Fisher Scientific

accuSpin™ 1 / 1R

OPERATING INSTRUCTIONS

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.

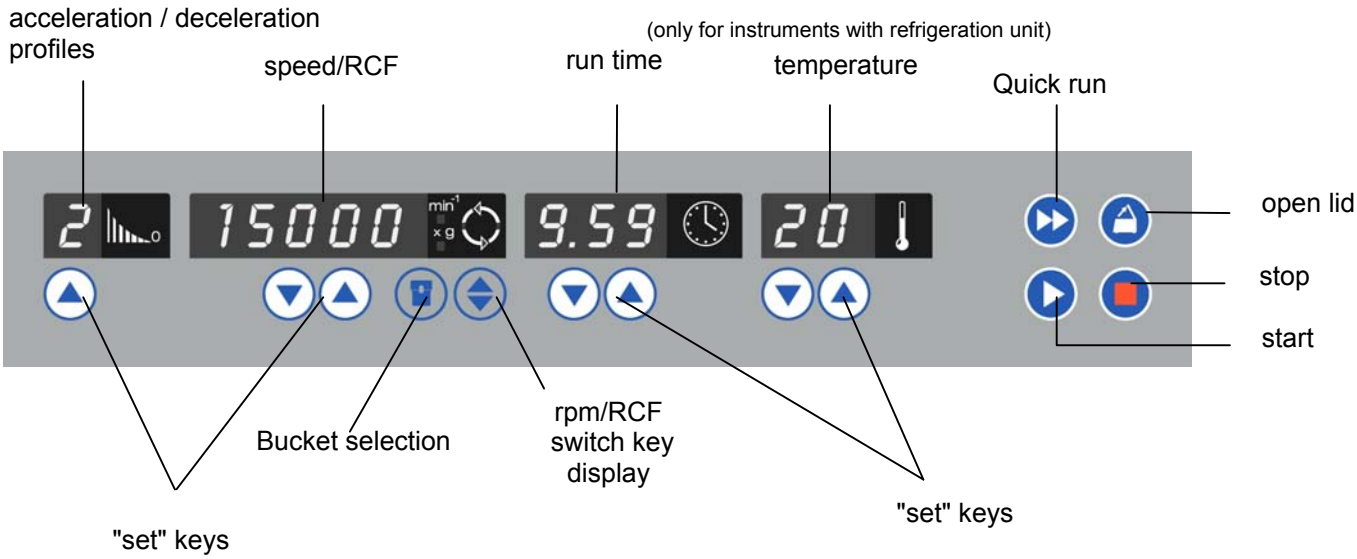
A manual that is not kept handy cannot provide protection against improper handling and thus against damage to persons and objects.

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

Control panel of the accuSpin™ 1 / 1R

Display panels

Program selection

acceleration / deceleration profiles:

1 = slow acceleration – brake off
2 = fast acceleration – brake on
(see appendix page 69)

Speed / RCF

run:	current value of speed or RCF after activation of switch key
lid open: (before start)	"OPEN"
lid closed:	"0"
error code:	will flash in display

Run time

time selection:	- remaining run time to “0”
continuous operation (hLd)	- run time passed (hLd) (in hours, minutes)
"Quick Run":	- run time passed (as long as button is held; in minutes and seconds)

Temperature*

run:	current sample temperature in °C (in temperature equilibrium)

* only for instruments with refrigeration unit

Keys

start :	normal start of the centrifuge
stop :	manual stop of a run
open lid:	open lid (possible only with the instrument switched on)
Quick run:	short-term operation of the centrifuge as long as key remains pressed
rpm/RCF switch:	switching between rpm and RCF display
rotor / bucket set.:	Setting of the rotor / bucket number
"set" keys:	stepwise increase/decrease of setpoint values

Short pressing of any of the "set" keys: switch from current to preset value, signaled by flashing display.

Error codes (troubleshooting see chapter "Troubleshooting"):

E-03: speed measuring is disturbed during run
E-07: Overtemperature alarm
E-17: lid locking mechanism is clamping
E-21: insufficient acceleration power (e.g. in case of tremendous imbalance)
Lid : lid switch protection circuit has released
bAL : unbalance

Contents

For your safety

Fisher Scientific® 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 at the power cord or at casing were noticed the centrifuge has 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 (11.8 inches) around the centrifuge must be maintained where neither persons nor hazardous materials may be present.

The centrifuge may cause harm to 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 with 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 exception 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 still turns.
- 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 the lid open.
- Never use the centrifuge if the front panel has been partially or totally removed.
- Changes in mechanical or electrical components of the centrifuge may be carried out only by individuals authorized by Fisher Scientific®.

Conformity to current standards

Fisher Scientific® centrifuges are manufactured and tested according to the following standards and regulations:

- for all voltages

- **IEC 61010**

- for 120 V only

-

- for 230 V only

-

Details of the test standards take you please from the technical data.

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.

Notes

The accuSpin™ 1 / 1R

The figure below shows a *accuSpin™ 1R* with the lid open and a swinging bucket rotor installed.

Description

The *accuSpin™ 1R* is a general-purpose tabletop centrifuge for biotechnological and pharmaceutic research that moves high capacity centrifugation onto the fast track. It spins more tubes, at higher RCFs, more rapidly than competitive instruments, and can process nominally one liters of sample in a single run. There are various rotors with high RCF values that can accommodate a wide range of accessories for all common tube types, microtiter plates and deep-wells.

The user-friendly "Easycontrol" control panel permits easy selection of speed, RCF value, run time and run profile (acceleration and deceleration), as well as temperature of the *accuSpin™ 1R*. You can switch from speed to RCF display and vice versa, with a touch of a button and even during a run.

Safety systems

The *accuSpin*™ is equipped with a number of safety systems:

- Housing and lid is constructed of 8 mm steel.
- Lid with window
- Lid lock with safety check

  You can open the centrifuge lid only when the power is turned on and the rotor has come to a stop. You can start the centrifuge only if the lid is properly locked.

Do not tamper with the safety system!

Parts supplied

Accessories supplied with the centrifuge are:

- power cord
- collet chuck (Cat.-No. 70003100)

- a special wrench for securing the rotor

- corrosion protective oil

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

Function and features

Basic unit/ function	Description / feature
Cabinet / frame	galvanized steel
Chamber	stainless steel
Drive	Brushless induction drive
Key pad and display	key pad and display elements covered by an easy-care continues surface
Control	Microprocessor driven by "Easycontrol II"
Main memory	Recalls last run parameters
Program memory	data are stored until new values are entered.
Advanced features	RCF-programming, quick run, temperature control during standby *
Acceleration / deceleration profiles	2 acceleration / deceleration profiles

*(* only with refrigeration unit)*

The Easycontrol user interface

Function	Feature
Acceleration / deceleration profile	1 = slow acceleration – brake off 2 = fast acceleration – brake on
Setting speed by rpm	adjustable from 300 rpm to 15 000 rpm (depending on the rotor), - in 10 rpm increments
RCF selection	upon activation of RCF switch , the RCF value can then be entered
Time selection	adjustable in minutes from 1 min to 9 h 59 min, and with an increment of 1 hour from 10h up to 99 h – ”hLd“-mode: continuous operation
Run time display in "quick run“ mode	between 1 s and 60 s in seconds´ steps, above in minutes´ steps
Setting temperature *(only with refrigeration unit)*	adjustable from 0°C to +40°C, in one degree increments
Lid opening	automatic unlocking via ”Open lid“ key ( ) (unlocking in case of power failure: see chapter ”Troubleshooting“)
Start	start key ( )
Stop	stop key ( )
"Quick Run“ mode	pressing the "Quick Run“ key ( ) activates maximum acceleration up to the maximum permissible speed of rotor; upon key release centrifuge stops with maximum deceleration power.
Diagnostic messages	general instrument malfunction (error messages with ERROR codes, see “Troubleshooting“)

Before use

Centrifuge transport and installation

After opening the box remove the protective materials.

When transporting the centrifuge, consider its weight (see „Technical Data“); always grab it on both sides taking care that enough helpers are around.

Do not lift on the front panel!

The centrifuge can be damaged by jolting during the transport!

Transport the centrifuge only in the upright position using proper containment and secure it properly. Handle the centrifuge carefully.

Proper location

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

- A safety zone of at least 30 cm (12 inches) around the centrifuge must be maintained. Hazardous materials must not be stored beside unit while centrifugation.
- The laboratory bench or centrifuge trolley must be stable and resonance-free. A good support is provided by a laboratory bench or a centrifuge cart with lockable casters.
- To ensure sufficient air circulation, a minimum distance from the wall of 10 cm (4 inches) at the back and of 15 cm (6 inches) on each side must be kept.

- The centrifuge must be protected from heat and direct sunlight.
- The location must be well ventilated at all times.

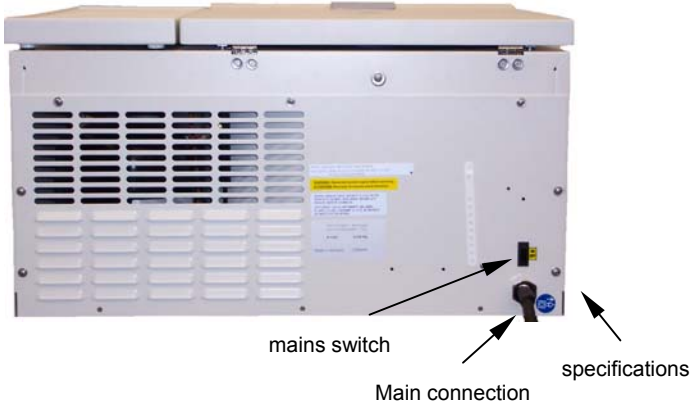
UV rays reduce the durability of plastics.

Protect the centrifuge, rotors and plastic accessories from direct sunlight.

Main connection

Connect the centrifuge only to an grounded main power supply. Make sure that the power cord is compatible with the safety regulations valid, and that your main voltage and frequency correspond to the specifications on the instrument label.

Make sure that the centrifuge is switched off before connecting electrical wire to main power supply.



Rotors and accessories

A rotor is not included as part of a *accuSpin™ 1 or 1R* centrifuge.

In addition, there are adapters and reduction sleeves for a variety of commercially available tubes and bottles.

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

Rotors for the accuSpin™ 1

Table 1:

Rotor designation	**Swinging Bucket Rotor 7500 3450**		
With bucket Order no.	**Round bucket 400 ml 7500 3451**	**Rectangular bucket 150 ml 7500 3452**	**Carrier for microplates 7500 3453**
Maximum permissible load [g]	4 x 600	4 x 510	4 x 450
Maximum speed n_{max} [rpm]	4000	4000	4000
Maximum RCF value at n_{max}	3345	3220	2773
Radius (max.) [cm]	19.0	18.1	15.5
Acceleration / deceleration time [s]	60 / 55	60 / 55	60 / 55
Aerosol-tight	yes* (with cap 75007584)	yes	no
Autoclavable	no	no	no

*** Checked by CAMR, Porton-Down, UK**

Table 1:

Rotor designation Order no.	**Sealed Rotor** **48 x 15 ml** **7500 3454**	
Maximum permissible load [g]	4 x 510	
Maximum speed n_{max} [rpm]	6000	
Maximum RCF value at n_{max}	6238	
Radius (max.) [cm]	15.5	
Tube angle [°]		
Acceleration / deceleration time [s]	95 / 95	
Aerosol-tight	yes	
Autoclavable	121°	

Rotors for the accuSpin™ 1R

Table 2:

Rotor designation	**Swinging Bucket Rotor 7500 3450**		
With bucket Order no.	**Round buckets 400 ml 7500 3451**	**Rectangular buckets 150 ml 7500 3452**	**Carrier for microplates 7500 3453**
Maximum permissible load [g]	4 x 600	4 x 510	4 x 450
Maximum speed n_{max} [rpm]	4000	4000	4000
Maximum RCF value at n_{max}	3345	3220	2773
Radius (max.) [cm]	19.0	18.1	15.5
Acceleration / deceleration time [s]	60 / 55	60 / 55	60 / 55
Min temperature at n_{max} relative to room temperature 23°C	< 4°C	< 4°C	< 4°C
Speed at 4°C [rpm]	4000	4000	4000
Aerosol-tight	yes* (with cap 75007584)	yes	no
Autoclavable	no	no	no

* Checked by CAMR, Porton-Down, UK

Table 2:

Rotor designation Order no.	**Sealed Rotor** **48 x 15 ml** **7500 3454**	**Micro Liter Rotor** **18 x 1.5 / 2.0 ml** **7500 3455**
Maximum permissible load [g]	4 x 510	18 x 4
Maximum speed n_{max} [rpm]	6000	15 000
Maximum RCF value at n_{max}	6238	17 860
Radius (max.) [cm]	15.5	7.1
Tube angle [°]		45
Acceleration / deceleration time [s]	95 / 95	25 / 30
Min temperature at n_{max} relative to room temperature 23°C	0°C	< 4°C
Speed at 4°C [rpm]	6000	15 000
Aerosol-tight	yes	yes
Autoclavable	121°C	no

Adapter

Table 3: Adapter (1) * max. tube length with aerosol-tight cap

Adapter and accessories for round buckets 7500 3451	max. tube dimensions d[1)] x length / * [mm]	cap diameter [mm]	tubes per rotor	color	order no.
Centri-Lab® Adapter type E					
34 x 1.5 / 2 ml micro liter tube	10.5 x 46	14.0	136	black	7500 7578
18 x 7 ml DIN	13.0 x 123	14.0	72	yellow	7500 7571
10 x 7 ml blood sampling	13.0 x 123	18.4	40	grey	7500 7579
7 x 15 ml conical	17.2 x 119	23.0	28	brown	7500 7576
10 x 15 ml DIN	17.2 x 122	18.4	40	red	7500 7572
5 x 25 ml US-urine	16.5 x 123	27.5	20	orange-red	7500 7581
5 x 25 ml DIN	25.5 x 121	29.0	20	orange	7500 7573
3 x 50 ml universal container	25.0 x 120	32.0	12	green-yellow	7500 7580
5 x 50 ml conical	29.0 x 119	37.5	12	green-yellow	7500 7577
3 x 50 ml DIN	34.5 x 120	36.0	12	green	7500 7574
1 x 100 ml DIN	45.0 x 134	59.0	4	blue	7500 7575
1 x 250 ml bottle	62.0 x 135	-	4	nature	7500 7582
400 ml bottle	80.0 x 135	-	4	nature	7500 7583
Aerosol-tight caps	1 pieces, incl. seals				**7500 7584**
Spare seal					**20290559**

[1)] d = diameter

Table 3: Adapter (2) * max. tube length with aerosol-tight cap

Adapter and accessories for rectangular buckets 7500 3452	max. tube dimensions d[1)] x length / * [mm]	cap diameter [mm]	tubes per rotor	color	order no.
Centri-Lab® Adapter type A					
40 x 1.5 / 2 ml micro liter tube	11.0 x 45	-	160	black	7500 5335
20 x 7 ml DIN	13.0 x 115	13.0	80	yellow	7500 5321
12 x 7 ml blood sampling	14.0 x 117	18.0	48	grey	7500 5330
6 x 15 ml conical	17.0 x 120	22.0	24	brown	7500 5387
11 x 15 ml blood sampling	17.0 x 117	19.5	44	white	7500 5327
12 x 15 ml DIN	17.0 x 115	18.3	48	red	7500 5322
4 x 25 ml universal container	22.5 x 100	31.0	16	green	7500 5391
5 x 25 ml DIN	25.0 x 115	25.9	20	orange	7500 5323
2 x 50 ml DIN	34.0 x 120	35.6	8	green	7500 5324
2 x 50 ml conical	29.5 x 120	37.5	8	green-yellow	7500 5386
2 x 50 ml universal container	29.5 x 120	37.5	8	green-yellow	7500 5389
1 x 50 ml oil test	-	-	4	nature	7500 5339
1 x 100 ml DIN	44.0 x 120	48.1	4	blue	7500 5325
1 x 150 ml DIN	50.0 x 110	-	4	black	7500 5326
for cyto-system	-	-	-	-	7600 3417
Spare seal					**20290061**

[1)] d = diameter

Table 3: Adapter (3)

Adapter and accessories for sealed rotor 7500 3454	max. tube dimensions d[1] x length / [mm]	cap diameter [mm]	tubes per rotor	color	order no.
Centri-Lab® Adapter type A					
40 x 1.5 / 2 ml micro liter tube	11.0 x 45	-	160	black	7500 5335
20 x 7 ml DIN	13.0 x 115	13.0	80	yellow	7500 5321
12 x 7 ml blood sampling	14.0 x 117	18.0	48	grey	7500 5330
11 x 15 ml blood sampling	17.0 x 117	19.5	44	white	7500 5327
12 x 15 ml DIN	17.0 x 115	18.3	48	red	7500 5322
4 x 15 ml conical	17.0 x 120	22.0	16	brown	7500 5388
4 x 25 ml universal container	22.5 x 100	31.0	16	green	7500 5391
5 x 25 ml DIN	25.0 x 115	25.9	20	orange	7500 5323
2 x 50 ml DIN	34.0 x 120	35.6	8	green	7500 5324
2 x 50 ml conical	29.5 x 120	37.5	8	green-yellow	7500 5386
1 x 50 ml oil test	-	-	4	nature	7500 5339
1 x 100 ml DIN	44.0 x 120	48.1	4	blue	7500 5325
for cyto-system	-	-	-	-	7600 3417

[1] d = diameter

Handling the rotor

Swinging Bucket Rotor 7500 3450

On swinging bucket rotors, at regular intervals, apply a light coating of lubricant to the rotor body trunnion pins and to the corresponding mating surfaces on the buckets!

Lubricant 7000 6692 is supplied with the centrifuge.

- Molycote and graphite lubricants are not permitted! -

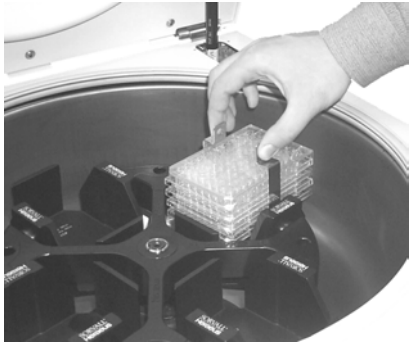
All positions have to be loaded with identical carrier buckets always!

Handling microplates

Remove the microplate holder from carrier to load and unload the microplate carrier 7500 3453. Make sure, before loading, that the rubber bottom is placed in the cut-outs of the bottom of plate carrier.

Deepwell plates can also be inserted in the carrier without using plate holder.

Insert the individual plate holders as shown in the illustration below.



Make sure the rotor is uniformly loaded!

The maximum loading height is 60 mm with a base of 127 x 85 mm.

Sealed Rotor 7500 3454

These instructions must be read and observed closely before each sealed rotor is put into operation!

The Sealed Rotor is a swing-out rotor with a sealing lid designed for applications involving infectious or pathogenic samples. The centrifugal force of the buckets in this rotor is absorbed by an exterior ring of fiberglass-reinforced plastic. The lid reduces air friction which allows this rotor to reach a higher maximum speed than without lid.

It is essential that these instructions are followed to prevent the centrifuge and the rotor from being damaged and in turn causing damage to equipment and objects as well as injuries or worse still deaths.

A centrifuge with a sealed rotor may only be operated by persons who are experienced in every detail of the operation of the centrifuge and the rotor.

Fitting the rotor

It is possible to fit the rotor with or without the lid.

With the lid:

- Take hold of the lid release button in the center of the rotor lid …

Without the lid:

- Using both hands take hold of the overlapping rim of the wind-shield from the inside (at opposite points) …

and fit the rotor to the chuck as far as the groove.

Ensure all metal weights on sealed rotor are in their correct positions

The sector-shaped metal weights in rotor 7500 3454 must remain at the positions defined for these throughout the centrifugation process to ensure stability is maintained. The weights are marked with their position numbers.

If the weights have been removed (e.g. for cleaning), ensure that they are placed back into the correct positions and that they lie on the convex edge (the tips of the weights must lie in the direction of the rotational axis).

The position number of the weights must be observed.

The weights of different rotors may not be mixed up as this can result in serious material damage and injuries.

Fit all buckets and tube racks

The sealed rotor must not be operated under any circumstances when tube racks or buckets are being removed as this will result, in all probability, in an accident with serious consequences.

In the case of partial loads it is essential that the tubes are arranged symmetrically on all the tube racks.

During centrifugation the sealed rotor will only be stable if the sealing ring has been positioned evenly over all bucket positions. This applies only if all buckets and tube racks have been inserted.

Observe maximum admissible weight differences

Weight differences in

- adjacent swinging buckets of more than 100 g and in
- opposing swinging buckets of more than 10 g

are not permitted and should not be used under any circumstances otherwise serious material damage and injuries will occur!

Filling the tubes

When filling the tubes do not rely on the levels of the samples to assess weight distribution as the thickness of the sides of the tubes and their volumes can vary.

The best way of checking that weight is evenly distributed is to weigh the racks containing the tubes which are arranged symmetrically and filled evenly as determined by eye on suitable laboratory scales.

Observe maximum supplementary bucket load

The absolute supplementary load weight of 510g (sample including adapter and tube) for a bucket may not be exceeded if centrifugation takes place at top speed!

When the 510g weight limit is exceeded the top speed of the rotor must be reduced as follows:

$$N\ adm = N\max * \sqrt{\frac{510\ g}{actual\ load\ (g)}}$$

Check the condition of the rotor lid

The life of the lid is limited to a period of 5 years

(see manufacturing date marked on it).

The polycarbonate bid of the rotor must be checked regularly for any changes!

The lid must be replaced with a new lid:

- at the end of its life
- if cracking is detected or the lid becomes dub (caused by more than 5 autoclave cycles)

Lock rotor lid correctly

Ensure that the lid has been locked correctly so that it cannot come loose during centrifugation.

Check the tightness of the lid regularly!

Each time damage occurs the seal must be replaced!

The lid can be fitted to or removed from the rotor chamber by depressing the central (sprung) lid release button.

Observe the top speed of the rotor

The top speeds of the sealed rotors should not be exceeded under any circumstances.

Check list for operation with a Sealed Rotor

These instructions have to be observed absolutely!

If these instructions are not observed the strength of the rotor will be extremely hazarded. With the utmost probability this can result in the complete destruction of the rotor and centrifuge causing highly probable damages to persons‘ health and property!

1. **Attach the rotor correctly**
2. **Ensure each counter-weight is in its own position 1 – 4**
3. **Insert all buckets and all tube racks. All buckets must be loaded!**
4. **Load buckets evenly and symmetrically**
5. **Do not exceed permitted weight differences:**
   - between adjacent buckets: 100 g
   - between opposing buckets: 10 g
6. **Do not exceed maximum sample load (510g per bucket)**
7. **Check troublefree operation of the rotor lid and observe expiration date (5 years later than imprinted date)**
8. **Lock rotor lid correctly**
9. **Do not exceed the speed limit of the rotor (see Rotor Tables)**

If these rules are not observed there is a serious risk that the rotor seal will fail which may, in all probability, result in complete destruction of the rotor and the centrifuge!

Check these 9 rules before every centrifugation operation!

Notes

Aerosol-tight operation

Aerosol-tight rotors and tubes are only to be opened in an approved safety work bench when centrifuging dangerous samples!

Paying attention to the maximum permissible filling quantities is necessary!

Correct operation when filling the sample tubes and closing the rotor cover are prerequisites for aerosol biocontainment.

Before use, the seals in the rotors and rotor covers, as well as the aerosol-tight caps, have to be checked for abrasion or damage and slightly greased.

Replace damaged O-rings and seals!

Use the special lubricant 7600 3500 only to grease the seals !

Spare parts are delivered with the rotor or may be ordered separately.

Replace damaged or clouded caps and lids of rotors and tubes immediately.

The tubes are only to be filled such that the sample does not reach the rim of the tube during centrifuging.

Checking of aerosol-tight bio-containment

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 being tested for wear and damages like cracks, scratches and embitterment carefully!

As a quick test there is the possibility to check the aerosol-tight buckets and fixed angle rotors according to the following procedure:

- grease slightly 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.

The construction of Sealed Rotor does not allow a quick test according to this procedure by the user; therefore a very careful control of seals, seal surfaces and lids is necessary!

Operation

Switching on the centrifuge

Locate the main power switch on the back of the centrifuge, and set it to the ON (I) position. For a couple of seconds the following reading appears in the control panel:

The display shows that the instrument is going through an internal check of its software.
(see table on page 63).

After this check, the display shows to the actual value mode. The remaining run time and speed should both read “0”.

The following figure gives an example of possible readings. A detailed description of possible settings is given below in this chapter.

Actuating the lid

Opening the lid

Press the "open lid" key .

(Emergency release in case of malfunction or power failure: see chapter "Troubleshooting")

Closing the lid

The centrifuge lid is locked by pressing down the front part of the lid.

Do not slam the lid!

Installing the rotor

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

The rotors approved for the *accuSpin*™ are detailed in the chapter "Rotors and accessories". Use only rotors listed for this instrument.

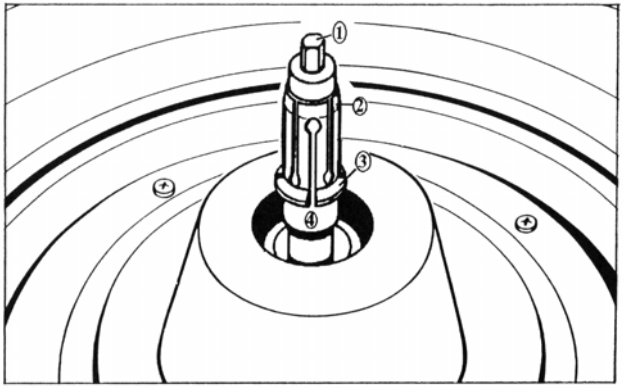
To install the rotor, you need the collet chuck and the socket wrench supplied (see chapter "Parts supplied").

When clamping on the rotor to the drive shaft, the temperature of the rotor, the drive shaft and the collet chuck must all be in the range of 10 – 30°C to avoid loosening of the collet chuck by temperature variation.

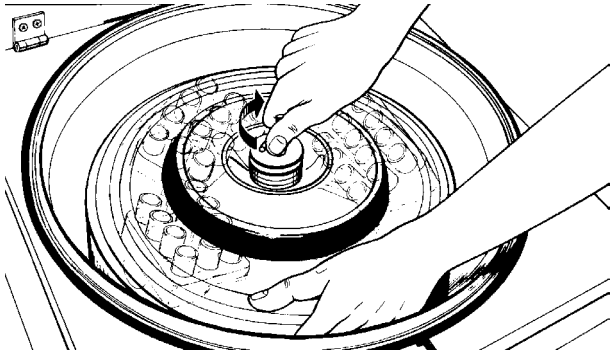
The centrifuge must not be started with only the chuck fitted, i.e. without the rotor.

Proceed as follows:

1. Open the lid and make sure that the rotor chamber is clean. Clean any dust, foreign material or sample residues out of chamber before use.
2. The rotor must be clamped firmly onto the drive shaft using a collet chuck (Cat.-No. 70003100). First, grease the conical drive shaft (incl. thread) and the collet chuck slightly.
3. Place the collet chuck (2) onto the drive shaft (4) and twist it by hand at maximum 3 turns clockwise



4. Check whether the collet chuck is loose (collet chuck moves freely on the spindle). If not, loosen the rotor seat using the socket wrench supplied.
5. Place the rotor on top of the collet chuck so that the rotor is located precisely above the center.
6. The rotor must glide freely down the collet chuck until it hits the lower stop(3).
7. If you have positioned the rotor correctly, you can tighten the collet chuck easily using the socket wrench supplied (1).



8. Place the rotor cover on the rotor and tighten securely.

Regularly check the proper positioning of the rotor and re-tighten the collet chuck as needed.

Please take care of the readability of the inscription of the swinging bucket rotor cross installed.

For the swinging bucket rotor the set bucket type must be permitted for the operation in the respective rotor. Please note the hints of chapter "Rotor / Bucket selection"

The rotor must be removed before transporting the centrifuge!

Damage to the rotor and centrifuge may result if the rotor is not removed prior to transporting.

Loading the rotor

Maximum loading

Overloading can result in destruction and severe damage to the centrifuge.

The *accuSpin*™ 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.

Please note the data about the maximum permissible loads and maximum speeds in chapter "Rotors and accessories".

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:

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

* n_{perm} = permissible speed
n_{max} = maximum speed

Filling the centrifuge tubes

Check carefully whether your tubes are approved for the respective RCF value. Follow tube manufacturers recommendation.

For common borosilicate glass tubes the maximum permissible rcf is limited to 4000 xg!

The tube manufacturers normally limit the respective maximum allowed RCF value to the fixed angle rotor.

Please note that for the same RCF value the stress for the tubes in a swinging-bucket rotor is higher!

Because of the higher difference of the radius (r_{max} - r_{min}) the pressure of liquid column to the tube bottom is appreciably higher and strongly depended on filling.

Plastic tubes and bottles – especially for the highest load (speed, temperature) – have a limited life time only and must be replaced as recommended by the manufacturer.

Maximum permissible load difference

The smaller the imbalance of the centrifuge, the better the separation effect, because as imbalance is minimized, so is the resultant vibration that could affect separation quality.

Therefore it is important, that the tubes are balanced properly.

The maximum permissible load difference depends on several factors (e.g. rotor, loading). For a swinging bucket rotor 7500 3451 this amounts to at least 10 g in opposite carriers.

The values refer to a weight difference on the bottom of the tube. If there is a weight difference resulting from inhomogeneously filled tubes, the centrifuge can operate with larger weight differences as well, without causing an imbalance interruption.

Inserting the centrifuge tubes

The rotor must be loaded symmetrically. Failure to do so can cause rotor imbalance, which may lead to noisy operation, affect separation quality, or result in imbalance detection shut-down, as well as introduce significant detrimental wear to the motor and drive system.

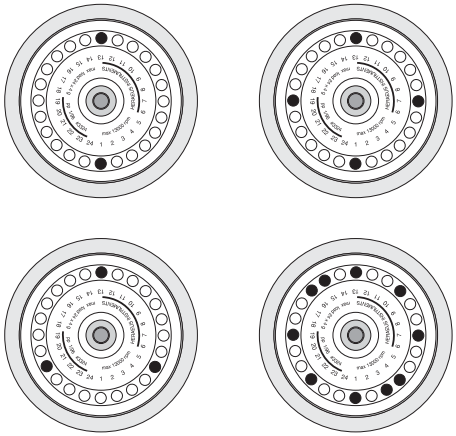
The rotor has to be loaded symmetrically. When loading the rotor only partially, you have to ensure that opposite bores always receive tubes of equal weight (when centrifuging a single sample, place a centrifuge tube e.g. filled with water).

After placing the tubes, install the rotor cover.

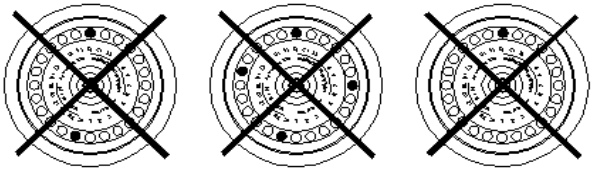
● loaded place

O empty place

Fixed-angle rotors:

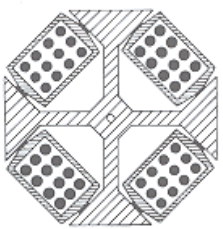


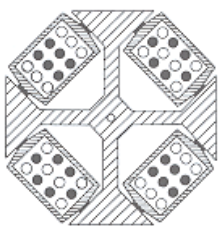
Proper loading

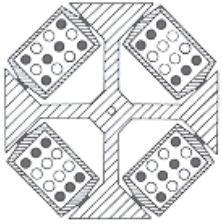


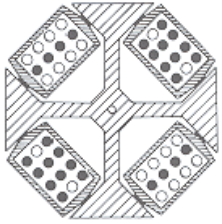
Improper loading

Swinging bucket rotors:

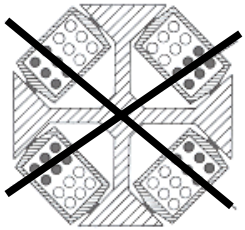


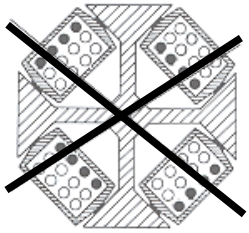






Proper loading





Improper loading

These examples are to be applied to the other rotors in an analogous manner!

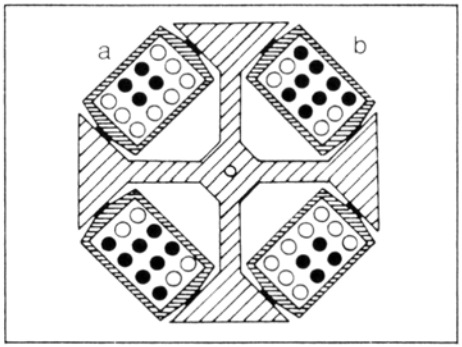
Loading instructions for Sealed Rotor

Special loading instructions must be observed when using the Sealed Rotor 7500 3454!

The buckets of rotor 7500 3454 should be loaded with Centri-Lab racks or inserts of identical exterior dimensions and weight.

The rotor is intended to accommodate tubes 100 mm in length. However, shorter or longer tubes can be used. Under certain circumstances, only the middle positions of the tube rack may be occupied by the longer tubes to prevent them from being knocked against the rotor yoke. Check that the buckets swing out freely.

In this case, always conduct a manual swing-out test with empty tubes before committing samples.



Correct loading for tube length > 100 mm

Do not run the centrifuge with empty glass tubes. Glass tubes of equal weight may exhibit very different centers of gravity resulting in substantial imbalance. This effect is reduced by filling the tubes.

The unique construction of the Sealed Rotor requires special precautions when operating. The following rules must be absolutely observed in every detail.

WARNING!

It is essential that these rules are precisely followed in order to prevent damage to the rotor or centrifuge resulting in a potential hazard to nearby equipment and personnel.

1. **Attach the rotor correctly**
2. **Ensure each counter-weight is in its own position 1 – 4**
3. **Insert all buckets and all tube racks. All buckets must be loaded!**
4. **Load buckets evenly and symmetrically**
5. **Do not exceed permitted weight differences:**
   - between adjacent buckets: 100 g
   - between opposing buckets: 10 g
6. **Do not exceed maximum sample load (510g per bucket)**
7. **Check troublefree operation of the rotor lid and observe expiration date (5 years later than imprinted date)**
8. **Lock rotor lid correctly**
9. **Do not exceed the speed limit of the rotor (see Rotor Tables)**

Notes

Entering parameters

Rotor / Bucket selection

The corresponding type of bucket must be selected! Otherwise the maximum allowed rotor speed can be exceeded and damage to persons or property may result.

On using the swing-out rotor, always program the Cat. No. of the really installed buckets!

The bucket selection affects the correct RCF values display and the correct selection of the corresponding parameters of the temperature regulation.

The current part number of the rotor / bucket is displayed by pressing the bucket selection key (corresponds to the last four 4 digits of the order number).

To change the rotor / bucket selection, press the bucket selection key again until the correct set of rotor / bucket appears.

The value is accepted when the change back to the speed RCF display has occurred.

Deceleration curves

The *accuSpin*™ offers 2 acceleration / deceleration profiles for optimal centrifuging samples and gradients. Please consult the diagrams in the Appendix for more detail of the acceleration / deceleration curves (for rotors not mentioned here you may extrapolate the respective values).

By pressing the “set“ key ▲ you can scroll through the profile settings until the desired profile is reached.

Once the display stops flashing, the value is stored in memory and remains unchanged until changed by a new entry.

Brake cut-out speed selection

The setting of the brake cut-out speed allows the brake to be turned off at any speed up to the preprogrammed value of the set speed. If there is no use of any brake cut-out speed set this value to zero.

Setting the brake cut-out speed is done as follows:

1. Push the "set" key ▲ for acceleration / deceleration curves and keep it pushed.

2. Push one of the "set" keys for speed. When doing so, the display for speed shows the actual brake cut-out speed. All other displays are blank.
3. Now you can release the set key for acceleration / deceleration curves.
4. Use the set keys for speed to enter the required value for the brake cut-out speed.
5. If you hold down the key pressed, the display changes at first slowly and after a few seconds at an accelerated pace.
6. Release the key as soon as you have reached the desired value, and adjust if necessary by repeatedly pressing the key. The decimal place flashes for a number of seconds, then changes to permanent display. The brake cut-out speed is now stored.

Selecting speed

The centrifuge speed can be set to a minimum of 300 rpm and to a maximum of 15 000 rpm (depending on the rotor).

You can adjust the in 10 rpm increments. Proceed as follows:

7. By pressing the "set" keys once (for an increase) or (for a decrease) in the "speed" section of the control panel, you switch from actual to set point values. The value last stored is displayed, with the digit entered flashing.
2. By briefly pressing the input key you can raise or lower the speed by one step (10 rpm) at a time.

3. If you hold down the key pressed, the display changes at first slowly and after a few seconds at an accelerated pace.
4. Release the key as soon as you have reached the desired value, and adjust if necessary by repeatedly pressing the key. The decimal place flashes for a number of seconds, then changes to permanent display. The speed is now stored.

For faster operation, you may shift the flashing cursor in the speed/RCF and the run time panels: just press both ▲ and ▼ simultaneously. The cursor moves by one digit to the left for each key depression.

Switching from speed to RCF display

Upon turning the centrifuge on, the speed display is set.

Use the speed mode selection key ⇕ to switch speed entry and display between rpm and RCF.

Entering the RCF value

You can adjust the RCF set point in steps of 1. The set point is entered analogously to the speed.

NOTE:

If you set an extremely low RCF value, this may be automatically corrected if the resulting speed would be lower than 300 rpm.

More about the RCF value

The **r**elative **c**entrifugal **f**orce (RCF) is 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

The maximum RCF value refers to the maximum radius of the tube bore.

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

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

Selecting run time

You can select a run time between 1 min and 9 h 59 min and 10 h up to 99 h (from 10 h in one-hour steps), or continuous operation (hLd).

Run time selection

To set a time, proceed as follows:

1. Press one of the "set" keys ▲ (for an increase) or ▼ (for a decrease) in the "run time" section of the control panel once to switch from the actual to the set point mode.
2. By **briefly** pressing the “set” key you can now raise or lower the run time in 1-minute increments.

3 If you keep the selected key pressed, the display changes at first slowly and after a few seconds at an accelerated pace.

4 Release the key as soon as you have reached the desired value, and adjust if necessary by repeatedly pressing the key.

The minute display flashes for a number of seconds, then changes to permanent display. The run time is now stored.

You may shift the flashing cursor to set the value as described under "Selecting speed".

Continuous operation

To switch the *accuSpin*™ to the continuous mode, you must press the key ▼ until the display reads "hLd") .

With this ● setting, the centrifuge keeps run until stopped manually.

Selecting the temperature

(accuSpin 1R only)

You can select the temperature in the range of 0°C to +40°C.

To adjust the temperature, proceed as follows:

1. Press one of the "set" keys ▲ (for an increase) or ▼ (for a decrease) in the "temperature" section of the control panel once to switch from the actual to the set point mode.
2. By **briefly** pressing the input key you can now raise or lower the run time in 1° steps.

3. If you keep the selected key pressed, the display changes continuously slowly at first and then at accelerated paces up or down.
4. Release the key as soon as you have reached the desired value, and adjust if necessary by repeatedly pressing the key.

The temperature display flashes for a number of seconds, then changes to the current value display. The temperature set point is now stored.

Starting the centrifuge

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

Press the “start“ key ▶ in the control panel. The centrifuge accelerates to the selected value. Simultaneously time display starts counting down from the set time selected in minutes (during continuous operation the time display goes forward).

You cannot open the lid during the run.

Imbalance display

If rotor imbalance is detected, shortly after the rotor reaches 300 rpm, the message "bAL" will appear in the speed display.

The run is terminated, and you may restart the centrifuge after correcting the imbalance (check loading).

Changing the settings during the run

You can change all settings during a run. By pressing once any one of the "set" keys in the control panel you can switch from the actual to the set point mode.

The setting to be adjusted flashes and can then be altered. Once the data input is finished and the display has changed to the actual value display mode, the new settings become operative.

Stopping the centrifuge

Stopping with preset run time

Normally the run time has been selected, and all you have to do is wait until the centrifuge terminates the run automatically at the end of the set time.

As soon as the speed reaches zero, you can open the centrifuge by pressing the "open lid" key and remove your samples.

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

At this point the remaining run time is displayed.

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 deceleration with the preset deceleration profile.

As soon as the speed reaches zero, you can open the lid by pressing the "Open lid" key and remove your samples.

”Quick Run”

For short-term operation, the *accuSpin*™ 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. The set speed or RCF is ignored in this case.

Depending on the rotor, the centrifuge accelerates to the maximum speed!

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

During acceleration the time is counted forward in seconds. The display remains until the centrifuge lid is opened.

Removing the rotor

1. Open the centrifuge lid.
2. Remove the rotor cover.
3. Unscrew the clamping sleeve counterclockwise using the socket wrench supplied with the instrument until no resistance exists.
4. Grab the rotor with both hands and pull it perpendicularly off the drive shaft carefully. Make sure not to tilt it.

Grab rotor with both hands and pull upwards perpendicularly .

When using an aerosol-tight bio-containment cover, you may remove the respective rotor from the drive shaft without opening the cover! You may then open the rotor e.g. in a safety work bench and decontaminate it.

Audible alarm

Accompanying all error messages, a warning signal is given out which only is silenced upon pressing any key.

Turning the centrifuge off

By switching the main switch into "0“ position the centrifuge is turned off.

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

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

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.

For other cleaning agents please consult Fisher - Scientific®!

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.

Instruments with refrigeration unit:

If a strong ice sheet is present in the internal chamber, be sure to remove all condensate after defrosting!

Please control and clean the venting slots regularly!

Before cleaning the venting slots please disconnect the centrifuge from the mains supply.

Please pull mains plug!

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 use 70% ethanol for disinfection.

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

For other disinfectants please consult Fisher-Scientific®!

- 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!

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.

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!

Corrosion protective oil 7000 9824 is delivered with the centrifuge.

Sealed Rotor 7500 3454

Cleaning

The sealed rotor can be washed and rinsed as a complete unit. Care must be taken to ensure the central bore where the rotor rests on the chuck is dried immediately after cleaning to prevent corrosion.

Cleaning agents

Alkaline cleaning and disinfecting agents with a pH> 7 should not be used as these attack aluminum parts and polycarbonate (lid).

A weak acid or neutral agent with a pH value in the region of 6-7 should be used for cleaning.

Action in the event of glass breakage

against risk of injury!

It is strongly advised that rubber gloves made of a thick, strong material be worn to avoid injury from glass splinters.

If buckets are contaminated by samples and glass splinters these should be plugged with a cellulose material after the tube racks have been removed. This prevents sample remains and glass splinters from falling into the interior of the rotor when the swing bucket swings out

Removal of swing buckets

After the inside of the rotor has been rinsed with warm water it should be dried. In order to do this the buckets need to be removed as follows:

- remove the tube rack
- turn the swing bucket as tar as it will go
- in this position pull the bucket out vertically.

Decontamination

Visual inspection

Contamination can occur if glass breaks and an infectious substance leaks out.

At the end of the run it is possible to check whether all the tubes are intact through the transparent lid.

If this is not the case and it is suspected that infectious material has beaked into the interior of the rotor and contaminated other samples the following action is normally recommended:

- **Removal of locked rotor**

Removal of the unopened rotor from the centrifuge by loosening the chuck.

If the rotor has to be opened to remove undamaged tubes before sterilization it must be opened inside a glove box or in a laminar flow box.

It each tube is individually sealed the likelihood of contamination will be minimal. Decontaminate the outside of each tube which is removed in the laminar flow box.

After removing all undamaged, sealed tubes relock the rotor lid and autoclave only after external decontamination has taken place.

- **Autoclaving**

The sealed rotor can be autoclaved for 30 minutes at +121°C with or without samples.

- In principle the rotor lid should be removed from the rotor chamber before autoclaving.

- Water, disinfection or cleaning agents must not be put inside the rotor and be heated as this can cause serious material damage!

- The lid becomes dull.

We would bike to point out that the material used for the lid can alter as a result of repeated autoclaving.

The maximum number of autoclave cycles (at 121°C) to which the lid can be subjected is 5 after which the lid should be replaced.

- If the surface of the lid has been growing dull gradually it must be replaced immediately after sterilization.

- **Disinfection**

If need be, the rotor can be disinfected chemically with a disinfectant solution instead of being autoclaved. However, only an expert who knows the type, composition, character etc of the sample can decide ultimately if this action can be taken.

The application, period of Operation etc prescribed for the disinfectant must be observed!

The disinfectants used should only be applied in dilute form (following the manufacturer‘s instructions). The rotor and the (removed) lid must be immersed completely in the disinfection bath! Only neutral or weak acid (pH 6 - 7) disinfectants should be used (not phenol) and no alkaline disinfectants.

Only the lid may be treated with methanol or ethanol. After disinfection the rotor and lid must be rinsed thoroughly in distilled water and dried carefully (in a drying cupboard up to 50°C max.).

Notes

Troubleshooting

Emergency lid release

In case of a power failure the lid could not be opened normally using the electrical lid unlocking mechanism. To permit unloading in this case, the centrifuge is equipped with an emergency override release. However, you may use this system in case of emergency only.

Rotors 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 deceleration takes much longer than normal!

Proceed as follows:

1. Make sure that the rotor is at a stand still (observe through window in the cover).

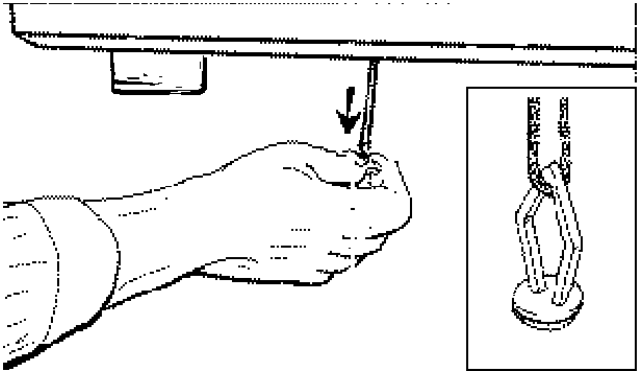
During a power failure it is impossible to lock the lid once the emergency lid release has been used. Never stop the rotor using your hands or tools!

2. Unplug the main power cord.
3. Facing the centrifuge under the front panel there is a plastic plug that can be removed using a screwdriver. After removal, use your fingers or a pair of pliers to pull the attached cord and activate the manual door override. The lid will open and you can remove your samples.

4. After finished, push the cord back into the instrument and reinserting the plastic plug.

Once the power is restored, you can connect the instrument to the main supply and turn it on.

Following the self test of the centrifuge, the lid may be closed and locked with the motor.



Error troubleshooting

If problems other than those described in the following tables arise, you must contact Fisher Scientific® service.

Error	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 plug connected to the mains socket? 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.	**Brief interruption of mains supply** 1. Turn off mains switch. 2. Check whether the plug is plugged in properly. 3. Restart the centrifuge.
Lid cannot be opened.	Pressing the "open lid" key has no effect.	**Lid not correctly engaged or lid warped.** 1. Check whether mains connection is OK and the instrument switched on (displays lit). 2. Press lid down in the middle of the front section once, and actuate the "open lid" key anew. 3. If this is unsuccessful, you may open the lid using the emergency lid release (see page 55).

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
-	Centrifuge is exceptionally noisy.	1. Stop the centrifuge by pressing the "stop" 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. If you cannot locate and solve the problem, call Service.
Message "bAl" appears in display.	Rotor stops without braking.	**Unbalance switch actuated** 1. Open the instrument by pressing "open lid" key. 2. Check whether the rotor is properly loaded. 3. Check whether a broken vessel or damage to the rotor was responsible for unbalance switch actuation.

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
Display "OPEN" appears although lid is closed .	Start impossible.	**A) Lid not properly closed** Press the front of the lid firmly down. **B) Overtemperature protection of the motor has been triggered.** 1. Pull mains plug. 2. Check and clean if necessary the ventilation slots underneath the instrument. 3. You may restart the instrument after 20 min. If the safety circuit is triggered again, you must call our Service.
Message "Lid" appears in the display.	Drive stops. Rotor coasts to rest.	**A) Lid was opened manually during the run.** 1. Press the lid shut again. The instrument stops without braking. 2. If you want to continue the run, you must switch the instrument off and on again.. **B) Overtemperature protection of the motor has been triggered.** 1. Pull mains plug. 2. Check and clean if necessary the ventilation slots underneath the instrument. 3. You may restart the instrument after 20 min. If the safety circuit is triggered again, you must call our Service.

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
E-00	Motor does not start.	**Motor or rotor blocked.** 1. Switch instrument off and on again using the mains switch. 2. Open the lid. 3. Check whether the rotor can turn freely. If you cannot thus relieve the malfunction, call our Service.
E-02	Rotor stops without braking to standstill. Instrument cannot be operated.	**Internal program error in memory** Switch the instrument off and on again. If the error persists, call our Service.
E-03	Rotor stops without braking to standstill. Instrument cannot be operated.	**Error in speed measurement** Switch the instrument off and on again. If the error persists, call our Service.
E-04 - only accuSpin 1R	Rotor stops without braking to standstill. Instrument cannot be operated.	**Error in temperature measurement** Switch the instrument off and on again. If the error persists, call our Service.

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
E-06	Rotor stops without braking to standstill. Instrument cannot be operated.	**Communication error between keyboard and main processor.** Switch the instrument off and on again. If the error persists, call our Service.
E-07 - only accuSpin 1R	Rotor does not start or brakes to standstill.	**Overtemperature alarm.** Temperature in chamber exceeds allowable limit. Let centrifuge cool down. If the error persists, call our Service.
E-08	Rotor stops without braking to standstill. Instrument cannot be operated.	**Overvoltage at the U/F converter** Mains voltage outside tolerance. Brake resistance defective. Call Service if trouble persists.
E-10		**NV-RAM; error in program memory** Switch the instrument off and on again. If the problem persists, call Service.
E-12 - only accuSpin 1R	Rotor stops without braking to standstill. Instrument cannot be operated.	**Error in temperature measurement** Switch the instrument off and on again. If the error persists, call our Service.

Error	Behavior of the centrifuge	Possible cause(s) and measures to be taken
E-15	Rotor stops without braking to standstill. Instrument cannot be operated.	**Check sum in NV-RAM wrong.**
E-17	Lid does not open.	**Lid blocked or jammed.** Press the front part of the lid centrally down once, and press the "open lid" key anew. Otherwise see "Emergency lid release"
E-18 - only accuSpin 1R		**A) Rotor # 3455 selected but another rotor is installed** Select correct rotor **B) Rotor # 3455 selected and installed – profile #1 selected** Rotor # 3455 can not be accelerated with profile #1 **C) Rotor # 3455 selected and installed – speed set below 1000 rpm** Rotor # 3455 can not be operated at lower speed than 1000 rpm
E-19		**Wrong NV-RAM or keyboard**
E-22		**NV-RAM parameter incompatible with processor**

Contacting Fisher Scientific® Service

Should you require our Service, please advise us of the catalog and serial number of your instrument. You will find the pertinent information at the specifications, near the socket for the main plug.

Moreover it is helpful for our service representative to know the software version. You can determine the software version as follows:

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

   For about 1 sec all displays read:

   Subsequently, the following readings will be displayed for 5 seconds each:
   (numbers are examples)

Software version keyboard	__536	__2
Software version	__498	__6
NV-RAM version	_4300	__7

The value in the time panel give the development stage.

The last information displayed is the current cycle status.

Cycle counter	__235	_CY

The values given are only examples!

Notes

Technical Data

Features	specification
Ambient conditions	- indoor use - maximum elevation 2000 m (6562 ft) above sea level - max. relative humidity 80 % up to 31°C (88°F), linearly decreasing down to 50 % relative humidity at 40°C (104°F).
Ambient temperature allowed	+2 °C to +35 °C (36°F to 95°F)
run time	- standard mode : 1min - 9 h 59 min, hold = permanent - extended mode : 1min – 99 h, hold
maximum speed (n_{max})	15 000 rpm (rotor-dependent, adjustable in steps of 10)
minimum speed (n_{min})	300 rpm
maximum RCF	17 860 (Micro Liter Rotor 7500 3455)
maximum kinetic energy *accuSpin 1* *accuSpin 1R*	26.0 kNm (19 177 ft.lb) 26.0 kNm (19 177 ft.lb)
noise at maximum speed *accuSpin 1* *accuSpin 1R*	< 70 dB (A) < 64 dB (A) (sound pressure level of emission according to DIN EN ISO 11 201)
Temperature set range *accuSpin 1R*	0°C to +40°C (32°F to 104°F)

Features		specification
Dimension (H x W x D)	*accuSpin 1* *accuSpin 1R*	410 mm x 460 mm x 540 mm (16.1 x 18.1 x 21.3 inches) 410 mm x 710 mm x 580 mm (16.1 x 27.9 x 22.8 inches)
Weight without rotor	*accuSpin 1* *accuSpin 1R*	52 kg (114.6 lb) 104 kg (229.3 lb)
Testing standards - all devices manufactured and examined in agreement also:		IEC 61010-1:1990 + amendment 1:1992 + amendment 2:1995 IEC 61010-2-020:1993 + amendment 1:1996 - Pollution degree 2, - Overvoltage category II
- for 120 V only		CAN/CSA-C22.2 No. 151
- for 230 V only		EN 61 010-1, EN 61 010-2-020 EN 61326 (+ EN 61000-3-2/A14:2000-06) EN 55011 B

Electrical connections / fuses

Order no.	Voltage	Frequency	Nominal current	Power consumption	Fuse protection of instrument*	Fuse protection of building
accuSpin 1 7500 3448	120 V	60 Hz	8.0 A	700 W	15 A	15 AT
accuSpin 1 7500 3446	230 V	50/60 Hz	4.5 A	700 W	16 A	16 AT
accuSpin 1R 7500 3449	120 V	60 Hz	11.5 A	1100 W	15 A	15 AT
accuSpin 1R 7500 3447	230 V	50/60 Hz	5.8 A	1100 W	16 A	16 AT

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

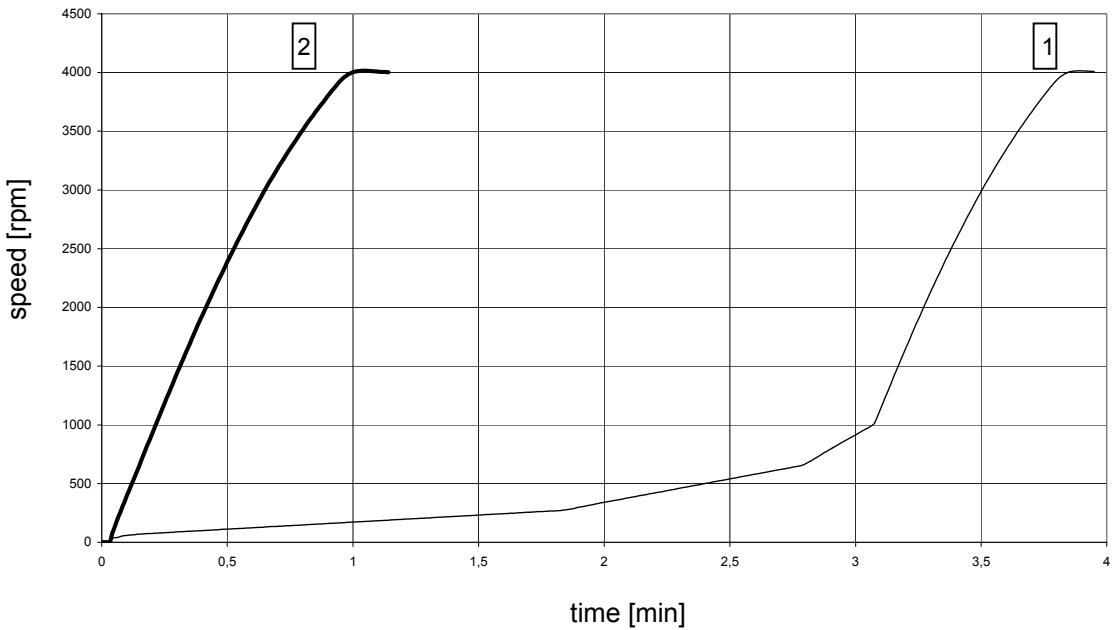
Appendix

Acceleration / deceleration profiles

On the following pages you find acceleration and deceleration profiles for each rotor type respectively.

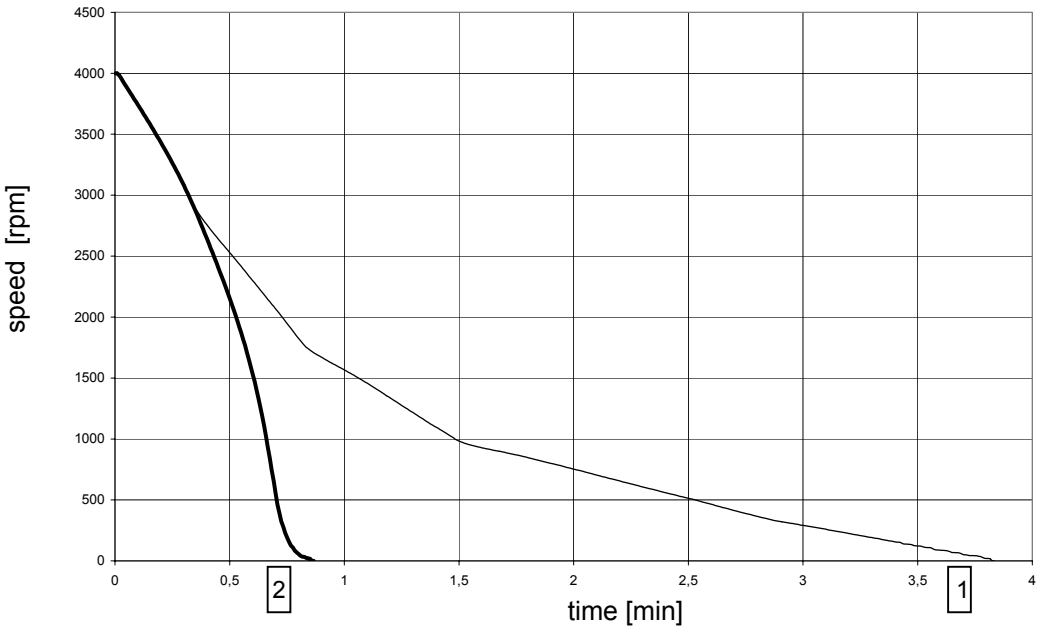
acceleration profiles

Swinging bucket rotor 7500 3450



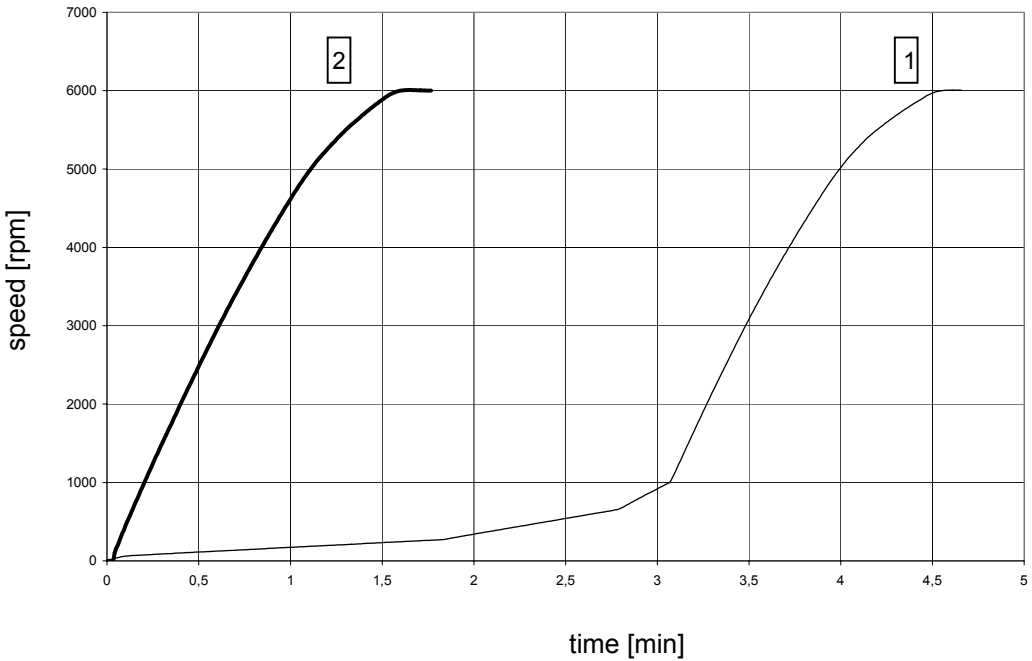
deceleration profiles

Swinging bucket rotor 7500 3450



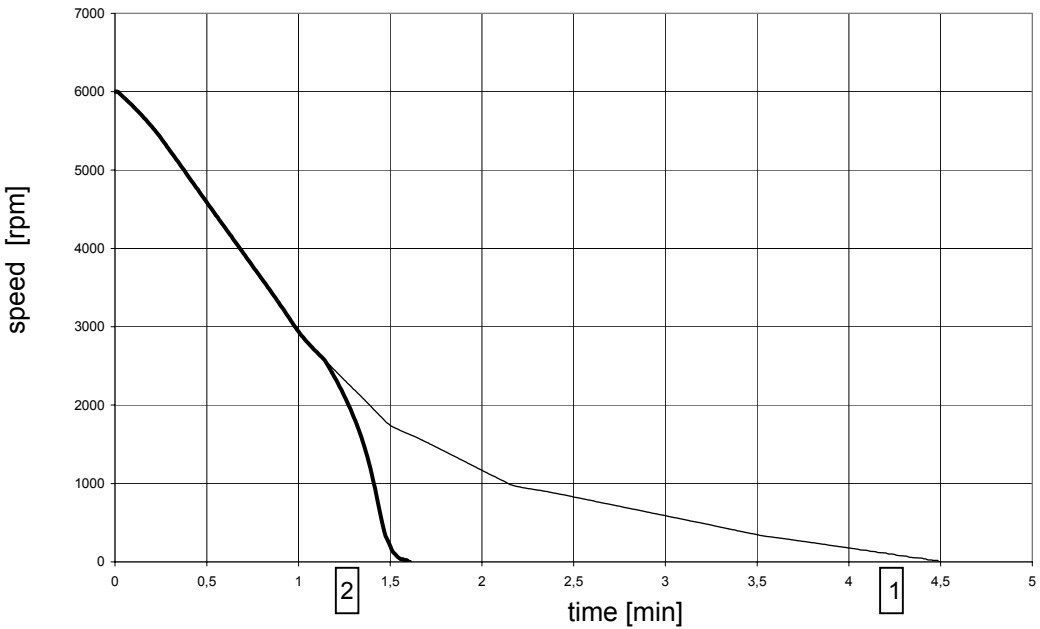
acceleration profiles

Sealed rotor 7500 3454



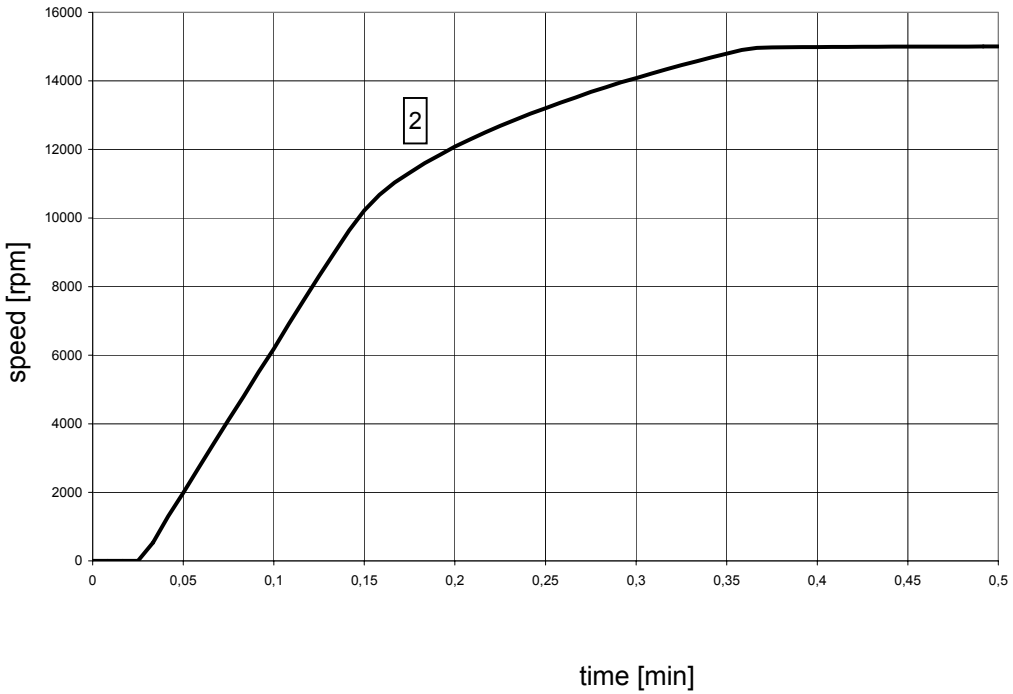
deceleration profiles

Sealed rotor 7500 3454



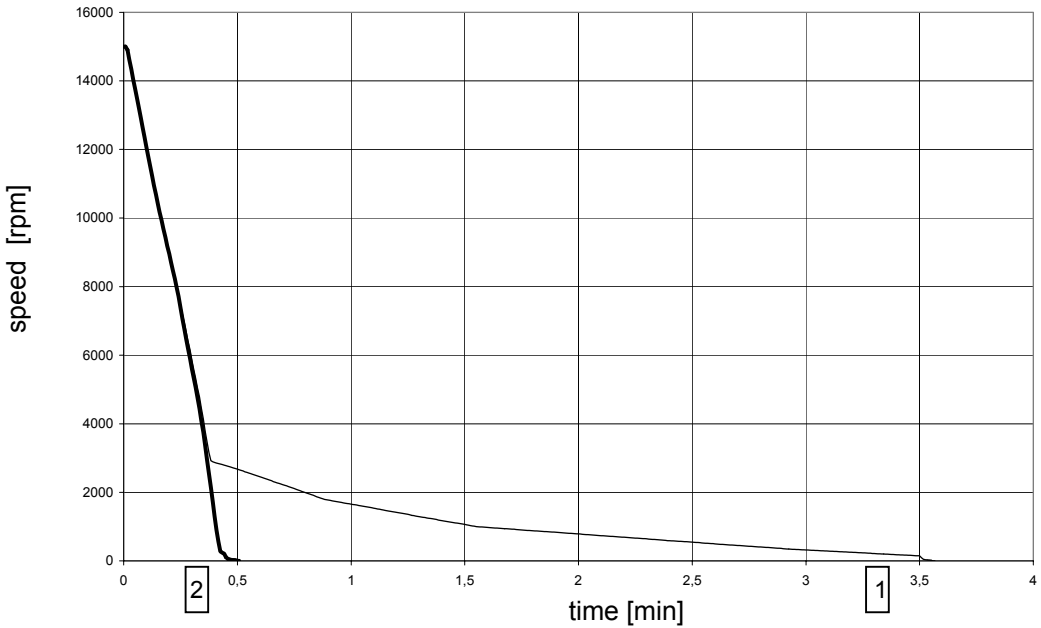
acceleration profiles

Micro Liter Rotor 7500 3455



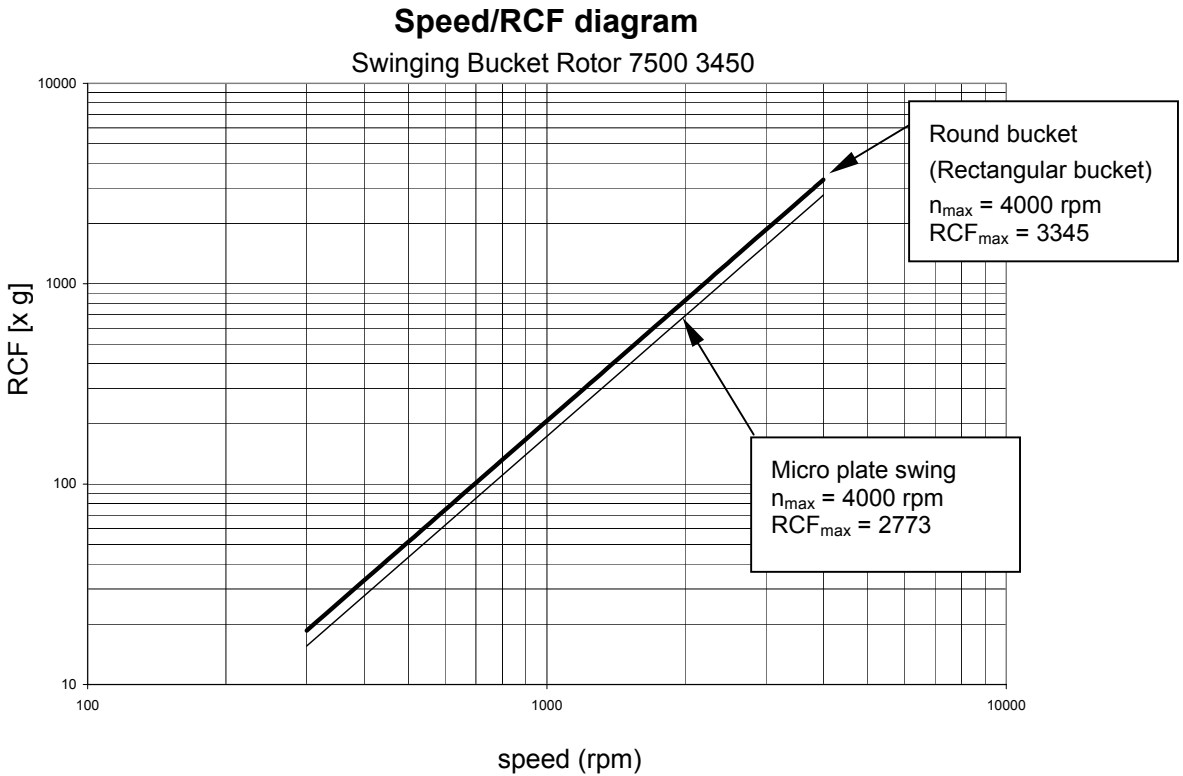
deceleration profiles

Micro Liter Rotor 7500 3455



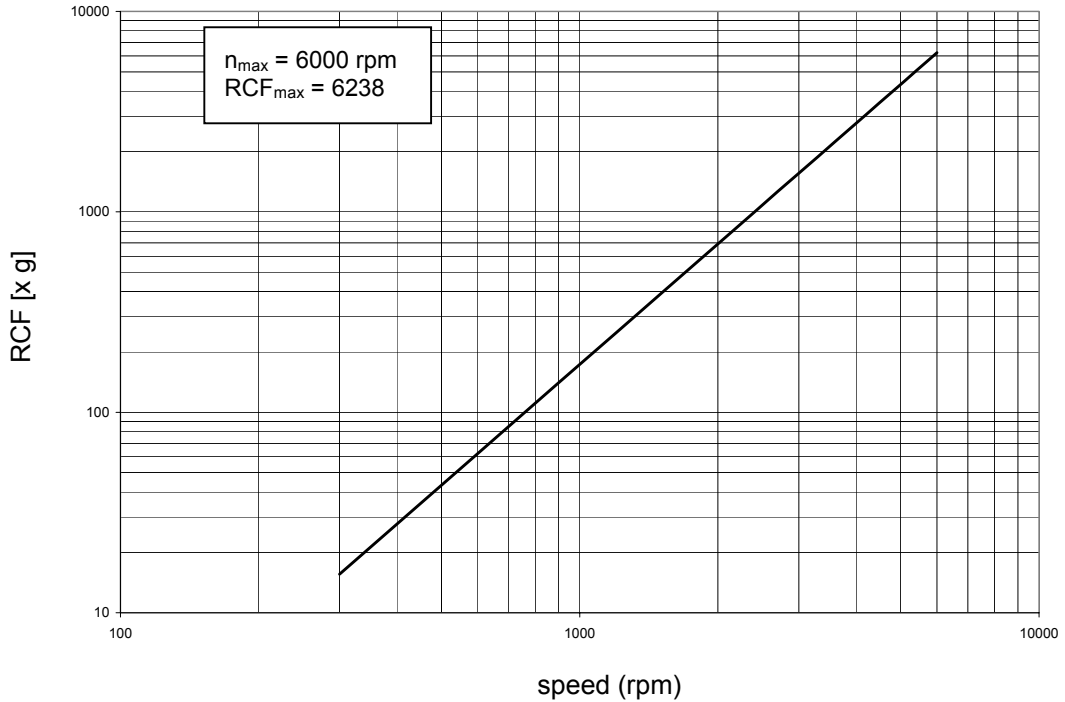
Speed/RCF diagrams

* n_{max} = max. speed



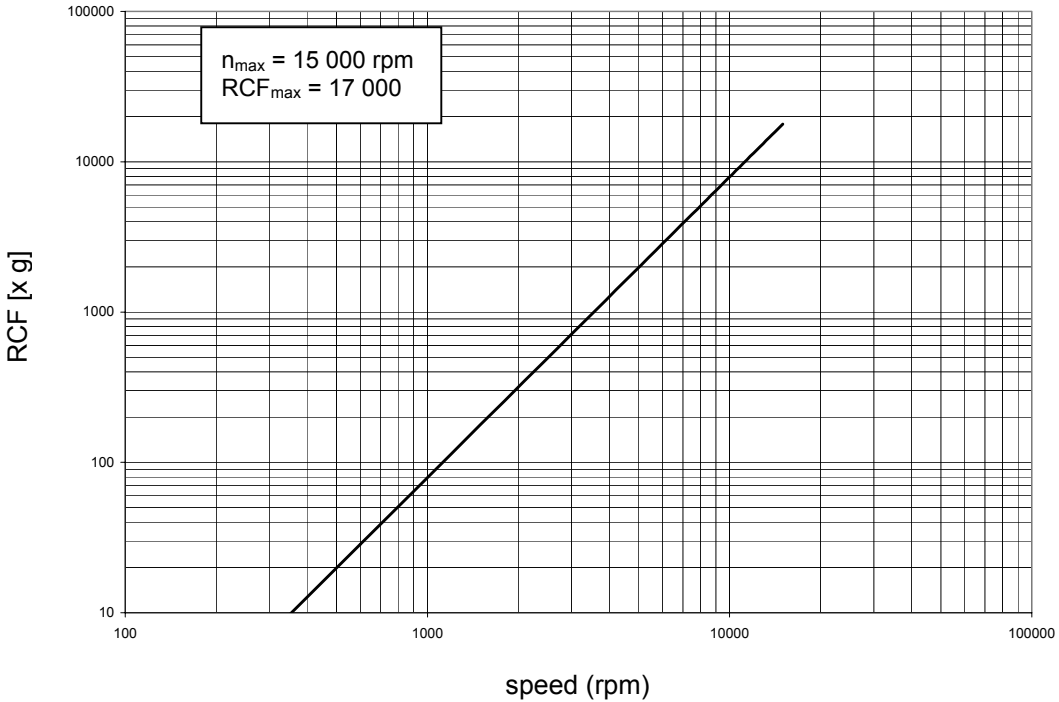
Speed/RCF diagram

Sealed Rotor 7500 3454



Speed/RCF diagram

Micro Liter Rotor 7500 3455



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