put the rotor to the motor shaft (take care that the cross pin is sitting right to the driving disk of the rotor) (s. Figure 1 and Figure 2).

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see Figure 3).

The charging of the buckets and the adapters must be done appropriately figure 7 and figure 8.

In principle swing out rotors may be taken in operation first if all buckets or racks are put into the rotor.

The bolts at the rotor must be easily greased with silicone grease.

The glasses have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1.0 g.

It is allowed to operate e.g. a 4-place-rotor with 2 loaded tubes only. But the loaded borings must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see Figure 7 and 8).



Figure 7: wrong



Figure 8: right

2.1.3 Overloading of rotors

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded.

The liquids the rotors are loaded with, should have an average homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

In case of any questions, please contact the manufacturer!

2.1.4 Removing the rotor

Take off the lid of the rotor. Hold the rotor with one hand. Loosen the rotor nut with the included allen key by turning it clockwise.

ATTENTION:

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances which could damage the rotor and buckets.

2.2 Operation

2.2.1 Power switch


The centrifuge has no power switch.


You can connect the unit by plug in the main plug or disconnect it by unplugging.

The Centrifuge has a stand-by function, i. e. is the Centrifuge for 3-4 min. not in use or no button is pressed, the digital displays will switch off.

If now one of the buttons or knobs are actuated, the display will hook up again.

2.2.2 Lid release

When the green control lamp on the key  is flashing, the rotor is standing still and the lid of the centrifuge is ready to open.

Press the key  (3) (see Figure 8), in order to open the lid. The green control lamp (4) turns off, as soon as the lid opens or the centrifuge starts.

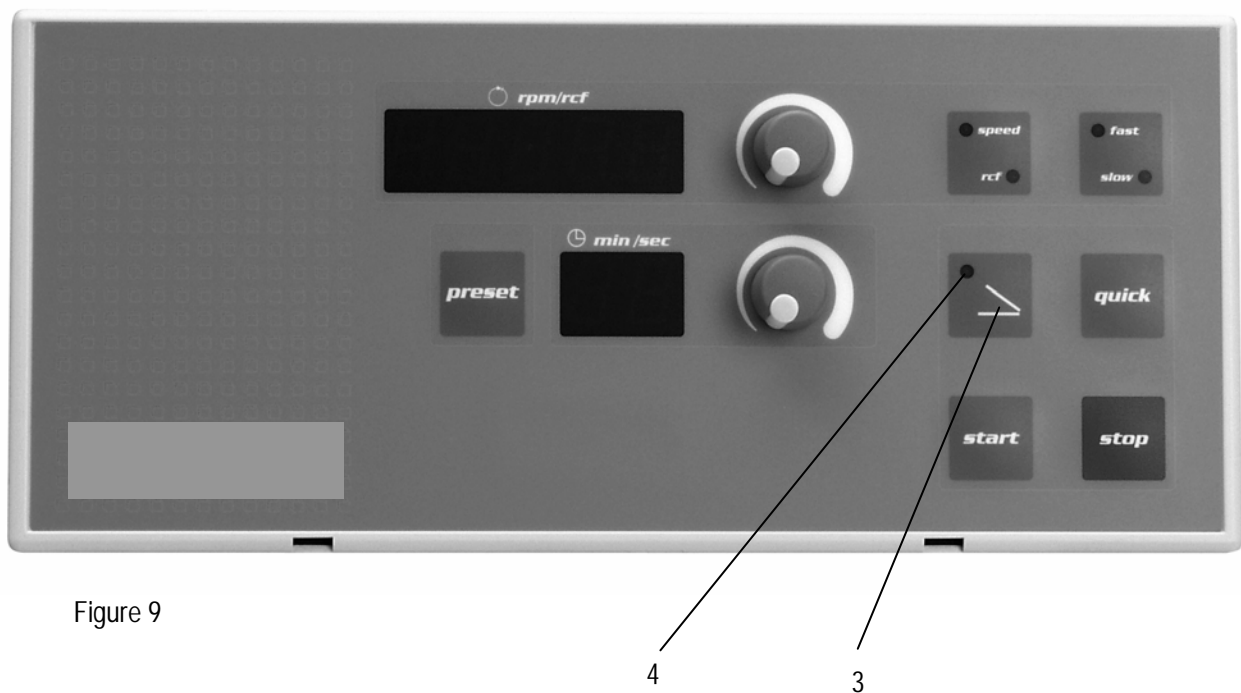



Figure 9

2.2.3 Lid lock

After mounting and loading the rotor correctly, the lid of the centrifuge can be closed.

The centrifuge can only be started when the lid is closed correctly.

The green control lamp of the key  will flash as soon as the lid is closed correctly.

When the rotor starts acceleration, the control lamp will turn off and the lid will be impossible to open.

In case the green control lamp is still flashing after pressing the "START" key, you have to open the lid again. This safety feature shows, that a run is already finished. When the lid of the centrifuge is closed, the display will switch from preset to actual value. In order to check preset speed / RCF-value, running time and temperature press key "PRESET".

2.2.4 Pre-selection of speed / RCF-value

When the lid of the centrifuge is open, you can preset the requested speed or RCF-value by turning the speed potentiometer (5).

With the key "SPEED/RCF" (6) you can switch between speed and RCF-value to be shown in the display. The green control lamps (7) indicate, which mode is activated.

When the lid of the centrifuge is closed or during a run, speed can be changed as follows:

Press the "PRESET" key (8), hold it and at the same time turn the speed / RCF potentiometer (5) to change the value.

Maximum speed of this unit is 13.500 rpm.

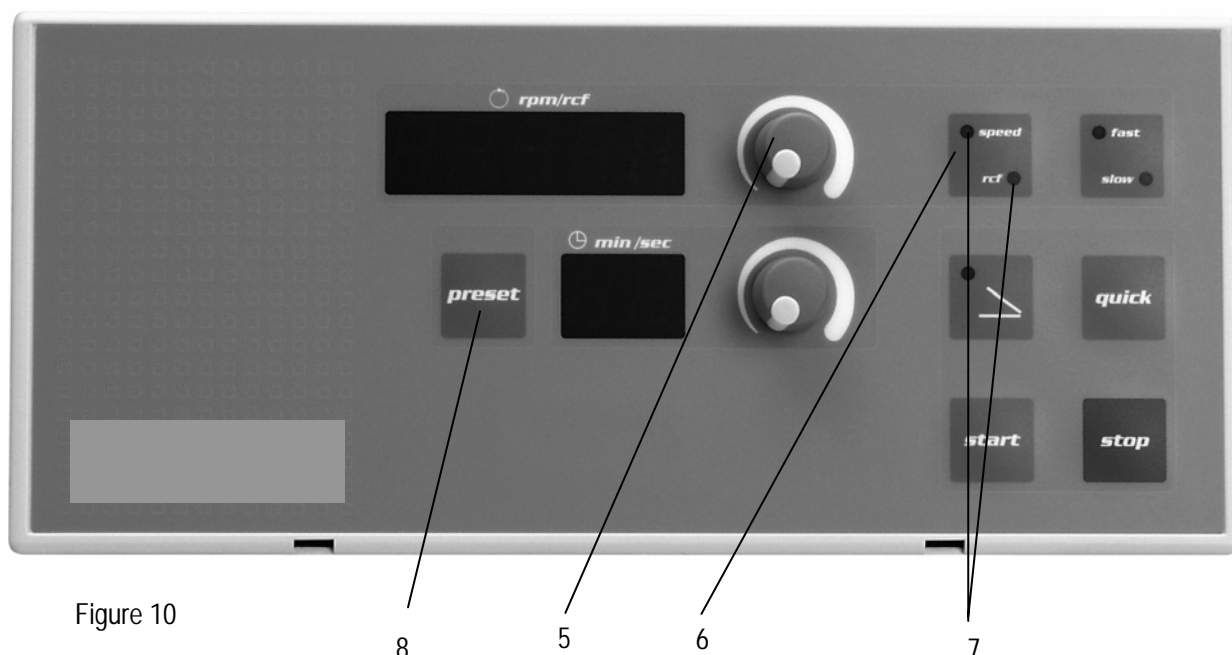


Figure 10

Max. Revolution per minutes of the valid rotors Z 400 and Z 400 K

Rotor-Number	Max. revolution
220.86 V01	3500 min ⁻¹
221.08 V01	3500 min ⁻¹
220.93 V01	3500 min ⁻¹
221.02 V01	4000 min ⁻¹
221.03 V01	4000 min ⁻¹
220.27 V02	3500 min ⁻¹
220.87 V03/04	13500 min ⁻¹
220.97 V02	6000 min ⁻¹
220.96 V02	6000 min ⁻¹
220.50 V06	3500 min ⁻¹
220.88 V01	13500 min ⁻¹
220.92 V01	13500 min ⁻¹
220.81 V01	3500 min ⁻¹
221.16 V01	4500 min ⁻¹

2.2.5 Pre-selection of running time

Running time is adjustable from 1 to 60 min. or continuous.

When the lid of the centrifuge is open, running time can be preset with the "TIME" potentiometer (9) in increments of 1 minute. During the run or when the lid is closed you have to additionally press the key "PRESET" (10) in order to change running time values.

The preset running time will be shown in the display (11) in minutes. The preset running time will be stored after the run. When the lid of the centrifuge is closed, the running time display will switch from preset to actual value.

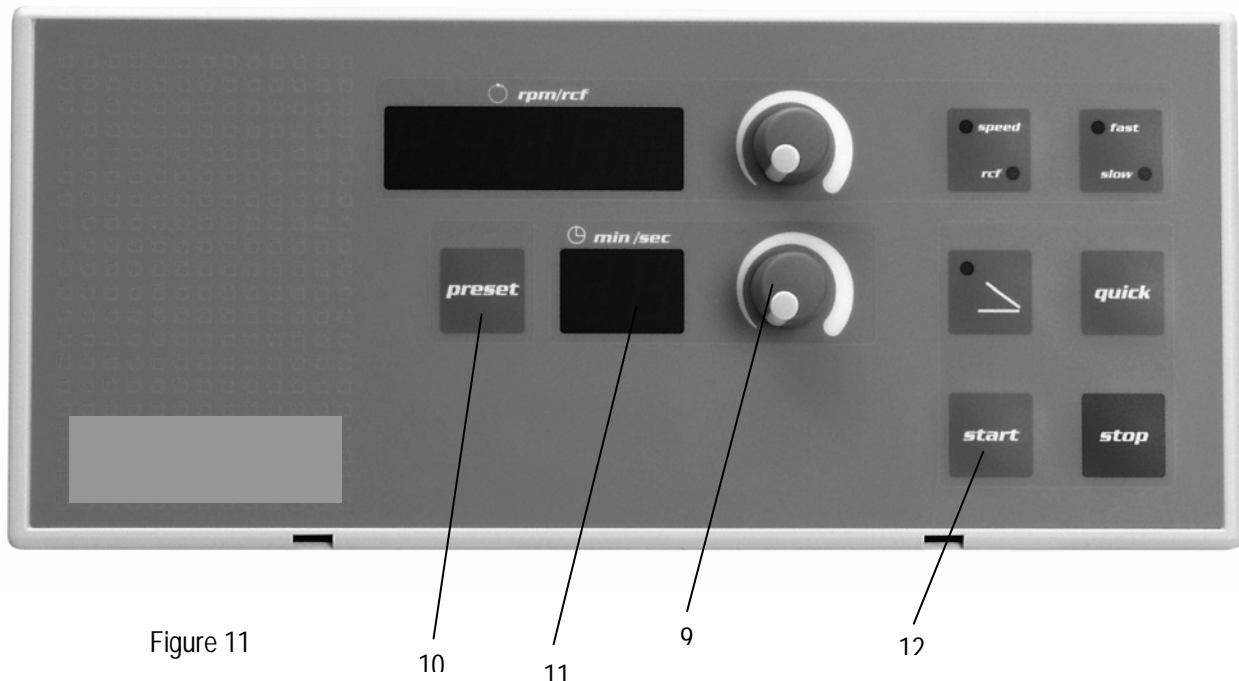


Figure 11

For continuous run, turn the time potentiometer (9) clockwise to the limit stop. The display (11) indicates continuous run with two dashes " - -".

During continuous run, the running time passed can be read off as follows:

- Press key "START" (12).
Afterwards, running time is shown in display (11) in following steps:
- First, there is symbol "h" for hours, and then the number of hours will be shown.
Afterwards, there is symbol "m" for minutes, and then the number of minutes will be shown.

Example: 1 hour 47 minutes running time passed

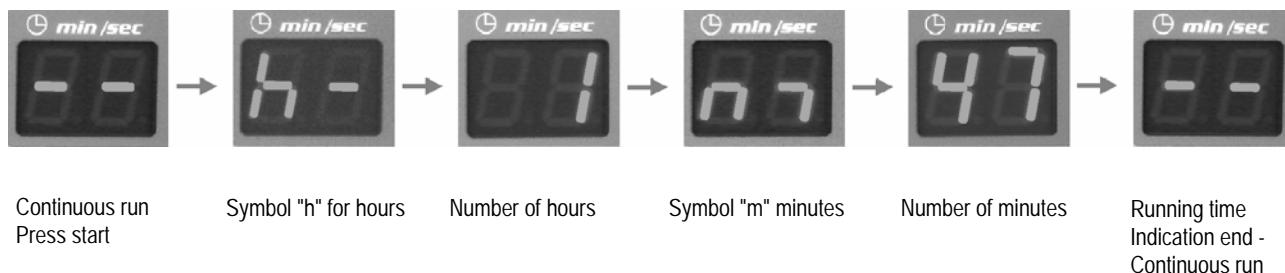


Figure 12

ATTENTION:

In order to check the running time passed the unit must already be running for at least one minute.

A run in continuous mode can only be finished by pressing key "STOP".

2.2.6 Pre-selection of brake intensity and acceleration

With the key "FAST / SLOW" (13) you can choose between two profiles for brake and acceleration intensity.



Figure 13

Acceleration- and deceleration times Z 400 and Z 400 K (120 V / 230 V) in seconds

Rotor-number	Acceleration values		Deceleration values	
	fast	slow	fast	slow
220.86 V01	45	103	51	97
221.08 V01	67	120	58	110
220.93 V01	45	105	50	100
221.02 V01	30	60	40	60
221.03 V01	30	65	30	60
220.27 V02	45	120	52	100
220.87 V03/04	23	77	32	124
220.97 V02	23	49	26	60
220.96 V02	27	63	40	115
220.50 V06	30	60	30	77
220.88 V01	28	37	33	57
220.92 V01	25	37	30	57
220.81 V01	25	37	30	57
221.16 V01				

When control lamp "FAST" is flashing, the unit accelerates and brakes fast. When control lamp "SLOW" is flashing, the unit accelerates and brakes slowly and gently below 2.000 rpm.

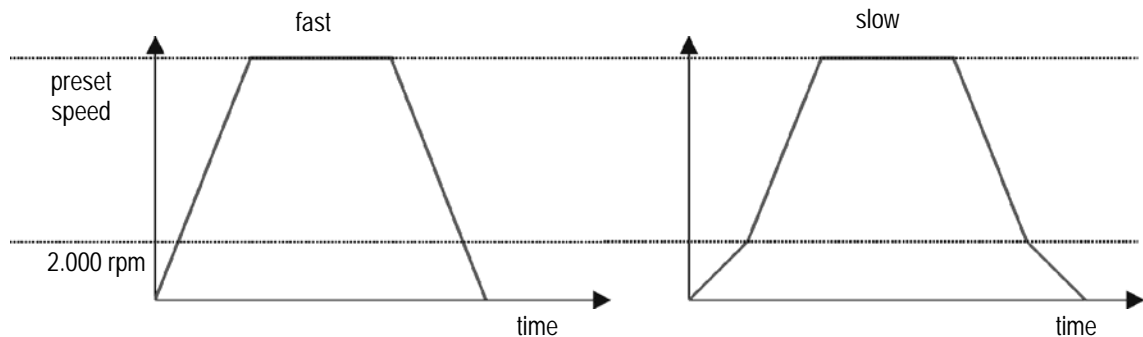


Figure 14

2.2.7 Keyboard – Starting the centrifuge – "QUICK"-key

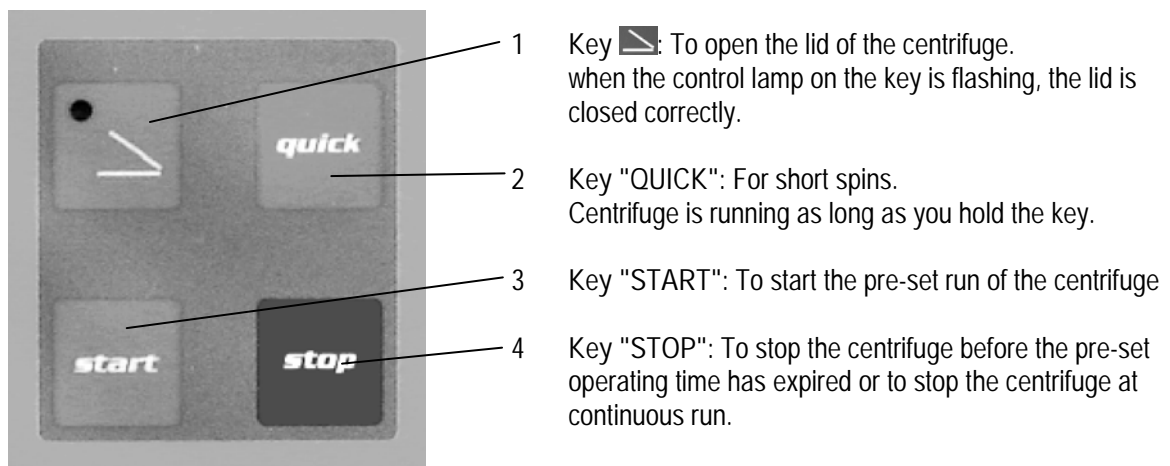



Figure 16

Starting the centrifuge

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. as soon as the control lamp at the key  is flashing, the centrifuge run can be started. Therefore, press key "START".

ATTENTION: The rotor has to be checked and / or tightened previous to each run!

"QUICK"-key – short runs

For short centrifuge runs you can start the run with key "QUICK". Press the key "QUICK". The centrifuge starts and runs as long as you hold the key "QUICK". The running time is shown in the display "TIME" in seconds.

2.3 Safety features

2.3.1 Imbalance detection

In case of the rotor not being equally loaded (see chapter 2.1.1), the drive will turn off during acceleration. The rotor decelerates to stand still.

When error message "1" appears in the actual "SPEED" display, the weight difference of the samples is too huge. Weigh out the samples exactly.
Load the rotor as described in chapter 2.1.1.

When error message "2" appears in the actual "SPEED" display, there could be following reasons:

- The imbalance switch is not correctly adjusted.
- The imbalance switch is defective.

3.1 Service and maintenance

3.1.1 Maintenance and cleaning

Maintenance:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

Vaseline, available in nearly each store, is the most suitable lubricant. The Vaseline must be free of resin and acids. Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance:

- Alkalies
- Alkaline soap solutions
- Alkaline amines
- Concentrated acids
- Solutions containing heavy metals
- Water-free chlorinated solvents
- Saline solutions, e.g. salt water

Cleaning:

Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.

In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.

After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. temperature + 50°C).

It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.

Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.

The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week.

3.1.2 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor.

If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

3.1.3 Disinfection

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C, except rotor 220.58 V08, which must not be autoclaved.

The rotor and rotor chamber should be cleaned with a universal, neutral disinfection agent, e.g. on formalin base. A disinfection spray is most suitable in order to easily reach all difficult to access spots.

ATTENTION:

Before applying any other cleaning resp. decontamination method than recommended by the manufacturer, contact the manufacturer to ensure yourself, you would not damage the unit or the rotor by applying the designated method!

4.1 Error messages: cause / solution

Preface:

The error messages are listed to help localize possible errors faster.

The diagnose referred to in this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this instruction manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing there is a plastic plug tightened to a cord.
- Pull the plastic plug out of the housing and pull the cord to open the lid of the centrifuge (see Figure 18).



Figure 18

4 TROUBLE SHOOTING

4.2.2 Description of the error message system

The error message is shown in the "SPEED" display through particular figures (see Figure 18).

There is a distinction between two different kinds of errors.

The digits in the "SPEED" display have the following meaning:

- Error No. 1 – 49 (forced stop)

In case of one of these errors occurring, the rotor decelerates from pre-set speed down to 0. As soon as the rotor stops, the error message can be reset by opening and closing the lid of the centrifuge.

- Error No. 50 – 99 (emergency stop)

In case one of these errors occurring, the frequency converter switches off. This means, the rotor stops without applying the brakes. To reset the error message you have to switch off the unit and turn it on again (power switch).

In case the unit stops due to an error indication, you should restart the unit to check whether the error occurs again.

The error message figures not listed in this chapter are currently not in use. They are reserved for future use in completing the error message recognition program.

Example: figures are flashing



Figure 19

4.2.3 Error messages

Error No. 1: Imbalance

- Cause: Incorrect loading of the rotor (see chapter 2.2.1)
- Solution: Balance your samples
- Cause: Incorrect adjustment of the imbalance sensor
- Solution: Imbalance sensor has to be re-adjusted (call service department)

4 TROUBLE SHOOTING

Error No. 2: Permanent imbalance signal

- Cause: Incorrect position of the imbalance sensor
- Solution: Imbalance sensor has to be readjusted (call service department)
- Cause: Imbalance sensor is defective
- Solution: Imbalance sensor has to be replaced (call service department)

Error No. 11: Temperature sensor is defective

- Cause: Temperature sensor is defective
- Solution: Call service department. Temperature sensor has to be changed.

Error No. 25: Power failure

- Cause: Power failure while rotor was in motion
- Solution: Open and close the lid of the centrifuge, restart the unit; check contact of plug in (loose contact)

Error No. 36: Relay of the frequency converter cannot be released / lid cannot be opened

- Cause: Power board malfunction
- Solution: Call service department
- Cause: Lid of the centrifuge is jammed
- Solution: Open the lid of the centrifuge manually when rotor is at stand still. Grease the lid lock slightly. In case this error occurs again, call service department; check coil of lid lock
- Cause: Lid lock is defective
- Solution: Call service department, replace lid lock
- Cause: Speed sensor wire is cutted
- Solution: Call service department, replace speed sensor wire

Error No. 50 / 51: Memory failure

- Cause: Internal or external memory failure
- Solution: Restart the unit. In case this error occurs again, call service department; replace control panel

Error No. 54: Wrong configuration

- Cause: Jumper is placed at the wrong position on control panel
- Solution: Re-place jumper

4 TROUBLE SHOOTING

Error No. 55: Over speed

- Cause: Speed sensor is defective
- Solution: Restart the unit. In case this error occurs again, call service department.
possibly loose speed magnet, fix with super glue

Error No. 60: Engine speed sensor signal is missing

- Cause: Speed sensor is defective or cable breakage at speed sensor, possibly lose magnet
- Solution: Call service department; check speed magnet, fix with super glue

Error No. 82: Cut off power board – frequency converter

- Cause: Over current or under voltage due to power supply fluctuations
- Solution: Restart the unit, take care the power supply is stable

Error No. 83: Preset speed cannot be reached

- Cause: Preset speed cannot be reached
- Solution: Call service department

Error No. 84: Over temperature frequency converter

- Cause: Frequency converter cut off due to over temperature
- Solution: Take care, there is enough space around the centrifuge for heat dissipation

Error No. 85: Over temperature motor

- Cause: Temperature protection switch of motor turns off
- Solution: Take care, there is enough space around the centrifuge for heat dissipation.
Motor mounting is defective, replace motor

Error No. 90: Emergency switch off lid lock

- Cause: The lid of the centrifuge has been opened while centrifuge was running
- Solution: Close the lid of the centrifuge. DANGER OF ACCIDENT!
- Cause: Control switch of lid lock is defective
- Solution: Call service department



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Instruction Manual for Table Top Centrifuge Z 400 K

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1 PRODUCT DESCRIPTION

1.1 Usage in accordance with safety standards

1.1.1 General information

1.1.1.1 Hazards and precautions

Before setting the centrifuge into operation, please read this instruction manual carefully!

This centrifuge must not be operated by unqualified personnel not being familiar with the correct use of the unit.

Always, use the original accessories only!

For your personal safety, please pay attention to following precautions:

- The HERMLE Z 400 K is not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. During centrifugation, it is prohibited to stay within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area.
- Centrifugation of flammable, explosive and radioactive substances or substances, which chemically react with high energy, is strictly prohibited!
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited.
The user is obligated to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and / or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2 m/s.

Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismounted (e.g. without metal cover).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with by unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

1 PRODUCT DESCRIPTION

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.1.1.2 Brief description

Model Z 400 K is a refrigerated microliter centrifuge. Various rotors are available for this unit. Speed / RCF-value, running time and temperature can easily be set with turning knobs and are displayed on large LED's.

The pre-set run parameters are stored after the end of each run.

The lid is latched and released with an electromagnetic lid lock.

The centrifuge has a maintenance-free brushless induction drive with a low noise level.

It also has an CFC-free hermetically sealed refrigeration system (refrigerant type R 404 a).

1.1.1.3 Safety standards

The centrifuge corresponds with the General Requirements for Medical Units Regulations (MedGV) (group 3).

Following standards have been considered for the production of our centrifuges:

- Accident Prevention Regulation for electrical units and installations UVV VBG 4
- Accident Prevention Regulation for centrifuges as per BGR 500; Chapter 2.11; Part 3
- DIN 58970 part 1, 2 and 4 for centrifuges and tubes
- Electrical Interference Suppression according to interference degree B as per VDE 0871
- Electrical Safety as per IEC 1010-1 and IEC 1010-2-D
- European Standard PR EN 61 010-1 and PR EN 61 010-2-2

1 PRODUCT DESCRIPTION

1.1.1.4 Extent of supply

Following parts are supplied as accessories with each centrifuge:

- 2 fine-wire fuses 10 AT (230 V)
- 2 fine-wire fuses 15 AT (120 V)
- 1 instruction manual
- 1 Allan key for removing rotors

Spare fuses are at the rear side of the centrifuge.

1.1.1.5 Warranty

The centrifuge has been subjected to thorough testing and quality controls.

In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of one year from date of delivery.

This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement.

1.2 Installation

1.2.1 Installation of the centrifuge

1.2.1.1 Unpacking the centrifuge

Model Z 400 K is supplied in a carton.

Remove the strap retainer, open the carton, remove the cover carton and the centrifuge. The instruction manual must always be kept with the centrifuge.

1.2.1.2 Space requirements

The centrifuge should be installed on an even and solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

In order to enable a safe and smooth operation, level the centrifuge with a spirit level.

The centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit in order to ensure necessary heat dissipation.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

Safety regulations require that the safety area of 30 cm around the unit is marked in order to indicate that neither hazardous substances nor persons should be within this area during centrifugation.

1 PRODUCT DESCRIPTION

1.2.1.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label which is mounted on the rear panel.
- The line voltage circuit breaker is max. 16 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Remove the transport spacer blocks from the motor shaft (see chapter 2.2.2).

The socket for the power cord must be easy to reach respectively easy to disconnect!

1.3 Technische Daten

Manufacturer	HERMLE Labortechnik GmbH	
Type / Model	Z 400 K	
Dimensions		
Width	74 cm	
Depth	58 cm	
Height	34 cm	
Weight	89 kg	
Noise level (max.)	60 +2,0 dB (A)	
Max. speed	13.500 min ⁻¹	
Max. volume	4 x 250 ml	
Max. RCF	17.523 x g	
Admissible density	1,2 kg/dm ³	
Admissible kinetic energy	3.475 Nm	
Electrical connection AC	230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph
Current	4,8 A	9,2 A
Connected load	1.100 Watt	1.100 Watt
Interference suppression	VDE 0871, Funkentstörgrad B	
Test obligations	yes	
To be filled in by purchaser:		
Inventory-No.:		
Check-No.:		
Location:		
Maintenance contract:		
Your service department	HERMLE Labortechnik GmbH Siemensstrasse 25 78564 Wehingen Phone: +49-7426 / 96 22-17	
Your agent		

1 PRODUCT DESCRIPTION

1.4 Conformity declaration

We, the company

Hermle Labortechnik GmbH
Siemensstrasse 25
78564 Wehingen

declare in mere responsibility that our product

Centrifuges

of models

Z 100 M; Z 160 M
Z 206 A
Z 233 M-2; Z 216 MK
Z 300; Z 300 K; SIEVA-2; Z 32 HK
Z 323; Z 323 K; Z 326 ; Z 326 K
Z 366; Z 36 HK; Z 383; Z 383 K
Z 400; Z 400 K; Z 513; Z 513 K
SETA Oil test centrifuge

as from month/year of construction 06 / 07

to which this declaration refers to, have been manufactured according to the following standards or according to normative documents.

DIN EN 61 010-1; EN 61 010-2-020;
EN 61000-6-1 ; EN61000-6-2 ;
EN 61000-3-2 ; EN 61000-3-3;
EN 55011
89/336/EWG ; 92/31/EWG ; 93/68/EWG ;
93/42/EG ; 98/37/EG; 98/79/EG;
DIN EN ISO 12100-1; DIN EN ISO 12100-2

Wehingen/Germany, 13th July 2009



Harald Hermle
President

2 OPERATION

2.1 Installation of rotors

2.2.1 Mounting and loading angle rotors

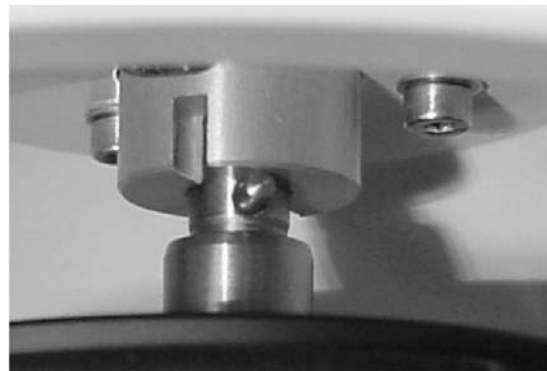
Clean the motor shaft as well as the rotor mounting boring with a clean, grease-free piece of cloth. Place the rotor onto the motor shaft, ensuring that the pin aligns correctly with the rotor slot (see Figures 1 and 2).



Figure 1: correct



Figure 2: wrong



2 OPERATION

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see Figure 3).



Figure 3

It is allowed to operate e.g. a 8-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other.

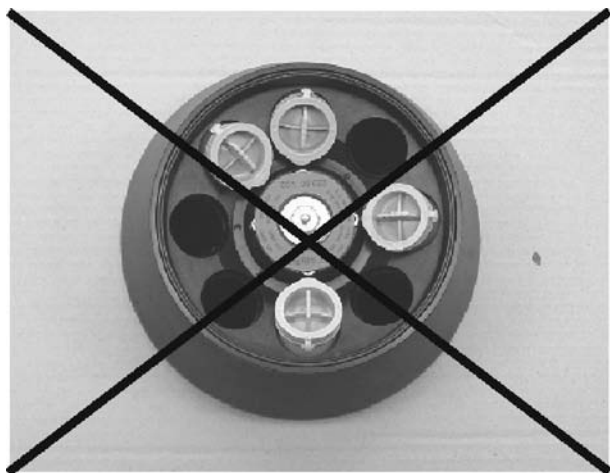


Figure 4: wrong

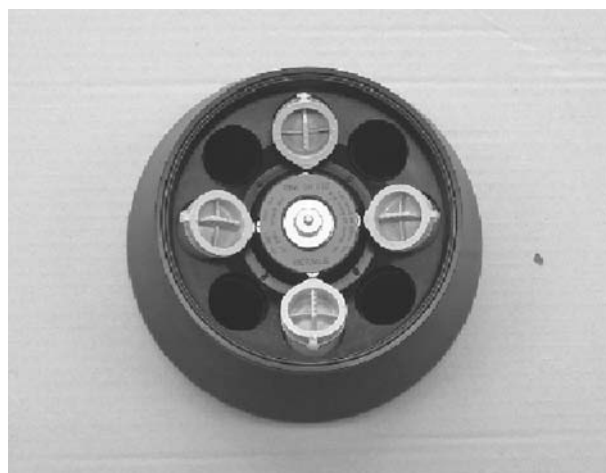


Figure 5: correct

2 OPERATION

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector lightly onto the rotor nut. Take care the lid is correctly placed into the guide.



Figure 6

2.1.2 Mounting and loading swing out rotors

Clean the motor shaft, as well as the device hole of the rotor with a clean and fat free cloth. Put the rotor to the motor shaft (take care that the cross pin is sitting right to the driving disk of the rotor) (s. Figure 1 and Figure 2).

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see Figure 3).

The charging of the buckets and the adapters must be done appropriately figure 7 and figure 8.

In principle swing out rotors may be taken in operation first if all buckets or racks are put into the rotor.

The bolts at the rotor must be easily greased with silicone grease.

The glasses have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1.0 g.

It is allowed to operate e.g. a 4-place-rotor with 2 loaded tubes only. But the loaded borings must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see Figure 7 and 8).



Figure 7: wrong



Figure 8: right

2.1.3 Overloading of rotors

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded.

The liquids the rotors are loaded with, should have an average homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

In case of any questions, please contact the manufacturer!

2.1.4 Removing the rotor

Take off the lid of the rotor. Hold the rotor with one hand. Loosen the rotor nut with the included allen key by turning it clockwise.

ATTENTION:

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances which could damage the rotor and buckets.


2.2 Operation


2.2.1 Power switch

The centrifuge has a power switch.

You can connect the unit with the power supply or disconnect it by switching the power switch on or off.

2.2.2 Lid release

When the green control lamp on the key  is flashing, the rotor is standing still and the lid of the centrifuge is ready to open.

Press the key  (3) (see Figure 8), in order to open the lid. The green control lamp (4) turns off, as soon as the lid opens or the centrifuge starts.

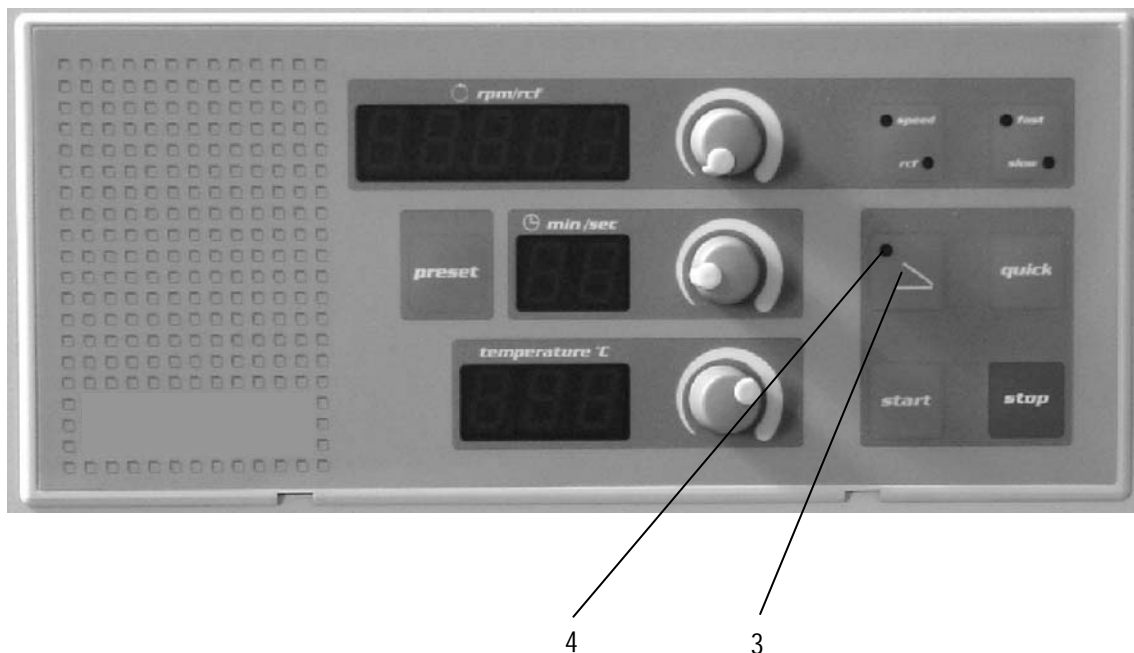



Figure 9

2.2.3 Lid lock

After mounting and loading the rotor correctly, the lid of the centrifuge can be closed.

The centrifuge can only be started when the lid is closed correctly.

The green control lamp of the key  will flash as soon as the lid is closed correctly.

When the rotor starts acceleration, the control lamp will turn off and the lid will be impossible to open.

In case the green control lamp is still flashing after pressing the "START" key, you have to open the lid again. This safety feature shows, that a run is already finished. When the lid of the centrifuge is closed, the display will switch from preset to actual value. In order to check preset speed / RCF-value, running time and temperature press key "PRESET".

2.2.4 Pre-selection of speed / RCF-value

When the lid of the centrifuge is open, you can preset the requested speed or RCF-value by turning the speed potentiometer (5).

With the key "SPEED/RCF" (6) you can switch between speed and RCF-value to be shown in the display. The green control lamps (7) indicate, which mode is activated.

When the lid of the centrifuge is closed or during a run, speed can be changed as follows:

Press the "PRESET" key (8), hold it and at the same time turn the speed / RCF potentiometer (5) to change the value.

Maximum speed of this unit is 13.500 rpm.

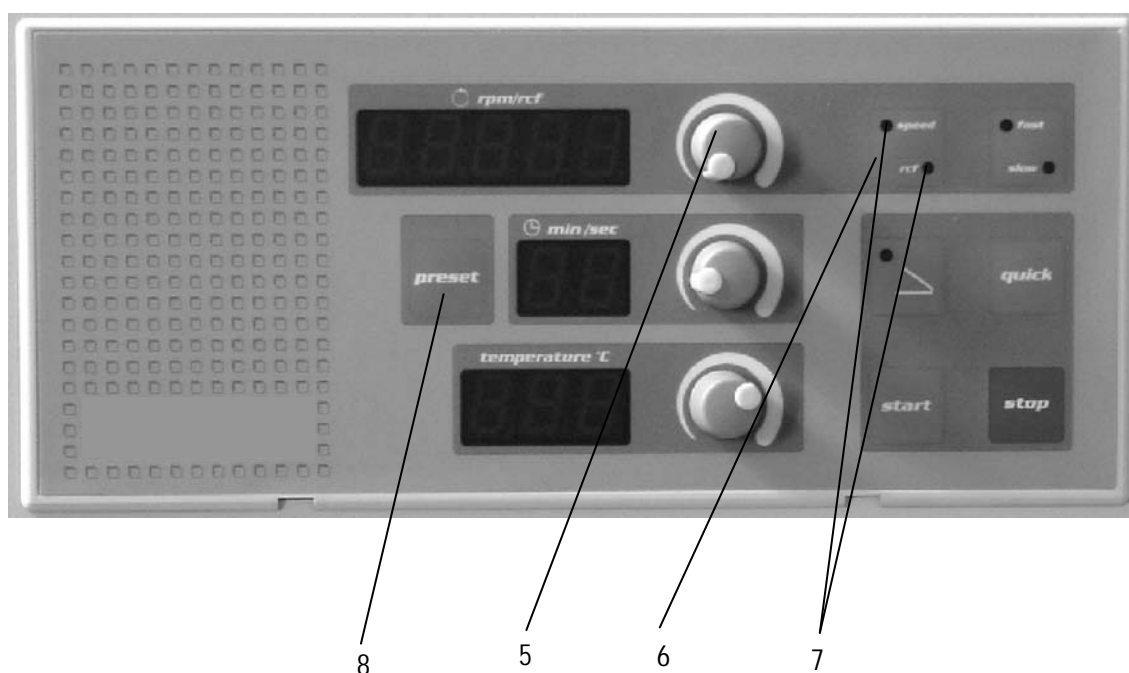


Figure 10

Max. Revolution per minutes of the valid rotors Z 400 and Z 400 K

Rotor-Number	Max. revolution
220.86 V01	3500 min ⁻¹
221.08 V01	3500 min ⁻¹
220.93 V01	3500 min ⁻¹
221.02 V01	4000 min ⁻¹
221.03 V01	4000 min ⁻¹
220.27 V02	3500 min ⁻¹
220.87 V03/04	13500 min ⁻¹
220.97 V02	6000 min ⁻¹
220.96 V02	6000 min ⁻¹
220.50 V06	3500 min ⁻¹
220.88 V01	13500 min ⁻¹
220.92 V01	13500 min ⁻¹
220.81 V01	3500 min ⁻¹
221.16 V01	4500 min ⁻¹

2.2.5 Pre-selection of running time

Running time is adjustable from 1 to 60 min. or continuous.

When the lid of the centrifuge is open, running time can be preset with the "TIME" potentiometer (9) in increments of 1 minute. During the run or when the lid is closed you have to additionally press the key "PRESET" (10) in order to change running time values.

The preset running time will be shown in the display (11) in minutes. The preset running time will be stored after the run. When the lid of the centrifuge is closed, the running time display will switch from preset to actual value.

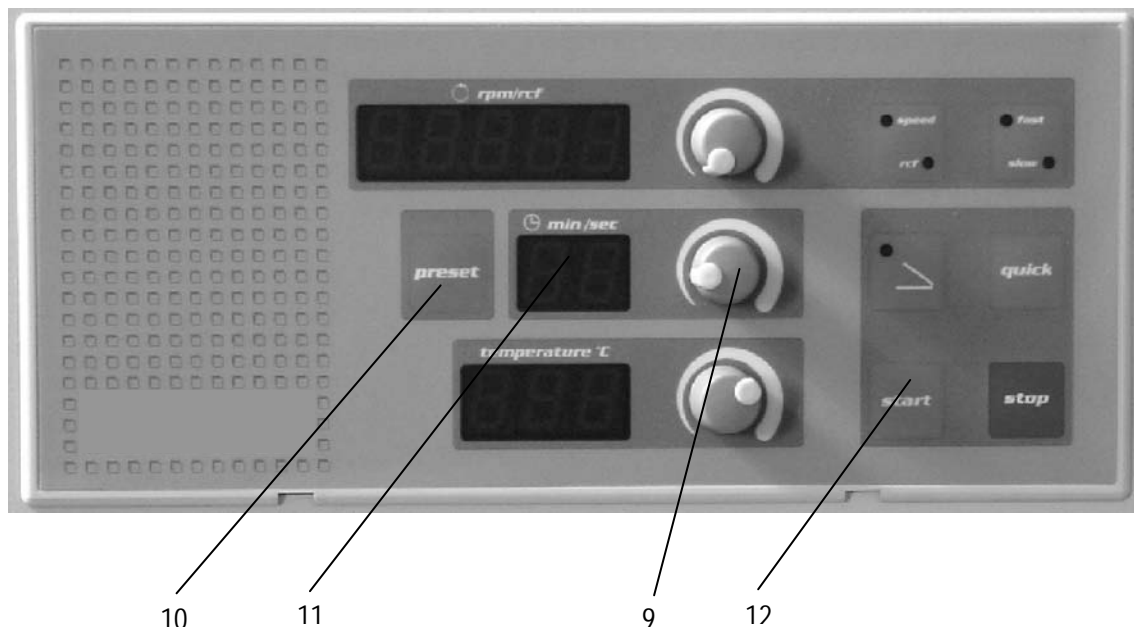


Figure 11

For continuous run, turn the time potentiometer (9) clockwise to the limit stop. The display (11) indicates continuous run with two dashes " - -".

During continuous run, the running time passed can be read off as follows:

- Press key "START" (12).
Afterwards, running time is shown in display (11) in following steps:
- First, there is symbol "h" for hours, and then the number of hours will be shown.
Afterwards, there is symbol "m" for minutes, and then the number of minutes will be shown.

Example: 1 hour 47 minutes running time passed

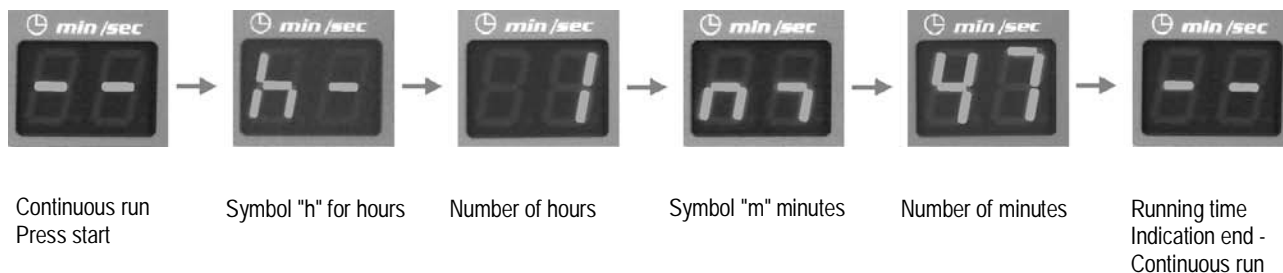


Figure 12

ATTENTION:

In order to check the running time passed the unit must already be running for at least one minute.

A run in continuous mode can only be finished by pressing key "STOP".

2.2.6 Pre-selection of brake intensity and acceleration

With the key "FAST / SLOW" (13) you can choose between two profiles for brake and acceleration intensity.



Figure 13

Acceleration- and deceleration times Z 400 and Z 400 K (120 V / 230 V) in seconds

Rotor-number	Acceleration values		Deceleration values	
	fast	slow	fast	slow
220.86 V01	45	103	51	97
221.08 V01	67	120	58	110
220.93 V01	45	105	50	100
221.02 V01	30	60	40	60
221.03 V01	30	65	30	60
220.27 V02	45	120	52	100
220.87 V03/04	23	77	32	124
220.97 V02	23	49	26	60
220.96 V02	27	63	40	115
220.50 V06	30	60	30	77
220.88 V01	28	37	33	57
220.92 V01	25	37	30	57
220.81 V01	25	37	30	57
221.16 V01				

2 OPERATION

When control lamp "FAST" is flashing, the unit accelerates and brakes fast. When control lamp "SLOW" is flashing, the unit accelerates and brakes slowly and gently below 2.000 rpm.

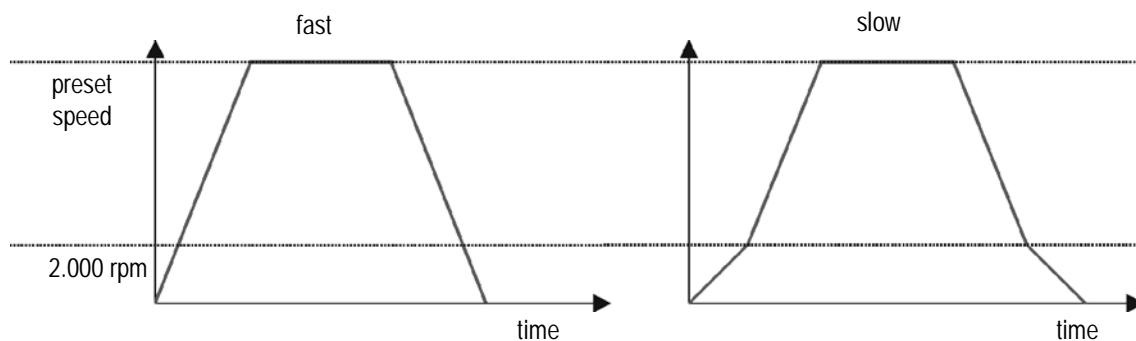


Figure 14

2.2.7 Pre-selection of temperature and pre-cooling

The requested sample temperature can be pre-selected in 1°C increments in a range from -10°C to +40°C.

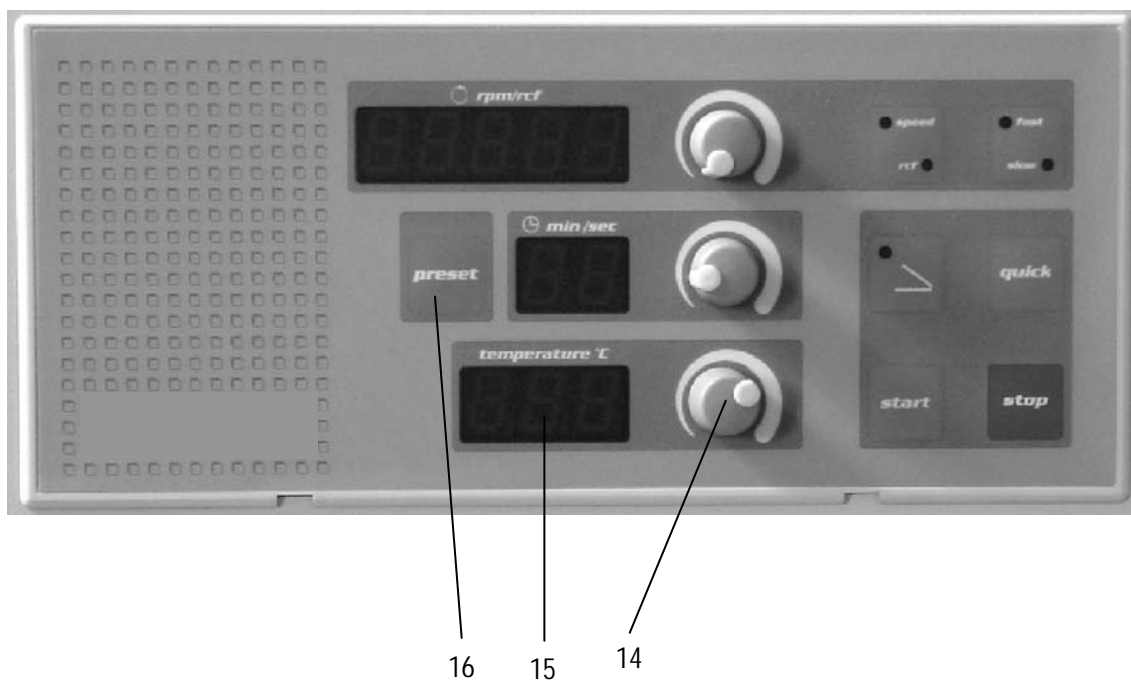


Figure 15

2 OPERATION

Pre-selection of temperature:

When the lid of the centrifuge is open, temperature can be pre-set by turning the "TEMPERATURE" potentiometer (14). During a run or when the lid of the centrifuge is closed, you additionally have to press the key "PRESET" (16), hold it and turn the potentiometer.

When the lid of the centrifuge is open the pre-set temperature is shown in the temperature display (15) in °C. During a run or when the lid of the centrifuge is closed, the current rotor temperature is shown in the temperature display (15).

The refrigerating set will switch on when closing the lid of the centrifuge.

Lowest temperatures Z 400 and Z 400 K (120 V / 230 V)

Rotor-Number	n-max.
220.86 V01	- 8°C
221.08 V01	+ 2°C
220.93 V01	- 8°C
221.02 V01	- 4°C
221.03 V01	- 4°C
220.27 V02	- 8°C
220.87 V03/04	+/- 0°C
220.97 V02	- 10°C
220.96 V02	- 10°C
220.50 V06	- 10°C
220.88 V01	- 4°C
220.92 V01	- 4°C
220.81 V06	- 10°C
221.16 V01	

Air temperature: 23°C

The absolute end temperatures know due to be subject to fluctuations of ± 2 degrees C of performance tolerances of the cooling circuit.

The deepest test temperatures are dependent on the room temperature. If the room temperature climbs, then the deepest test temperature to be reached also climbs.

Pre-cooling:

In order to avoid considerable temperature deviations at the beginning of a run, you should pre-cool the centrifuge together with the rotor, the buckets, etc.

For pre-cooling, please proceed as follows:

- Insert rotor, buckets and adapters correctly (see chapter 2.1).
- Pre-set the requested temperature and close the lid of the centrifuge.
- In order to shorten the pre-cooling process, set a speed of about 20 % of the max. speed indicated for the rotor.
- Start the centrifuge. Within 10-15 minutes the centrifuge should reach the pre-selected temperature. Now you can insert the samples and start your actual run.

2.2.8 Keyboard – Starting the centrifuge – "QUICK"-key

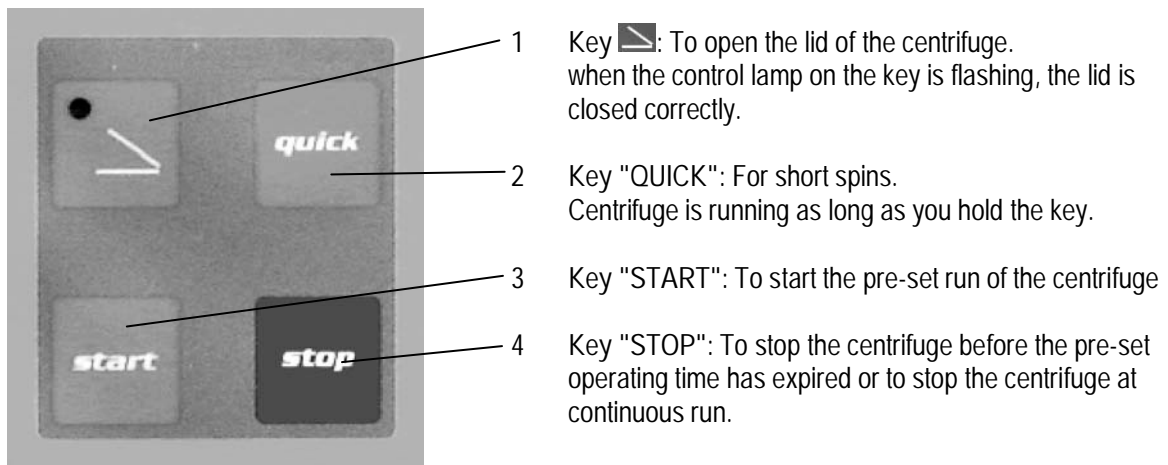



Figure 16

Starting the centrifuge

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. as soon as the control lamp at the key  is flashing, the centrifuge run can be started. Therefore, press key "START".

ATTENTION: The rotor has to be checked and / or tightened previous to each run!

"QUICK"-key – short runs

For short centrifuge runs you can start the run with key "QUICK". Press the key "QUICK". The centrifuge starts and runs as long as you hold the key "QUICK". The running time is shown in the display "TIME" in seconds.

2.3 Thermal behaviour

2.3.1 Temperature adjustment

The temperature adjustment with sensor, refrigeration system and processor control is designed that way, that the set temperature is reached within the shortest time possible. During this adjustment period it is possible, that the temperature varies above or below the set temperature (see figure 16). These variations depend on rotor, temperature and speed.

In case you want to process samples which are very temperature sensitive, you have to pre-cool the rotor, buckets and tube racks to the requested temperature (see chapter 2.2.7).

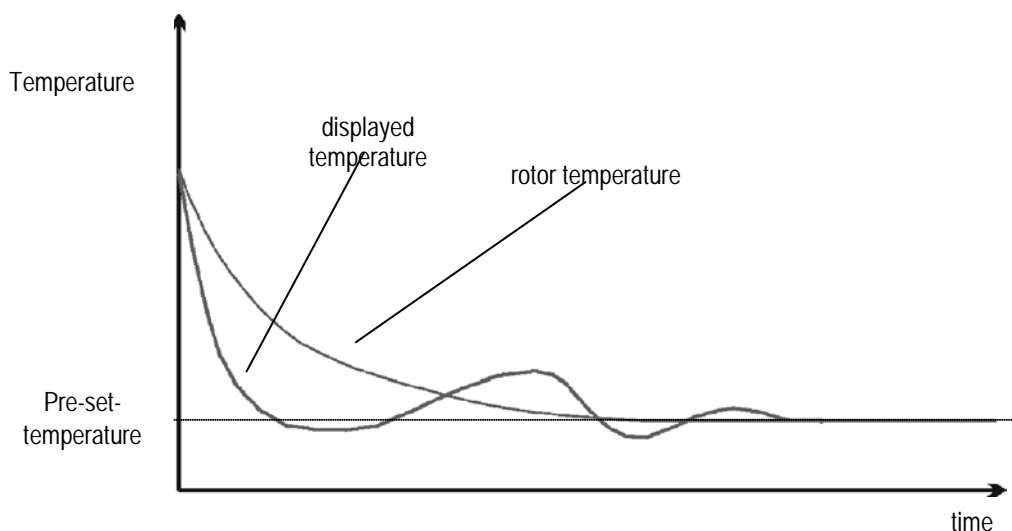


Figure 17

2.4 Safety features

2.4.1 Imbalance detection

In case of the rotor not being equally loaded (see chapter 2.1.1), the drive will turn off during acceleration. The rotor decelerates to stand still.

When error message "1" appears in the actual "SPEED" display, the weight difference of the samples is too huge. Weigh out the samples exactly.
Load the rotor as described in chapter 2.1.1.

When error message "2" appears in the actual "SPEED" display, there could be following reasons:

- The imbalance switch is not correctly adjusted.
- The imbalance switch is defective.

3.1 Service and maintenance

3.1.1 Maintenance and cleaning

Maintenance:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

Vaseline, available in nearly each store, is the most suitable lubricant. The Vaseline must be free of resin and acids. Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance:

- Alkalies
- Alkaline soap solutions
- Alkaline amines
- Concentrated acids
- Solutions containing heavy metals
- Water-free chlorinated solvents
- Saline solutions, e.g. salt water

Cleaning:

Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.

In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.

After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. temperature + 50°C).

It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.

Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.

The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week.

3.1.2 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor.

If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

3.1.3 Disinfection

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C, except rotor 220.58 V08, which must not be autoclaved.

The rotor and rotor chamber should be cleaned with a universal, neutral disinfection agent, e.g. on formalin base. A disinfection spray is most suitable in order to easily reach all difficult to access spots.

ATTENTION:

Before applying any other cleaning resp. decontamination method than recommended by the manufacturer, contact the manufacturer to ensure yourself, you would not damage the unit or the rotor by applying the designated method!

3.1.4 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)

ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material.

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Boxes, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.

ATTENTION: Because the temperature may rise during the sterilization, rotors, boxes and bottles must not be closed respectively must be totally unscrewed.

Chemical sterilization

Bottles, boxes and rotors may be treated with the usual liquid disinfectants.

4.1 Error messages: cause / solution

Preface:

The error messages are listed to help localize possible errors faster.

The diagnose referred to in this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this instruction manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing there is a plastic plug tightened to a cord.
- Pull the plastic plug out of the housing and pull the cord to open the lid of the centrifuge (see Figure 18).



Figure 18

4 TROUBLE SHOOTING

4.2.2 Description of the error message system

The error message is shown in the "SPEED" display through particular figures (see Figure 18).

There is a distinction between two different kinds of errors.

The digits in the "SPEED" display have the following meaning:

- Error No. 1 – 49 (forced stop)

In case of one of these errors occurring, the rotor decelerates from pre-set speed down to 0. As soon as the rotor stops, the error message can be reset by opening and closing the lid of the centrifuge.

- Error No. 50 – 99 (emergency stop)

In case one of these errors occurring, the frequency converter switches off. This means, the rotor stops without applying the brakes. To reset the error message you have to switch off the unit and turn it on again (power switch).

In case the unit stops due to an error indication, you should restart the unit to check whether the error occurs again.

The error message figures not listed in this chapter are currently not in use. They are reserved for future use in completing the error message recognition program.

Example: figures are flashing



Figure 19

4.2.3 Error messages

Error No. 1: Imbalance

- Cause: Incorrect loading of the rotor (see chapter 2.2.1)
- Solution: Balance your samples

- Cause: Incorrect adjustment of the imbalance sensor
- Solution: Imbalance sensor has to be re-adjusted (call service department)

4 TROUBLE SHOOTING

Error No. 2: Permanent imbalance signal

- Cause: Incorrect position of the imbalance sensor
- Solution: Imbalance sensor has to be readjusted (call service department)
- Cause: Imbalance sensor is defective
- Solution: Imbalance sensor has to be replaced (call service department)

Error No. 10: Chamber over temperature (above +50°C)

- Cause: Refrigeration system malfunction
- Solution: Wait until temperature is below +30°C again. Restart the centrifuge. In case temperature in rotor chamber is again at about 50°C, call service department.
- Cause: Temperature sensor is defective
- Solution: Call service department

Error No. 11: Temperature sensor is defective

- Cause: Temperature sensor is defective
- Solution: Call service department. Temperature sensor has to be changed.

Error No. 25: Power failure

- Cause: Power failure while rotor was in motion
- Solution: Open and close the lid of the centrifuge, restart the unit; check contact of plug in (loose contact)

Error No. 36: Relay of the frequency converter cannot be released / lid cannot be opened

- Cause: Power board malfunction
- Solution: Call service department
- Cause: Lid of the centrifuge is jammed
- Solution: Open the lid of the centrifuge manually when rotor is at stand still. Grease the lid lock slightly. In case this error occurs again, call service department; check coil of lid lock
- Cause: Lid lock is defective
- Solution: Call service department, replace lid lock
- Cause: Speed sensor wire is cutted
- Solution: Call service department, replace speed sensor wire

Error No. 50 / 51: Memory failure

- Cause: Internal or external memory failure
- Solution: Restart the unit. In case this error occurs again, call service department; replace control panel

4 TROUBLE SHOOTING

Error No. 54: Wrong configuration

- Cause: Jumper is placed at the wrong position on control panel
- Solution: Re-place jumper

Error No. 55: Over speed

- Cause: Speed sensor is defective
- Solution: Restart the unit. In case this error occurs again, call service department. possibly loose speed magnet, fix with super glue

Error No. 60: Engine speed sensor signal is missing

- Cause: Speed sensor is defective or cable breakage at speed sensor, possibly lose magnet
- Solution: Call service department; check speed magnet, fix with super glue

Error No. 82: Cut off power board – frequency converter

- Cause: Over current or under voltage due to power supply fluctuations
- Solution: Restart the unit, take care the power supply is stable

Error No. 83: Preset speed cannot be reached

- Cause: Preset speed cannot be reached
- Solution: Call service department

Error No. 84: Over temperature frequency converter

- Cause: Frequency converter cut off due to over temperature
- Solution: Take care, there is enough space around the centrifuge for heat dissipation

Error No. 85: Over temperature motor

- Cause: Temperature protection switch of motor turns off
- Solution: Take care, there is enough space around the centrifuge for heat dissipation. Motor mounting is defective, replace motor

Error No. 90: Emergency switch off lid lock

- Cause: The lid of the centrifuge has been opened while centrifuge was running
- Solution: Close the lid of the centrifuge. DANGER OF ACCIDENT!
- Cause: Control switch of lid lock is defective
- Solution: Call service department

5 RECEIPT OF CENTRIFUGES TO REPAIR AND DISPOSAL

5.1 Receipt of centrifuges to repair

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:
The centrifuge must be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

Thank you for your cooperation!

Enclosure: Retraction form (see page 27)

5.2 Disposal

Please take care that you comply to the respective legal regulations when you dispose of the unit. According to the directive 2002/96/EG (WEEE) all units delivered after the 13.08.2005 must not be disposed of with the domestic waste. This unit belongs to group 8 (Medical Units) and is ranged in the Business-to-Business-Field.



This symbol of the crossed out garbage bin points out that the unit must not be disposed of with the domestic waste.

Please also note that the disposal regulations may be different in the particular EU-Countries.

Should occur any questions about this matter please contact your distributor.



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Instruction manual
for
filtration centrifuge
Sieva-2

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1. General Information

1.1 Danger, precautions and warranty

Before putting the centrifuge into operation, please read this instruction manual carefully.



This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE Sieva 2 is non explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of $> 2\text{m/s}$

The following rules must be strictly adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.2 Description

The model SIEVA-2 is a filtration centrifuge which covers many fields of applications by offering a wide range of accessories.

The centrifuges are equipped with the Hermle Standart-Control panel.

Speed and running time are set with easy to use control knobs.

The precise parameters selected are shown on the large digital LED display.

1.3 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

1.4 Accessories supplied with each centrifuge unit

2 Replacement fuses, 1 Instruction manual

2. Installation

2.1 Unpacking the centrifuge

The centrifuges are supplied in a carton. Remove the thighting straps. Open the carton take the centrifuge togehter with the styropore out of the carton.

The instruction manual and the accessories should be kept with the centrifuge.

2.2 Required space

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

2.3 Installation

- Check that the power supply corresponds to that on the manufacturer's rating label which is mounted on the rear panel or left side, then connect the power cord of the centrifuge to the socket.
- The line voltage circuit breaker is maximum at 16 Amp. type K slow release for commonly used instruments.
- That an emergency switch is installed outside the room to disconnect the power supply in case of a troubled run.
- The digital indications on the display are lighting up.
- Press key "lid". You can open the centrifuge lid now.

3. How to install and load a rotor

3.1 Installing the centrifugal basket

Clean the hub, as well as the mounting hole of the centrifugal basket with a piece of cloth. Then place the basket on the hub, ensuring that the pins align correctly with the slots of the basket. Tighten the screw of the basket.

3.2 Overloading of rotor

The max. load permitted for a rotor, which is determined by the manufacturer, as well as the max. speed allowed with the rotor must not be exceeded.

The liquids with which the rotors are loaded should have an average homogeneous density of 1,2 g per ml or less, when the rotor is running at maximum speed.

To spin liquids of a higher density, the speed should be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

4. Operation

4.1 Power up

Connect the cord plug to the appropriate wall socket.
After connecting the digital displays will light up.
The control panel is equipped with a stand by function.

4.2 Lid release

When the green control lamp of the key "lid" lights (4), the rotor stands still and centrifuge lid is ready to open.

Press key "lid" (3) (see figure 1) to open the lid. The green control lamp will extinguish as soon as the lid will be opened or the unit started.

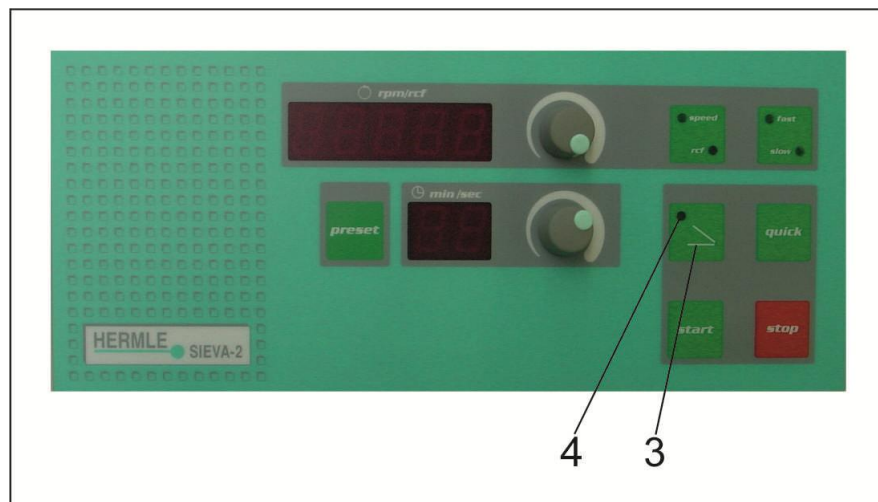


figure 1

4.3 Lid lock

Close the centrifuge lid, after the rotor has been fixed correctly as described.

The centrifuge can only be started when the lid is closed correctly.

The green control lamp of the key "lid" will light as soon as the lid is closed correctly.

When the rotor starts accelerating the control lamp of the key "lid" extinguishes and the lid be opened.

4.4 Preselection of speed / RCF

You can preset the speed between 250 rpm and 10000 rpm in steps of 250 rpm

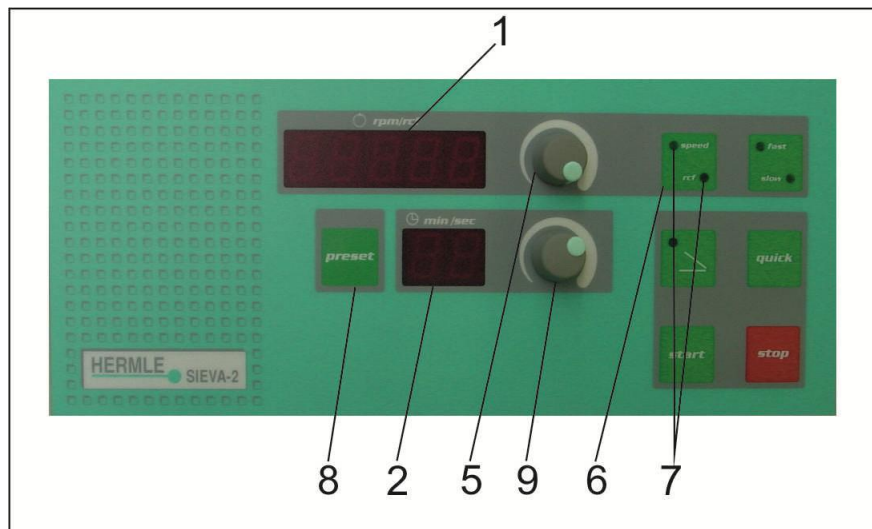


figure 2

When the centrifuge lid is open, you can preset the required speed or rcf with the knob (5).

If the centrifuge lid is closed and during the run, the speed can be changed as follows:

Press key "preset" (8), hold it and at the same time change speed with the knob (5).

The preselected speed will be indicated in the speed display (1).

The allowed max. speed for all rotors please see table under.

SIEVA-2

Rotor	max. speed
221.07 V02	10000 rpm
221.07 V04	10000 rpm

4.5 Preselection of operating time

You can adjust the desired operating time between 1 and 60 minutes or hold.

With the centrifuge lid open you can preset the operating time with the knob (9). During the run and with the centrifuge lid closed you have to press additionally key "preset" (8) to change operating time during the run.

The preselected running time will be indicated on the time display (2).

At the end of a run the preset operating time will be kept for further runs.

For continuous runs turn the knob clockwise to the limit stop. The continuous run will be indicated on the digital indication with two minus signs "--".

You can stop a continuous run with key "stop".

4.6 Keyboard - Starting the centrifuge - "quick"-key

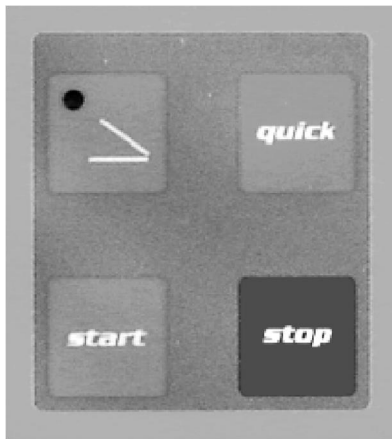



figure 3

Starting the centrifuge

Close the centrifuge lid. As soon as the green LED of the key "lid" is lighting the centrifuge can be started. Therefore press key "start".

"quick" - key - short time runs

For short centrifuge runs you can start the run with the key "quick". Press the key "quick". The centrifuge starts and keeps running as long as you press the "quick"-key. The operating time will be indicated in seconds on the digital indication "time".

Key : To open the lid of the centrifuge.

when the control lamp on the key is flashing, the lid is closed correctly.

Key "QUICK": For short spins.

Centrifuge is running as long as you hold the key.

Key "START": To start the pre-set run of the centrifuge

Key "STOP": To stop the centrifuge before the pre-set operating time has expired or to stop the centrifuge at continuous run.

4.7 Key "stop"

Press the key "stop" if you want to interrupt a centrifuge run. The centrifuge decelerates according to the fix adjusted brake intensity. You can not change the brake intensity.

5. Temperature Features

5.1 Temperature

During centrifugation, heat is generated by air friction between the rapidly spinning centrifugal basket and the air inside the rotor chamber.

The temperature rise depends on the rotor (swing-out or angle rotor), bucket type, ambient temperature, running time and the speed of the rotor.

The continuous air flow through the centrifuge housing restricts the temperature rise of the samples to the standard value of 40 °C even at maximum speed.

6. Safety facilities

6.1 Imbalance

If the centrifugal basket is loaded too fast during the acceleration phase, there can appear an imbalance in the basket. In that case the operation will be interrupted and the centrifugal basket will be decelerated to standstill. Additionally the error message "ERROR" and 01 flashes alternately on the preset display "speed".

7. Service and Maintenance

7.1 Service and inspection of the centrifuge

Centrifuge service and inspection should be done regularly and only by authorized and qualified personnel. Use only original spare parts!

7.2 Maintenance and cleaning

General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the offered HERMLE High TEF oil – Order no.: 34-5147.

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.

- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and cannot be autoclaved at 134°C.

Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material


Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning

but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.


Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.

 **ATTENTION:** Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization


Bottles, adapters and rotors may be treated with the usual liquid disinfectants.

 **ATTENTION:** Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.

 **ATTENTION:** Please check the relevant specifications of the tubes centrifuges with the manufacturer!

Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of max. 7 years from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to 3 years from first use.

Condition for the operating time:

Proper use, damage-free condition, recommended care.

8. Trouble Shooting

8.1 Emergency lid release

In case of power failure or any malfunction, the lid can be opened manually to protect your samples. Please proceed as follows:

- Switch off the centrifuge and unplug the power cord.
- There is a plastic plug at the left side of the centrifuge housing. Behind that plastic plug there is a red cord.
- Remove the plastic plug and pull the red cord.
- The lid can then be opened (see figure 4).

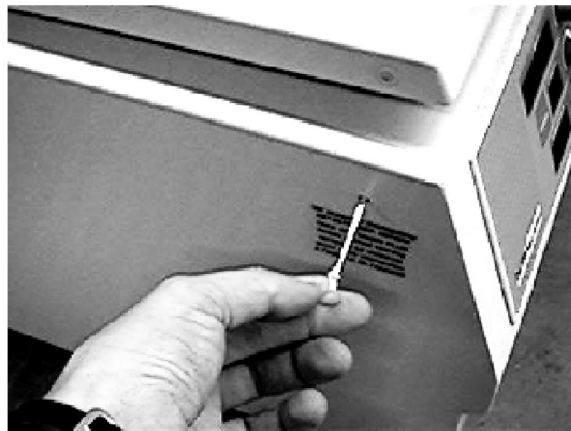


figure 4

8.2 Check list / Trouble shooting

The error message will be indicated by a certain number on the digital speed display. At the same time "ERROR" appears on the preset display.

There is a distinction between two different kinds of errors. The digits on the indication "speed" have the following meaning:

Error no. 1-49 (Forced stop)

If one of those errors occurs, the rotor will be braked from the preset speed to 0. As soon as the rotor has stopped, the error message can be reset by opening and closing the centrifuge lid.

Error no. 50 - 99 (Emergency stop)

If this occurs, the frequency converter will be switched off. This means that the rotor will be stopped brakeless. To reset the error message you have to plug off and plug in the power cord.

If the unit stops due to an error indication you should restart the unit to check if the error occurs again.

The error numbers which are not listed in this chapter are not in use at the time of publication and they are reserved for future use in widening the error recognition program.

Detailed information about possible error messages are in "table 4: error messages" (see Appendix VII)

9. TRANSPORT, STORAGE AND DISPOSAL

Transport

- Before transporting, take out the rotor.
- Only transport the unit in the original packaging.
- Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

10. APPENDIX

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EC Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)“
Laboratory centrifuge with accessories to “IVD (other device)”

Typenbezeichnung
Typ designation

SIEVA-2

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

EN 61 010-1; EN 61 010-2-020; EN 61 010-2-101
ISO 9001:2008

Wehingen, den 01.01.2012

HERMLE
LABORTECHNIK

A handwritten signature in black ink, appearing to read 'A. Hermle'.

Alexander Hermle
Geschäftsführer, Managing Director

Table 1: Technical Data

Manufacturer		HERMLE Labortechnik GmbH			
Type		Sieva-2			
Dimensions					
Width		35,5 cm			
Depth		49 cm			
Height		33 cm			
Weight without rotor		25 kg			
max. speed		10000 rpm			
max. volume		500 ml			
max. RCF		7826 xg			
allowable density		1,2 kg/dm ³			
allowable kinetic energy		5788 Nm			
Mains power connection AC		230 V / 50 Hz 1 ph		120 V / 60 Hz 1 ph	
Voltage fluctuation		± 10 %		± 10 %	
Current consumption		3,2 A		4,0 A	
Power consumption		0,58 kW		0,36 kW	
Radio interference		IEC 61326-1			
Audit requirement (BGR 500)		no			
Ambient conditions (EN/IEC 61010-1)					
- Environment		for indoor use only Use up to an altitude of 2000 m above MSL 2°C up to 35 °C Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.			
- High					
- Ambient temperature					
- Max. relative humidity					
- Overvoltage category (IEC 60364-4-443)					
- Degree of contamination		II			
Class of protection		2			
		I			
Not suitable for use in hazardous environments.					
EMV		EN / IEC		FCC Class B	
Interference emission , noise		61326-1		61326-1	
		Category B		Category B	
Noise level (depending on the rotor)		≤ 59 +2 dB(A)			
Write from operator					
Inventory-No.:					
Monitoring-No.:					
Environment:					
Maintenance contract:					
responsible service office		HERMLE Labortechnik GmbH		or dealer service office	
		Siemensstrasse 25			
		78564 Wehingen			
		Tel.: (49)7426 / 96 22-17			
		Fax: (49)7426 / 96 22-49			
responsible dealer					

Table 2: Max. speed and RCF-values for permissible rotors

Rotor-Number	Max. Speed	RCF value
221.07 V02	10000 min ⁻¹	7826 x g
221.07 V04	10000 min ⁻¹	7826 x g

Table 3: Permissible net weight

Rotor-Number	Max. Speed	Permissible weight
221.07 V02	10000 min ⁻¹	600 g
221.07 V04	10000 min ⁻¹	600 g

Table 4: Error message

Error-No.:	Description
1	Imbalance
2	Imbalance switch constantly pressed
10	Chamber temperature > set over temperature (only at colled units)
25	Motor shaft turns when switching on (start) the centrifuge.
36	Lid can not be opened
40 + 41	Processor fault (writing mistake E-Prom)
50	Processor fault (internal RAM faulty)
51	Processor fault (external RAM faulty)
53	PIC not work
54	Jumper setting wrong
55	Over speed (rotor speed higher than allowed)
60	Speed step jumps between 2 measuring
61	Rotor identification signal at speed signal = 0
70	From the serial interface communication to the frequency converter
82	Low voltage - frequency converter
83	Over voltage - frequency converter
84	Over temperature - frequency converter
85	Over temperature - motor
86	To big current - frequency converter
87	Frequency converter release
88	No release - frequency converter
90	Lid of the centrifuge got open as long as the rotor turned
94	Low voltage - main plug
98	E-Prom fault (memory)
99	Processor fault - Stack over flow

Table 5: Abbreviations used

Symbol/Abbreviations	Unit	Description
U (=rpm)	[min ⁻¹]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____

place: _____

Telephone: _____

fax: _____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis:..... ☐ Yes ☐ No

Potentially infectious agents: ☐ Yes ☐ No

Organic reagents and solvent: ☐ Yes ☐ No

Radioactive substances: ☐ α .. ☐ β .. ☐ γ .. ☐ Yes ☐ No

Health endangering proteins: ☐ Yes ☐ No

DNA: ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one, if yes:

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company/dept . _____ place and date: _____

Signature of the authorized person: _____

[illegible]



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Instruction Manual for Table Top Refrigerated Centrifuge Z 513 K

1 PRODUCT DESCRIPTION

- 1.1 Usage in accordance with safety standards
 - 1.1.1 General Information
 - 1.1.1.1 Hazards and precautions
 - 1.1.1.2 Brief description
 - 1.1.1.3 Safety standards
 - 1.1.1.4 Extent of supply
 - 1.1.1.5 Warranty
- 1.2 Installation
 - 1.2.1 Installation of the centrifuge
 - 1.2.1.1 Unpacking the centrifuge
 - 1.2.1.2 Space requirements
 - 1.2.1.3 Installation
- 1.3 Technical Data
- 1.4 Conformity Declaration

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- 2.2 Operation
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 - 2.2.9 Keyboard – Starting the centrifuge – "QUICK"-key
 - 2.2.10 Storage of programs
- 2.3 Thermal behaviour
 - 2.3.1 Temperature adjustment
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 - 2.4.1 Imbalance detection

3 MAINTENANCE

- 3.1 Service and Maintenance
 - 3.1.1 Maintenance and cleaning
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- 4.1 Error messages: Cause / Solution
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- 5.1 Receipt of Centrifuges to Repair
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1 PRODUCT DESCRIPTION

1.1 Usage in accordance with safety standards

1.1.1 General information

1.1.1.1 Hazards and precautions

Before setting the centrifuge into operation, please read this instruction manual carefully!

This centrifuge must not be operated by unqualified personnel not being familiar with the correct use of the unit.

Always, use the original accessories only!

For your personal safety, please pay attention to following precautions:

- The **HERMLE Z 513 K** is not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. During centrifugation, it is prohibited to stay within the safety zone of 30 cm around the centrifuge or deposit hazardous substances within this area.
- Centrifugation of flammable, explosive and radioactive substances or substances, which chemically react with high energy, is strictly prohibited!
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited.
The user is obligated to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and / or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2 m/s.

Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismantled (e.g. without metal cover).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with by unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

1 PRODUCT DESCRIPTION

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.1.1.2 Brief description

Model **Z 513 K** is a refrigerated table top centrifuge. Various rotors are available for this unit. Speed / RCF-value, running time and temperature can easily be set with turning knobs and are displayed on large LED's.

The pre-set run parameters are stored after the end of each run.

The lid is latched and released with an electric motor driven lid lock.

The centrifuge has a maintenance-free brushless induction drive with a low noise level.

It also has an CFC-free hermetically sealed refrigeration system (refrigerant type R 404 a).

1.1.1.3 Safety standards

The centrifuge corresponds with the General Requirements for Medical Units Regulations (MedGV) (group 3).

Following standards have been considered for the production of our centrifuges:

- Accident Prevention Regulation for electrical units and installations UVV VBG 4
- Accident Prevention Regulation for centrifuges as per BGR 500; Chapter 2.11; Part 3
- DIN 58970 part 1, 2 and 4 for centrifuges and tubes
- Electrical Interference Suppression according to interference degree B as per VDE 0871
- Electrical Safety as per IEC 1010-1 and IEC 1010-2-D
- European Standard PR EN 61 010-1 and PR EN 61 010-2-2

1 PRODUCT DESCRIPTION

1.1.1.4 Extent of supply

Following parts are supplied as accessories with each centrifuge:

- 2 fine-wire fuses 16 AT (230 V)
- 2 fine-wire fuses 15 AT (120 V)
- 1 instruction manual
- 1 Allan key for removing rotors

Spare fuses are at the rear side of the centrifuge.

1.1.1.5 Warranty

The centrifuge has been subjected to thorough testing and quality controls.

In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery.

This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement.

1.2 Installation

1.2.1 Installation of the centrifuge

1.2.1.1 Unpacking the centrifuge

Model **Z 513 K** is supplied in a palletcarton.

Remove the strap retainer, open the carton, remove the cover carton and the centrifuge. The instruction manual must always be kept with the centrifuge.

1.2.1.2 Space requirements

The centrifuge should be installed on an even and solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

In order to enable a safe and smooth operation, level the table of the centrifuge with a spirit level.

The centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit in order to ensure necessary heat dissipation.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, because of the obtainable chamber temperature is referenced of a average room heat of 23° C.

Safety regulations require that the safety area of 30 cm around the unit is marked in order to indicate that neither hazardous substances nor persons should be within this area during centrifugation.

1 PRODUCT DESCRIPTION

1.2.1.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label which is mounted on the rear panel.
- The line voltage circuit breaker is max. 16 A (type K) slow release for commonly used instruments.
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Remove the transport spacer blocks from the motor shaft (see chapter 2.2.2).

The socket for the power cord must be easy to reach respectively easy to disconnect!

1 PRODUCT DESCRIPTION

1.3 Technische Daten

Manufacturer	HERMLE Labortechnik GmbH			
Type / Model	Z 513 K			
Dimensions				
Width	79 cm			
Depth	73 cm			
Height	46.5 cm			
Weight	140 kg			
Noise level (max.)	67 +2,0 dB (A)			
Max. speed	12.000 rpm			
Max. volume	4 x 1000 ml			
Max. RCF	16.904 x g			
Admissible density	1,2 kg/dm ³			
Admissible kinetic energy	31.000 Nm			
Electrical connection AC	230 V / 50 Hz 1 ph	120 V / 60 Hz 1 ph		
Current	9 A	15 A		
Connected load	1980 Watt	1800 Watt		
Interference suppression	VDE 0871, Funkentstörgrad B			
Test obligations (BGR 500)	yes			
Ambient conditions (EN/IEC 61010-1)				
-Environnement	for indoor use only			
-High	use up to an altitude of 2000 m above MSL			
-Ambiente temperature	2°C up to 35 °C			
-Max relative hum idity	max. relative humidity 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity up to 35 °C			
-Overvoltage category (IEC 60364-4-443)	II			
Degree of contamination	2			
Class of protection	I			
Not suitable for use in hazardous environements				
EMV	EN / IEC	FCC Class B	EN / IEC	FCC Class B
Interference emission, noise immunity	61326-1 Category B		61326-1 Category B	
To be filled in by purchaser:				
Inventory-No.:				
Check-No.:				
Location:				
Maintenance contract:				
Your service department	HERMLE Labortechnik GmbH Siemensstrasse 25 78564 Wehingen Phone: +49-7426 / 96 22-17			
Your agent				

1.4 Conformity declaration

EG Konformitätserklärung EC Conformity Declaration



Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen.
Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

**Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)”
Laboratory centrifuge with accessories to “IVD (other device)”**

Typenbezeichnung
Typ designation

**Z 206 A; Z 233 M-2; Z 306; Z 326; Z 366; Z 383; Z 400; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 36 HK; Z 383 K; Z 400 K; Z 513 K**

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

**RL 98/79/EG ; 2006/95/EG ; 2004/108/EG
EN 61010-1:2011-07; EN 61010-2-020 :2007-03; EN 61010-2-101:2003-09
DIN EN ISO 14971:2012-10; DIN EN ISO 13485:2012-06**

Wehingen, den 01.10.2012



Alexander Hermle
Geschäftsführer, Managing Director

2 OPERATION

2.1 Installation of rotors

2.2.1 Mounting and loading angle rotors

Clean the motor shaft as well as the rotor mounting boring with a clean, grease-free piece of cloth. Place the rotor onto the motor shaft, ensuring that the pin aligns correctly with the rotor slot (see photos 1 and 2).

For reasons of safety you should check the correct position of the rotor before each run!!

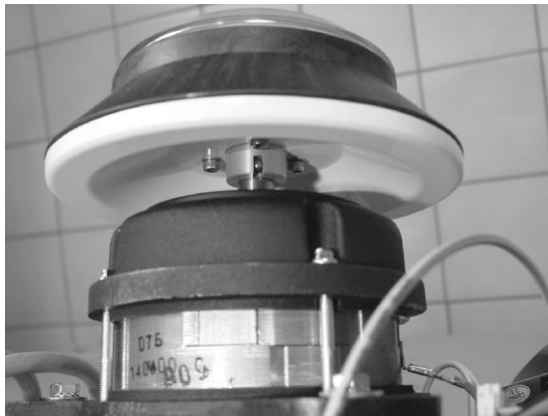


Photo 1: correct

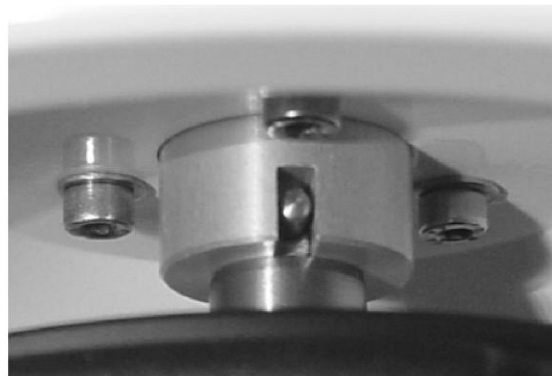
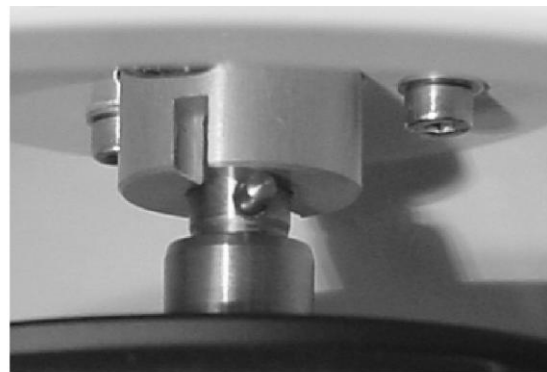


Photo 2: wrong



2 OPERATION

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see photo 3).

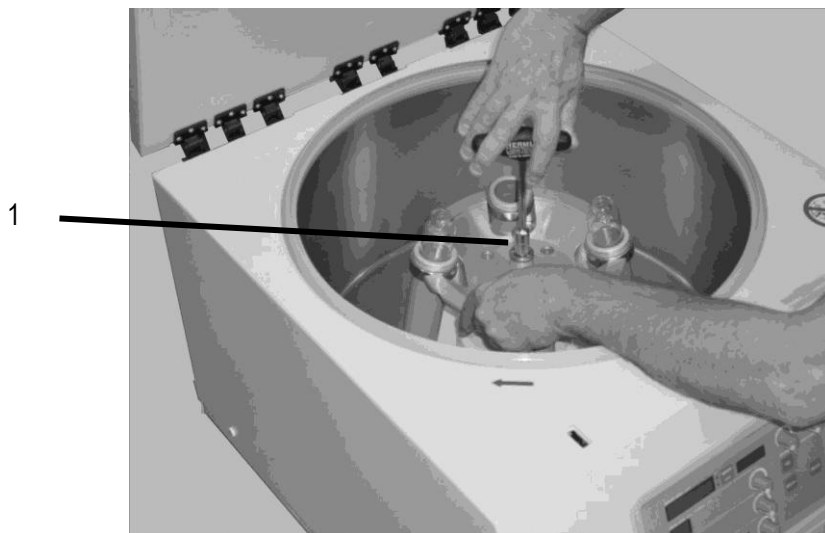


Photo 3

It is allowed to operate e.g. a 8-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other.

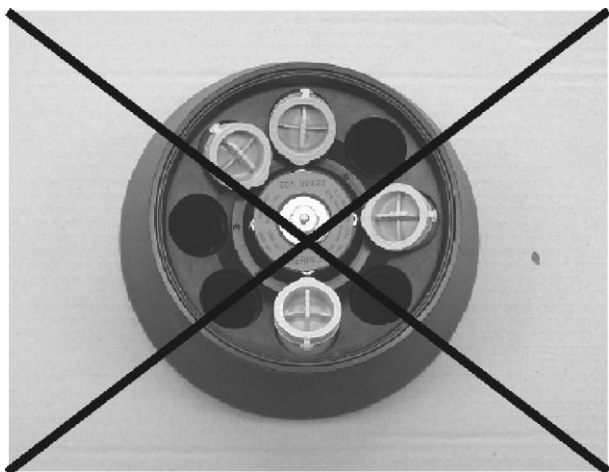


Photo 4: wrong

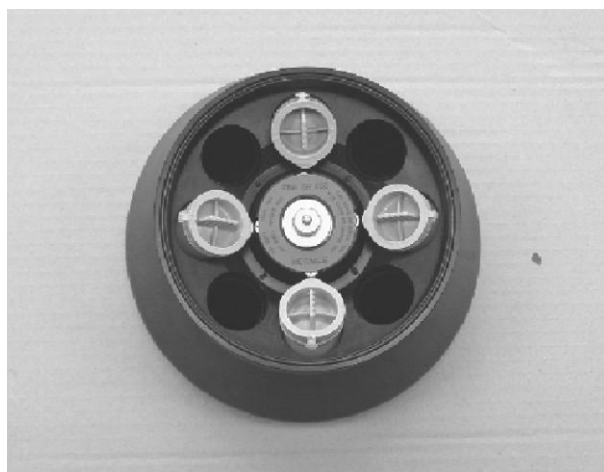


Photo 5: correct

2 OPERATION

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector lightly onto the rotor nut. Take care the lid is correctly placed into the guide.



Photo 6

2.1.2 Mounting and loading swing out rotors

Clean the motor shaft, as well as the device hole of the rotor with a clean and fat free cloth. Put the rotor to the motor shaft (take care that the cross pin is sitting right to the driving disk of the rotor) (s. photo 1 and photo 2).

Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. Tighten rotor nut with enclosed allen key (see photo 3).

The charging of the buckets and the adapters must be done appropriately figure 7 and figure 8.

In principle swing out rotors may be taken in operation first if all buckets or racks are put into the rotor.

The bolts at the rotor must be easily greased with silicone grease.

The glasses have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 6 gramme.

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded borings must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see Figure 7 and 8).



Photo 7: wrong



Photo 8: correct

2 OPERATION

2.1.3 Overloading of rotors

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded.

The liquids the rotors are loaded with, should have an average homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{\text{red}} = \sqrt{\frac{1,2}{\text{higher density}}} \times \text{max. speed } (n_{\text{max}}) \text{ of the rotor}$$

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

In case of any questions, please contact the manufacturer!

2.1.4 Removing the rotor

Take off the lid of the rotor. Hold the rotor with one hand. Release the rotor nut with the included allen key by turning it clockwise.

ATTENTION:

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances which could damage the rotor and buckets.

2.2 Operation

2.2.1 Power switch / Main fuses

The power switch is down below on the left side of the unit. The main fuse of the centrifuge is on the backside at the power inlet.

After switch on the centrifuge the displays on the control panel will flash up.

The disconnection from the network just happens by unplugging the main plug.

2.2.2 Lid release

When the green control lamp on the key „LID“ (4) is flashing, the rotor is standing still and the lid of the centrifuge is ready to open.

Press the key „LID“(3) (see photo 9), and the lid will open automatically. While the lid is opening itself it appears the word “OPEN” in the actual value display (see photo 9).

After approx. 6 seconds the word disappears in the actual value display and the lid can be opened.

2 OPERATION



Photo 9

Actual Value Display

4

3

2.2.3 Lid lock

After mounting and loading the rotor correctly as described, the lid may be closed.

Please proceed as follows:

- The lid must only be lay down slightly until you feel that the lid will be tightened.
- Afterwards the lid will close automatically within 6 seconds.
While the closing of the lid it appears the word „CLOSE“ in the actual value display.
(see photo 9)
- As soon as the lid is closed correctly the word „CLOSE“ disappears in the actual value display.
- When the control lamp (4) on the key „LID“ flashed up, the centrifuge can be started.

The centrifuge may only be started with closed lid (Lid lock according to BGR 500; Chapter 2.11; Part 3). As soon as the rotor starts, the control lamp (4) on the key „LID“ turns off and an opening of the lid is impossible.

If the control lamp (4) on the key „LID“ flashes after pressing the "START" - key, you have to open the lid once again. This safety precaution shows the end of the run.

2.2.4 Pre-selection of speed / RCF-value

With the key "SPEED/RCF" (7) you can switch between speed and RCF-value to be shown in the display. The green control lamps (8) indicate, which mode is activated.

Select the desired mode. With the speed potentiometer (4) you can pre-select the speed/RCF-value in steps of 500 or you can change the values during the run.

With the speed potentiometer (5) you can pre-select the speed/RCF-value in steps of 10 or you can change the values during the run.

The pre-selected value is indicated in the nominal value display (1). The actual speed is indicated in the actual value display (2).

2 OPERATION

The pre-selected speed should not be higher than the max. speed of the rotor. If the pre-selected speed is too high the nominal value display (1) flashed after approx. 200 rpm. (see photo 10). However the centrifuges accelerates only up to the maximum speed of the placed rotor.

The maximum speed of the Z 513 K is 12.000 rpm.

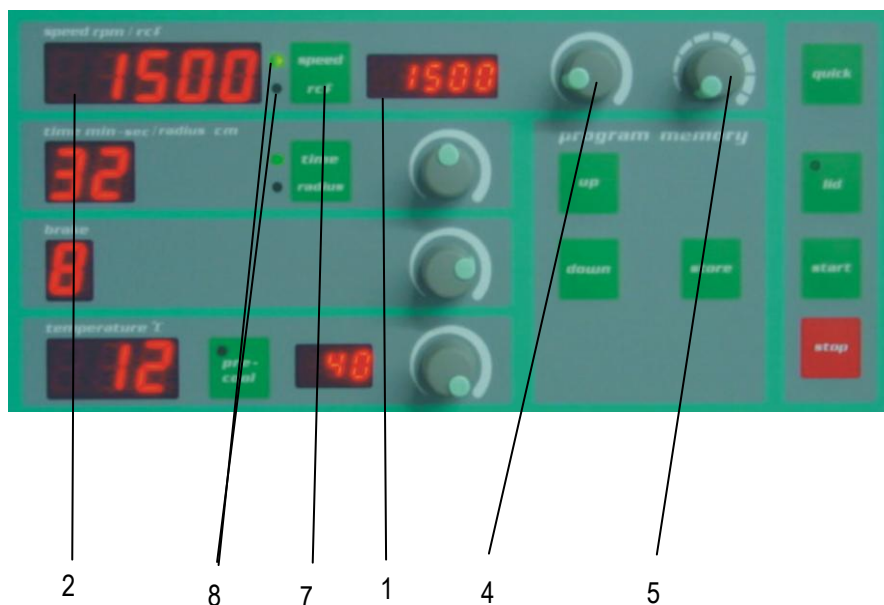


Photo 10

Max. Revolution per minutes of the valid rotors Z 513 and Z 513 K

Rotor Number	Max. Speed
220.70 V06	5.000 rpm
220.70 V05	3.600 rpm
220.41 V04	2.000 rpm
220.78 V02/V04	12.000 rpm
220.80 V02/V04	12.000 rpm
221.11 V01	4.000 rpm

2 OPERATION

2.2.5 Pre-selection of running time

Running time is adjustable from 1 to 60 min. with the time potentiometer (12) or continuous. The running time is indicated in the display (10). The preset running time will be stored after the run. For continuous run, turn the time potentiometer (12) clockwise to the limit stop. The display (10) indicates **continuous run** with two dashes "- -". You can stop the run by pressing the „stop“ key.

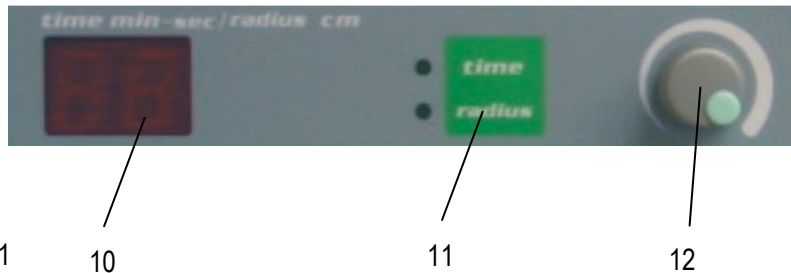


Photo 11

2.2.6 Pre-selection of radius correction (IMPORTANT FOR THE RCF-VALUE DISPLAY)

Explanation:

The Z 383 K has an automatic rotor identification. Therefore the control system of the centrifuge knows the maximum centrifugal radius of the respective rotors to indicate the correct RCF-Values. If you use adapters it could change the centrifugal radius of the respective rotors.

That the control system of the centrifuge is supposed to calculate the right RCF-Value, the respective radius must be corrected.

Pre-selection:

Please look up the correction value in the following table under the respective rotor and adapter.

While pressing the key "time/radius" (11) you can adjust your value with the potentiometer (12) (see photo 11). If you press the key "time/radius" (11) this value is indicated during the run, too. After release the key "time/radius" (11), the display (10) indicates the running time again.

ATTENTION:

After the key is released the adjusted value is stored and must be readjusted for an **other** adapter or rotor.

2 OPERATION

Radius correction values of the usable rotors

Z 513 und Z 513 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; 6 Place; R-max. 23,6 cm				
221.11 V01		625.000	0	
		625.001	0,4	
		625.002	0,4	
		625.003	0,6	
		625.004	0,8	
		625.005	1,6	
		625.006	0,3	
		625.007	0,3	
		625.008	0,2	
		625.009	3,9	
		625.010	1,6	
		625.013	5,8	
Swing out rotor; 4 x 750 ml; R-max. 22,0 cm				
220.70 V06	614.000		2,0	
		714.003	0,3	
		714.004	0,6	
		714.005	0,6	
		714.006	0,4	
		714.007	0,3	
		714.008	0,6	
		714.009	0,6	
		714.010	0,6	
		714.011	0,6	
	616.065		0,7	
		716.016	0,7	
		716.018	0,5	
		716.019	0,2	
		716.020	0,2	
		716.021	0,2	
		716.022	0,3	
		716.023	0,2	
		716.024	0,4	
		716.025	0	
		716.026	0	
		716.015	0,4	
	614.040	ohne	3,1	

2 OPERATION

Z 513 und Z 513 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; 4 x 1000 ml, R-max.: 23,3 cm				
220.70 V05	614.000		3,3	
		714.003	0,3	
		714.004	0,6	
		714.005	0,6	
		714.006	0,4	
		714.007	0,3	
		714.008	0,6	
		714.009	0,6	
		714.010	0,6	
		714.011	0,6	
	614.040	ohne	4,4	
	616.065		2,0	
		716.015	0,4	
		716.016	0,6	
		716.018	0,5	
		716.019	0,2	
		716.020	0,2	
		716.021	0,2	
		716.022	0,3	
		716.023	0,2	
		716.024	0,4	
		716.025	0	
		716.026	0	
	616.060		0	
		716.045	0,5	
		716.015	0,4	
		716.016	0,6	
		716.018	0,5	
		716.019	0,2	
		716.020	0,2	
		716.021	0,2	
		716.022	0,3	
		716.023	0,2	
		716.024	0,4	
		716.025	0	
		716.026	0	

2 OPERATION

Z 513 und Z 513 K				
Rotor-number	Bucket	Adapter	Radius-correction	Comment
Swing out rotor; 4 Place, R-max.:23,4 cm				
220.41 V04		617.005		
		45.5029		
		717.005		
		45.5030		
		717.010		
Angle rotor; 6 x 85 ml, R-max.: 10,5 cm				
220.78 V02 / V03		707.000	0	
		707.001	0,7	
		707.002	0,7	
		707.003	0,3	
		707.004	0,5	
		707.003+	0,3	
		708.001	0,5	
		707.003+	0,3	
		708.000	0,8	
Angle rotor; 8 x 50 ml, R-max.: 9,5 cm				
220.80 V02 / V03		708.000	0,5	
		708..004	0,4	
		708.003	0,6	
		708.002	0,2	
		708.001	0,2	

2.2.7 Pre-selection of brake intensity and acceleration

With the potentiometer (13) (see photo 12) you can choose different brake levels from 0 to 9. With the level 0 the unit accelerates and brakes slowly and gently. With the level 9 the unit accelerates and brakes fast.



Photo 12

13

2 OPERATION

Acceleration- and deceleration times Z 513 and Z 513 K (120 V / 230 V) in seconds

Rotor - Number	Acceleration values	Deceleration values	
		Brake level 0	Brake level 9
220.70 V06	88	744	85
220.70 V05	36	313	47
220.41 V04	20	79	20
220.78 V02/V04	78	247	34
220.80 V02/V04	48	192	33
221.11 V01	48	436	44

2.2.8 Pre-selection of temperature and pre-cooling

The requested sample temperature can be pre-selected in 1°C increments in a range from -20°C to +40°C. (see photo 13)

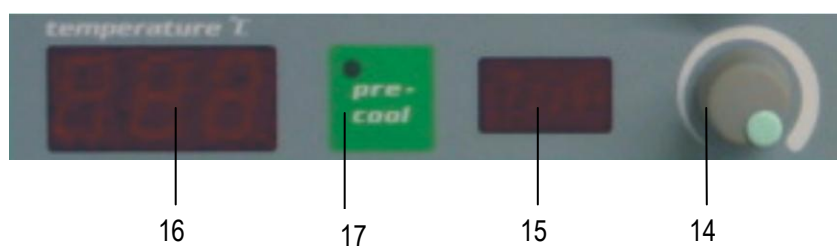


Photo 13

Pre-selection of temperature:

The temperature can be pre-selected with the potentiometer (14).

The pre-selected temperature is indicated in °C in the nominal value display (15).

During the run the actual test temperature is indicated in the actual value display (16).

2 OPERATION

Lowest temperatures Z 513 K (120 V / 230 V)

Rotor Number	at max. Speed
220.70 V06	+14°C
220.70 V05	+4°C
220.41 V04	-22°C
220.78 V02/V04	-6°C
220.80 V02/V04	-8°C
221.11 V01	+9°C

Air temperatur: 23°C

The absolute end temperatures know due to be subject to fluctuations of ± 2 degrees C of performance tolerances of the cooling circuit.

The deepest test temperatures are dependent on the room temperature. If the room temperature rises, then the deepest test temperature to be reached also rises.

Pre-cooling:

In order to avoid considerable temperature deviations at the beginning of a run, you should pre-cool the centrifuge together with the rotor, the buckets, etc.

For pre-cooling, please proceed as follows:

- Insert rotor, buckets and adapters correctly (see chapter 2.1).
- Pre-set the requested temperature and close the lid of the centrifuge.
- By pressing the key „precool“ (17) (see photo 13) the centrifuge starts. The unit spins up to 20 % of the adjusted speed in order to shorten the pre-cooling process. Within 10-15 minutes the centrifuge should reach the pre-selected temperature. Now you can insert the samples and start your actual run.

2.2.9 Keyboard – Starting the centrifuge – "QUICK"-key



- 1 **Key "QUICK"**: For short spins
Centrifuge is running as long as you hold the key.
- 2 **Key "LID"**: To open the lid of the centrifuge.
Control lamp indicates the correctly closed lid.
- 3 **Key "START"**: To start the pre-set run of the centrifuge.
- 4 **Key "STOP"**: To stop the centrifuge before the pre-set operating time has expired or to stop the centrifuge at continuous run.

Photo 14

Starting the centrifuge

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. As soon as the control lamp at the key "LID" is flashing, the centrifuge run can be started. Therefore press key "START".

ATTENTION: The rotor has to be checked and / or tightened previous to each run!

"QUICK" –Key – Short runs

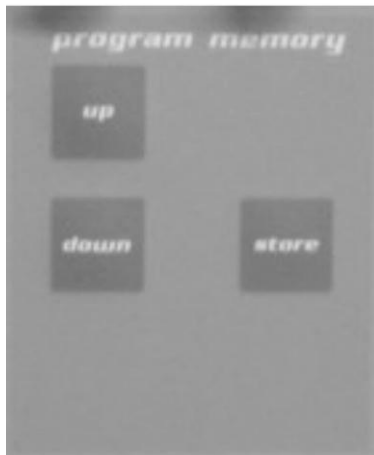
For short centrifuge runs you can start the run with key "QUICK". Press the key "QUICK". The centrifuge starts and runs as long as you hold the key "QUICK". The running time is shown in the display "TIME" in seconds.

"STOP" -Key

Press the key „STOP“, to break off the centrifuge run.

The unit decelerates then with the adjusted brake intensity. The brake intensity can also be changed during the deceleration.

2.2.10 Storage of programs



1 Key „up“: to call up and count forward the storage numbers

2 Key „store“: to store and leave the program mode

3 Key „down“: to call up and count backwards the storage numbers

Photo 15

Storage of runs:

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. Pre-select the desired run parameters, as i.e. speed and running time.

Press the key „START“

As soon as the actual speed display indicates more than 200 rpm the run can be stored.

Press the key „UP“ or „DOWN“. The storage number is indicated with the numbers 0 to 9 in the actual value speed display.

Press the key „UP“ or „DOWN“ that long until the desired storage number is indicated and then press the key „STORE“.

Now the actual speed display indicates on the right side the rotor type of the indicated program. (see photo 16)

If the display indicates the rotor type 0, this storage number is free.

To store the run press the key „STORE“ and hold on for **3 seconds**. The actual value display flashes as long as the storage lasted.

Recall of stored programs:

Press the key „UP“ or „DOWN“. The actual value display indicated on the left side the program number and on the right side the rotor number.



Photo 16

Select with the key „UP“ or „DOWN“ the desired and stored program number.

The display indicates a rotor number. Place this rotor in the centrifuge. (see. point 2.1). Close the lid of the unit and press the key „start“.

The centrifuge is in the program mode.

You can stop the run at any time by pressing the key „Stop“.

While running in the program mode the potentiometers are out of function.

2 OPERATION

Leave the program mode:

The centrifuge is in the program mode and indicates the program number as well as the rotor number on the actual value display. Open the lid and press the key „STORE“ for 3 seconds. If the program number and the rotor number have disappeared, the centrifuge can be operated as usual.

Overwrite of a program:

Insert a correctly and fully loaded rotor and tighten it to the motor shaft. Close the lid of the centrifuge. Pre-select the desired run parameters, as i.e. speed and running time.

Press the key „START“

As soon as the actual speed display indicates more than 200 rpm the run can be stored.

Press the key „UP“ or „DOWN“. The storage number is indicated with the numbers 0 to 9 in the actual speed display.

Press the key „UP“ or „DOWN“ that long until the desired storage number is indicated and then press the key „STORE“.

Now the actual speed display indicates on the right side the **new** rotor type of the indicated program. (see photo 16)

If the display indicates the rotor type 0, this storage number is free.

To store the run press the key „STORE“ and hold on for **3 seconds**. The actual value display flashes as long as the storage lasted.

You can not erase a program but just overwrite.

2.3 Thermal behaviour

2.3.1 Temperature adjustment

The temperature adjustment with sensor, refrigeration system and processor control is designed that way, that the set temperature is reached within the shortest time possible. During this adjustment period it is possible, that the temperature varies above or below the set temperature (see figure 17).

These variations depend on rotor, temperature and speed.

In case you want to process samples which are very temperature sensitive, you have to pre-cool the rotor, buckets and tube racks to the requested temperature (see chapter 2.2.8).

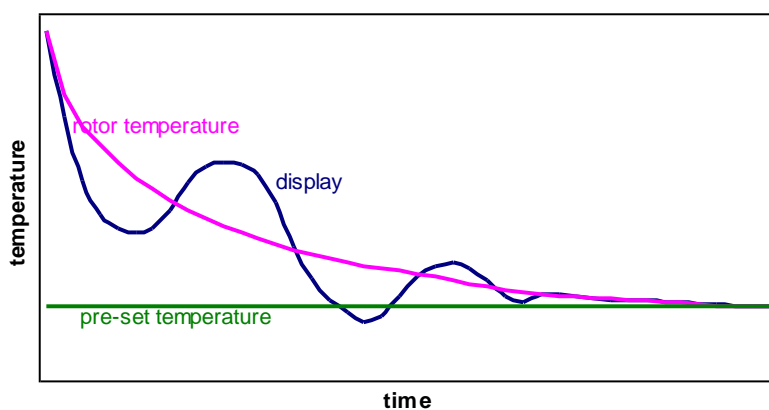


Photo 17

2.4 Safety features

2.4.1 Imbalance detection

In case of the rotor not being equally loaded (see chapter 2.1.1), the drive will turn off during acceleration. The rotor decelerates to stand still. The actual "SPEED" display indicates "ERROR".

When error message "1" appears in the actual "SPEED" display, the weight difference of the samples is too huge. Weigh out the samples exactly.
Load the rotor as described in chapter 2.1.1.

When error message "2" appears in the actual "SPEED" display, there could be following reasons:

- The imbalance switch is not correctly adjusted.
- The imbalance switch is defective.

3.1 Service and maintenance

3.1.1 Maintenance and cleaning

Maintenance:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

Vaseline, available in nearly each store, is the most suitable lubricant. The Vaseline must be free of resin and acids. Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminium parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance:

- Alkalies
- Alkaline soap solutions
- Alkaline amines
- Concentrated acids
- Solutions containing heavy metals
- Water-free chlorinated solvents
- Saline solutions, e.g. salt water

Cleaning:

Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.

In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.

After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. temperature + 50°C).

It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.

Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.

The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week.

3 MAINTENANCE

3.1.2 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor.

If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

3.1.3 Disinfection

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C, except rotor 220.58 V08, which must not be autoclaved.

The rotor and rotor chamber should be cleaned with a universal, neutral disinfection agent, e.g. on formalin base. A disinfection spray is most suitable in order to easily reach all difficult to access spots.

ATTENTION:

Before applying any other cleaning resp. decontamination method than recommended by the manufacturer, contact the manufacturer to ensure yourself, you would not damage the unit or the rotor by applying the designated method!

4 TROUBLE SHOOTING

4.1 Error messages: cause / solution

Preface:

The error messages are listed to help localize possible errors faster.

The diagnose referred to in this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this instruction manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows:

- Switch the centrifuge off and unplug the power cord.
- At the left side of the centrifuge housing find to be a plastic stopper.
- Remove this plastic stopper.
Behind this stopper there is a hexagon nut.
- Take the delivered box spanner , put him into the hole and lock the box spanner with the hexagon nut.
- Now turn the box spanner to the left side up to the limit.
ATTENTION: Just turn to the limit, don't tighten the nut.
- Now open the lid of the centrifuge.
- Turn the hexagon nut back to the start position up to the limit.
- Switch the centrifuge on again, for go on working.



Photo 18

4 TROUBLE SHOOTING

4.2.2 Description of the error message system

The error message is shown in the "SPEED" display through particular figures (see photo 19).

There is a distinction between two different kinds of errors.

The digits in the "SPEED" display have the following meaning:

- **Error No. 1 – 49 (forced stop)**

In case of one of these errors occurring, the rotor decelerates from pre-set speed down to 0. As soon as the rotor stops, the error message can be reset by opening and closing the lid of the centrifuge.

- **Error No. 50 – 99 (emergency stop)**

In case one of these errors occurring, the frequency converter switches off. This means, the rotor stops without applying the brakes. To reset the error message you have to switch off the unit and turn it on again (power switch).

In case the unit stops due to an error indication, you should restart the unit to check whether the error occurs again.

The error message figures not listed in this chapter are currently not in use. They are reserved for future use in completing the error message recognition program.

Example: figures are flashing



Photo 19

4.2.3 Error messages

Error No. 1: Imbalance

- Cause: Incorrect loading of the rotor (see chapter 2.2.1)
- Solution: Balance your samples
- Cause: Incorrect adjustment of the imbalance sensor
- Solution: Imbalance sensor has to be re-adjusted (call service department)

Error No. 2: Permanent imbalance signal

- Cause: Incorrect position of the imbalance sensor
- Solution: Imbalance sensor has to be readjusted (call service department)
- Cause: Imbalance sensor is defective
- Solution: Imbalance sensor has to be replaced (call service department)

4 TROUBLE SHOOTING

Error No. 11 Temperature sensor

- Cause: Heating system failure
- Solution: Call service department
- Cause: Temperature sensor is defective
- Solution: Call service department. Temperature sensor has to be changed.

Error No. 25: Power failure

- Cause: Power failure while rotor was in motion
- Solution: Open and close the lid of the centrifuge, restart the unit; check contact of plug in (loose contact)

Error No. 36: Relay of the frequency converter cannot be released / lid cannot be opened

- Cause: Power board malfunction
- Solution: Call service department
- Cause: Lid of the centrifuge is jammed
- Solution: Open the lid of the centrifuge manually when rotor is at stand still. Grease the lid lock slightly. In case this error occurs again, call service department; check coil of lid lock
- Cause: Lid lock is defective
- Solution: Call service department, replace lid lock

Error No. 50 / 51: Memory failure

- Cause: Internal or external memory failure
- Solution: Restart the unit. In case this error occurs again, call service department; replace control panel

Error No. 55: Over speed

- Cause: Speed sensor is defective
- Solution: Restart the unit. In case this error occurs again, call service department. possibly loose speed magnet, fix with super glue

Error No. 60: Engine speed sensor signal is missing

- Cause: Speed sensor is defective or cable breakage at speed sensor, possibly lose magnet
- Solution: Call service department; check speed magnet, fix with super glue

Error No. 70: Converter interface

- Cause: Communication of regulator, power board, interface cable and converter failed.
- Solution: Call service department

4 TROUBLE SHOOTING

Error No. 82: Cut off power board – frequency converter

- Cause: Over current or under voltage due to power supply fluctuations
- Solution: Restart the unit, take care the power supply is stable

Error No. 83: Preset speed cannot be reached

- Cause: Preset speed cannot be reached
- Solution: Call service department

Error No. 84: Over temperature frequency converter

- Cause: Frequency converter cut off due to over temperature
- Solution: Take care, there is enough space around the centrifuge for heat dissipation

Error No. 85: Over temperature motor

- Cause: Temperature protection switch of motor turns off
- Solution: Take care, there is enough space around the centrifuge for heat dissipation.
Motor mounting is defective, replace motor

Fehler Nr. 87: Converter Release

- Cause: Converter don't drive the motor.
- Solution: Check cable, internal conduction error
Check configuration of the control panel
Converter is defective. Call service department

Error No. 90: Emergency switch off lid lock

- Cause: The lid of the centrifuge has been opened while centrifuge was running
- Solution: Close the lid of the centrifuge. DANGER OF ACCIDENT!
- Cause: Control switch of lid lock is defective
- Solution: Call service department

Error No. 94: Voltage drop during the run

- Cause: The voltage supply drops under the limit for a little time
- Solution: Wait until the stand still of the rotor.
If the green control lamp „LID“ flashes open the lid of the centrifuge.
Restart the centrifuge.

5 RECEIPT OF CENTRIFUGES TO REPAIR AND DISPOSAL

5.1 Receipt of centrifuges to repair

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:
The centrifuge **must** be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.

Thank you for your cooperation!

Enclosure: Retraction form (see page 32)

5.2 Disposal

Please take care that you comply to the respective legal regulations when you dispose of the unit. According to the directive 2002/96/EG (WEEE) all units delivered after the 13.08.2005 must not be disposed of with the domestic waste. This unit belongs to group 8 (Medical Units) and is ranged in the Business-to-Business-Field.



This symbol of the crossed out garbage bin points out that the unit must not be disposed of with the domestic waste.

Please also note that the disposal regulations may be different in the particular EU-Countries.

Should occur any questions about this matter please contact your distributor.

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Please fill out in block capitals:

Surname; last name: _____

Organization/company: _____

Street: _____

ZIP CODE: _____ **place:** _____

Telephone: _____ **fax:** _____

E-mail: _____

Pos.	Crowd	Decontaminated object	Serial number	Description/comment
1				
2				
3				
4				

Are these the parts listed above in touch come with the following substances?

Health endangering watery solutions, buffers, acids, alkalis; ☐ Yes ☐ No

Potentially infectious agents; ☐ Yes ☐ No

Organic reagents and solvent; ☐ Yes ☐ No

Radioactive substances; ☐ α .. ☐ β .. ☐ γ .. ☐ Yes ☐ No

Health endangering proteins; ☐ Yes ☐ No

DNA; ☐ Yes ☐ No

These substances have reached the equipment/assembly? ☐ Yes ☐ No

Which one if yes:

Description of the measures for the decontamination of the listed parts:

I confirm the proper decontamination:

Company / dept.: _____ place and date: _____

Signature of the authorized person: _____



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LIMITED WARRANTY

Labnet International, Inc. warrants that this product will be free from defects in material and workmanship for a period of two (2) years from date of purchase. This warranty is valid only if the product is used for its intended purpose and within the guidelines specified in the supplied instruction manual.

Should this product require service, contact Labnet International, Inc.'s Service department at 732-417-0700 to receive a return authorization number and shipping instructions. Products received without proper authorization will be returned. All items returned for service should be sent postage prepaid in the original packaging or other suitable carton, padded to avoid damage. Labnet International, Inc. will not be responsible for damage incurred by improper packaging. Labnet International, Inc. may elect for onsite service for larger equipment.

This warranty does not cover damage caused by accident, neglect, misuse, improper service, natural forces or other causes not arising from defects in original material or workmanship. This warranty does not cover motor brushes, fuses, light bulbs, batteries or damage to paint or finish. Claims for transit damage should be filed with the transportation carrier.

ALL WARRANTIES INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION OF 24 MONTHS FROM THE ORIGINAL DATE OF PURCHASE.

LABNET INTERNATIONAL, INC.'S SOLE OBLIGATION UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT, AT LABNET INTERNATIONAL, INC. DISCRETION, OF A DEFECTIVE PRODUCT. LABNET INTERNATIONAL, INC. IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE, COMMERCIAL LOSS OR ANY OTHER DAMAGES RESULTING FROM THE USE OF THIS PRODUCT.

Some states do not allow limitation on the length of implied warranties or the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights. You may have other rights which vary from state to state.

No individual may accept for, or on behalf of Labnet International, Inc., any other obligation of liability, or extend the period of this warranty.

Mail Warranty Registration to :

or

Register online at

**Labnet International, Inc.
31 Mayfield Ave.
Edison, NJ 08837**

www.labnetinternational.com

✂ cut along the dotted line

To validate the warranty, complete and return this card within 10 days.

Model _____

Serial No. _____ Date Tested _____

Date Rec'd _____ PO# _____

Name/Title _____

Phone _____

Institution _____

Address _____

City _____ State _____ Zip/Postal Code _____ Country _____

Purchased from (distributor) _____

How would you rate the quality of this product? ☐ Excellent ☐ Good ☐ Fair ☐ Poor

What feature(s) on this product made you purchase it? _____

What feature(s) would you change to improve the performance of this product? _____



**31 Mayfield Avenue. Edison.NJ.08837
(p) 732.417.0700 (f) 732.417.1750**

Rotor Guide

Includes:

Part No.

Picture

Angle°

Capacity

Specifications

Adapters

Z233MK-2

Z216MK

Z206

Z300-K

Z323-K

Z326-K

Z383-K

Z400-K

Z366

Z36HK

Z306



Rotors

Part No.:

C0200-95

Angle rotor: 18 x 1.5/2.0mL
Angle: 45°

temp at max speed: -6°C



Part No.:

C0230-2A(H)

Angle rotor: 24 x 1.5/2.0mL
Angle: 40°

temp at max speed: -3°C



Part No.:

C0230-9A

Angle rotor: 44 x 1.5/2.0mL
Angle: 40°

temp at max speed: 3°C



Part No.:

C0230-43A

Angle rotor: 64 x 0.5mL
Angle: 40°

temp at max speed: 3°C



Part No.:

C0230-55A

Angle rotor: 24 x 1.5/2.0mL, 24 x 0.5mL
Angle: 40°

temp at max speed: 3°C



Part No.:

C0230-58

(hematocrit)

Angle rotor: 64 x 0.5mL
Angle: 40°



Specifications/Adapters

acceleration in sec: 9/30
deceleration in sec: 11/18
max speed: 14,000 rpm
RCF-value: 15,894 x g
max radius: 7.3 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling, pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 15/26
deceleration in sec: 15/28
max speed: 15,000 rpm
RCF-value: 21,380 x g
max radius: 8.5 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling, pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 17/25
deceleration in sec: 19/34
max speed: 14,000 rpm
RCF-value: 15,558/19,068 x g
max radius: 7.1/8.7 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling, pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 17/25
deceleration in sec: 19/34
max speed: 14,000 rpm
RCF-value: 15,339/17,968 x g
max radius: 7.0/8.2 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling, pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 17/25
deceleration in sec: 19/34
max speed: 14,000 rpm
RCF-value: 18,400 x g
max radius: 8.4 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling, pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 24
deceleration in sec: 32
max speed: 12,000 rpm
RCF-value: 14,811 x g
max radius: 9.2

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling, pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

Rotors

Part No.:

C0230-HLA-RA

Angle rotor: 12 x 1.5/1.0mL microcytometry tubes
Angle: 0 - 90°



Specifications/Adapters

acceleration in sec: N/A
deceleration in sec: N/A
max speed: 10,500 rpm
RCF-value: 9,614 x g
max radius: N/A

swing-out

Rotors

Part No.: C0216-24/H



Angle rotor: 24 x 1.5/2.0mL
Angle: 45°

Part No.: C0216-30H



Angle rotor: 30 x 1.5/2.0mL
Angle: 45°

Part No.: C0216-44



Angle rotor: 44 x 1.5/2.0mL
Angle: 40°

Part No.: C0216-48



Angle rotor: 24 x 1.5/2.0mL, 24 x 0.5mL
Angle: 40°

Part No.: C0216-64



Angle rotor: 64 x 0.5mL
Angle: 40°

Specifications/Adapters

acceleration in sec: 20/150
deceleration in sec: 17/210
max speed: 15,000 rpm
RCF-value: 21,380 x g
max radius: 8.5 cm

Part No.	Tube Racks	Ø (mm)
C1205	0.5/0.6mL, pk/6	8.0
C1206	0.4/0.25mL, pk/6	6.0
C1222	0.2mL thermal cycling, pk/6	6.0
no adapter	1.5/2.0mL	

C0216-24H - Aerosol tight rotor



acceleration in sec: 27/230
deceleration in sec: 24/180
max speed: 13,500 rpm
RCF-value: 19,153 x g
max radius: 9.4 cm

Part No.	Tube Racks	Ø (mm)
C1205	0.5/0.6mL, pk/6	8.0
C1206	0.4/0.25mL, pk/6	6.0
C1222	0.2mL thermal cycling, pk/6	6.0
no adapter	1.5/2.0mL	11.0

acceleration in sec: 17/140
deceleration in sec: 17/140
max speed: 13,500 rpm
RCF-value: 14,670/17,625 x g
max radius: 7.1/8.7 cm

Part No.	Tube Racks	Ø (mm)
C1205	0.5/0.6mL, pk/6	8.0
C1206	0.4/0.25mL, pk/6	6.0
C1222	0.2mL thermal cycling, pk/6	6.0
no adapter	1.5/2.0mL	11.0

acceleration in sec: 15
deceleration in sec: 15
max speed: 13,500 rpm
RCF-value: 17,720 x g
max radius: 8.7 cm
*only fit in 1.5/2.0mL slot

Part No.	Tube Racks	Ø (mm)
C1205*	0.5/0.6mL, pk/6	8.0
C1206*	0.4/0.25mL, pk/6	6.0
C1222*	0.2mL thermal cycling, pk/6	6.0
no adapter	1.5/2.0mL	11.0

acceleration in sec: 19/150
deceleration in sec: 19/150
max speed: 13,500 rpm
RCF-value: 16,708/14,263 x g
max radius: 8.2/7.0 cm

Part No.	Tube Racks	Ø (mm)
C1205	0.5/0.6mL, pk/6	8.0
C1206	0.4/0.25mL, pk/6	6.0
C1222	0.2mL thermal cycling, pk/6	6.0
no adapter	1.5/2.0mL	11.0

Accessories Z206A

fixed angle

Rotors

Part No.:

C0200-96



Angle rotor: 12 x 15mL
Angle: 28°

Part No.:

C0200-97



Angle rotor: 6 x 50mL
Angle: 28°

Part No.:

C0200-1



Angle rotor: 18 x 1.5mL
Angle: 45°

Specifications/Adapters

acceleration in sec: 40/70 deceleration in sec: 35/150 max speed: 6,000 rpm RCF-value: 4,180 x g max radius: 10.4 cm	Part No. C0200-17A no adapter no adapter	Tube Racks comb. adapter for 5, 7 and 10mL, pk/6 12 x 15mL, conical 12 x 15mL, round	Ø (mm) 13.0 17.0 17.0	Length (min/max) 70/95, 95/115 120 105/125
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acceleration in sec: 35/60 deceleration in sec: 35/150 max speed: 6,000 rpm RCF-value: 3,820 x g max radius: 9.5 cm	Part No. C0232-8B C0232-9B no adapter	Tube Racks 15mL, conical/round, pk/6 5, 7mL, pk/6 6 x 50mL	Ø (mm) 17.0 30.0	Length (min/max) 120, 105/125 115
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acceleration in sec: 11/60 deceleration in sec: 10/30 max speed: 6,000rpm RCF-value: 2,930 x g max radius: 7.3 cm	Part No. C1205 C1206 C1222 no adapter	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling pk/6 18 x 1.5mL	Ø (mm) 8.0 6.0 6.0 11.0
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swing-out

Rotors

Part No.:

C0200-18



Angle rotor: 6 x 5mL
Angle: 0° - 90°

Specifications/Adapters

acceleration in sec: 8/35 deceleration in sec: 7/25 max speed: 4,000 rpm RCF-value: 1,660 x g max radius: 10.4 cm	Part No. no adapter	Tube Racks 6 x 5mL	Ø (mm) 13.0	Length (min/max) 75
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Rotors

Part No.:
C0323-81



Angle rotor: 24 x 15mL
Angle: 32°

temp at max speed: -8°C

Part No.:
C0300-96



Angle rotor: 12 x 15mL
Angle: 28°

temp at max speed: -5°C

Part No.:
C0300-97



Angle rotor: 6 x 50mL
Angle: 38°

temp at max speed: -4°C

Part No.:
C0252-87
C0252-87H



(hermetically sealed)

Angle rotor: 24 X 1.5/2.0mL
Angle: 45°

temp at max speed: 0°C

Part No.:
C0252-55



Angle rotor: 24 x 1.5/2.0mL, 24 x 0.5mL
Angle: 40°

temp at max speed: N/A

Part No.:
C0252-9



Angle rotor: 44 x 1.5/2.0mL
Angle: 40°

temp at max speed: 4°C

Specifications/Adapters

acceleration in sec: 40/113 deceleration in sec: 35/111 max speed: 3,500 rpm RCF-value: 1,890/1,972 x g max radius: 13.8/14.4 cm	Part No. C0200-17A C0230-20	Tube Racks comb adapt for 5, 7 and 10mL, pk/2 1.5mL, pk/4	Ø (mm) 13.0 11.0	Length (min/max) 70/90, 95/115
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acceleration in sec: 27/100 deceleration in sec: 28/142 max speed: 6,000 rpm RCF-value: 4,185 x g max radius: 10.4 cm	Part No. C0200-17A C0200-05 C0230-30	Tube Racks comb adapt for 5, 7 and 10mL, pk/6 5/7mL vaccutainer tubes, pk/2 1.5mL, pk/4	Ø (mm) 13.0 13.0 11.0	Length (min/max) 70/95, 95/115 75
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acceleration in sec: 26/100 deceleration in sec: 27/142 max speed: 6,000 rpm RCF-value: 3,904 x g max radius: 9.7 cm	Part No. C0232-89 C0232-98 C0230-41	Tube Racks 15mL conical/round, pk/6 5/7mL, pk/6 cushion for C0232-98 (12 x 75mm), pk/12	Ø (mm) 17.0 13.0	Length (min/max) 120
	no adapter no adapter	50mL conical 50mL round	30.0 30.0	105/120 95/115

acceleration in sec: 23/77 deceleration in sec: 32/124 max speed: 13,500 rpm RCF-value: 17,320 x g max radius: 8.5 cm	Part No. C1205 C1206 C1222	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling, pk/6	Ø (mm) 8.0 6.0 6.0	
	no adapter	1.5/2.0mL	11.0	

acceleration in sec: N/A deceleration in sec: N/A max speed: 13,500 rpm RCF-value: 17,110 x g max radius: 8.4 cm *only fit in 1.5/2.0mL slot	Part No. C1205* C1206* C1222*	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling, pk/6	Ø (mm) 8.0 6.0 6.0	
	no adapter	1.5/2.0mL	11.0	

acceleration in sec: 23/37 deceleration in sec: 21/56 max speed: 13,500 rpm RCF-value: 14,467/17,523 x g max radius: 7.1/8.6 cm	Part No. C1205 C1206 C1222	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling, pk/6	Ø (mm) 8.0 6.0 6.0	
	no adapter	1.5/2.0mL	11.0	

Rotors

Part No.:

C0323-72



Angle rotor: 4 x 100mL

Angle: 0 - 90°

temp at max speed: -4°C

Part No.:

C0300-16



Angle rotor: 2 x 3 microplates

Angle: 0 - 90°

temp at max speed: -4°C

Part No.:

C0300-50



Angle rotor: 4 x 50mL

Angle: 0 - 90°

temp at max speed: -4°C

Part No.:

C0300-15



Angle rotor: 8 x 15mL

Angle: 0 - 90°

temp at max speed: 0°C

Part No.:

C0300-12



Angle rotor: 4 x 100mL

Angle: 0 - 90°

temp at max speed: -5°C

Specifications/Adapters

acceleration in sec: 32/126 deceleration in sec: 39/106 max speed: 4,000 rpm RCF-value: 2,540 x g max radius: 14.2 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0320-720	1 x 100mL, pk/2	40.0	90/108
	C0320-728	1 x 50mL conical, pk/2	29.0	116
	C0320-726*	2 x 15mL conical, pk/2	17.0	120
	C0326-722	1 x 15mL conical, pk/2	17.0	120
	C0320-724	4 x 10mL, pk/2	17.0	100/115
	C0320-730	4 x 5, 7mL, pk/2	12.5	64/115
	C0320-721	5 x 1.5/2.0mL, pk/2	11.0	42
	C0320-728	sealing lid		

*Sealing lid does not fit

acceleration in sec: 24/26 deceleration in sec: 33/58 max speed: 4,500 rpm RCF-value: 2,762 x g max radius: 12.2 cm	Part No.	Tube Racks	max loading height: 58mm max loading weight: 310g
	C0320-504	Tube rack, 48 x 1.5mL, pk/2	

*only accepts fully skirted plates

acceleration in sec: 19/56 deceleration in sec: 21/70 max speed: 4,000 rpm RCF-value: 2,540 x g max radius: 14.2 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0232-88	15mL conical/round, pk/6	17.0	120
	C0232-98	5,7mL, pk/6	13.0	75/120
	C0230-41	cushion for C0232-98 (12 x 75mm), pk/12		

acceleration in sec: 22/82 deceleration in sec: 25/69 max speed: 5,000 rpm RCF-value: 4,165 x g max radius: 14.9 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0200-17A	comb adapt for 5, 7 and 10mL, pk/6	13.0	70/90, 95/115
	C0230-20	1.5mL, pk/4		

acceleration in sec: 36/57 deceleration in sec: 44/71 max speed: 4,500 rpm RCF-value: 3,350 x g max radius: 14.8 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0300-120	1 x 100mL, pk/2	44.0	90/108
	C0300-122	1 x 50mL conical, pk/2	29.0	116
	C0300-123	2 x 15mL conical, pk/2	17.0	120
	C0300-124	7 x 10mL round, pk/2	17.0	90/108
	C0300-126	7 x 5, 7mL vacu, pk/2	13.0	75/100
	C0300-127	10 x 1.5mL, pk/2	11.0	42

Rotors

Part No.:

C0326-72C (with buckets)

C0326-72 (w/o buckets)



Angle rotor: 4 x 100mL
Angle: 0 - 90°

Carriers w/o buckets

Part No.:

C0326-12



Angle rotor: 4 x 100mL
Angle: 0 - 90°

Part No.:

C0036-16



Angle rotor: 2 x 3 microplates
Angle: 0 - 90°

Specifications/Adapters

acceleration in sec: 14/110
deceleration in sec: 17/170
max speed: 4,000 rpm
RCF-value: 2,486 x g
max radius: 13.9 cm

Part No.	Tube Racks	Ø (mm)	Length (min/max)
Inserts			
C0320-720	1 x 100mL, pk/2	40.0	90/108
C0320-728	1 x 50mL conical, pk/2	29.0	116
C0320-726*	2 x 15mL conical, pk/2	17.0	120
C0326-722	1 x 15mL conical, pk/2	17.0	120
C0320-724	4 x 10mL, pk/2	17.0	90/108
C0320-730	4 x 5, 7mL, pk/2	13.0	75/100
C0320-721	5 x 1.5mL, pk/2	11.0	42
C0320-728	sealing lid		
carriers			
C0326-72A**	3 x 15mL, pk/2	17.0	120
C0326-72B**	2 x 50mL, pk/2	29.0	116

*sealing lid does not fit
**For use without buckets

acceleration in sec: 14/110
deceleration in sec: 19/260
max speed: 4,500 rpm
RCF-value: 3,350 x g
max radius: 14.8 cm

Part No.	Tube Racks	Ø (mm)	Length (min/max)
C0300-120	1 x 100mL, pk/2	44.0	90/108
C0300-122	1 x 50mL conical, pk/2	29.0	116
C0300-123	1 x 15mL conical, pk/2	17.0	120
C0300-124	7 x 10mL round, pk/2	17.0	90/108
C0300-126	7 x 5, 7mL vacu, pk/2	13.0	75/100
C0300-127	10 x 1.5mL, pk/2	11.0	42

acceleration in sec: 25/230
deceleration in sec: 28/490
max speed: 4,500 rpm
RCF-value: 2,740 x g
max radius: 12.1 cm

Part No.	Tube Racks	max loading height: 58 mm
C0320-904	48 x 1.5mL, pk/2	max loading weight: 310 g

*only accepts fully skirted plates

Rotors

Part No.:

C0036-19

Angle rotor: 30 x 15mL
Angle: 35°



Part No.:

C0326-96

Angle rotor: 12 x 15mL
Angle: 28°



Part No.:

C0326-97

Angle rotor: 6 x 50mL
Angle: 28°



Part No.:

C0036-17

Angle rotor: 30 x 1.5/2.0mL
Angle: 60°



Part No.:

C0326-24

C0326-24H

(hermetically sealed)

Angle rotor: 24 x 1.5/2.0mL
Angle: 40°



Specifications/Adapters

acceleration in sec: 15/157 deceleration in sec: 20/590 max speed: 4,500 rpm RCF-value: 2,830 x g max radius: 10.9/12.5 cm	Part No. C0200-10 C0200-17A	Tube Racks 10 mL round, pk/2 comb adapt for 5, 7 and 10mL, pk/6	Ø (mm) 17.0 13.0	Length (min/max) 95/115 70/90, 95/115
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acceleration in sec: 13/105 deceleration in sec: 13/300 max speed: 6,000 rpm RCF-value: 4,180 x g max radius: 10.4 cm	Part No. C0200-17A C0230-20 C0200-03 no adapter no adapter	Tube Racks comb adapt for 5, 7 and 10mL, pk/6 1.5mL, pk/4 5/7mL vacu, pk/2 15mL conical 15mL round	Ø (mm) 13.0 11.0 13.0 17.0 17.0	Length (min/max) 70/90, 95/115 75 120 105/125
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acceleration in sec: 13/105 deceleration in sec: 13/300 max speed: 6,000 rpm RCF-value: 3,820 x g max radius: 9.5 cm	Part No. C0232-88 C0232-98 C0230-41 no adapter	Tube Racks 15mL conical/round, pk/6 5/7mL, pk/6 cushion for C0232-98 (12 x 75mm), pk/12 50mL conical	Ø (mm) 17.0 130 30.0	Length (min/max) 120 75/120 120
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acceleration in sec: 27/250 deceleration in sec: 34/450 max speed: 12,000 rpm RCF-value: 15,133 x g max radius: 9.4 cm	Part No. C1205 C1206 C1222 no adapter	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling, pk/6 1.5/2.0mL	Ø (mm) 8.0 6.0 6.0 11.0
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acceleration in sec: 22/200 deceleration in sec: 35/290 acceleration in sec: 25/200 deceleration in sec: 35/340 max speed: 13,500 rpm RCF-value: 17,319 x g max radius: 8.5 cm	Part No. C1205 C1206 C1222 no adapter	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling, pk/6 1.5/2.0mL	Ø (mm) 8.0 6.0 6.0 11.0
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Rotors

Part No.:
C0036-755C



Angle rotor: 4 x 250mL
Angle: 0 - 90°

temperature at max: -20°C

Part No.:
C0036-165C



Angle rotor: 2 x 3 microplates
Angle: 0 - 90°

temperature at max: -15°C

Specifications/Adapters

acceleration in sec: 20/185	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec: 25/300	C0036-75A	7 x 15mL, conical, pk/2	17.0	95/120
max speed: 4,000 rpm	C0036-75B	3 x 50mL, round, pk/2	29.0	95/120
RCF-value: 2,990 x g	C0036-75C	3 x 50mL, conical, pk/2	29.0	120
max radius: 16.7 cm	C0036-75E	8 x 10mL, pk/2	16.0	80/100
	C0036-75G	10 x 5/7mL, pk/2	13.0	75/120
	C0036-75D	1 x 250mL, pk/2	62.0	110/130
	C0036-75UD	sealing lid		

acceleration in sec: 20/180	Part No.	Tube Racks	max loading height: 58 mm
deceleration in sec: 25/390	C0320-504	48 x 1.5mL, pk/2	max loading weight: 310 g
max speed: 4,500 rpm			
RCF-value: 2,720 x g			
max radius: 12.0 cm			

*only accepts fully skirted plates

Rotors

Part No.:

C0036-175C

Angle rotor: 30 x 1.5/2.0mL
Angle: 45°



temperature at max: 79°C

Part No.:

C0036-225C

Angle rotor: 6 x 50mL round
Angle: 26°



temperature at max: 6°C

Part No.:

C0036-215C

Angle rotor: 6 x 250mL
Angle: 28°



temperature at max: 1°C

Part No.:

C0036-285C

Angle rotor: 20 x 10mL
Angle: 30°



temperature at max: 0°C

Part No.:

C0036-235C

Angle rotor: 12 x 1.5/2.0mL
Angle: 40°



temperature at max: 4°C

Part No.:

C0036-195C

Angle rotor: 30 x 15mL
Angle: 35°



temperature at max: -20°C

Part No.:

C0036-185C

Angle rotor: 6 x 85mL
Angle: 30°



temperature at max: -10°C

Part No.:

C0036-205C

Angle rotor: 4 x 85mL
Angle: 30°



temperature at max: 15°C

Specifications/Adapters

acceleration in sec: 55/510
deceleration in sec: 55/340
max speed: 20,000 rpm
RCF-value: 42,030 x g
max radius: 9.4 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling,
pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 50/440
deceleration in sec: 50/520
max speed: 21,000 rpm
RCF-value: 41,410 x g
max radius: 8.4 cm

Part No.

C0360-91C

C0360-91A

C0360-91D

C0232-8B

no adapter

Tube Racks

30mL, pk/2

16mL, pk/2

15mL, pk/2

15mL conical, pk/2

50mL

Ø (mm)

30.0

18.0

17.0

17.0

30.0

Length (min/max)

92/95

100/105

100/105

116/125

95/115

acceleration in sec: 70/570
deceleration in sec: 85/520
max speed: 10,000 rpm
RCF-value: 15,650 x g
max radius: 14.0 cm

Part No.

C0036-21A

C0036-21B

C0036-21C

C0036-21D

C0036-21E

C0036-21F

no adapter

Tube Racks

4 x 15mL conical, pk/2

50mL round, pk/2

50mL conical, pk/2

2 x 30mL round, pk/2

5 x 10mL round, pk/2

8 x 1.5mL, pk/2

250mL

Ø (mm)

17.0

29.0

29.0

26.0

16.0

11.0

62.0

Length (min/max)

120

103

118

92

80

40

122

acceleration in sec: 40/400
deceleration in sec: 40/630
max speed: 16,000 rpm
RCF-value: 38,040 x g
max radius: 9.8 cm

Part No.

no adapter

Tube Racks

1 x 10mL

Ø (mm)

16.0

Length (min/max)

80

acceleration in sec: 30/300
deceleration in sec: 45/230
max speed: 30,000 rpm
RCF-value: 85,390 x g
max radius: 6.5 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling,
pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 15/110
deceleration in sec: 20/450
max speed: 4,500 rpm
RCF-value: 2,830 x g
max radius: 12.5 cm

Part No.

C0200-10

C0200-17A

Tube Racks

10/15mL round, pk/2

comb adapt for 5, 7
and 10mL, pk/6

Ø (mm)

17.0

13.0

Length (min/max)

95/115

70/90, 95/115

acceleration in sec: 60/500
deceleration in sec: 70/1,080
max speed: 12,000 rpm
RCF-value: 18,510 x g
max radius: 11.5 cm

Part No.

C0360-94C

C0360-94D

C0360-94A

C0360-94D

C0360-94X

no adapter

Tube Racks

15mL, pk/2

30mL, pk/2

50mL, pk/2

50mL conical, pk/2

15mL conical, pk/2

85mL

Ø (mm)

17.0

25.0

29.0

29.0

17.0

38.0

Length (min/max)

103/110

90/103

105

118

120

113

acceleration in sec: 42/400
deceleration in sec: 52/800
max speed: 20,000 rpm
RCF-value: 41,140 x g
max radius: 9.2 cm

Part No.

C0360-94C

C0360-94B

C0360-94A

C0360-94D

C0360-94X

no adapter

Tube Racks

15mL, pk/2

30mL, pk/2

50mL, pk/2

50mL conical, pk/2*

15mL conical, pk/2*

85mL

Ø (mm)

17.0

25.0

29.0

29.0

17.0

38.0

Length (min/max)

103/110

90/103

105

118

120

113

*rotor lid does not fit

Rotors

Part No.:
C0036-75



Angle rotor: 4 x 250mL
Angle: 0 - 90°

Part No.:
C0036-16



Angle rotor: 2 x 3 microplates
Angle: 0 - 90°

Specifications/Adapters

acceleration in sec: 20/185	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec: 25/300	C0036-75A	7 x 15mL conical, pk/2	17.0	95/120
max speed: 4,500 rpm	C0036-75B	3 x 50mL round, pk/2	29.0	95/120
RCF-value: 3,780 x g	C0036-75C	3 x 50mL conical, pk/2	29.0	120
max radius: 16.7 cm	C0036-21E	8 x 10mL, pk/2	16.0	80/100
	C0036-21G	10 x 5, 7mL, pk/2	13.0	75/120
	C0036-75D	1 x 250mL, pk/2	62.0	110/130
	C0036-75UD	sealing lid		

acceleration in sec: 20/180	Part No.	Tube Racks	max loading height: 58 mm
deceleration in sec: 25/390	C0320-504	48 x 1.5mL, pk/2	max loading weight: 310 g
max speed: 4,500 rpm			
RCF-value: 2,720 x g			
max radius: 12.0 cm			

*only accepts fully skirted plates

Rotors

Part No.:

C0036-17

Angle rotor: 30 x 1.5/2.0mL
Angle: 45°



Part No.:

C0036-22

Angle rotor: 6 x 50mL round
Angle: 26°



Part No.:

C0036-21

Angle rotor: 6 x 250mL
Angle: 26°



Part No.:

C0036-28

Angle rotor: 20 x 10mL
Angle: 30°



Part No.:

C0036-23

Angle rotor: 12 x 1.5/2.0mL
Angle: 40°



Part No.:

C0036-19

Angle rotor: 30 x 15mL
Angle: 35°



Part No.:

C0036-18

Angle rotor: 6 x 85mL
Angle: 38°



Part No.:

C0036-20

Angle rotor: 4 x 85mL
Angle: 30°



Specifications/Adapters

acceleration in sec: 55/510
deceleration in sec: 55/340
max speed: 15,000 rpm
RCF-value: 23,645 x g
max radius: 9.4 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling,

pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 50/440
deceleration in sec: 50/520
max speed: 13,000 rpm
RCF-value: 15,671 x g
max radius: 8.4 cm

Part No.

C0360-91C

C0360-91A

C0360-91D

C0232-8B

no adapter

Tube Racks

30mL, pk/2

16mL, pk/2

15mL, pk/2

15mL conical, pk/2

50mL

Ø (mm)

30.0

18.0

17.0

17.5

30.0

Length (min/max)

92/95

100/105

100/105

116/125

95/115

acceleration in sec: 70/570
deceleration in sec: 85/520
max speed: 8,000 rpm
RCF-value: 10,017 x g
max radius: 14.0 cm

Part No.

C0036-21A

C0036-21B

C0036-21C

C0036-21D

C0036-21E

C0036-21F

no adapter

Tube Racks

4 x 15mL conical, pk/2

50mL round, pk/2

50mL conical, pk/2

2 x 30mL round, pk/2

5 x 10mL round, pk/2

8 x 1.5mL, pk/2

250mL

Ø (mm)

17.0

29.0

29.0

26.0

16.0

11.0

62.0

Length (min/max)

120

103

118

92

80

40

122

acceleration in sec: 40/400
deceleration in sec: 40/630
max speed: 12,000 rpm
RCF-value: 15,777 x g
max radius: 9.8 cm

Part No.

no adapter

Tube Racks

1.5/2.0mL

Ø (mm)

16.0

Length (min/max)

80

acceleration in sec: 30/300
deceleration in sec: 45/230
max speed: 20,000 rpm
RCF-value: 29,068 x g
max radius: 6.5 cm

Part No.

C1205

C1206

C1222

no adapter

Tube Racks

0.5/0.6mL, pk/6

0.4/0.25mL, pk/6

0.2mL thermal cycling,

pk/6

1.5/2.0mL

Ø (mm)

8.0

6.0

6.0

11.0

acceleration in sec: 15/110
deceleration in sec: 20/450
max speed: 4,500 rpm
RCF-value: 2,830 x g
max radius: 12.5 cm

Part No.

C0200-10

C0200-17A

Tube Racks

10mL round, pk/4

comb adapter for 5, 7

and 10mL, pk/2

Ø (mm)

17.0

13.0

Length (min/max)

95/115

70/95, 95/115

acceleration in sec: 60/500
deceleration in sec: 70/1,080
max speed: 11,000 rpm
RCF-value: 15,556 x g
max radius: 11.5 cm

Part No.

C0360-94C

C0360-94B

C0360-94A

C0360-94D

C0360-94X

no adapter

Tube Racks

15mL, pk/2

30mL, pk/2

50mL, pk/2

50mL conical, pk/2

15mL conical, pk/2

85mL

Ø (mm)

17.0

25.0

29.0

29.0

17.0

38.0

Length (min/max)

103/110

90/103

105

118

120

113

acceleration in sec: 42/400
deceleration in sec: 52/800
max speed: 12,000 rpm
RCF-value: 14,811 x g
max radius: 9.2 cm

Part No.

C0360-94C

C0360-94B

C0360-94A

C0360-94D

C0360-94X

no adapter

Tube Racks

15mL, pk/2

30mL, pk/2

50mL, pk/2

50mL conical, pk/2

15mL conical, pk/2

85mL

Ø (mm)

17.0

25.0

29.0

29.0

17.0

38.0

Length (min/max)

103/110

90/103

105

118

120

113

Rotors

Part No.:
C0383-75



Angle rotor: 4 x 500mL
Angle: 0 - 90°

temperature at n-max: 2°C

Part No.:
C0400-50



Angle rotor: 12 x 50mL
Angle: 0 - 90°

temperature at n-max: -4°C

Part No.:
C0400-15



Angle rotor: 20 x 15mL
Angle: 0 - 90°

temperature at n-max: -4°C

Part No.:
C0300-16



Angle rotor: 2 x 3 microplates
Angle: 0 - 90°

temperature at n-max: -7°C

Specifications/Adapters

acceleration in sec: 67/120 deceleration in sec: 58/110 max speed: 3,500 rpm RCF-value: 2,547 x g max radius: 18.6 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0383-75D**	1 x 500mL bottle, pk/2	80.0	126
	C0383-75E	1 x 250mL bottle, pk/2	62.0	110/130
	C0383-75C*	7 x 50mL conical, pk/2	28.5	120
	C0383-75B	5 x 50mL conical, pk/2	28.5	120
	C0383-75A	12 x 15mL conical, pk/2	16.0	120
	C0383-75F	19 x 10mL, pk/2	16.5	95/105
	C0383-75G	19 x 5/7mL, pk/2		
	C0383-75I	25 x 1.5/2.0mL, pk/2	11.0	42
	C0383-75H	3 std. microplates, 1 deepwell plate, pk/2	4 carriers required	
*sealing lid does not fit **for use with C0383-750B	C0383-75L	sealing lid		
	C0383-750B	bottle, 500mL, pk/2		

acceleration in sec: 30/60 deceleration in sec: 30/60 max speed: 4,000 rpm RCF-value: 3,166 x g max radius: 17.7 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0232-88	15mL conical/round, pk/6	17.0	120
	C0232-98	5, 7mL, pk/6	13.0	75/120
	C0230-41	cushion for C0232-98 (12 x 75mm), pk/12		

acceleration in sec: 30/60 deceleration in sec: 40/60 max speed: 4,000 rpm RCF-value: 3,327 x g max radius: 18.6 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0200-17A	comb adapt for 5, 7 and 10mL, pk/6	13.0	70/90, 95/115
	C0230-20	1.5mL, pk/4		

acceleration in sec: 30/60 deceleration in sec: 30/77 max speed: 4,500 rpm RCF-value: 2,762 x g max radius: 12.2 cm	Part No.	Tube Racks	max loading height: 58mm max loading weight: 310g
	C0120-504	48 x 1.5mL, pk/2	

*only accepts fully skirted plates

Rotors

Part No.:
C0323-81



Angle rotor: 24 x 15mL
Angle: 52°

temp at max speed: -10°C

Part No.:
C0300-96



Angle rotor: 12 x 15mL
Angle: 28°

temp at max speed: -10°C

Part No.:
C0300-97



Angle rotor: 6 x 50mL
Angle: 28°

temp at max speed: -10°C

Part No.:
C0252-87
C0252-87H
(hermetically sealed)



Angle rotor: 24 x 1.5/2.0mL
Angle: 45°

temp at max speed: 0°C

Part No.:
C0252-55



Angle rotor: 24 x 1.5/2.0mL/24 x 0.5mL
Angle: 45°

temp at max speed: 1°C

Part No.:
C0252-9



Angle rotor: 44 x 1.5/2.0mL
Angle: 40°

temp at max speed: -4°C

Specifications/Adapters

acceleration in sec: 25/37
deceleration in sec: 30/87
max speed: 3,500 rpm
RCF-value: 1,890/1,972 x g
max radius: 13.8/14.4 cm

Part No.
C0200-17A

Tube Racks
comb adapt for 5, 7
and 10mL, pk/2
C0230-20 1.5mL, pk/4

Ø (mm)
13.0

Length (min/max)
70/90, 95/115

acceleration in sec: 27/63
deceleration in sec: 40/115
max speed: 6,000 rpm
RCF-value: 4,186 x g
max radius: 10.4 cm

Part No.
C0200-17A

Tube Racks
comb adapt for 5, 7
and 10mL, pk/6
C0230-20 1.5mL, pk/4

Ø (mm)
13.0

Length (min/max)
70/95, 95/115

acceleration in sec: 23/48
deceleration in sec: 26/60
max speed: 6,000 rpm
RCF-value: 3,863 x g
max radius: 9.7 cm

Part No.
C0232-88

Tube Racks
15mL conical/round,
pk/6

Ø (mm)
17.0

Length (min/max)
120

C0232-98

5/7mL, pk/6

13.0

75/120

C0230-41

cushion for C0232-98

13.0

75/120

no adapter

50mL conical

30.0

105/120

no adapter

50mL round

30.0

95/115

acceleration in sec: 23/77
deceleration in sec: 31/124
max speed: 13,500 rpm
RCF-value: 17,320 x g
max radius: 8.5 cm

Part No.
C1205

Tube Racks
0.5/0.6mL, pk/6

Ø (mm)
8.0

C1206

0.4/0.25mL, pk/6

6.0

C1222

0.2mL thermal cycling,
pk/6

6.0

no adapter

1.5/2.0mL

11.0

acceleration in sec: N/A
deceleration in sec: N/A
max speed: 13,500 rpm
RCF-value: 17,110 x g
max radius: 8.4 cm
*only fit in 1.5/2.0mL slot

Part No.
C1205*

Tube Racks
0.5/0.6mL, pk/6

Ø (mm)
8.0

C1206*

0.4/0.25mL, pk/6

6.0

C1222*

0.2mL thermal cycling,
pk/6

6.0

no adapter

1.5/2.0mL

11.0

acceleration in sec: 28/37
deceleration in sec: 33/67
max speed: 13,500 rpm
RCF-value: 14,467/17,523 x g
max radius: 7.1/8.6 cm

Part No.
C1205

Tube Racks
0.5/0.6mL, pk/6

Ø (mm)
8.0

C1206

0.4/0.25mL, pk/6

6.0

C1222

0.2mL thermal cycling,
pk/6

6.0

no adapter

1.5/2.0mL

11.0

Rotors

Part No.:
C0383-75



Angle rotor: 4 x 500mL
Angle: 0 - 90°

temperature at max: 10°C

Part No.:
C0400-50



Angle rotor: 12 x 50mL
Angle: 0 - 90°

temperature at max: -8°C

Part No.:
C0400-15



Angle rotor: 20 x 15mL
Angle: 0 - 90°

temperature at max: -8°C

Part No.:
C0300-16



Angle rotor: 2 x 3 microplates
Angle: 0 - 90°

temperature at max: -7°C

Specifications/Adapters

acceleration in sec: 50 deceleration in sec: 40/240 max speed: 4,500 rpm RCF-value: 4,211 x g max radius: 18.6 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0383-75D**	1 x 500mL bottle, pk/2	80.0	126
	C0383-75E	1 x 250mL bottle, pk/2	62.0	110/130
	C0383-75C*	7 x 50mL conical, pk/2	28.5	120
	C0383-75B	5 x 50mL conical, pk/2	28.5	120
	C0383-75A	12 x 15mL conical, pk/2	16.0	120
	C0383-75F	19 x 10mL, pk/2	16.5	95/105
	C0383-75G	19 x 5/7mL, pk/2		
	C0383-75I	25 x 1.5/2.0mL, pk/2	11.0	42
	C0383-75H	3 std. microplates, 1 deepwell plate, pk/2	4 carriers required	
*sealing lid does not fit **for use with C0383-750B	C0383-75L	sealing lid bottle, 500mL, pk/2		

acceleration in sec: 15 deceleration in sec: 8/37 max speed: 4,250 rpm RCF-value: 3,574 x g max radius: 17.7 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0232-88	15mL conical/round, pk/6	17.0	120
	C0232-98	5.7mL, pk/6	13.0	75/120
	C0230-41	cushion for C0232-98 (12 x 75mm), pk/12		

acceleration in sec: 30 deceleration in sec: 10/47 max speed: 5,000 rpm RCF-value: 5,189 x g max radius: 18.6 cm	Part No.	Tube Racks	Ø (mm)	Length (min/max)
	C0200-17A	comb adapt for 5, 7 and 10mL, pk/6	13.0	70/90, 95/115
	C0230-20	1.5mL, pk/4		

acceleration in sec: 20 deceleration in sec: 15/89 max speed: 4,500 rpm RCF-value: 2,762 x g max radius: 12.2 cm	Part No.	Tube Racks	max loading height: 58mm max loading weight: 310g	
	C0320-50A	48 x 1.5mL, pk/2		

*only accepts fully skirted plates

Rotors

Part No.:
C0323-81



Angle rotor: 24 x 15mL
Angle: 52°

temp at max speed: -10°C

Part No.:
C0252-55



Angle rotor: 24 x 1.5/2.0mL/24 x 0.5mL
Angle: 45°

temp at max speed: N/A

Part No.:
C0252-9



Angle rotor: 44 x 1.5/2.0mL
Angle: 40°

temp at max speed: -9°C

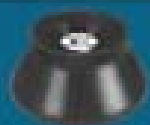
Part No.:
C0252-87
C0252-87H
(hermetically sealed)



Angle rotor: 24 x 1.5/2.0mL
Angle: 45°

temp at max speed: 2°C

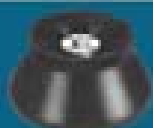
Part No.:
C0382-91
C0382-91H
(hermetically sealed)



Angle rotor: 8 x 50mL
Angle: 25°

temp at max speed: 1°C

Part No.:
C0382-76
C0382-76H
(hermetically sealed)



Angle rotor: 8 x 30mL
Angle: 25°

temp at max speed: N/A

Part No.:
C0382-78
C0382-78H
(hermetically sealed)



Angle rotor: 6 x 85mL
Angle: 25°

temp at max speed: 10°C

Specifications/Adapters

acceleration in sec: 22
deceleration in sec: 16/105
max speed: 3,900 rpm
RCF-value: 1,890/1,972 x g
max radius: 13.8/14.4 cm

Part No.
C0200-17A

Tube Racks
combo adapt for 5, 7
and 10mL, pk/6
1.5mL, pk/4

Ø (mm)
13.0

Length (min/max)
70/90, 95/115

acceleration in sec: N/A
deceleration in sec: N/A
max speed: 13,500 rpm
RCF-value: 17,110 x g
max radius: 8.4 cm

Part No.
C1205*
C1206*
C1222*

Tube Racks
0.5/0.6mL, pk/6
0.4/0.25mL, pk/6
0.2mL thermal cycling,
pk/6

Ø (mm)
8.0
6.0
6.0

*only fit in 1.5/2.0mL slot

no adapter

1.5/2.0mL

11.0

acceleration in sec: 17
deceleration in sec: 12/153
max speed: 13,500 rpm
RCF-value: 14,467/17,523 x g
max radius: 7.1/8.6 cm

Part No.
C1205
C1206
C1222

Tube Racks
0.5/0.6mL, pk/6
0.4/0.25mL, pk/6
0.2mL thermal cycling,
pk/6

Ø (mm)
8.0
6.0
6.0

no adapter

1.5/2.0mL

11.0

acceleration in sec: 30
deceleration in sec: 39/320
max speed: 17,000 rpm
RCF-value: 27,464 x g
max radius: 8.5 cm

Part No.
C1205
C1206
C1222

Tube Racks
0.5/0.6mL, pk/6
0.4/0.25mL, pk/6
0.2mL thermal cycling,
pk/6

Ø (mm)
8.0
6.0
6.0

no adapter

1.5/2.0mL

11.0

acceleration in sec: 66
deceleration in sec: 50/367
max speed: 15,000 rpm
RCF-value: 24,149 x g
max radius: 9.6 cm

Part No.
C0360-91C
C0360-91A

Tube Racks
30mL, pk/2
16mL, pk/2
50mL

Ø (mm)
25.0
18.0
29.0

Length (min/max)
92/95
100/105
105

no adapter

acceleration in sec: N/A
deceleration in sec: N/A
max speed: 15,000 rpm
RCF-value: 25,900 x g
max radius: 10.3 cm

Part No.
C0360-76C
C0360-76A

Tube Racks
16mL, pk/2
15mL, pk/2

Ø (mm)
18.0
17.0

Length (min/max)
103
109

acceleration in sec: 83
deceleration in sec: 83/547
max speed: 15,000 rpm
RCF-value: 25,910 x g
max radius: 10.3 cm

Part No.
C0360-94D
C0360-94A
C0360-94B
C0360-94C
C0360-94X

Tube Racks
50mL conical, pk/2
50mL round, pk/2
30mL, pk/2
15mL round, pk/2
15mL conical, pk/2

Ø (mm)
29.0
29.0
25.0
17.0
17.0

Length (min/max)
118
105
90/103
103/110
120

no adapter

85mL

38.0

113

Rotors

Part No.:

C0326-72C (with buckets)

C0326-72 (w/o buckets)



Angle rotor: 4 x 100mL
Angle: 0 - 90°

Carriers w/o buckets
temp at max speed: -3°C

Part No.:

C0326-12



Angle rotor: 4 x 100mL
Angle: 0 - 90°

temp at max speed: -7°C

Part No.:

C0036-16



Angle rotor: 2 x 3 microplates
Angle: 0 - 90°

temp at max speed: -6°C

Specifications/Adapters

acceleration in sec: 15/100
deceleration in sec: 15/150
max speed: 5,000 rpm
RCF-value: 3,885 x g
max radius: 13.9 cm

Part No.	Tube Racks	Ø (mm)	Length (min/max)
Inserts			
C0320-720	1 x 100mL, pk/2	40.0	90/108
C0320-728	1 x 50mL conical, pk/2	29.0	116
C0320-726*	2 x 15mL conical, pk/2	17.0	120
C0326-722	1 x 15mL conical, pk/2	17.0	120
C0320-724	4 x 10mL, pk/2	17.0	90/108
C0320-730	4 x 5, 7mL, pk/2	13.0	75/100
C0320-721	5 x 1.5mL, pk/2	11.0	42
C0320-728	sealing lid		
carriers			
C0326-72A**	3 x 15mL, pk/2	17.0	120
C0326-72B**	2 x 50mL, pk/2	29.0	116

*sealing lid does not fit
**For use without buckets

acceleration in sec: 15/100
deceleration in sec: 15/150
max speed: 4,500 rpm
RCF-value: 3,350 x g
max radius: 14.8 cm

Part No.	Tube Racks	Ø (mm)	Length (min/max)
C0300-120	1 x 100mL, pk/2	44.0	90/108
C0300-122	1 x 50mL conical, pk/2	29.0	116
C0300-123	1 x 15mL conical, pk/2	17.0	120
C0300-124	7 x 10mL round, pk/2	17.0	90/108
C0300-126	7 x 5, 7mL vacu. pk/2	13.0	75/100
C0300-127	10 x 1.5mL, pk/2	11.0	42

acceleration in sec: 20/180
deceleration in sec: 15/360
max speed: 4,500 rpm
RCF-value: 2,739 x g
max radius: 12.1 cm

Part No.	Tube Racks	max loading height: 58 mm
C0320-904	48 x 1.5mL, pk/2	max loading weight: 310 g

*only accepts fully skirted plates

Rotors

Part No.:
C0036-17



Angle rotor: 30 x 1.5/2.0 mL
Angle: 45°

temp at max speed: 9°C

Part No.:
C0326-24
C0326-24H
(hermetically sealed)



Angle rotor: 24 x 1.5/2.0 mL
Angle: 45°

temp at max speed: 6°C

Part No.:
C0036-23



Angle rotor: 12 x 1.5/2.0 mL
Angle: 40°

temp at max speed: -2°C

Part No.:
C0036-28



Angle rotor: 20 x 10 mL
Angle: 30°

temp at max speed: 2°C

Specifications/Adapters

acceleration in sec:	Part No.	Tube Racks	Ø (mm)
25/300	C1205	0.5/0.6 mL, pk/6	8.0
deceleration in sec: 25/360	C1206	0.4/0.25 mL, pk/6	6.0
acceleration in sec: 25/210	C1222	0.2 mL thermal cycling pk/6	6.0
deceleration in sec: 30/360			
max speed: 13,000 rpm	no adapter	1.5/2.0 mL	11.0
max speed: 14,000 rpm			
RCF-value: 17,760 x g			
RCF value: 20,598 x g			
max radius: 9.4 cm			

acceleration in sec:	Part No.	Tube Racks	Ø (mm)
23/240	C1305	0.5/0.6 mL, pk/6	8.0
deceleration in sec: 16/240	C1306	0.4/0.25 mL, pk/6	6.0
acceleration in sec: 25/230	C1222	0.2 mL thermal cycling pk/6	6.0
deceleration in sec: 17/420			
max speed: 14,000 rpm	no adapter	1.5/2.0 mL	11.0
max speed: 15,000 rpm			
RCF-value: 18,625 x g			
RCF value: 21,381 x g			
max radius: 8.5 cm			

acceleration in sec:	Part No.	Tube Racks	Ø (mm)
25/240	C1205	0.5/0.6 mL, pk/6	8.0
deceleration in sec: 20/210	C1206	0.4/0.25 mL, pk/6	6.0
max speed: 18,000 rpm	C1222	0.2 mL thermal cycling pk/6	6.0
RCF-value: 23,545 x g			
max radius: 6.5 cm	no adapter	1.5/2.0 mL	11.0

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
40/360	no adapter	10 mL	16.0	80
deceleration in sec: 30/570				
max speed: 12,000 rpm				
RCF-value: 15,938 x g				
max radius: 9.9 cm				

Rotors

Part No.:
C0036-19



Angle rotor: 30 x 15mL
Angle: 35°

temp at max speed: -9°C

Part No.:
C0326-96



Angle rotor: 12 x 15mL
Angle: 28°

temp at max speed: -7°C

Part No.:
C0326-97



Angle rotor: 6 x 50mL
Angle: 28°

temp at max speed: -8°C

Part No.:
C0326-78
C0326-78H

(hermetically sealed)



Angle rotor: 6 x 85mL
Angle: 28°

temp at max speed: 17°C

Part No.:
C0036-18



Angle rotor: 6 x 85mL
Angle: 38°

temp at max speed: -5°C

Part No.:
C0036-20



Angle rotor: 4 x 85mL
Angle: 30°

temp at max speed: 5°C

Part No.:
C0036-22



Angle rotor: 6 x 50mL round
Angle: 26°

temp at max speed: -5°C

Specifications/Adapters

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0200-10	10mL round, pk/2	17.0	95/115
max speed: 4,500 rpm	C0200-17A	comb adapt for 5, 7 and 10mL, pk/6	13.0	70/90, 95/115
RCF-value: 2,467/2,829 x g				
max radius: 10.9/12.5 cm				

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0200-17A	comb adapt for 5, 7 and 10mL, pk/6	13.0	70/95, 95/115
max speed: 6,000 rpm	C0230-20	1.5mL, pk/4	11.0	
RCF-value: 4,185 x g	C0200-05	5/7mL vacutainer tube, pk/2	13.0	75
max radius: 10.4 cm	no adapter	15mL conical	17.0	120
	no adapter	15mL round	17.0	105/125

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0232-88	15mL conical/round, pk/6	17.0	120
max speed: 6,000 rpm	C0232-98	5, 7mL, pk/6	13.0	75/120
RCF-value: 3,823 x g	C0230-41	cushion for C0232-98 (12 x 75mm), pk/12		
max radius: 9.5 cm	no adapter	50mL	30.0	120

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0360-94D	50mL conical, pk/2	29.0	118
acceleration in sec:	C0360-94A	50mL round, pk/2	29.0	105
deceleration in sec:	C0360-94B	30mL, pk/2	25.0	90/103
max speed: 11,000 rpm	C0360-94C	15mL round, pk/2	17.0	103/110
max speed: 13,500 rpm	C0360-94X	15mL conical, pk/2	17.0	120
RCF-value: 13,813 x g	no adapter	85mL	38.0	113
RCF-value: 20,986 x g				
max radius: 10.3 cm				

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0360-94D	50mL conical, pk/2	29.0	118
max speed: 9,000 rpm	C0360-94A	50mL round, pk/2	29.0	105
RCF-value: 10,414 x g	C0360-94B	30mL, pk/2	25.0	90/103
max radius: 11.5 cm	C0360-94C	15mL round, pk/2	17.0	103/110
	C0360-94X	15mL conical, pk/2	17.0	120
	no adapter	85mL	38.0	113

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0360-94D	50mL conical, pk/2	29.0	118
max speed: 12,000 rpm	C0360-94A	50mL round, pk/2	29.0	105
RCF-value: 14,811 x g	C0360-94B	30mL, pk/2	25.0	90/103
max radius: 9.3 cm	C0360-94C	15mL round, pk/2	17.0	103/110
	C0360-94X	15mL conical, pk/2	17.0	120
	no adapter	85mL	38.0	113

acceleration in sec:	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec:	C0360-91C	30mL, pk/2	30.0	92/95
max speed: 12,000 rpm	C0360-91A	16mL, pk/2	18.0	100/105
RCF-value: 13,523 x g	C0360-91D	15mL, pk/2	17.0	100/105
max radius: 8.4 cm	C0232-88	15mL conical/round, pk/6	17.0	120
	no adapter	50mL round	29.0	95/115

Rotors

Part No.:

C0323-72



Angle rotor: 4 x 100mL

Angle: 0 - 90°

temp at max speed: -8°C

Part No.:

C0300-12



Angle rotor: 4 x 100mL

Angle: 0 - 90°

temp at max speed: -11°C

Part No.:

C0300-50



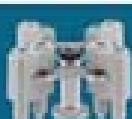
Angle rotor: 4 x 50mL

Angle: 0 - 90°

temp at max speed: -10°C

Part No.:

C0300-15



Angle rotor: 8 x 15mL

Angle: 0 - 90°

temp at max speed: -10°C

Part No.:

C0300-16



Angle rotor: 2 x 3 microplates

Angle: 0 - 90°

temp at max speed: -14°C

Specifications/Adapters

acceleration in sec: 31	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec: 31/142	C0320-720	1 x 100mL, pk/2	40.0	90/114
max speed: 5,000 rpm	C0320-728	1 x 50mL conical, pk/2	29.0	116
RCF-value: 3,969 x g	C0320-726*	2 x 15mL conical, pk/2	17.0	120
max radius: 14.2 cm	C0326-722	1 x 15mL conical, pk/2	17.0	120
	C0320-724	4 x 10mL, pk/2	17.0	100/115
	C0320-730	4 x 5, 7mL, pk/2	12.5	64/115
	C0320-721	5 x 1.5/2.0mL, pk/2	11.0	42
	C0320-729	sealing lid		

*Sealing lid does not fit

acceleration in sec: 35	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec: 9/133	C0300-120	1 x 100mL, pk/2	44.0	90/108
max speed: 4,500 rpm	C0300-122	1 x 50mL conical, pk/2	29.0	116
RCF-value: 3,150 x g	C0300-123	1 x 15mL conical, pk/2	17.0	120
max radius: 14.8 cm	C0300-124	7 x 10mL round, pk/2	17.0	90/108
	C0300-126	7 x 5, 7mL vacu, pk/2	13.0	75/100
	C0300-127	10 x 1.5mL, pk/2	11.0	42

acceleration in sec: 26	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec: 11/62	C0232-88	15mL conical/round, pk/6	17.0	120
max speed: 4,000 rpm	C0232-98	5, 7mL, pk/6	130	75/120
RCF-value: 2,540 x g	C0230-41	cushion in C0232-98, pk/12		
max radius: 14.2 cm				

acceleration in sec: 30	Part No.	Tube Racks	Ø (mm)	Length (min/max)
deceleration in sec: 11/74	C0200-17A	comb adapt for 5, 7 and 10mL, pk/6	13.0	70/90, 95/115
max speed: 5,000 rpm	C0230-30	1.5mL, pk/4	11.0	
RCF-value: 4,165 x g				
max radius: 14.9 cm				

acceleration in sec: 24/26	Part No.	Tube Racks	max loading height: 58mm
deceleration in sec: 33/58	C0320-504	Tube rack, 48 x 1.5mL, pk/2	max loading weight: 310g
max speed: 4,500 rpm			
RCF-value: 2,762 x g			
max radius: 12.2 cm			

*only accepts fully skirted plates

Rotors

Part No.:

C0382-76

C0382-76H

(hermetically sealed)

Angle rotor: 8 x 30mL

Angle: 25°

temp at max speed: N/A



Part No.:

C0382-78

C0382-78H

(hermetically sealed)

Angle rotor: 6 x 85mL

Angle: 25°

temp at max speed: 19°C



Specifications/Adapters

acceleration in sec: N/A
deceleration in sec: N/A
max speed: 13,500 rpm
RCF-value: 19,150 x g
max radius: 10.3 cm

Part No.

C0360-76C

C0360-76A

Tube Racks

16mL, pk/2

13mL round/conical,
pk/2

Ø (mm)

18.0

17.0

Length (min/max)

97/103

97/103

acceleration in sec: 64
deceleration in sec: 71/563
max speed: 13,500 rpm
RCF-value: 20,987 x g
max radius: 10.3 cm

Part No.

C0360-94D

C0360-94A

C0360-94B

C0360-94C

C0360-94X

no adapter

Tube Racks

50mL conical, pk/2

50mL round, pk/2

30mL, pk/2

15mL round, pk/2

15mL conical, pk/2

85mL

Ø (mm)

29.0

29.0

25.0

17.0

29.0

Length (min/max)

118

105

90/103

103/110

105

Rotors

Part No.:
C0323-81



Angle rotor: 24 x 15mL
Angle: 32°

temp at max speed: -9°C

Part No.:
C0300-96



Angle rotor: 12 x 15mL
Angle: 28°

temp at max speed: -6°C

Part No.:
C0300-97



Angle rotor: 6 x 50mL
Angle: 28°

temp at max speed: -6°C

Part No.:
C0252-87
C0252-87H



(hermetically sealed)

Angle rotor: 24 x 1.5/2.0mL
Angle: 45°

temp at max speed: -5°C

Part No.:
C0252-55



Angle rotor: 24 x 1.5/2.0mL/24 x 0.5mL
Angle: 45°

temp at max speed: N/A

Part No.:
C0252-9



Angle rotor: 44 x 1.5/2.0mL
Angle: 40°

temp at max speed: -7°C

Part No.:
C0382-91
C0382-91H



(hermetically sealed)

Angle rotor: 8 x 50mL
Angle: 25°

temp at max speed: -2°C

Specifications/Adapters

acceleration in sec: 31 deceleration in sec: 18/90 max speed: 3,500 rpm RCF-value: 1,890/1,972 x g max radius: 13.8/14.4 cm	Part No. C0200-17A C0230-20	Tube Racks comb adapt for 5, 7 and 10mL, pk/2 1.5mL, pk/4	Ø (mm) 13.0 11.0	Length (min/max) 70/90, 95/115
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acceleration in sec: 21 deceleration in sec: 28/60 max speed: 6,000 rpm RCF-value: 4,185 x g max radius: 10.4 cm	Part No. C0200-17A C0230-20 C0200-05	Tube Racks comb adapt for 5, 7 and 10mL, pk/6 1.5mL, pk/4 5/7mL vacu, pk/2	Ø (mm) 13.0 11.0 13.0	Length (min/max) 70/90, 95/115 75
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acceleration in sec: 26 deceleration in sec: 27/60 max speed: 6,000 rpm RCF-value: 3,904 x g max radius: 9.7 cm	Part No. C0232-88 C0232-98 C0230-41 no adapter	Tube Racks 15mL conical/round, pk/6 5, 7mL, pk/6 cushion for C0232-98 (12 x 75mm), pk/12 50mL conical, round	Ø (mm) 17.0 13.0 30.0	Length (min/max) 120 75/120 105/120, 95/115
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acceleration in sec: 22 deceleration in sec: 30/234 max speed: 17,000 rpm RCF-value: 27,464 x g max radius: 8.5 cm	Part No. C1205 C1206 C1222 no adapter	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling pk/6 1.5/2.0mL	Ø (mm) 8.0 6.0 6.0 11.0
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acceleration in sec: N/A deceleration in sec: N/A max speed: 13,500 rpm RCF-value: 17,110 x g max radius: 8.4 cm *only fit in 1.5/2.0mL slot	Part No. C1205* C1206* C1222* no adapter	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling pk/6 1.5/2.0mL	Ø (mm) 8.0 6.0 6.0 11.0
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acceleration in sec: 19 deceleration in sec: 19/154 max speed: 13,500 rpm RCF-value: 14,467/17,523 x g max radius: 7.1/8.6 cm	Part No. C1205 C1206 C1222 no adapter	Tube Racks 0.5/0.6mL, pk/6 0.4/0.25mL, pk/6 0.2mL thermal cycling pk/6 1.5/2.0mL	Ø (mm) 8.0 6.0 6.0 11.0
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acceleration in sec: 50 deceleration in sec: 44/310 max speed: 13,500 rpm RCF-value: 19,561 x g max radius: 9.6 cm	Part No. C0360-91C C0360-91A C0232-88 C0232-98 C0230-41 no adapter	Tube Racks 30mL, 92/95mm, pk/2 16mL, 105mm, pk/2 15mL, conical/round, pk/6 5, 7mL, pk/6 cushion for C0232-98 (12 x 75mm), pk/12 50mL	Ø (mm) 25.0 18.0 17.0 13.0 29.0	Length (min/max) 92/95 100/105 120 75/120 105
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