Heraeus

# Biofuge *pico*

**Instructions for Use**


Thermo
ELECTRON CORPORATION

# 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.

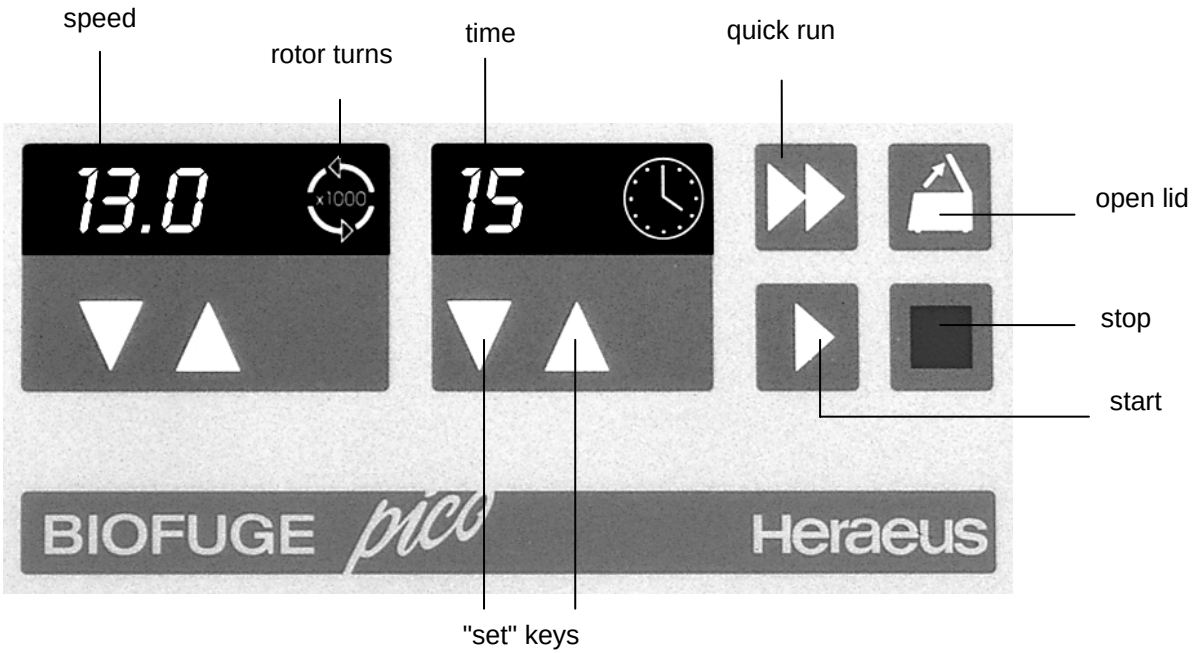
**A manual that is not kept handy cannot provide protection against improper handling and thus against damage to persons and objects.**

The manual comprises chapters on

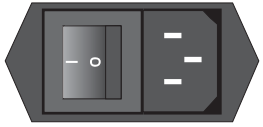
- Safety regulations
- Instrument description
- Rotor program and accessories
- Transportation and hook-up
- Use of the centrifuge
- Maintenance and care
- Troubleshooting
- Technical data
- Index

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

**Please fold out**




Before switching on the centrifuge please read this manual



*back panel:*
socket for mains connection
mains switch

# The control panel of the *Biofuge pico*

## Display

**Speed**

| | |
|---|---|
| Resting state: | preselected speed |
| During run: | current speed; *rotating light:* rotor turns |
| End: | "End" |
| Running/resting: | error codes (if present) |

**Time**

| | |
|---|---|
| Resting/end: | preselected run time (in minutes; in "hold" mode, "hd") |
| During run: | remaining run time or (with quick start) run time passed |
| Lid open: | "OP" |

**Keys**

| | |
|---|---|
| Start: | normal start |
| Stop: | manual stop |
| Open lid: | open lid (possible only with mains switch ON) |
| Quick run: | short-term acceleration as long as key is pressed, with indication of run time passed |
| "Set" keys: | stepwise increase/decrease of preset 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-0: | motor blockage (transport protection removed?) |
| E-8: | excess voltage |
| E-10: | internal error |
| E-11: | internal error |
| br: | power turned off during run or power failure |
| Lid: | lid turned loose or opened during run; drive overheated |
| OP: | with lid closed: safety circuit triggered (drive overheated) |

**Warnings can span several display panels**

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# For your safety

Heraeus centrifuges are manufactured according to current technical standards and regulations. Nonetheless, centrifuges may pose danger to individuals and surrounding if

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

**Therefore, personnel involved 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 centrifuge assembly and must be kept close at hand at all times.

**When damages to the power cord or at casing are noticed the centrifuge must to be set out of operation!**

## Proper use

The centrifuge is designed to separate liquid-suspended materials having different densities and particle size, respectively (maximum sample density is 1.2 g/cm³ {ml} 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 present.

The centrifuge may cause harm to its user or other persons or may damage goods if safety measures are not followed:

## Centrifuging hazardous materials

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

- Do not centrifuge toxic or radioactive substances or pathogenic microorganisms without suitable safety systems.
  If microbiological samples of risk group II (according to "Laboratory Bio-safety Manual" of WHO) are being centrifuged, aerosol-tight bio-seals have to be used.
  For materials in a higher risk group, more than one precaution is required.
- Should toxins or pathogenic substances enter the centrifuge or its parts, you must perform appropriate procedures for disinfection (see "Maintenance and care – Disinfection").
- Strongly corrosive substances that may cause damage to materials and reduce the mechanical strength of the rotor may be centrifuged only inside protective tubes.

## Handling the centrifuge

- Use only original accessories for the centrifuge. The only exceptions are common glass or plastic centrifuge tubes if they are approved for the rotor speed and RCF values.
- Never use the centrifuge unless the rotor is properly installed.
- You may use the centrifuge only with a properly loaded rotor. You must not overload the rotor.
- Strictly follow the rules and regulations for cleaning and disinfection
- If the rotor or the rotor lid shows signs of corrosion or wear, you must stop using it.
- Never open the lid manually if the rotor is still turning.
- You may use the emergency lid release only in case of emergency, e.g. during an interruption of power supply
  (see chapter "Troubleshooting").
- Never use the centrifuge with an opened lid.
- Never use the centrifuge if the front panel has been partially or totally removed.
- Changes in mechanical or electrical components of the centrifuge may only be carried out by individuals authorized by Thermo Electron.

## Conformity to current standards

Heraeus centrifuges are manufactured and tested according to the following standards and regulations:

CE

for all voltages:

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

for 120 V only:

- CAN/CSA-C22.2 No. 1010.1-92
- CAN/CSA-C22.2 No. 1010.2.020-94

## Safety instructions in this manual

This symbol denotes potential hazards to persons.

This symbol denotes potential damage to the centrifuge or parts in its immediate surroundings.

General hints are marked with this symbol.

Before switching on the centrifuge please read this manual

for your notes

## The *Biofuge pico*

The figure below shows the *Biofuge pico* with the lid opened and the rotor put in place.


## Safety systems

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

- Connection rotor – motor
- Body and rotor chamber made from impact-resistant plastic
- Lid with hinge and control window
- Lid lock mechanism

  You can open the lid only when the power is turned on and the rotor has come to a halt. You can start the centrifuge only if the lid is properly locked.
- Warning if lid is manually opened during a run (safety circuit actuated)

  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 "OP", respectively).
- Emergency lid release (only in case of emergency)

  In order to permit you to remove samples even after a power failure, the centrifuge is equipped with an emergency lid release. (see chapter "Operation").

**Do not tamper with the safety systems!**

## Properties

The *Biofuge pico* is a benchtop centrifuge for use in the biochemical and medical laboratory.

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 are displayed before the run. During operation, the control panel shows the actual values; upon briefly pressing any one of the "set" keys △ or ▽ the preset values for speed and run time are displayed instead. After the run, the "speed" panel displays "End".

If you press the △ or ▽ keys repeatedly, you increase 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.

You can change the preset values during operation.

## „Quick run“ operation

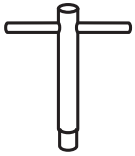
As long as the "quick run" key ( ⏩ ) is pressed, the rotor is accelerated with maximum power, potentially up to the maximum speed (overriding any preset speed value).

## Pieces delivered

The *Biofuge pico* 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 3328
- cable for mains connection
- this Manual

cap nut
order no.
70056208



tubular socket wrench
order no.
2036 0072

for your notes

# Accessories

The *Biofuge pico* is delivered complete with a fixed-angle 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.

A further option is a PCR-Strip rotor.

Please consult our sales documentation for a complete collection of accessories including technical data, order numbers and special low-cost package offers.

For more information you can visit our web site at http://www.Thermo.com

## Rotor program

| Rotor designation | **Microliter rotor 24 x 2 ml PP** | **PCR-rotor** |
|---|---|---|
| order no. | **7500 3328** | **7500 3327** |
| places / volume | 24 x 1,5 / 2 ml | 4 x PCR-Strip |
| maximum permissible load [ g ] | 24 x 4 | 4 x 4 ( 32 x 0,5 ) |
| maximum speed $n_{max}$ [ $min^{-1}$ ] | 13 000 | 13 000 |
| minimum speed $n_{min}$ [ $min^{-1}$ ] | 2 000 | 2 000 |
| maximum RCF value at $n_{max}$ | 16 060 | 12 846 ( 11 524* ) |
| maximum radius [ cm ] | 8,5 | 6,8 ( 6,1* ) |
| minimum radius [ cm ] | 5,9 | 6,1 ( 4,7* ) |
| angle [ ° ] | 40 | 45 |
| acceleration / deceleration time [ s ] | 15 / 12 | 15 / 12 |
| aerosol-tight | yes (reduced filling) | yes (reduced filling) |
| permissible temperature range<br>autoclavable (number of cycles) | -4 °C to +40 °C<br>121°C, (10 cycles) | -4 °C to +40 °C<br>121°C, (10 cycles) |

* The values relate to vessel places 4 and 5 in the PCR-Rotor

## Adapters for rotor order no. 7500 3328

| Adapter | Dimensions (∅ x H) | Capacity | Number per Set | Color | Order No. |
|---|---|---|---|---|---|
| reduction sleeve PCR | 6,2 x 20 mm | 0,2 ml | 24 | gray | 7600 3750 |
| reduction sleeve | 8 x 43,5 mm | 0,5/0,6 ml | 24 | turquoise | 7600 3758 |
| reduction sleeve | 6 x 46 mm | 0,25/0,4 ml | 24 | red | 7600 3759 |

for your notes

# Before use

## Where to install the centrifuge

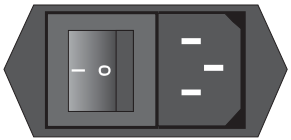
The centrifuge must be operated in a place meeting the following criteria:

- 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 resonance-free. 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 voltage and frequency correspond to the specifications on the instrument label.

Turn the mains switch on the back panel 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 12 s the routine internal software check sequence. Open the lid by pressing the "open 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.

The *Biofuge pico* is now ready for use.

for your notes

# Operation

## Transport and installation

**Damage to the centrifuge by jolts or jerky placement!**

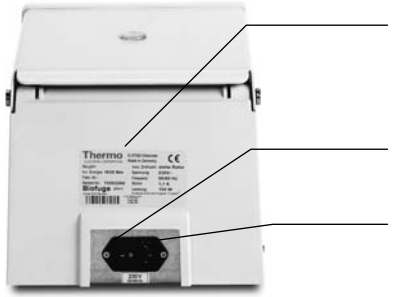
**Transport the centrifuge only in the upright position using the special box provided with the instrument and secure it properly. Place the centrifuge carefully.**

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

## Mains connection

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

Turn on the mains switch at the back of the centrifuge.




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. (see table on page 44).

After this check the display changes. The values now shown in the display panel are the ones last used.

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 and the preset run time is 10 min.

## 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 ⏏.

## Emergency lid release

In case of a power failure you cannot open the lid normally using the "open lid" key. 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, proceed as follows using an appropriate tool:

1. Make sure the rotor stands still. (control window).
2. Unplug the mains plug.
3. Push a 7-cm end of thin wire, e.g. a bent-up paper clip or another suitable tool, through the hole on the

upper right of the front panel (see figure). Push the lock bolt back until the lid unlocks audibly. Remove the auxiliary tool 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.

## Inserting the rotor

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

Rotors which are allowed for use in a *Biofuge pico* centrifuge are detailed in the chapter "Accessories", and only these rotors are to be used in this centrifuge.

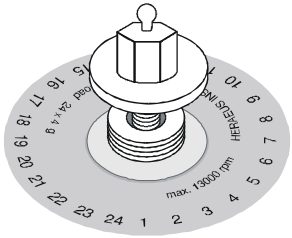
To insert the rotor you will need the cap nut and the socket wrench delivered with the centrifuge (see the chapter "*The Biofuge pico* – Pieces delivered").

**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.**

Proceed as follows:

1. Open the lid and make sure that the rotor chamber and the rotor are clean. Remove eventual dust, foreign material 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. Place the rotor cap onto the rotor.

**Do not push the rotor down using force. If you cannot screw on the cap nut, you must carefully lift off the rotor and insert it again.**

Regularly check the proper positioning of the rotor and retighten the cap nut as needed.

**Permissible rotor temperature**

**The rotors are only to be used within the temperature range from -4°C to +40°C. Pre-cooling in the freezer is not permitted**

**Lifetime of the rotor**

There is no limitation on the service life of the high performance rotors. However please observe the following due to safety reasons:

**Rotors and accessories made of plastic should not be exposed to direct sunlight and UV rays!**

**If the rotor shows signs of discoloration, deformation or wear, or is out of balance it must be exchanged straight away!**

## 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.

**Danger of irreparable motor damage!**

**Never tilt the rotor. Always grab it in the middle and pull out perpendicularly.**

1. Open the lid of the centrifuge.
2. Screw the cap nut open by turning it counterclockwise using the socket wrench delivered with the instrument. Remove the cap nut.
3. Grab the rotor in the middle and pull gently upwards off the drive shaft. Be careful not to jam it.

## Loading the rotor

### 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 pico* can reach high rotational speeds implying enormous centrifugal force. The rotors are 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.

If you wish to centrifuge samples that together with the adapters exceed the maximum permissible load, you must either reduce the sample volume or calculate the permissible speed $n_{perm}$ according to the following formula:

$$n_{perm} = n_{\max} * \sqrt{\frac{maximum\ permissible\ load}{actual\ \ load}}$$

**Filling the centrifuge tubes**

**Check carefully whether your sample vessels are permissible for the respective *g* value and reduce the speed if necessary.**

The smaller the unbalance of the centrifuge, the better the separation since separated zones are no longer 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.

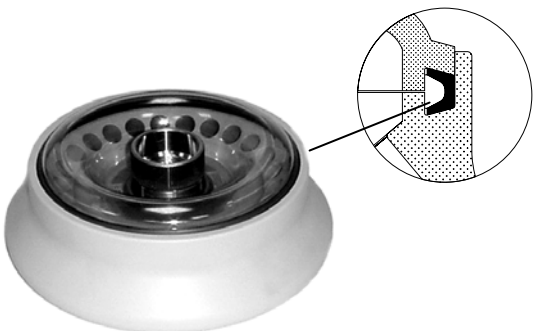
Please note that plastic sample vessels only have a limited service life - particularly when used at maximum rpm or temperature - and must be replaced as necessary!

## Aerosol-tight application

**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. 10 K 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**

## Checking for aerosol tightness

The checking of the rotor type and bucket was done according to the dynamic microbiological test procedure with regard to EN 61010-2-020 appendix AA.

The aerosol-tight bio-containment of the rotor mainly depends on proper handling!

**Check the aerosol-tight bio-containment of your rotor whenever necessary!**

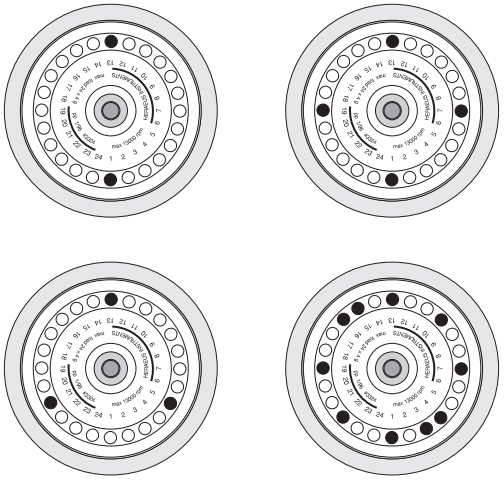
It is very important that all the seals and seal-surfaces are carefully inspected for wear and damages like cracks, scratches and embrittlements!

For a quick test one can check the aerosol-tight buckets and fixed angle rotors according to the following procedure:

- Slightly grease all seals.
- Fill the bucket or rotor with approx. 50 ml carbon dioxide mineral water.
- Close the bucket or rotor according to the respective handling instructions.
- Shaking the bucket releases the carbon dioxide of the water, and an excessive pressure is built up.
- Leaks are recognized by humidity release and audible disinflation of gas mix.
- Finally buckets respectively rotor, lid and lid seal have to be dried.

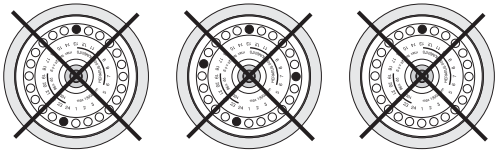
## Placing the tubes in the rotor

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

When you have loaded the tubes, fasten the rotor lid by screwing the cap nut centrally on it.

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 centrifuge can be set to a minimum of 2000 $min^{-1}$ and to a maximum of 13 000 $min^{-1}$. 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 △ (for an increase) or ▽ (for a decrease) in the "speed" section of the control panel (see also the foldout page in the cover).


   By pressing the selected 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 have reached the desired value, and fine tune if necessary by repeatedly pressing one of the keys. The digit after the decimal point flashes for a number of seconds, then changes to permanent display. The speed is now stored.

## Selecting the run time

You can select a run time between 1 and 99 min or continuous operation.

### Preselected run time

To predetermine the run time, proceed as follows:

1. Press one of the "set" keys △ (for an increase) or ▽ (for a decrease) in the "time" section of the control panel (see also the foldout page in the cover).


   By pressing the selected key **briefly**, you increase or decrease the preset run time in steps of 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 have reached the desired value, and fine tune if necessary by repeatedly pressing one of the keys. The minute display flashes for a number of seconds, then changes to permanent. The run time is now stored.

**Continuous operation**

To operate the *Biofuge pico* in the continuous mode, you must press the key ▽ until the display changes to „hd“ (for "hold").

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

Please note that the lifetime of plastic tubes in particular is limited. Extended use may damage them.

## Starting the centrifuge

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

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

## Changing the settings during the run

You can change the settings during a run. The respective altered setting flashes for a couple of seconds. Once the display changes to the continuous mode, the new settings become operative.

## 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 down to zero, the display reads "End". By pressing the "open lid " key, you can now open the lid and remove your samples.

You can stop the centrifuge at any time by pressing the "stop“ key .

### Stopping with continuous operation

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

## Short-time centrifugation

For short-term operation, the *Biofuge pico* is equipped with a "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 $min^{-1}$.**

**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.

## RCF value

The **r**elative **c**entrifugal **f**orce (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:

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

r = radius of centrifugation in cm

n = speed in rpm

**At a speed of 13000 min$^{-1}$, the centrifuge achieves a maximum performance of 16060 *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.

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).

## Turning off the centrifuge

The centrifuge is turned off by switching the main switch into the "0"position.

The main power switch should be turned off after a complete centrifugation run. Without motor deceleration, it takes much longer until the rotor comes to a halt.

The centrifuge lid can only be opened automatically if the centrifuge is turned on!

## WEEE Compliance:

This product is required to comply with the European Union`s Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:

Thermo Electron has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Electron`s compliance with these Directives, the recyclers in your country, and information on Thermo Electron products wich may assist the detection of substances subject to the RoHS Directive are available at **www.thermo.com/WEEERoHS**.

for your notes

# Maintenance and care

## Maintenance to be performed by the customer

For the protection of persons, environment and material 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 accessories!**

**If you intend to use cleaning agents or disinfection procedures not recommended by the manufacturer, you have to make sure by consulting the manufacturer, that the procedure foreseen does not cause any damages to the instrument!**

### Cleaning

**Pull mains plug before cleaning the instrument!**

Clean the casing, the rotor chamber, the rotor and the accessories regularly and in case of need. This is indicated both for reasons of hygiene and to prevent corrosion due to contamination sticking to the instrument and its accessories.

Clean them with mild agents of pH values ranging from 6 to 8.

Immediately after cleaning, dry the aluminum parts or put them into a warm-air dryer at a temperature not exceeding 50°C.

**During cleaning liquids and especially organic solvents should not come into contact with the drive shaft and the ball bearing.**

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

**Disinfection**

If a centrifuge tube containing infectious material leaks during a run, you have to disinfect the centrifuge immediately.

**Infectious material could enter the centrifuge if spills or tube breakage occur.**

**Danger of infection may occur upon contact! Take appropriate protective measures for personnel!**

**Mind the permissible filling volumes and loading limits for the tubes!**

**In case of contamination the operator has to make sure, that no further persons are jeopardized!**

**Contaminated parts have to be decontaminated immediately.**

**If required further protective measures have to be initiated.**

Rotor and rotor chamber must be treated with a neutral, universal disinfectant. Best suited for this purpose are disinfectant sprays, ensuring that all rotor and accessory surfaces are covered evenly.

**Please note the safety measures and handling hints when applying these substances!**

- 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 mains plug.
2. Unscrew the rotor chuck.
3. Grab the rotor with both hands and pull it perpendicularly off the drive shaft.

4. Remove the centrifuge tubes and adapters, and disinfect them or dispose of them as necessary.
5. Treat the rotor and the rotor lid according to the instructions given for the disinfectant (soaking in liquid or spraying). You must strictly observe the specified action times!
6. Turn the rotor head down and drain off the disinfectant. Thereafter thoroughly rinse rotor and lid with water.
7. Dispose of the disinfectant according to valid regulations.
8. Aluminum rotors have to be treated with anticorrosive protective oil subsequently.

**Disinfection with bleaching lye**

**These agents contain highly aggressive hypochlorites and must not be used with aluminum rotors!**

The following precautionary measures are to be taken for extensive protection of the 7500 3327 and 7500 3328 rotors:

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!
3. After disinfection, rinse the rotor thoroughly with distilled water and allow to dry.

**Decontamination**

For general radioactive decontamination, use a solution of equal parts of 70% ethanol, 10% SDS and water. Follow this with ethanol rinses, then de-ionized water rinses, and dry with a soft absorbent cloth.

Dispose of all washing solutions in appropriate radioactive waste containers!

**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.

**For safety reasons, the 7500 3327 and 7500 3328 rotors must only be subjected to a maximum of 10 autoclavings!**

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.**

**Never exceed the maximum permissible values for autoclaving temperature and autoclaving time.**

**Should the rotor show signs of wear, you must stop using it!**

## The Thermo Electron Service offer

Thermo Electron recommends annual servicing of the centrifuge and the accessories by authorized customer service or trained professionals. The customer service personnel is inspecting:

- the electrical installations
- the suitability of the location
- the lid lock mechanism and the safety circuit
- the rotor
- the rotor fastening and the drive shaft

Defective material is exchanged.

Thermo Electron offers inspection and service contracts covering it. Inspection costs are charged as flat-rate contracts.

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

## 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 provable faults in materials or workmanship.

Conditions for a warranty are:

- the centrifuge is used according to the instructions of use
- mounting, extensions, settings, alterations or repairs are carried out exclusively by personnel authorized by Thermo Electron
- the required maintenance and care procedures are carried out regularly.

for your notes

# Troubleshooting

## Problems you can handle yourself

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

| Error | Behavior of the centrifuge | Possible cause(s) and measures to be taken |
|---|---|---|
| Displays remain dark | The motor stops.<br>The rotor stops without braking.<br>The lid cannot be opened. | **Mains failure or not connected**<br>1. Is the mains switch turned on?<br>2. Check the mains connection.<br>3. If the mains connection is OK, call your nearest Service. |
| Displays fail briefly | The motor stops suddenly.<br>The rotor stops without braking.<br>The display reads "br", see br. | **Brief interruption of mains supply**<br>1. Check whether the plug is plugged in properly.<br>2. Wait for 75 seconds.<br>3. Restart the centrifuge |

| Error | Behavior of the centrifuge | Possible cause(s) and measures to be taken |
|---|---|---|
| Lid cannot be opened | Pressing the "open lid" key has no effect | **A) Lid not correctly engaged or lid warped.**<br>1. Check whether the mains supply is OK and the instrument is switched on (displays lit).<br>2. Press the lid down on the right-hand front end and actuate the "open lid" key once again.<br>3. In case these measures have not the desired effect, you may open the lid with the emergency lid release. (see page 18).<br>**B) Heat monitoring relays in the lid unlocking magnets have been actuated.**<br>Press the key again after waiting for about 1 min. |
| - | Centrifuge is exceptionally noisy. | 1. Stop the centrifuge by pressing the "stop" key ■, in case of emergency pull mains plug.<br>2. Wait until the centrifuge stands still.<br>3. Check whether the rotor is properly loaded<br>4. Check whether a broken vessel, damage to the rotor or motor malfunction was responsible for the noise.<br>5. If you cannot locate and solve the problem, call Service. |
| br | Instruments stops without braking. | There was a short mains failure, or the instrument was switched off during the run.<br>Wait for about 75 seconds; the instrument is then again ready for use. |

| Error | Behavior of the centrifuge | Possible cause(s) and measures to be taken |
|---|---|---|
| E-0 | Motor does not start | **Motor or rotor blocked.**<br>1. Switch the instrument off and on again with the mains switch.<br>2. Open the lid.<br>3. Check whether the transport protection has been removed.<br>If you cannot solve the problem, call nearest Service. |
| E-8 | Overvoltage or over-current at the U/F converter | Mains voltage outside tolerance. Brake resistance defective.<br>Switch the instrument off and on again. If the problem persists, call Service. |
| 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. |

| Error | Behavior of the centrifuge | Possible cause(s) and measures to be taken |
|---|---|---|
| Message "Lid" appears in the display | Motor stops.<br>Rotor comes to a stop without braking. | **A) The lid was manually opened during the run.**<br>1. Press the lid shut. The instrument comes to a stop without braking.<br>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).<br>**B) The excess temperature safety circuit of the motor has been actuated**<br>1. Pull mains plug.<br>2. Control ventilation slots underneath the instrument and clean if necessary.<br>3. After 20 min you can start the instrument again.<br>4. If the safety circuit is again actuated, call Service. |
| Display "OP“ appears although lid is closed | Start impossible | **A) The lid is not properly closed**<br>Press the lid forcefully down on the right-hand front part.<br>**B) The excess temperature safety circuit of the motor has been actuated**<br>1. Pull mains plug.<br>2. Control ventilation slots underneath the instrument and clean if necessary.<br>3. After 20 min you can start the instrument again.<br>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 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* for a couple of seconds.

   Subsequently, the display may read e.g. the following readings for 2 seconds each:

| | | |
|---|---|---|
| Software number | *047* | *8_* |
| Software version | *_01* | |
| NV-RAM number | *104* | *1_* |
| NV-RAM-version | *_01* | |

The values shown above are just examples. Your readings may be different. In the example shown here the values mean the following:

- Software 0478 version 01
- NV-Ram 1041 version 01

for your notes

# Technical data

## Component parts and performance

| Part / function | Description |
|---|---|
| Body | Sheet steel with fitted plastic chassis |
| Keys and display panel | Keys and display panel covered with easy care protective foil |
| Operation | "Easycontrol" system |
| Rotor chamber | Dimensions (diameter x height): 188 mm x 63 mm |
| Rotor chamber | Up to 48 ml of spilled liquids are retained in the rotor chamber and cannot enter the instrument. |
| Lid lock | Automatic locking when the lid is pressed shut |
| Lid opening | Electromagnetic release via the "open lid" key  when connected to mains |
| Emergency lid release | Lid release in case of power failure: emergency opening with auxiliary tool. |

| Function / parameter | Value |
|---|---|
| environmental conditions | - indoor use<br>- max. elevation 2000 m above sea level<br>- max. relative humidity 80 % up to 31 °C; linearly decreasing down to 50 % relative humidity at 40 °C. |
| Permissible temperature of the environment | +2 °C to +40 °C |
| Maximum speed $n_{max}$ | 13 000 $min^{-1}$ |
| Maximum RCF value at $n_{max}$ | 16 060 |
| Minimum speed $n_{min}$ | 2 000 $min^{-1}$ |
| Maximum kinetic energy | 1,65 kNm |
| Permissible temperature of the rotor | -4 °C to +40 °C |
| Maximum sample temperature after 30 min run time | room temperature + 15 K |
| Noise | 56 dB (A) at maximum speed |
| Dimensions (H x W x D) | 206 mm x 233 mm x 335 mm |
| Weight without rotor | 9,8 kg |

## The "Easycontrol" user interface

| Function | Performance |
|---|---|
| Start | Start key ( ▷ ) |
| Stop | Stop key ( ■ ) |
| Short-term start and stop, respectively | „Quick run“ key ( ▷▷ ): short-term run when pressed permanently; stop when released |
| Mode of operation display | Turning rotor is signalled by rotating light (LED display) in the speed panel. |
| End of run | The speed display reads "end" |
| Cycle counter | Number of cycles is displayed upon pressing the two keys ▽△ below the speed display. |
| Digital parameter display | • speed<br>• run time |
| Speed selection | adjustable in steps of 100 $min^{-1}$ in the range of 2000 $min^{-1}$ to 13000 $min^{-1}$ |
| Run time selection | adjustable in minutes from 1 min to 99 min; „hd“-mode: continuous operation |
| Time display in „quick run“ mode | between 1 s and 60 s in seconds, over 1 min in minutes |

| Function | Performance |
|---|---|
| Parameter memory | • speed<br>• time |

| Function | Performance |
|---|---|
| Diagnostic messages | • lid not properly closed: display „OP“<br>• general malfunction<br>(ERROR Codes, see page 39) |
| Testing standards<br>230V instruments<br>Manufactured and tested in accordance with<br><br><br>120 / 100V instruments<br>Manufactured and tested in accordance with | <br><br>EN 61 010-1, EN 61 010-2-020<br>EN 61326 (+ EN 61000-3-2/A14:2000-6)<br>EN 55011 B<br><br>IEC 61010-1:1990 + amendment 1:1992 + amendment 2:1995<br>IEC 61010-2-020:1993 + amendment 1:1996<br>CAN/CSA-C22.2 No. 1010-1.92<br>CAN/CSA-C22.2 No. 1010-1.B97 amendment 2 |

## Electrical connections / fuses

| Order no. | Voltage | Frequency | Nominal current | Power consumption | Fuses inside instrument * |
|---|---|---|---|---|---|
| 7500 3235 | 230 V | 50/60 Hz | 1,1 A | 150 W | 2 x 2 A slow-blow<br>(5 x 20 mm) |
| 7500 3236 | 110/120 V | 60 Hz | 2 A | 150 W | 2 x 4 A slow-blow<br>(6.3 x 32 mm) |

* The fuse may be replaced only by authorized servicing personnel!

for your notes

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|---|---|---|---|---|
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| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
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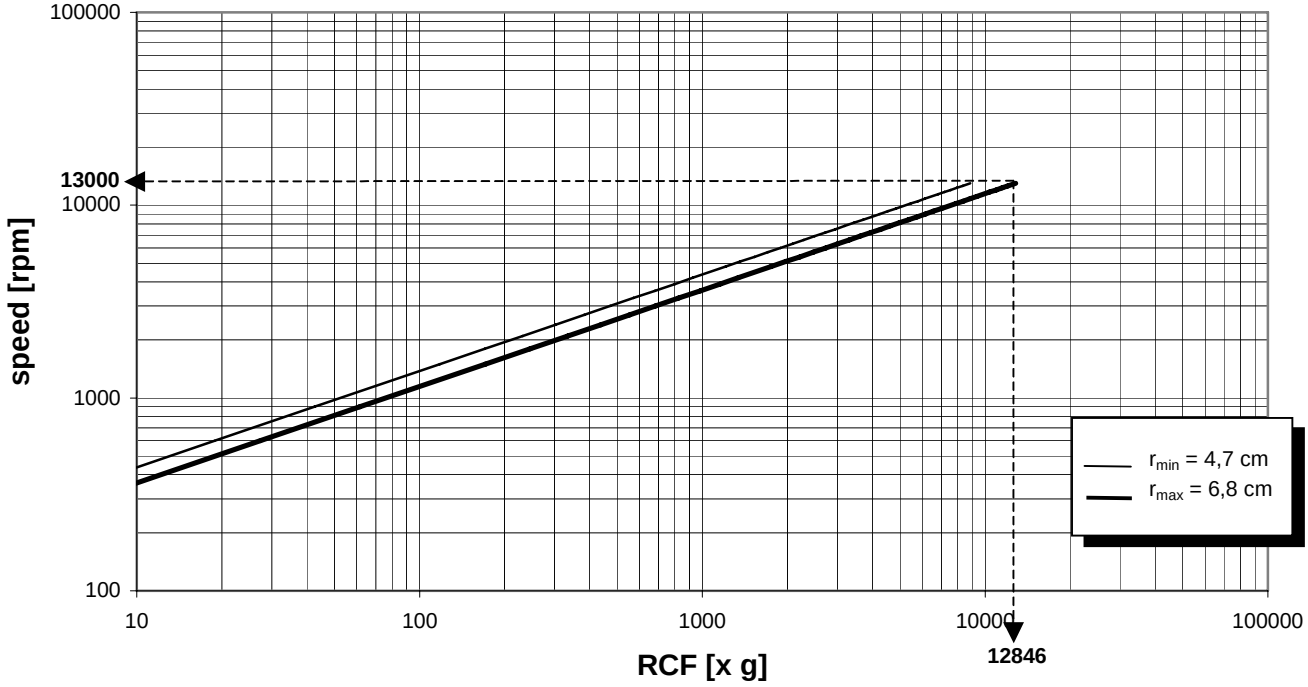
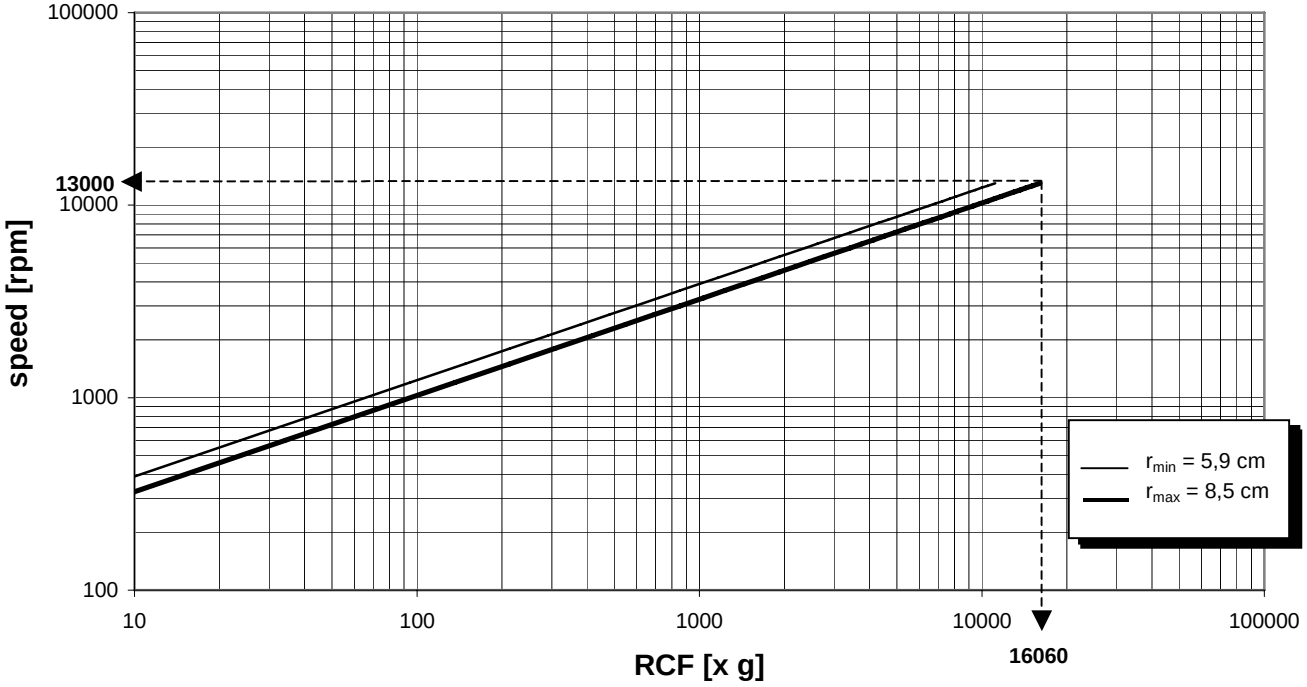
## Speed / RCF diagrams for PCR-Rotor 7500 3327



## Speed / RCF diagrams for 24 x 2ml Rotor 7500 3328



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