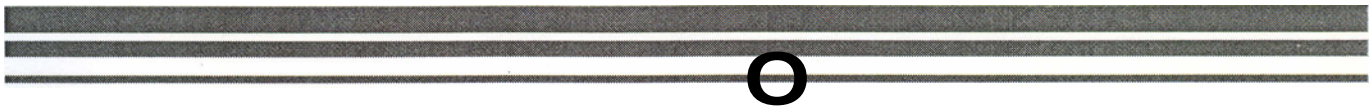
SORVALC
Biofuge fresco



OPERATING INSTRUCTIONS

'Kendra

Laboratory Products

PN 00000-0

How to use this manual

Use this manual to get acquainted with your centrifuge and its accessories.

The manual helps you to avoid inappropriate handling. Make sure to keep it always close to the centrifuge.

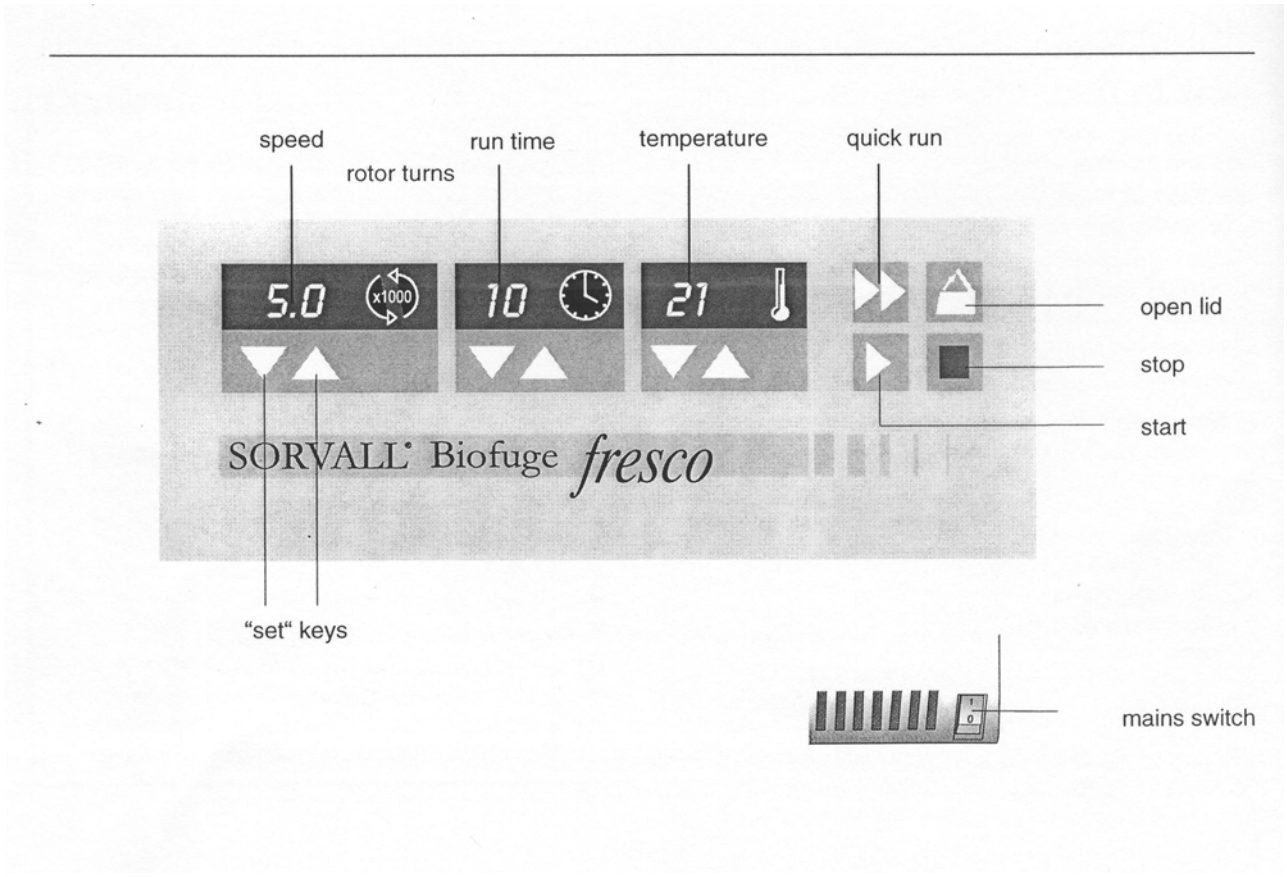
A manual that is not kept handy cannot provide protection against improper handling and thus against damage to persons and objects.

This manual comprises chapters on

- Safety regulations
- Instrument description
- Rotor program and accessories
- Transportation and hook-up
- Use of the centrifuge
- Maintenance and care
- Troubleshooting
- Technical data
- Index

Overleaf you will find a graphic representation of the control panel of the *Biofuge fresco* with a survey of the most important functions.

Please fold out


speed
rotor turns
run time
temperature
quick run
5.0
x1000
10
21
open lid
stop
start
SORVALL Biofuge fresco
"set" keys
mains switch

The control panel of the *Biofuge fresco*

Display

Speed

Resting:	preset speed
Run:	current speed; *rotating light:* rotor turns
End:	"End"
Stop/run:	error codes

Time

Resting/end:	preset run time
During run:	remaining run time or (with quick start) run time passed

Temperature

Resting/end/ run:	current temperature of sample

Keys

Start:	normal start
Quick run:	short-term acceleration as long as key is pressed, with indication of run time passed
Open lid:	open lid (possible only with mains switch ON)
Stop:	manual stop
"Set" keys:	stepwise increase/decrease of pre-set values, accelerated change when pressed permanently

Short pressing of any of the "set" keys: switch from current to preset value

Error codes (troubleshooting see chapter "Troubleshooting") E-OO: motor blockage (transport protection *removed?)*

E-4:	error in temperature measurement
E-7:	actual temperature out of range
E-8:	excess voltage
E-10:	internal error (call Service)
E-11:	internal error (call Service)
E-23:	*deviation* in internal temperature calibration

br: power turned off during run or power failure

Lid: lid turned loose or opened during run

OPEN: with lid closed: safety circuit triggered

Warnings can span several display panels

Contents

Co

Contents

For your safety

SORVALL~ centrifuges are manufactured according to current technical standards and regulations. Nonetheless, centrifuges may pose dangers if

- they are not used as designed
- they are operated by untrained personnel
- their design is improperly changed
- the safety instructions are not heeded

Therefore anybody concerned with operation and maintenance of the centrifuge must read and follow the safety instructions.

In addition, the pertinent regulations for prevention of accidents must be strictly followed.

~ This manual is an integral part of the centri~ fuge assembly and must be kept close at hand at all times.

Proper use

The centrifuge is designed to separate liquid-suspended materials having different densities and particle size, respectively. The maximum sample density is 1.2 g/cm^3 at maximum speed.

Improper use

During a run, a safety zone of 30 cm around the centrifuge must be maintained where neither persons nor hazardous materials may be stationed.

The centrifuge may cause harm to you or other persons and may damage material goods if you do not respect the following safety measures:

Centrifuging hazardous materials

- The centrifuge is neither made inert, nor is it explosion-proof. Therefore never use the centrifuge in an explosion-prone environment.
- Explosive or flammable substances must not be centrifuged. The same holds for substances prone to react briskly with each other.

For your safety

- Do not centrifuge toxic or radioactive substances or pathogenic microorganisms unless you have taken proper precautions.

  Such precautions can e.g. consist of biological seals.

- Should toxins or pathogenic substances enter the centrifuge or its parts, you must carry out the proper procedures for disinfection (see "Maintenance and care - Disinfection").
- Strongly corrosive substances that may cause damage to materials and impair the mechanical strength of the rotor may be centrifuged only inside protective vessels.

Handling

- Never use the centrifuge unless the rotor is properly mounted.
- Never manually open the lid if the rotor still turns.
- Use only original parts for the centrifuge. The only exception are common glass or plastic centrifuge tubes if these are approved for the rotor speed and RCF values of your rotor, respectively.
- Never use the centrifuge with the lid open.
- Never use the centrifuge if the paneling has been partially or totally removed.
- Changes in mechanical or electrical components may be carried out only by persons authorized to this effect by KENDRO Laboratory Products.
- You may use the centrifuge only with a properly loaded rotor. You must not overload the rotor.
- If the rotor or the lid shows visible traces of corrosion or wear, you must stop using it.
- Strictly follow the rules and regulations for cleaning and disinfection.

Conformity to current standards

SORV ALL" centrifuges are manufactured and tested according to the following standards and regulations:

(E

for all voltages:

- IEC 1010-1 / EN 61010-1
- IEC 1010-2/ EN 61010-2-020 -
  Pollution degree 2
  - Overvoltage category II

for 110 V only:

- CAN/CSA-C22.2 No.1 01 0.1-92
- CAN/CSA-C22.2 No. 1010.2.020-94

Safety instructions in this manual

A This symbol denotes potential hazards to per **ill** sons.

~

In addition, you are asked to adhere to the pertinent regulations, in Germany

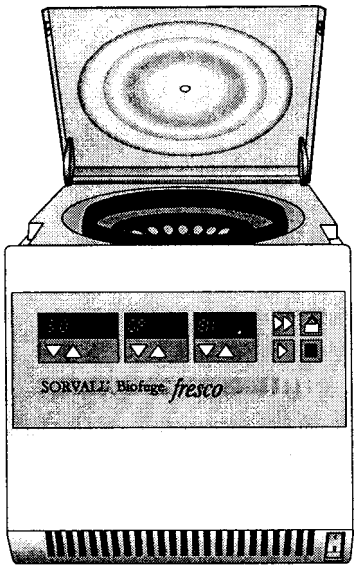
- Regulations for prevention of accidents VBG 4
- Regulations for prevention of accidents VBG 5
- Regulations for prevention of accidents VBG 7z
- Regulations for prevention of accidents VBG 20

For your safety

For your notes

The *Biofuge fresco*

The figure below shows the *Biofuge fresco* with the lid opened. In this state the standard display is speed x 1,000 and "OPEN".



The biofuge fresco

Safety systems

The *Biofuge fresco* is equipped with a number of safety systems.

Rotor chamber

The rotor chamber consists of a stainless steel case which is sealed against the motor with a rubber cover. When the lid is closed, the rotor chamber is sealed against the surroundings by a rubber ring with a special profile.

The rotor chamber is wrapped in evaporating tubing filled with the ecologically harmless cooling agent R134a, which is free from fluorinated/chlorinated hydrocarbons.

Warning if lid is manually opened during a run, or if drive is overheated

If the lid is manually opened during a run, or if the temperature of the drive exceeds a critical value, a corresponding message appears in the display ("Lid" and "OPEN", respectively).

Lid lock

You can open the lid only when the power is turned on and the rotor has practically come to a halt

The Biofuge fresco
«80 rpm). You can start the centrifuge only if the lid is properly closed.

Emergency lid release

In order to permit you to remove samples even after a power failure, the centrifuge is equipped with an emergency lid release.

Features

The *Biofuge fresco* is a refrigerated benchtop centrifuge for the preparation of sensitive samples in the biochemical and medical laboratory. The rotor accepts a large array of common centrifuge tubes up to a volume of 2 ml.

The powerful refrigeration permits, at a room temperature of 25°C, to maintain a sample temperature of 0 °e over prolonged periods of time even at the maximum speed of 13,000 rpm.

The preset speed is reached in seconds. You can also spin samples for only a few seconds using the "quick run" key if this is required for the task in question. The extremely long-lived, maintenance-free induction motor provides quiet and vibration-free operation even at high speeds.

The user-friendly "Easycontrol" control panel permits easy operation. With the centrifuge turned on and the : lid closed, the preset speed and run time and the actual temperature are displayed before the run. , During operation, the control panel shows the actual values; upon briefly pressing anyone of the "set" keys or the preset values for speed, run time ." and temperature are indicated instead. :

After the run, the speed control panel displays "End".

If you press the or keys repeatedly, you in- crease the corresponding preset value stepwise. If you press and hold down the chosen key, the respective value increases continuously, at first slowly , and, after a few seconds, at an accelerated pace.

Temperature regulation of the *Biofuge fresco*

During a run, the spinning rotor creates frictional heat. This leads to a temperature increase of the rotor, the tubes and finally of the samples. The extent of warming depends on:

- run time
- temperature of the environment
- location of the centrifuge
- rotor speed

The *Biofuge fresco* is equipped with a powerful compression-type refrigeration. Possible settings are from -9°C to +40 DC. For short-term operation requiring precise temperature control, both the rotor and the rotor chamber must be preadjusted to the desired temperature.

“Quick run” operation

As long as the "quick run" key is pressed, the rotor is accelerated with maximum power, potentially up to the maximum speed.

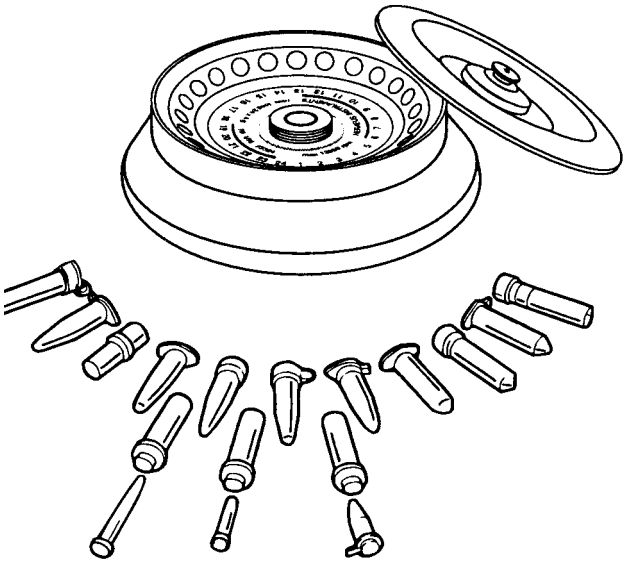
Accessories

Fixed-angle rotor for microliter tubes

The *Biofuge fresco* is delivered complete with a fixedangle rotor with 24 holes for placing microliter tubes with a volume of 1.5 or 2.0 ml.

In addition you may order three sets of adapters containing 24 reduction sleeves each. With these adapters you can centrifuge all commercially available microliter tubes with a volume between 0.2 and 0.6 ml as well as 0.2-ml PCR reaction vessels.

Please consult our sales documentation for a complete collection of accessories including technical data and order numbers.



The Rotor

Table 1: *Fixed-angle rotor 7500* 3325 *for Biofuge fresco*

places/volume		24 x 1,5/2 ml
maximum permissible Load		24 x 4 g
permissible temperature range		-4°C to +40 °C
maximum speed n_{max}	[minot]	13000
maximum RCF value at n_{max}		16060
minimum speed n_{min}	[minot]	2000
minimum RCF value at $n_{m,n}$		380
maximum radius	[cm]	8,5
minimum radius	[cm]	5,9
angle		~o
maximum kinetic energy	[s]	1,65 kNm

Adapters for rotor order no. 7500 3325

Table 2: *Adapters for the fixed-angle rotor of the Biofuge fresco*

Adapter	Dimensions (O x H)	Capacity	Number per Set	Color	Order No.
reduction sleeve PCR	6,2 x20 mm	0,2ml	24	gray	76003750
reduction sleeve	8 x 43,5 mm	0,5/0,6 ml	24	turquoise	76003758
reduction sleeve	6 x46 mm	0,25/0,4 ml	24	red	76003759

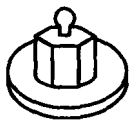
Items delivered

The *Biofuge fresco* is delivered complete with:

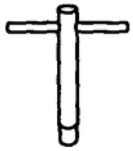
- a special cap nut for fixing the rotor
- 10-mm tubular socket wrench for fastening the cap nut
- fixed-angle rotor 24 x 1,5 / 2 ml 7500 3325
- screw-on top 7500 3326

• cable for mains connection

The printed documents consist of the delivery notes and this Manual.



cap nut
order no.
70056208



tubular socket wrench
order no.
20360072

Before use

Where to install the centrifuge

The centrifuge may only be used indoors. Its location must meet the following criteria:

- A safety zone of 30 cm around the centrifuge must be maintained. Hazardous materials must not be kept within this zone during centrifugation.
- The substructure must be stable and resonancefree. A good support is provided by a plane laboratory bench or a large laboratory carriage with casters that may be locked.
- To ensure sufficient air circulation, a minimum distance from the wall of 10 cm at the back and of 15 cm on each side must be kept.
- The centrifuge must be protected from heat and direct sunshine .
- The location should be well ventilated.

Mains connection

Make sure that the mains supply you use for the centrifuge meets the specifications printed on the type

plate.

Turn the mains switch off (press "0"); only then connect the centrifuge with the mains supply using the power cord supplied with the instrument.

Removing the transport protection

Turn the instrument on. The display panel shows for about 6 s the routine internal software check sequence. Open the lid by pressing the "$_{ope}$n lid" key ~ and remove the transport protection for the rotor.

Check that the rotor moves freely by lightly turning it, and make sure the rotor is tightly screwed on.

for your notes

Operation

Transport and installation

Transport the centrifuge only in the upright position using the special box provided with the instrument and secure it properly. Place the centrifuge carefully.

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Before using the centrifuge, make sure that the transport protection has been removed!

In order to allow the coolant to settle down in the compressor, the instrument must be left idle at the new location for about ½ to 1 hr.

The *Biofuge fresco* is now ready for use.

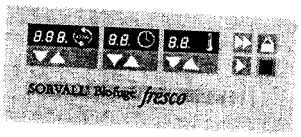
Mains connection

Make sure that your mains voltage and frequency match the specifications on the instrument. Turn off the mains switch on the lower right of the instrument (push down the "0" marking), then connect the instrument to the mains supply.

Turn on the mains switch on the lower right (see figure)

mains switch

For a couple of seconds the following reading appears in the control panel:



This tells you that the instrument carries out an internal check of its software.

After a Couple of seconds the display changes. The values now shown are (except for the temperature) the ones last used. The temperature reading gives the current temperature of the sample (before the start normally the temperature of the rotor chamber).

The following figure gives an example of possible readings. A detailed description of possible settings is given below.
In this example, the preset speed is 5,000 rpm, the preset run time is 10 min, and the current temperature reading is
21°e.

Opening the lid

For normal electrical unlocking, connect the centrifuge to the mains supply, turn the mains switch on and push the "open lid" key ~.
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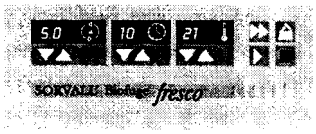


Emergency lid release

In case of a power failure you cannot open the lid normally using the "open lid" key (see previous section). To permit unloading even in this case, the centrifuge is equipped with a mechanical lid unlocking system. However, you may use this system only in case of emergency.
Rotor can spin at high speed! Touching it may cause severe injuries!

Always wait for several minutes until the rotor has come to a complete stop. Without power the brake does not function, and braking takes much longer than normal!
Should it be necessary to open the lid manually, carry out the following steps:

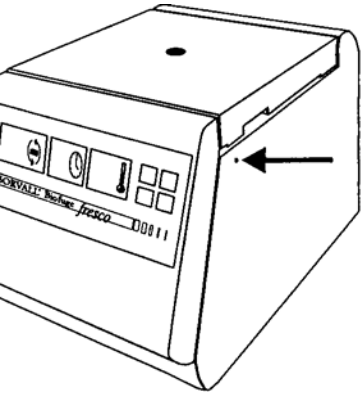
1. Make sure the rotor stands still.
2. Unplug the mains plug.

3. Push a thin screwdriver or another suitable tool horizontally from each side through the two openings in the side panels of the centrifuge (see figure).
   Push the locking pins under the side panels simultaneously from both sides until the lid unlocks audibly. Remove the auxiliary tools and open the lid.
4. In case the rotor still turns, close lid immediately and wait until it has come to a complete stop.

Never brake the rotor using your hands or tools!

5. As soon as the rotor stands still, remove your samples and close the lid.

Operation



Important application information for rotor 75003325 !

To attach the rotor, use the acorn nut with ball head! (Order no. 70056208)

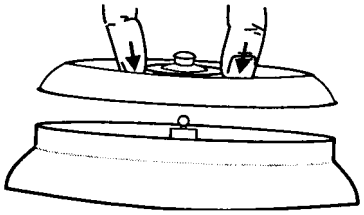
T^{o} tighten the acorn nut, use the 10 mm tubular hexagon box spanner .
(Order no. 20360072)

Please always close your microlitre containers carefully. Open container lids can damage the rotor lid.

For some special applications the container lids must remain unsealed. If this is the case, please use the screw top (order no. 75003326) instead of the standard snap-on lid (order no. 70901111).

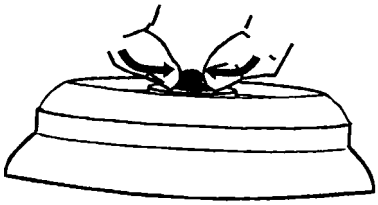
A) Position the snap-on lid .

Press the rotor lid down onto the rotor until the snap-on catch engages onto the ball of the acorn nut.



B) Remove the snap-on lid.

By activating the grip cap, the lock is released and the rotor lid can be removed.



Inserting the rotor

Possible damage to drive and rotor!

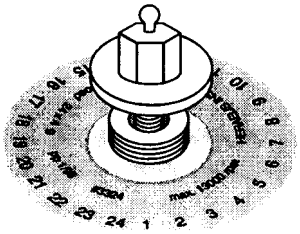
You may insert the rotor only if the temperature of the drive, the rotor and the cap nut is between 10 °C and 30°C.

The rotor approved for the *Biofuge fresco* is shown in the chapter "Accessories". Check whether the rotor you want to insert corresponds to the figure in this chapter.
To insert the rotor, you need the rotor, the cap nut and the tubular socket wrench supplied (see chapter "Accessories - items delivered").

Possible damage to drive and rotor! Do not push down the rotor by force. If you cannot screw on the cap nut easily, remove the rotor and reinsert it.

To put the rotor into position, proceed as follows

1. Open the lid and make sure that the rotor chamber is clean. Remove eventual dust, foreign material, condensation water, or sample residues. The thread and the O-ring on the motor shaft must be in perfect condition.
2. Turn the rotor so that the notch for engaging the drive shaft points downward.
3. Place the rotor on top of the drive shaft so that the notch of the rotor is located precisely above the retaining pin.
4. Push the rotor gently down until the thread is completely laid bare (see figure).



5. If you have placed the rotor correctly, you can screw on the cap nut easily and secure it with the tubular socket wrench delivered with the instrument.
6. Snap the rotor cap onto the rotor (the optional hermetic lid 7500 3326 is screwed on centrally with the lid nut).

Regularly check the proper positioning of the rotor and re-tighten the cap nut as needed .

Permissible rotor temperature

The rotor 7500 3325 may be used only within a temperature range of -4°C to +40 °C. Pre-cooling in the freezer is not permitted.

Lifetime of the rotor

High-performance rotors made from plastic have a limited lifetime. For reasons of safety the rotor 7500 3325 must be replaced after 5 years of use!

The date of production is marked on the rotor as follows:

2/96 where 2 means 2nd quarter of the year

and 96: year of production

The year of production plus 5 years gives the expiration date!

Removing the rotor

To remove the rotor, you must follow the steps described above in reverse order.

With the hermetic lid, you may in case of contamination separate the rotor from the drive without opening the lid! In this case you can open rotor upon removal from the centrifuge using e.g. a safety work bench before decontaminating it.

1. Open the lid of the centrifuge.
2. Remove rotor cap (not necessary with the hermetic lid).
1. Screw the cap nut open by turning it counterclockwise using the socket wrench delivered with the instrument. Remove the cap nut.

Danger of irreparable motor damage!
Never tilt the rotor. Always grab it in the middle and pull out perpendicularly.

4. Grab the rotor in the middle and pull gently upwards off the drive shaft. Be careful not to jam it.

Loading the rotor

The *Biofuge fresco* is delivered with the fixed-angle rotor 7500 3325 with 24 places. Three sets of adapters and a hermetic lid are available for this rotor (see under "Accessories").

Improper or improperly combined accessories may cause severe damage to the centrifuge!

Use only the parts and accessories listed in the chapter "Accessories".

Maximum loading

Overloading may cause the rotor to explode! Exploding parts may severely damage the centrifuge!

Never exceed the maximum permissible load of 4 g per place.

The *Biofuge fresco* can reach high rotational speeds implying enormous centrifugal force. The rotor is designed in a way warranting sufficient residual strength even at the highest permissible speed.

However, this safety system presupposes that the maximum permissible load of the rotor is not exceeded.

The maximum load for the rotor has been calculated for a sample density of 1,2 g . cm-^{3}• If the density of your sample is higher, you must either reduce its volume (to an overall weight of 4 g) or calculate a reduced speed npenn according to the following formula:

$$n_{perm} = n_{max} * \sqrt{\frac{\text{weight of tube with sample 1,2g} * \text{em}^{-3}}{\text{weight of tube with denser sample}}}$$

Filling the tubes

Separations by centrifugation function best when the unbalance of the rotor is minimized because separated zones are not perturbed by vibration. It is therefore important to balance the centrifuge tubes as well as possible.

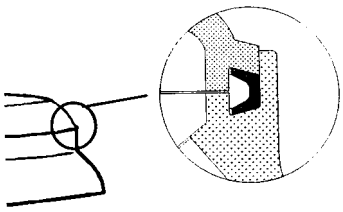
To minimize unbalance you should fill the tubes as evenly as possible. You can achieve this by eye. However, you must nonetheless ensure that opposite tubes are filled to the same level.

Aerosol-tight application
AAL only with screw-on top 75003326 and ~ not with open container lids!
The following steps have to be carried out:

-Lubricate the seals before inserting them (lubricant order no. 75003500)

-Insert the seal (C profile) in the groove at the side of the body of the rotor.

-Insert the O-ring into the inner groove on the screw-on top.



Attention:
Please check that your sample containers are suitable for the centrifugal application desired.

(16060 x g ; temperature in uncooled devices approx. 10K above room temperature)
Please observe the permissible filling volumes!

Nominal volume:		Permissible volume:
2.0 ml	-	1.5 ml
1.5 ml	-	1.0 ml
others	-	2/3 nominal volume

The sealing elements are to be checked regularly for damage to the shape and surface!
Exchange faulty parts immediately (spare sealing rings 75003268)

The snap-on lid is not suitable for aerosol-tight application!

Checking for aerosol tightness

Check the aerosol tightness of your rotor whenever appropriate.

To carry out the test, proceed as follows:

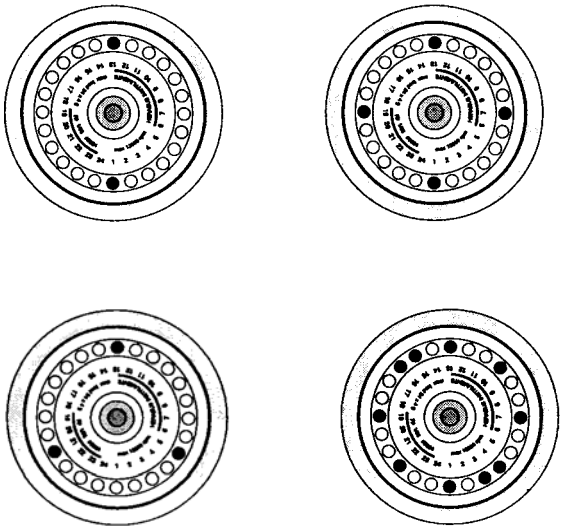
- Carefully clean and degrease the *rotor* chamber wall, then attach an adhesive white paper strip (about 4 x 2 cm) so that liquid leaking out of the *rotor* may precipitate on it.
- Fill all places of the *respective rotor* with water according to the following Table. Insert the *rotor* into the centrifuge and fasten *it*.
- Carefully *place* the amount of test liquid (0.5 % sodium fluorescein in water) specified in the column "leakage test" into the lower part of the *rotor* within a virtual circle comprising the vessel bores (not the bores themselves) using a pipette or syringe.
- Place the *rotor* lid on top and screw it on.

  A TTENTION: Make sure that there is no spilled test liquid on the *rotor* (clean if necessary)!
- *Carry* out a test run for 10 minutes at maximum *rotor* speed and 23 °C ambient temperature.
- Check the paper strip under *UV* light (preferentially in a darkened room):

  If there is no detectable fluorescence, the test is considered passed.
- Finally rinse *rotor, rotor* lid and lid seal in running water and allow to dry.

Placing the tubes in the rotor

The rotor must be loaded symmetrically. When loading the rotor only partially, you must ensure that opposite bores· always receive tubes of equal weight (when centrifuging a single sample, place a centrifuge tube e.g. filled with water). The following figure gives examples for proper loading.



properly loaded rotors

Improper loading can in the worst case lead to damage to rotor and centrifuge. Unbalance not only causes a noisy run, but rapidly damages the motor suspension .

improperly loaded rotors

After loading the rotor, snap on the rotor cap until it locks into place. The optional hermetic lid 75003326 is screwed onto the rotor with the central nut. Close the lid of the centrifuge by firmly pressing it down. There must be a clicking sound, and the lid must be locked so that it cannot be opened manually.

Selecting the speed

The minimum speed of the rotor is 2,000 rpm, the maximum speed 13,000 rpm. The built-in microprocessor prevents higher or lower speed settings. Between these extremes, you can select the speed in steps of 100 rpm using the following procedure:

1. Press one of the "set" keys a (increase) or g (decrease) in the speed control section of the control panel *(ct.* foldout leaf in the cover):

   By pressing the key briefly, you increase or decrease the speed in steps of 100 rpm. This option is supposed to be used for small changes and fine tuning.

2. If you keep the key pressed, the display changes at first slowly and after a few seconds at an accelerated pace.
3. Release the key as soon as you are close to the desired value, and fine tune if necessary by repeatedly pressing the selected key (or its counterpart if you have proceeded too far in one direction). The first digit after the decimal point flashes for a few seconds and then turns permanent. The speed is now stored.

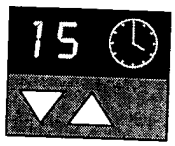
Selecting the run time

You can select a run time between 1 continuous operation.

Preselected run time

To predetermine the run time, proceed as follows:

1. Press one of the "set" keys a (increase) or (decrease) in the run time section of the control panel *(ct.* foldout leaf in the cover):

   By pressing the key briefly, you increase or decrease the preset run time in steps of 0.1 min. This option is supposed to be used for small changes and fine tUning.

2. If you keep the key pressed, the display changes at first slowly and after a few seconds at an accelerated pace.
3. Release the key as soon as you are close to the desired value, and fine tune if necessary by repeatedly pressing the key (or its counterpart if you nave proceeded too far). The display flashes for a

few seconds and then turns permanent. The run time is now stored.

Continuous operation

For continuous operation, press the key D repeatedly or press and hold until "hd" (for "hold") appears in the display.

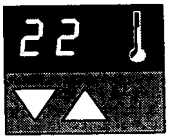
With this setting, the centrifuge keeps running until stopped manually.

r::.Jff=" Please note that the lifetime of plastic tubes in particular is limited. Extended use may damage them.

Setting the temperature The temperature is set as follows:

1. Press one of the "set" keys a (increase) or a (decrease) in the run temperature section of the control panel (cf. foldout leaf in the cover):

By pressing the key briefly, you increase or decrease· the temperature in steps of 1. This option is supposed to be used for small changes and fine tuning.



2. you keep the key pressed, the display changes at first slowly and after a few seconds at an accelerated pace.
3. Release the key as soon as you are close to the desired value, and fine tune if necessary by repeatedly pressing the key (or its counterpart if you have proceeded too far). The display flashes for a few seconds and then turns permanent. The temperature setting is now stored.

The refrigeration starts operating at once if the preselected temperature is below the temperature of the rotor chamber.

Bringing the rotor to the desired temperature in the centrifuge

You can precool or preheat the rotor inside the centrifuge by using the following procedure:

1. Insert the rotor if not already in place. **Attention!**
   To avoid jamming, do not tilt the rotor! Read the pertinent hints in the chapter "Before use",
2. Adjust the temperature as desired using the keys in the temperature control panel as described above.
3. Set the speed to the maximum value.

4. Select a run time of 15 min and start the centrifuge by briefly pressing the start key

If you wish to change the temperature of your samples, please consider that the time required for temperature adjustment is prolonged. The farther apart initial and final temperature, the longer it takes for the temperature to adjust.

~ The temperature reading does not give the change in the temperature of the sample (the reading is delayed with respect to the actual temperature change). You cannot follow the heating or the cooling of the samples directly. For critical applications you should take other precautions to ensure that the desired temperature is actually reached and maintained (e.g. by measuring the temperature immediately after the run).

Starting the centrifuge

Once the rotor is in place, the main switch turned on and the lid closed, you can start the centrifuge.

Press the "start" key lei in the control panel. The centrifuge accelerates to the preselected value. Simultaneously, the run time display starts going backwards from the preset time, giving the remaining run time in minutes. After reaching the last minute the display switches to seconds remaining. The rotating light tells you that the centrifuge is running. During the run, you cannot open the lid.

Changing the settings during the run

You can change the settings while the rotor is spinning (not in the "quick run" mode, see section "Short-time centrifugation" below). The altered value flashes for a few seconds, then changes to continuous display. At the same time the new values are activated.

Stopping the centrifuge

Stopping with preset time

Normally the run time has been preselected, and all you have to do is wait until the centrifuge terminates the run automatically. As soon as the speed is close to zero, the display reads "End". By pressing the "open lid" key ~ you can now open the lid and remove the samples.

You can also terminate the run at any time as described under "Stopping with continuous operation".

Stopping with continuous operation

If you have chosen continuous operation, you must stop the centrifuge manually by pressing the "stop" key. in the control panel. The centrifuge starts braking at once and stops within a few seconds. The speed display changes to "End", and the electrical unlocking mechanism of the lid is available. You can now open the lid by pressing the "open lid" key**.**

Short-time centrifugation

For short-term operation, the *Biofuge fresco* is equipped with the "quick run" function.

Short-term centrifugation is started by pressing the "quick run" key ⓜ continuously; it stops as soon as the key is released.

In this mode the centrifuge accelerates with full power up to the maximum speed of 13,000 rpm unless you release the "quick run" key ⓜ The preset speed is ignored.

The centrifuge accelerates to the maximum speed of 13000 min-'.

Check carefully whether you have to maintain a specific speed for your application.

During acceleration the time is counted forward in seconds. After 60 seconds the display changes to the minute mode.

ReF value

The *relative* centrifugal force (RCF) is usually given in multiples of the earth gravity *g*. It is a dimensionless number that allows one to compare the efficiency of separation or sedimentation of diverse instruments, since it is independent of the instrument used. The only values entered in the equation are radius and speed of centrifugation:

$$ReF = 11.18 * \left(\frac{\sim}{1000}\right)2 * r$$

r = radius of centrifugation in cm

n = speed in rpm

At a speed of 13,000 rpm the centrifuge reaches 16060 x *g!* Check carefully whether your tubes are designed for this centrifugal force, and reduce the speed if necessary.

The figure for the maximum RCF value is based on the maximum radius of the tube.

For the fixed-angle rotor 7500 3325 the above *formula* yields for the bottom of the bore (radius 8.5 cm) a maximum RCF value of 16,060:

$$RZB = 11.18 * \frac{(13{,}000)2}{1000} * 8.5 = 16060$$

Please note that this value becomes lower depending on the tubes and adapters used.

You may take this into account when calculating the RCF value for your application.

The figure on the *last* page of this manual gives a graphic representation of the relation between speed and RCF.

Apart from the maximum RCF value RCF_{max} (lower line) this graph also shows the minimum RCF value $RCF_{mIn'}$ *calculated* for the meniscus of the sample (upper line).

Maintenance and care

Maintenance operations to be carried out by the customer

For the protection of persons, the environment and the equipment you are obliged to clean the centrifuge regularly and to disinfect it if necessary.

Unsuitable cleaning agents or disinfection procedures may damage the centrifuge and its parts!

For cleaning and disinfection use only the cleaning and disinfection procedures detailed in this manual.

Cleaning

Pull mains plug before cleaning the instrument!

Control ventilation slots and clean if necessary.

The main care is to clean regularly (or as need arises) the housing, the rotor chamber, the rotor and the accessories. This is indicated both for reasons of hygiene and to prevent corrosion due to contamination sticking to the instrument and its accessories.

For cleaning you should only use agents approved by KENDRO:

- Caraform
- deconex 16 NT
- Extran MA 02 neutral
- RBS neutral

For all other cleaning agents please consult our Service Department!

Organic solvents decompose the lubricant of the motor bearing. The drive shaft may jam.

Liquids and especially organic solvents must not come into contact with the drive shaft and the ball bearing during cleaning.

If an ice sheet was present in the inner chamber, make sure to remove the water formed during defrosting.

Disinfection

Infectious material enters the centrifuge if spills or tube breakage occur! Danger of infection upon contact!

Comply with the permissible filling volumes!

In case of contamination immediately disinfect rotor, rotor chamber and any accessories (adapters) involved. Wear protective gloves!

If a centrifuge tube containing infectious material becomes leaky or breaks during a run, you must immediately disinfect the centrifuge. In doing this, you must heed the following points:

- To decontaminate the affected rotor chamber and rotor, use only disinfectants approved by KENDRO. These agents are to be used according to the Instructions for Use supplied with the respective disinfectant:

- Aldasan 2000
- Carlitt Spray

- Coldspore
- Gigasept FF
- HBV Pump-Spray
- Incidin Liquid Spray
- Incidur Spray
- Incidin plus
- Kohrsolin iD
- Lysetol FF
- Lysoform
- Lysoformin 3000
- Sagromed

  Sag rotan

For all other disinfectants please consult our Service Department!

Maintenance and care

- You may disinfect the rotor and the accessories as described in the following section. Be sure to follow the pertinent safety procedures for handling infectious material.

1. Pull the mains plug.
2. Unscrew the rotor seat.
1. Grab the rotor with both hands and pull it perpendicularly off the drive shaft.
1. Remove the centrifuge tubes and adapters, and disinfect them or dispose of them as necessary.
1. Treat the rotor and the rotor lid according to the instructions given for the disinfectant in question (soaking in liquid or spraying). You must strictly observe the specified reaction times!
1. Turn the rotor head down and drain it. Thoroughly rinse rotor and lid with water.
1. Dispose of the disinfectant solution as required by the respective valid regulations.
1. Aluminum rotors must subsequently be treated with anticorrosive grease.

Disinfection with eau de Javelle

These bleaching agents contain extremely aggressive hypochlorite solutions and may in no case be used with aluminium rotors. To protect the rotor 75003325 as far as possible you must take the following precautions:

1. Avoid high temperatures!
   The bleaching solution and the rotor should not be warmer than ca. 25°C.
2. Do not let the bleaching solution act longer than absolutely necessary!
2. After disinfection, rinse the rotor thoroughly with distilled water and allow to dry.

Autoclaving

Check whether autoclaving is permitted!

You may autoclave the rotor and the adapters at 121°C.
Maximum permissible autoclaving cycle: 20 min at 121°C.

The rotor must be cleaned and rinsed with distilled water before being autoclaved. Remove the rotor lid, the centrifuge tubes and the adapters. Place plastic rotors on an even surface to avoid deformation.

Chemical additives to the steam are not permitted.

For reasons of safety you may autoclave the rotor 7500 3325 maximally 10 times!
Never exceed the maximum permissible

The Service of KENDRO

Kendro Laboratory Products GmbH recommends annual servicing of the centrifuge and the accessories by the authorized service or skilled personnel. The service provided by KENDRO comprises checking:

- the electrical installation
- the suitability of the location
- the lid lock mechanism and the safety circuit
- the rotor

• the rotor fastening and the drive shaft

Defective parts are exchanged. Besides, the service personnel cleans the rotor chamber.

KENDRO offers inspection and service contracts covering these benefits. Inspection costs are charged as flat-rate contracts.

Necessary repairs are carried out free of cost during the warranty period, and against payment after expiration of the warranty.

Warranty conditions

The warranty period starts with the day of delivery. Within the warranty period the centrifuge is repaired or replaced free of cost if there are demonstrable faults in materials or workmanship.

Conditions for a warranty are that:

- the centrifuge is used according to the instructions of use
- installation, additions, adjustments, changes or repairs are carried out exclusively by personnel authorized for this by KENDRO
- the required maintenance and care procedures are carried out regularly.

1.
Troubleshooti ng

Problems you can handle yourself

If problems other than those described in the following tables arise, you must consult your nearest authorized service.

Erro r	Behavior of the centrifuge	Possible cause(s) and measures to be taken
Displays remain dark	The motor stops. The rotor stops without braking. The lid cannot be opened.	Mains failure or not connected 1. Is the mains switch turned on? 2. Check the mains connection. 3. If the mains connection is OK, call the nearest Service.
Displays fail briefly	The motor stops suddenly. The rotor stops without braking. The display reads "br", see br.	Brief interruption of mains supply 2. Check whether the plug is plugged in properly. 2.Wait for 75 seconds. 3. Restart the centrifuge.
Lid cannot be opened	Pressing the "open lid" key has no effect.	Lid not correctly engaged or lid warped. Press lid down in the middle of the front section. Heat monitoring relays in the lid unlocking magnets have been actuated. Press key again after a short pause (approx. 1 min).

3.

Troubleshooting

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
Loud running noise	Centrifuge is exceptionally noisy.	1. Stop the centrifuge by pressing the key ❙❙ , in case of emergency pull mains plug. 2. Wait until the centrifuge stands still. 3. Check whether the rotor is properly loaded. 4. Check whether a broken vessel, damage to the rotor or motor malfunction was responsible for the noise. 5. If you cannot locate and solve the problem, call Service.
br	Instrument was switched off during run, or brief mains failure.	If the instrument was switched off inadvertently, switch on again. Wait for about 75 seconds. The centrifuge comes to stop without braking.
E-OO	Motor does not start.	**Motor or rotor** is blocked. 1. Switch the instrument off and on again using the mains switch. 2. Open the lid. 3. Remove transport protection from the rotor.
E-4	Error in temperature measurement	1. Switch the instrument off and on again. 2. If the error persists, call Service.

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
E-?	Actual temperature outside tolerance «-10°C or >50 0c)	Switch the instrument off and on again. Should the display "E-?" persist, the temperature control circuit is defective. Please call your nearest Service.
E-8	Overvoltage at the U/F converter	Mains voltage outside tolerance. Brake resistance defective. Call Service if trouble persists.
E-10	Wrong check sum in the NV-RAM	Switch the instrument off and on again. If the problem persists, call Service.
E-11	Error in data transfer from NV-RAM	Switch the instrument off and on again. If the problem persists, call Service.
E-23	Deviation in the internal temperature adjustment	Switch the instrument off and on again. If the problem persists, call Service.

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
"Lid" appears in the display	Motor stops. Rotor comes to a stop without braking.	The lid was manually opened during the run. 1. Press the lid shut. The instrument comes to a stop without braking. 2. If you want to continue the centrifugation, you must switch the instrument off and on again. The message "br" is displayed and the centrifuge brakes (see br). The safety circuit has been actuated. 1. Pull the mains plug . 2. Control ventilation slots and clean if necessary. 3. After 20 min you can start the instrument again. 4. If the safety circuit is again actuated, call Service.
Display "OPEN" appears although lid is closed	Start impossible	The safety circuit has been actuated. 1. Pull the mains plug. 2. Control ventilation slots and clean if necessary. 3. After 20 min you can start the instrument again. 4. If the safety circuit is again actuated, call Service.

In case you must call the Service

Should you require our Service, please tell us the order no. and serial number of the instrument. You find the pertinent information at the back of the instrument near the socket for the mains plug.

Moreover it is helpful for our service technician (and saves you expenses) to know the valid software version. You can determine the software version as follows:

1. Switch the instrument off.
2. Switch the instrument on.

   The display reads 888 88 88 for a couple of seconds.

   Subsequently, the display may read e.g. 0978 06 (processor 0978 version 06) for about 2 seconds.

   For approximately another 2 seconds, the display may read e.g. 415803 (NV-RAM 4158 version 03).

Technical data

Component parts and performance

Part / function	Description
Design	**Armored** case: stainless steel Frame: torsion resistant, hot galvanized steel plates **Body and front** panel: impact-resistant, highly dampening plastic Lid: stove-enameled steel plate with integral high-resistance foam insulation
Keys and display panel	Keys and display panel covered with easy care protective foil
Control elements	User-friendly "Easycontrol" system
Rotor chamber	Material: stainless steel Dimensions (diameter x height): 180 mm x 54 mm
Lid release	Electromagnetic release with key ~ when switched on.
Lid lock	Automatic locking when the lid is pressed down
Emergency lid release	Lid release in case of mains failure: emergency release with straight pins
max. capacity	24 x2 ml
max. permissible load	24 x 4 g

Function / parameter	Value
environmental conditions	- indoor use - max. elevation 2000 m above sea level - max. relative humidity 80 % up to 31 DC; linearly decreasing down to 50 % relative humidity at 40 DC.
permissible temperature of the environment	10 DC to 35 DC during operation (no condensation) -10 DC to 50 DC for storage and shipping
maximum speed n_{max}	13,000 min"
minimum speed n_{min}	2,000 min"
maximum RCF value at n_{max}	16,060
minimum RCF value at n_{min}	380
maximum kinetic energy	1.65 kNm
noise at maximum speed	< 55 dB (A); <45 dB (A) with standstill refrigeration
set temperature range	-9 DC to +40 DC
Lowest sample temperature at highest speed	0 DC at a room temperature of 25 DC
dimensions (H x W x D)	305 mm x 290 mm x 450 mm
weight without rotor	27 kg

Function	Performance
Start	Start key (III)
Stop	Stop key (.)
Quick starting and stopping	"Quick run" key (In): short-time run when pressed permanently; stop when released
Indication of operating state	Spinning rotor indicated by rotating lights (LED) in the speed display panel
End of centrifugation	Speed display reads "End"
Digital parameter display	• speed • run time • temperature
Speed selection	adjustable in steps of 100 min-' in the range 2000 min-' to 13,000 min-'
Run time selection	adjustable in minutes between 1 min and 99 min; "hd" mode: continuous operation
Temperature selection	adjustable in steps of 1 K between -9°C and 40 °C

Function	Performance
Time display in "quick run" mode	between 1 sand 60 s in seconds, above 60 s in minutes
Parameter memory	• for speed • for run time • for temperature
Diagnostics	• lid not properly closed: display "OPEN" • aeneral faults in performance (error codes)
compliance with standards	Manufactured and checked in accordance with EN 61 010-1, EN 61 010-2-020, EN 50 081-1, EN 50 082-1.

Electrical connections/fuses

Centrifuge	Order no.	Voltage	Frequency	max. current	Power consumption	Fuses inside instrument *
Biofuge fresco	# 7500 5510	230 V	50/60 Hz	1.7 A	270W	2 x 4 A slow-blow (5 x 20 mm)
Biofuge fresco	# 7500 5515	120 V	60 Hz	3.8A	270W	1 x 6.25 A slow-blow (6.3 x 32 mm)
Biofuge fresco Baxter	# 7500 5525	120V	60 Hz	3.8A	270W	1 x 6.25 A slow-blow (6.3 x 32 mm)
Biofuge fresco	# 7500 5535	100 V	50/60 Hz	4.6A	270W	1 x 6.25 A slow-blow (6.3 x32 mm)

* Instrument fuses may be replaced by authorized Service personnel only

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Autoclaving protocol				
1	Date	Remark	Operator	Signature
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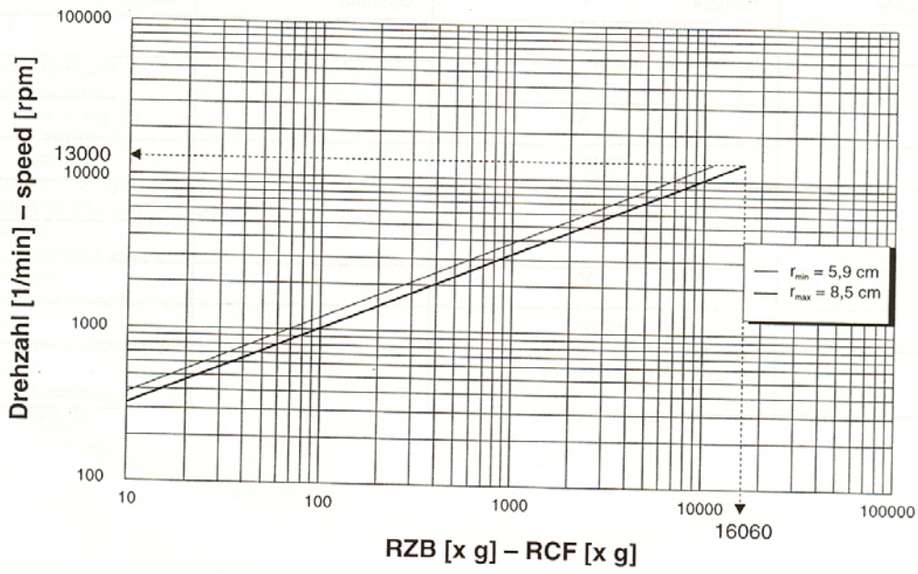
4				
5				
6				
7				
8				
9				
10				

Speed/*g* value diagram for rotor 7500 3325



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