

INSTRUCTION MANUAL

FOR

BENCH TOP CENTRIFUGE

Z 513

Hermle Labortechnik GmbH
Gosheimer Str. 56
D - 78564 Wehingen/Germany

Phone: (0 74 26) 96 22-0
Telex: 760 612
Fax: (0 74 26) 96 22 49

INDEX	Page
1. General Information	
1.1 Precautions and hazards	2 E
1.2 Description	3 E
1.3 Safety standards	3 E
1.4 Technical data	4 E
1.5 Accessories supplied with each centrifuge unit	5 E
1.6 Warranty	5 E
2. Installation	
2.1 Unpacking the centrifuge	5 E
2.2 Transport	5 E
2.3 Required space	5 E
2.4 Installation	6 E
3. How to install and load a rotor	
3.1 Mounting and securing a swing out rotor	6 E
3.2 Mounting and securing an angle rotor	7 E
3.3 Overloading of rotors	8 E
3.4 Removing of the rotor	8 E
4. Operation	
4.1 Power switch	9 E
4.2 Lid release	9 E
4.3 Lid lock	9 E
4.4 Preselection of speed / RCF	10 E
4.5 Preselection of operating time	11 E
4.6 Adjustment of the radius correction	11 E
4.7 Preselection of brake intensity	12 E
4.8 Keyboard - Starting the centrifuge - "quick"-key	13 E
4.9 Key "stop"	13 E
4.10 Program memory	13 E
5. Temperature	
5.1 Temperature	15 E
6. Safety facilities	
6.1 Imbalance	15 E
7. Service and Maintenance	
7.1 Service and inspection of the centrifuge	16 E
7.2 Cleaning the centrifuge	16 E
7.3 Cleaning the centrifuge after breakage of glass tubes/bottles	17 E
7.4 Disinfection	17 E
8. Breakdown	
8.1 Emergency lid release	18 E
8.2 Check list / Trouble shooting	18 E
9. Appendix	
9.1 Accessories	22 E

1. General Information

1.1 Precautions and hazards

Before putting the centrifuge into operation, please read this instruction manual carefully.

The centrifuge must not be operated by unqualified persons not familiar with the correct use and intended purpose of the machine. Please use only the original spare parts.

For personal and environmental safety, special attention has to be paid to the following precautions:

The Hermle Z 513 is neither explosion proof nor inert gas shielded and should therefore never be operated in explosion-hazardous locations.

Never stay in the safety zone of 30 cm around the centrifuge or deposit dangerous goods inside this zone during centrifugation.

The centrifugation of flammable or explosive or radioactive samples is not allowed.

Furthermore do not spin samples reacting chemically with each other with high energy when exposed to air.

Never spin toxic or pathological material without adequate safety precautions i.e. centrifuging of buckets/tubes without or with defective hermetic sealing is not allowed.

The end user is engaged to perform appropriate disinfection procedures in case dangerous goods have contaminated the centrifuge or its accessories.

The general universal laboratory precautions should be observed in case infectious materials are centrifuged. If necessary, please contact your local security officer! It is prohibited to run the centrifuge with rotors not suited for this centrifuge model.

Under no circumstances, the lid of the centrifuge should be opened while the rotor is still turning respectively running with a speed of more than 2 meter per second.

The following rules must be strictly adhered to:

Do not operate the centrifuge in case it is not installed correctly.

Never operate the centrifuge in a dismantled state (e.g. without covering sheet metal)

Do not run the centrifuge when electrical or mechanical assembly groups have been tampered with by unauthorized persons.

Never use accessories such as rotors and buckets which are not exclusively approved by **Hermle Labortechnik GmbH**, except commercially available centrifuge tubes of glass or plastic.

Do not spin corrosive samples which may cause damages in material and impair the mechanic resistance.

never operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage

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

The unit is operated according to the instruction manual.

Modifications, repairs and new adjustments are performed by HERMLE authorized persons and the electrical installation of the location where the centrifuge is operated corresponds to the IEC-regulations.

1.2 Description

Model Z 513 is a large volume bench top centrifuge with microprocessor control. The indications as speed, RCF-value, temperature, operating time, radius correction and brake intensity will be shown digitally on the LED.

With the program memory you can store 10 complete centrifugal runs with all running parameters, inclusive rotor type.

By offering a wide range of accessories, the centrifuge covers many fields of applications. For example a swing out rotor with a max. capacity of 4 x 1000 ml as well as angle rotor up to 15 000 rpm can be used.

The Z 513 is designed for research use only!

1.3 Safety standards

The centrifuge corresponds to the general requirements set by German law for medical apparatus, "MedGV" group 3.

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

- Accident prevention rules for centrifuges, UVV-VBG 7z.
- Accident prevention rules for electrical equipment & installations, UVV-VBG 4.
- International Standart IEC 1010-1 and IEC 1001-2-D
- European Standart PR EN 61010-1 and PR EN 61010-2-2
- Electrical interference suppression according to interference degree B as per VDE 0871.

1.4 Technical data

Manufacturer	Hermle Labortechnik GmbH
--------------	--------------------------

Type	Z 513 (For research only!)
------	----------------------------

Dimensions:	
Width	61 cm
Depth	46,5 cm
Height	73 cm

Weight	90 kg
--------	-------

Noise level	72 dB(A)
-------------	----------

Max. speed	15.000 rpm
Max. Volume	4000 ml
Max. RCF	25.900 x g
Admiss. density	1,2 kg/dm ³
Admiss. kinetic energy	39 500 Nm

Electrical connection	230 V/50-60 Hz 1ph	120 V/50-60 Hz 1 ph
Current	11 A	15 A
Connected load	1150 Watt	840 Watt

Interference suppression	VDE 0871, interference degree B
--------------------------	---------------------------------

Service dept. at Hermle	0 74 26 / 96 22 55
-------------------------	--------------------

Address of service:

Address of agent:

1.5 Accessories supplied with each centrifuge unit

2 Replacement fuses, 1 Instruction manual, 1 Tool for removing the rotor

1.6 Warranty

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

In the unlikely event 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 wrong operation, use on non-appropriate spare parts or accessories and non-authorized modification of rotor or centrifuge.

The manufacturer reserves the right for any technical modifications of the product in respect to technical improvement.

2. Installation

2.1 Unpacking the centrifuge

The centrifuge Z 513 is supplied in a carton on a pallet. Remove the tightening straps and the nails with which is the carton fixed to the pallet. Take off the carton.

The instruction manual and the accessories mentioned under 1.5 should be kept with the centrifuge.

2.2 Transport

Avoid impacts during transportation and do not drop the unit to preserve it from being damaged.

Transport the unit on both sides.

2.3 Required space

The centrifuge should be installed on a rigid, even surface. The Z 513 should only be operated on a stable laboratory table/cabinet etc..

Balance the centrifuge with a spirit level.

To guarantee the necessary heat dissipation, the unit has to be placed in that way, that there is a space of minimum 15 cm on each side of the unit.

Never place the centrifuge in positions subject to excessive heat, e.g., strong sunlight, as the performance of the unit is based upon an ambient temperature of +23°C.

Attention:

The new safety rules require a safety operation cycle of 30 cm around the centrifuge. Mark this area to indicate that no person and now dangerous material (e.g. comprising inflammable or infectious liquids) are present during centrifugation.

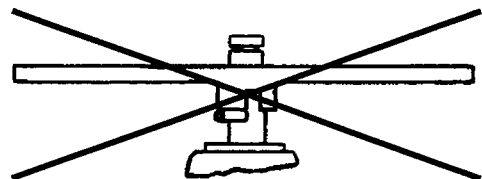
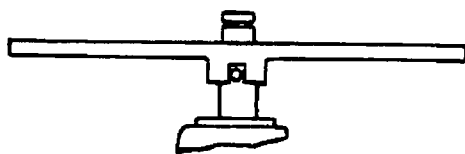
2.4 Installation

- Check that the power supply corresponds to that on the manufacturer's rating label which is mounted on the rear panel, then connect the power cord to the centrifuge and the socket.
- The line voltage circuit breaker is maximum a 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 power switch is at the rear side of the unit. Switch it on.
- 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 Mounting and securing a swing out rotor

Clean the motor shaft, as well as the rotor mounting hole with a piece of cloth and place the rotor on the motor shaft ensuring that the pins align correctly with the rotor slots (see sketch 1).

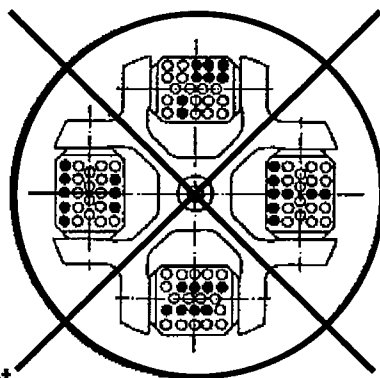


sketch 1

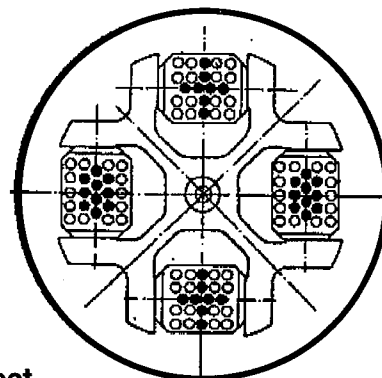
Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut counter-clockwise.

When loading the buckets and tube racks you should proceed according to Figure 2a and 2b. It is very important to load the rotor with the complete set of buckets/tube racks. **The bucket insert bolts of the rotor should be regularly greased with silicone grease.**

Fill the tubes equally by eye-measuring and insert them into the tube-holes or tube racks. The difference in weight between the buckets should not exceed 10 grams.



Incorrect



Correct

It is also allowed to operate for example a 4-place swing out rotor with 2 loaded and 2 unloaded buckets, but it is important that the loaded buckets are then opposite each other.

3.2 Mounting and securing an angle rotor

Clean the motor shaft, as well as the rotor mounting hole with a piece of cloth and place the rotor on the motor shaft ensuring that the pins align correctly with the rotor slots (see page 6 /sktech 1).

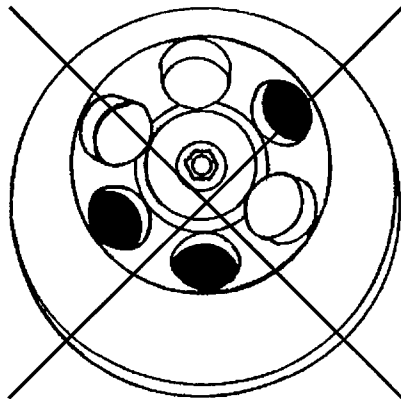
Hold the rotor with one hand and secure the rotor to the shaft by turning the rotor nut counter-clockwise.

ATTENTION!

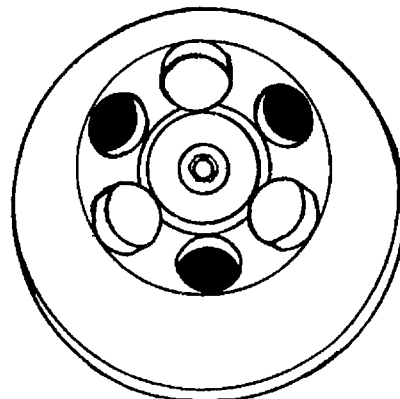
Before operation, secure the rotor lid to the rotor by pressing the snap connector on the rotor nut. Load the rotor according to Figure 1.

Fill the tubes equally by eye-measuring and insert them into the tube-holes of the rotor. The difference in weight between the tubes should not exceed 2 - 3 grams.

It is also allowed to operate a 6-place rotor with 2 or 4 loaded tubes only, but it is important that the 2 or 4 occupied bore-holes are opposite each other (see figure 1a and 1b). When using tubes without lid in angle rotors please note that the tubes should only be filled partly i.e. 60-75% of the maximum tube volume.



Incorrect



Correct

Figure 1

3.3 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 (see indications on the rotor itself) 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:

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

$$\text{Example :} \quad n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4000 = 3360 \text{ rpm}$$

In case of any questions please contact the manufacturer!

3.4 Removing of the rotor

Take off the rotor lid and hold the rotor with one hand. Turn the rotor nut clockwise, until the rotor is loose and take the rotor vertically off the shaft.

ATTENTION:

Never operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Never operate with strongly corrosive materials which could damage rotor and buckets.

4. Operation

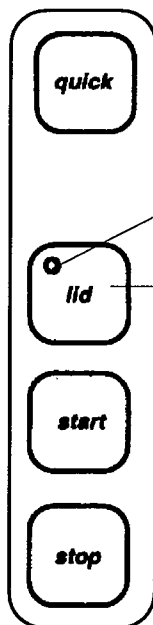
4.1 Power switch

You can switch on the centrifuge with the main switch on the left side of the unit. The digital indications on the display are lighting up.

4.2 Lid release

The green control lamp of the key "lid" lights(controlling that the rotor is stationary and the lid closed correctly).

Press the key "lid" to open the lid. After pressing, the lid will be open automatically this will take approx. 6 seconds.
The green control lamp in the key "lid"extinguish as soon as the lid can be open.



Control lamp (rotor is stationary):
Shows that the lid is closed correctly.

Key "lid".
To open the centrifuge lid

4.3 Lid lock

After correct fitting, loading and fixing of the rotor close the lid as described below.

Close the lid by using a small amount of pressure until the lid system locks. This will take approx 6 seconds.
The green control lamp in the key "lid" will light up as soon as the lid is closed correctly.
When the rotors start accelerating the control lamp extinguishes and the lid cannot be opened.

4.4 Preselection of speed / RCF

You have the choice between preselection of speed or RCF.

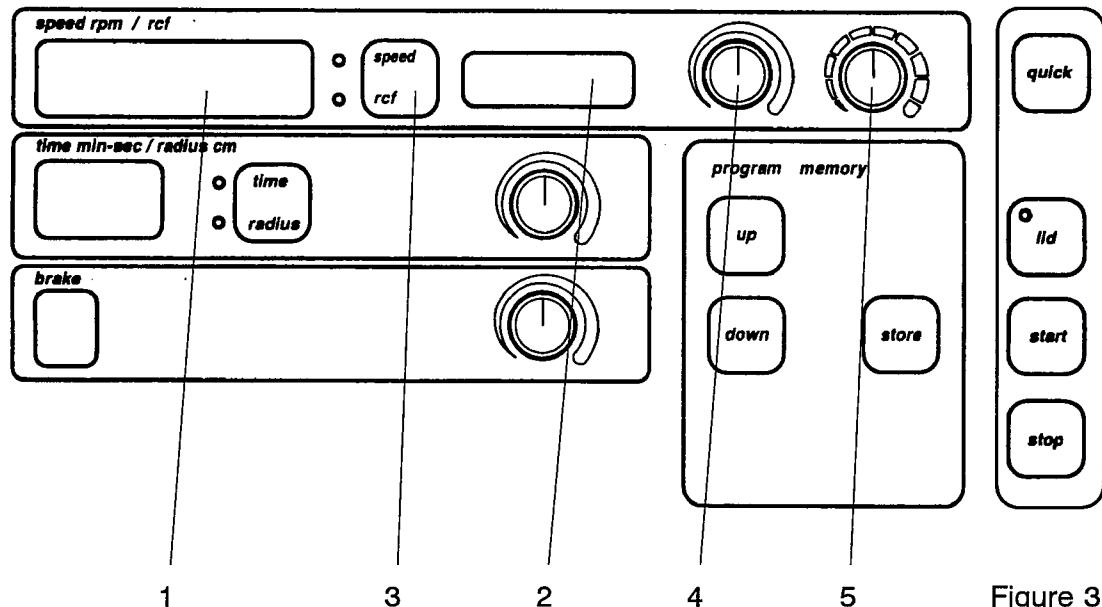


Figure 3

With the key 3 "speed/rcf" you can choose either the "speed" or "rcf" mode. The green LED indications shows which mode is activated. Select the desired mode. With the turn knob 4 you can preselect the speed/rcf in steps of 500 rpm or correct the preset speed/rcf during the run. With the turn knob 5 you can preselect the speed/rcf in steps of 10 rpm or correct the preset speed/rcf during the run.

The preset value will be indicated on the preset display 2.

The actual speed will be indicated on the actual display 1.

The preset speed/rcf should not be higher than the max. allowed speed/rcf of the inserted rotor. If the preset speed/rcf is too high, the preset display 2 of the speed/rcf is flashing (see figure 3).

The centrifuge will accelerate only to the max. allowed speed of the inserted rotor. It is not allowed to accelerate the bucket over the allowed max. speed .

rotor	maximum speed	bucket	maximum speed
220.70 V06	5 000 / *4500 rpm	614.000	5 000 rpm
		614.030	1 900 rpm
		614.010	4 500 rpm
220,70 V07	4 000 rpm	614.000	4 000 rpm
		614.020	3 500 rpm
		616.016	3 600 rpm
		614.030	1 900 rpm
220.29 V03	3 200 rpm	612.000	3 200 rpm
		612.010	2 000 rpm
220.41 V01	2 000 rpm	— — —	— — — —
220.78 V02	15 000 rpm	— — —	— — — —
220.80 V02	15 000 rpm	— — —	— — — —
220.76 V02	15 000 rpm	— — —	— — — —

* only 120 V version

4.5 Preselection of operating time

With the turn knob 3 you can adjust the desired operating time between 1 and 60 minutes. The operating time you set will appear on the digital indication 1. 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".

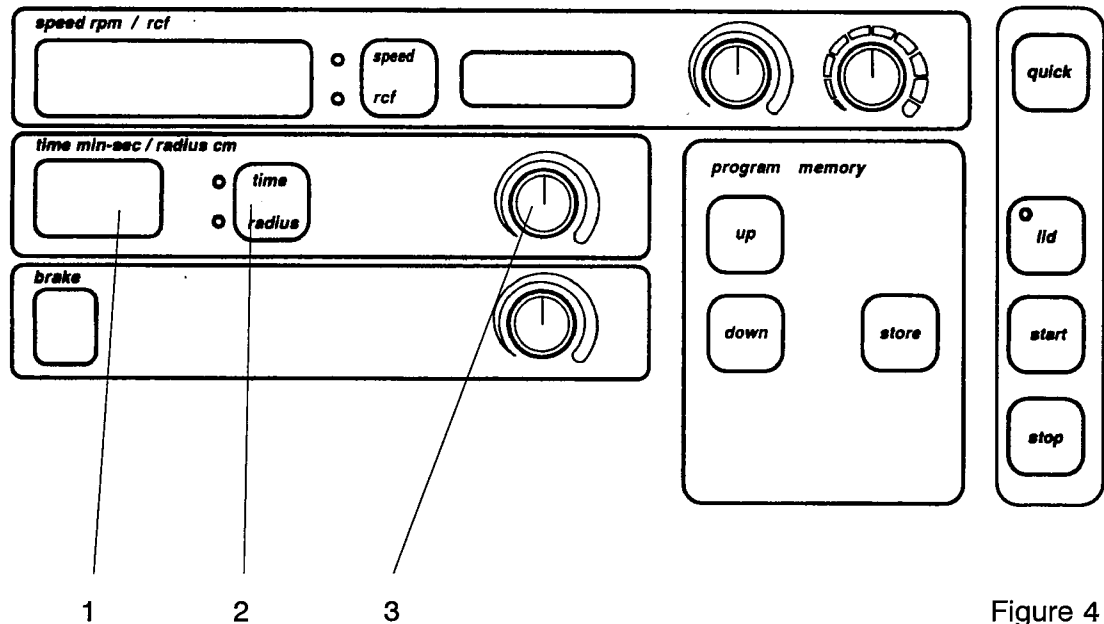


Figure 4

4.6 Adjustment of radius correction (important for rcf value indication)

Explanation:

The rotor identification sensor is passing on the information to the centrifuge control which rotor is inserted in the centrifuge. Therefore the centrifuge control knows the specific max. centrifuging radius. If you run the centrifuge with tube racks or adapters the centrifuge radius has to be reduced. Otherwise the centrifuge will not indicate the correct rcf value.

Preselection:

In the following chart the corresponding radius correction values for all rotor types, tube racks and adapters are listed.

Take the required radius correction values out of this charts page 25.

Press down key 2 and hold it (see figure 4). Choose with the turn knob 3 the required radius correction value which will be indicated on the digital indication 1. Release key 2 and the digital indication 1 will show the preset operating time. The preset radius correction value can be checked at any time by pressing key 2.

4.7 Preselection of brake intensity

To reduce the risk of resuspending samples during deceleration, it is possible to preselect the brake intensity with the knob "brake" (1), (10 intensity levels), see figure 11.

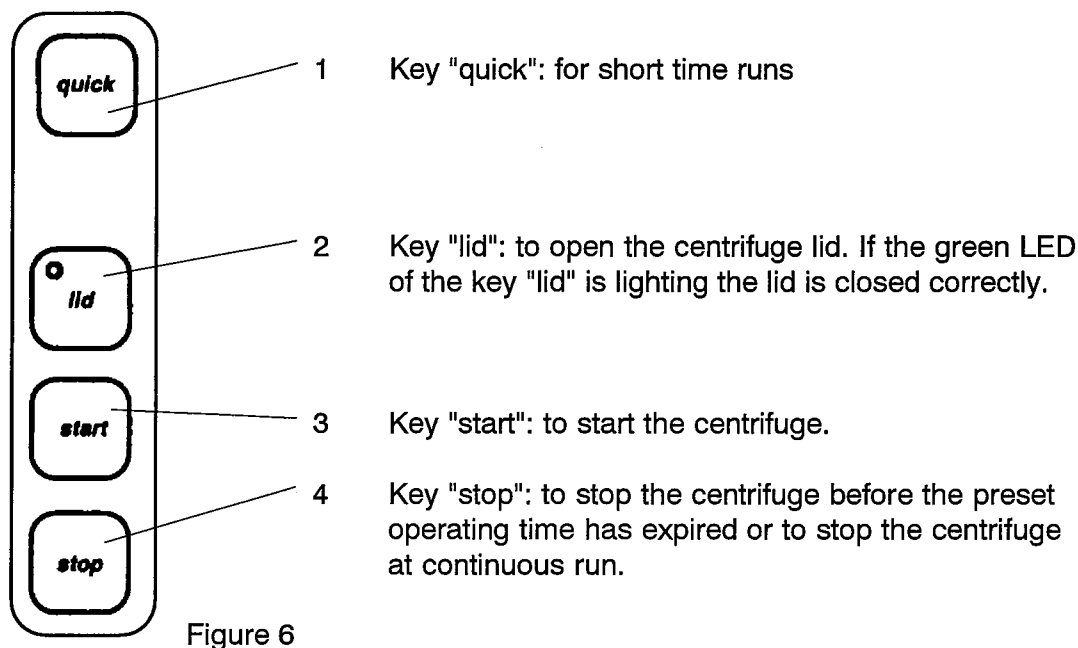


Figure 5

The following chart shows you the minimum and the maximum deceleration times of the different rotors.

Rotor	Deceleration time in seconds		Acceleration time in seconds
	Intensity "9"	Intensity "0"	
220.70 V06	179	731	99
220.70 V07	134	294	59
220.29 V03	76	211	42
220.41 V03	17	91	17
220.78 V02/V03	237	1039	58
220.80 V02/V03	169	772	51
220.76 V02/V03	169	753	51

4.8 Keyboard - Starting the centrifuge - "quick"-key



Starting the centrifuge

The rotor has to be fixed correctly and completely loaded (see point 3). 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".

4.9 Key "stop"

Press the key "stop" if you want to interrupt a centrifuge run. The centrifuge decelerates according to the adjusted brake intensity. You can change the brake intensity during deceleration.

4.10 Program memory (10 places)

Key "up": to recall a program and to count upwards the storage place numbers.

Key "store": to store a program and to leave the program memory.

Key "down": to recall a program and to count downwards the storage place numbers.

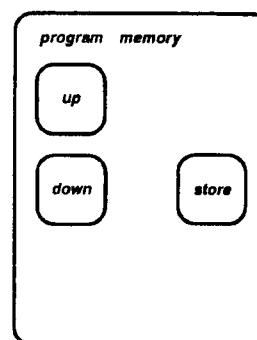


Figure 7

Storage of a run:

Set a rotor into the centrifuge. The rotor has to be secured to the motor shaft and correctly loaded. Close the centrifuge lid.

Preset the required running parameters, for example speed and running time. Press key "start". You can store the run as soon as the large speed indication indicates more than 200 rpm.

Press key "up" or "down". The program number will be indicated on the left by 0-9 on the large speed indication. Press key "up" or "down" so many times, till the required storage place number will be indicated.

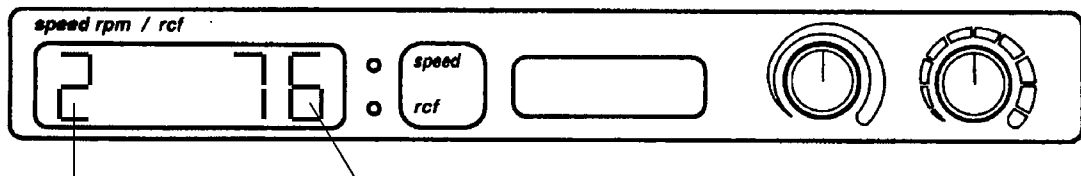
Touch key "store" very shortly. On the large digital speed indication on the right the rotor type of the corresponding program will be indicated (see figure 8). If rotor type "0" will be indicated, the storage place number is not occupied.

To store a program, you have to press key "store" for about **3 seconds** till the large digital speed indication is not flashing any longer.

The centrifuge run is stored.

Recall a program (centrifuge run):

Press key "up" or "down". On the large digital speed indication the program number will be indicated on the left side and the rotor number on the right (see figure 8).



Program number

Rotor type (220.76 V02 oder V03)

Figure 8

Choose the required program number with the keys "up" or "down".

Insert the rotor into the centrifuge which is indicated on the right of the large speed indication. Secure the rotor to the motor shaft and make sure that the rotor is loaded correctly. Close the centrifuge lid and press key "start". The unit is in the program mode now.

You can stop a program mode at any time by pressing key "stop".

The turn knobs are out of function during a program run.

Leaving the program:

The centrifuge is in the program mode and shows program and rotor number on the large speed indication.

Open the centrifuge lid. **Press key "store" for about 3 seconds.** As soon as program and rotor number disappears on the large speed indication, the unit left the program mode. The centrifuge can be operated regularly again.

5. Temperature Features

5.1 Temperature

During centrifugation, heat is generated by air friction between the rapidly spinning rotor 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 is restricting the temperature rise of the samples to the standard value of 40°C with each rotor even at maximum speed.

6. Safety facilities

6.1 Imbalance

In case of unequal loading of opposite buckets/tube racks or tube-holes, the operation will be interrupted during the acceleration phase. The rotor will be decelerated to standstill. Additionally the error message "ERROR" appears on the preset display "speed".

If the actual display "speed" shows error no. 1, the difference in weight of the samples is too big. Fill the tubes and load the rotor as described under point 3. If the actual display "speed" shows error no. 2, there can be several reasons for:

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

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

Maintenance

The maintenance of the centrifuge confines essentially to keeping clean the rotor chamber, the rotor and the accessories as well as to the regular lubrication at the rotor inserts bolts of the swing out rotor.

Vaseline, available in nearly each store, is the most suited lubricat. However, please ensure that the vaseline has to be free of resin and acid. The use of lubricants containing molykote and graphite is not allowed.

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

In case the rotor, buckets or tube racks get in touch with corrosive liquids, the respective spots and parts have to be cleaned carefully.

Corrosive liquids are for example:

- alkaline soup-solution
- alkaline amino
- strong acids
- solutions containg heavy metals
- waterfree and chlorinated solvents
- salt solutions e.g. sea-water

Cleaning:

The purpose of a thorough cleaning is, beside hygienical reasons, the avoidance of corrosion by soiling. In order to avoid the damage of anodized parts such as rotors, reduction plates ect., only neutral cleaning agents with aph-value 6-8 should be used.

Never use an alkaline cleaning agents ($\text{ph} > 8$). After cleaning please ensure that all parts are dried thoroughly by hand or in a warm-air-cabinet (max. temperature $+50^{\circ}\text{C}$).

It is recommended that all anodized aluminum parts are regularly treated with anti corrosion oil, so that their durability will be increased and the corrosion risk reduced.

By humidity and non hermetically closed samples, condensate (mist) may be formed. The condensate (mist) has to be removed regulary with a cloth from the rotor chamber.

7.3 Cleaning of centrifuge after breakage of glass tubes/glass bottles

With high g-values, there is a possibility that tube breakage will occur. Should this happen, the centrifuge, rotor, buckets, adapters and the rotor chamber must be thoroughly cleaned and all broken particles removed immediately.

If this is not done, they could scratch the protective coating of the rotor.

If the rotor chamber has not been properly cleaned, this will produce a fine black dust which can cause significant damage to the centrifuge chamber, rotor, buckets and the samples.

7.4 Disinfection

If, for example through tube breakage, infectious material is spilled into the centrifuge, the rotor, rotor chamber, buckets etc. should be disinfected !!!

Rotor and swing out buckets must not be autoclaved.

Rotor and rotor chamber should then be treated with a neutral disinfection agent, for example on formalin basis. A disinfectant spray should be used to thoroughly

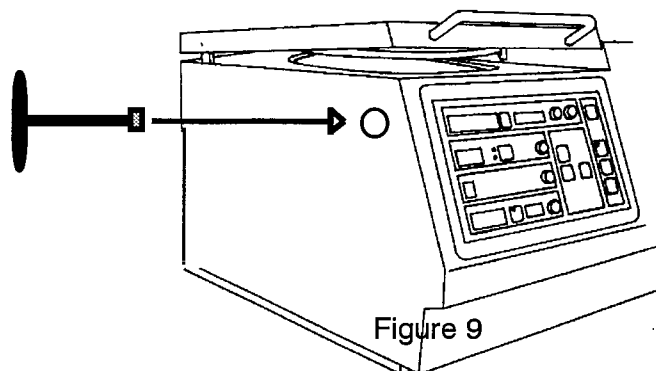
8. Breakdown

8.1 Emergency lid release

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

Please proceed as follows:

- switch off the centrifuge and unplug the power cord
- remove the plastic plug on the left side of the centrifuge housing
- loosen the nut behind the plastic plug by means of the tool for removing the rotor. Turn the tool clock wise till the stop
Attention: Please turn smooth to the stop!
- now you have to open the lid and remove the samples
- close the lid, and turn the tool counter clockwise till the stop.
- swich on the centrifuge and wait approx. 10 seconds until you start the unit again.



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. The error message can only be reset by switching the main switch on and off.

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.

Error no.: 1 Imbalance

<i>Reason:</i>	<i>Incorrect loading of the rotor</i>
----------------	---------------------------------------

<i>Action:</i>	<i>Balance your samples</i>
----------------	-----------------------------

<i>Reason:</i>	<i>Incorrect adjustment of the imbalance switch</i>
----------------	---

<i>Action:</i>	<i>Imbalance switch has to be readjusted (call service)</i>
----------------	---

Error no.: 2 Permanent imbalance signal

<i>Reason:</i>	<i>Position of the imbalance switch not correct</i>
----------------	---

<i>Action:</i>	<i>Imbalance switch has to be readjusted (call service)</i>
----------------	---

<i>Reason:</i>	<i>Imbalance switch is defective</i>
----------------	--------------------------------------

<i>Action:</i>	<i>Imbalance switch has to be replaced (call service)</i>
----------------	---

Error no.: 10 Overtemperature in the rotor chamber (more than + 50 ° C)

Reason: *Breakdown of the refrigeration system / Electronic failure*

Action: *Call service*

Reason: *Temperature sensor defective / Electronic failure*

Action: *Call service*

Error no.: 11 Temperature sensor

Reason: *Short circuit at the temperature sensor or at the sensor cable*

Action: *Call service*

Reason: *Chamber temperature is too low, below - 25°C*

Action: *Solenoid valve is not working. Call service*

Error no.: 20 No rotor identification

Reason: *No rotor inserted*

Action: *Insert rotor into the unit*

Reason: *Rotor identification sensor defective*

Action: *Call service*

Reason: *Inserted rotor has no indicator ring*

Action: *Use a correct rotor*

Reason: *Rotor is not fixed correctly to the motor shaft*

Action: *Insert rotor correctly. The pins has to align correctly with the rotor slots (see chapter 3)*

Error no.: 21 Start Bit is missing

Reason: *A magnet of the indicator ring is missing*

Action: *Check indicator ring and call service*

Error no.: 22 Rotor is not mentioned in the rotor chart

Reason: Rotor is not authorized for this unit

Action: Insert only rotors authorized for this unit

Error no.: 25 Power failure

Reason: Power failure while rotor is in motion

Action: Open and reclose the lid, restart the centrifuge

Error no.: 30 Radius correction

Reason: Radius correction value too big

Action: Adjust the radius correction to the correct value

Error no.: 36 Relay for the frequency converter cannot be released

Reason: Defect on the power board

Action: Call service

Error no.:50,51 Memory failure

Reason: Internal or external memory failure

Action: Restart the unit, if the failure occurs again, call service

Error no.: 55 Overspeed

Reason: Overspeed sensor or engine speed sensor defective

Action: Call service

Error no.: 60 Engine speed sensor signal is missing

Reason: Engine speed sensor defective or parting of a cable at the sensor

Action: Call service

Error no.: 70 Interface of the frequency converter

Reason: Communication of controller, power board, interface cable and frequency converter is not working

Action: Call service

Error no.: 82-83 Cutoff power board - frequency converter

Reason: Overcurrent or undervoltage due to power supply fluctuations

Action: Restart the unit, take care that the power supply is stable

Error no.: 84 Overtemperature at the driving

Reason: Temperature at the converter or motor too high

Action: Switch off the centrifuge. Wait for about 15 min. and switch the unit on again

Error no.: 85-87 Failures

Reason: Internal defect

Action: Call service

Error no.: 90 Emergency lid release

Reason: The centrifuge lid has been opened by the emergency lid release during the run

Action: Close centrifuge lid. Danger of accident!

Reason: Control switch of the lid lock is defective

Action: Call service

Error no.: 94 Voltage loss during run

Reason: The power supply is below the tolerance for a short moment

Action: Wait till stillstand of the rotor. Open centrifuge lid after the yellow LED "lid" is lighting. Switch off and on the main switch.

**Rotor 220.70 V06 und V05, swing-out 4 x 750 ml
rectangular bucket 614.000**

tube rack	radius correction
714.000	3,1 cm
714.002	2,5 cm
714.003	2,8 cm
714.004	3,1 cm
714.005	3,1 cm
714.006	2,9 cm
714.007	2,8 cm
714.008	3,1 cm
714.009	3,1 cm
714.010	3,1 cm
714.011	3,1 cm
714.012	3,1 cm
714.013	0,3 cm

**Rotor 220.29 V03 , Swing-out 6 x 500 ml, R - max. 23,5 cm
round bucket 612.000**

tube rack	radius correction
712.001	2,0 cm
712.002	0,3 cm
712.003	0,3 cm
712.004	0,3 cm
712.005	2,5 cm
712.006	0,3 cm
712.007	0,3 cm
712.008	0,3 cm
712.009	0,3 cm
712.010	0,8 cm
712.011	0,8 cm

Rotor 220.78 V02	adapter	radius correction
angle rotor	707.001	0,9 cm
6 x 85 ml	707.000	0,1 cm
R - max.: 10,3 cm	708.000	0,6 cm
	707.002	0,5 cm
	708.001	0,8 cm
	707.003	0,3 cm
	707.004	0,6 cm

Rotor 220.80 V02	adapter	radius correction
angle rotor	708.000	0,6 cm
8 x 50 ml	708.004	0,5 cm
R - max.: 9,5 cm	708.003	0,4 cm
	708.001	0,3 cm
	708.002	0,7 cm

Rotor 220.76 V02	adapter	radius correction
angle rotor	709.001	0,3 cm
8 x 30 ml	709.000	0,3 cm
R - max.: 9,4 cm		