Centrifuge 5417 C / R

Instruction Manual
Mode d'emploi
Instrucciones resumidas

eppendorf

Fig. 1

Fig. 2

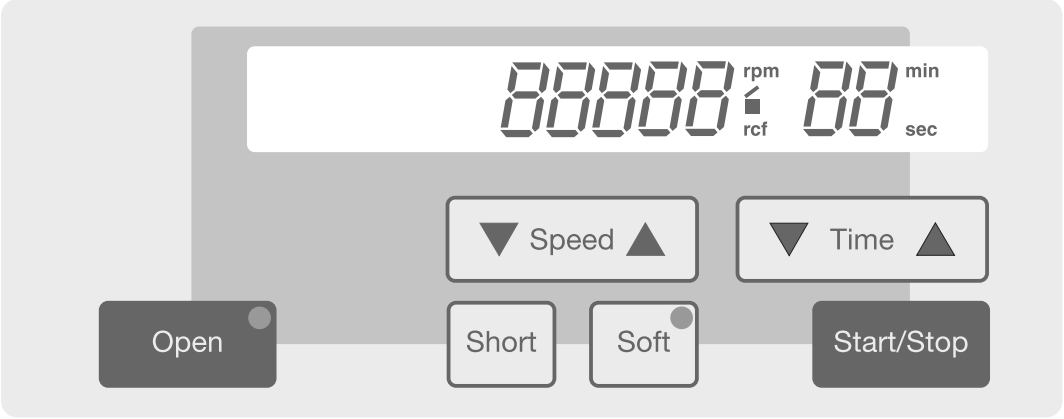

Fig. 3

Fig. 4

Centrifuge 5417 C / R

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1 Introduction

Centrifuge 5417 C is a non-refrigerated bench-top centrifuge and Centrifuge 5417 R is a refrigerated bench-top centrifuge. In both devices, Eppendorf Micro Test Tubes can be centrifuged at 20,800 rcf (14,000 rpm). It is possible to attain an rcf of up to 25,000 using a special 24-position rotor.
For special applications, a swing-bucket rotor is available with 8 positions for centrifuging Eppendorf Micro Test Tubes at a maximum rotational speed of 10,500 rpm (11,700 rcf).
PCR tubes can be centrifuged in a rotor which can accommodate six 8-tube strips.

Before starting up Centrifuges 5417 C / R for the first time, please read the operating manual and observe the safety regulations.

⚠ This sign is found on your centrifuge and on several pages in the operating manual. Texts labeled with this sign contain safety notes. Read these safety precautions before using the centrifuge for the first time.

1.1 Delivery package

1 Centrifuge 5417 C with fan cooling or 1 Refrigerated Centrifuge 5417 R
(rotor not included with centrifuges)
1 Mains cable
1 Operating manual
1 Hexagonal key
2 Spare fuses

1.2 Unpacking

When removing the centrifuge from the packaging, take hold of it at the sides, support it from underneath and lift it onto the lab bench.

1.3 Installing the device

Remove the transport safety devices according to the instructions on the pack insert and save these for possible future transport of the centrifuge. Only tilt the device slightly; do not place it on its side!

⚠ ***For 5417 R only:*** ***To avoid damage to the compressor caused by incorrect transportation, wait four hours after installation before switching on the device.***

To disconnect the mains supply from the centrifuge in the event of errors occurring, an emergency switch which is separate from the centrifuge must be available. This switch should be outside the room in which the centrifuge is operated or next to the exit of the room.

Before plugging in the centrifuge, check that the main voltage and frequency corresponds to the specifications on the identification plate of your centrifuge. The main connection of the centrifuge may only be connected to a socket with a protective conductor.

Place the centrifuge onto a stable, vibration-free, horizontal surface. Make sure that the centrifuge is not exposed to direct sunlight. To ensure sufficient ventilation, there should be clearance of 15 cm on both sides of the centrifuge to the wall or other devices. This is particularly important for the refrigerater mode of Centrifuge 5417 R. According to recommendations of the EN 61010-2-020 standard, a safety distance of 30 cm should be observed around the centrifuge during operation. No objects whose destruction may cause damage should be positioned in this space.

Connect the centrifuge to the main supply and press the main switch. The switch is located on the rear of the device (5417 C) or on the right-hand side of the device, directly next to the main connection. The centrifuge lid can now be opened by pressing ***Open***. Insert the rotor before starting ***and tighten***.

Please remove the protective strip from the display.

Do not move or knock against with the centrifuge during operation.

2 Safety

2.1 Intended use

The Centrifuge 5417 C / 5417 R is intended exclusively for indoor use and for separating aqueous solutions and suspensions of various densities in approved test tubes.

2.2 User profile

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

2.3 Application limits

In the interest of your own personal safety, always observe the following regulations:

The rotor and the rotor cover must always be securely fastened.
Do not begin centrifugation before the rotor has been securely fastened.

The rotor must be loaded symmetrically. Opposing tubes should be of the same type and should be filled equally.

Do not use buckets and rotors which show clear signs of corrosion or mechanical defects. Please check accessories at regular intervals.

Do not operate centrifuges which have not been correctly installed or repaired.

Do not move or knock against the centrifuge during operation.

Repairs must only be performed by an Eppendorf authorized service technician.

Only use original rotors and spare parts recommended by Eppendorf.

The Centrifuges 5417 C / R may only be used for special applications. They must not be operated in a hazardous or flammable environment and must not be used to centrifuge explosive or highly reactive substances.

If such liquids are spilled in the rotor or rotor chamber, the centrifuge must be cleaned with a moist cloth and a mild soap solution.

Close the test tube lids before centrifuging. Open lids can be ripped off during centrifuging and damage the centrifuge.

A liquid density of 1.2 g/ccm must not be exceeded at the maximum rotational speed.

During longer spin times in the 5417 C / R models, the sample tubes may heat up. Observe the limiting data specified by the tube manufacturer.

The use of organic solvents (e.g. chloroform, phenol) may have an adverse effect on the stability of plastic test tubes.

Following operation in a cooling room, run the centrifuge for 30 minutes in the cooling room until it is warm. Alternatively, allow it to warm up in a lab for at least three hours, but ***do not plug in the centrifuge*** in order to prevent damage caused by condensation.

Rotors are high-grade components which are subject to extreme mechanical strain. Aluminium rotors are protected against corrosion caused by commonly-used laboratory chemicals by means of an electrolytic coating, although this protection cannot be fully guaranteed.

Please ensure that the rotor is protected from mechanical damage. Even slight scratches and cracks can cause severe inner damage to the rotor materials.

Prior to centrifugation, the tubes should in any case be visually inspected for material damage. Damaged tubes may not be centrifuged. This is because broken tubes can, in addition to sample loss, result in further damage to the centrifuge and accessories.

Please avoid using aggressive chemicals with the rotors. Such chemicals include concentrated and mild alkalis, concentrated acids, solutions containing mercury ions, copper ions and other heavy-metal ions, chlorinated hydrocarbons and concentrated saline solutions.

When handling toxic or radioactive liquids or pathogenic bacteria out of Risk Group II (see World Health Organization: "Laboratory Biosafety Manual"), observe national regulations.

In the event of contamination caused by impurities or aggressive agents, the rotor must be cleaned ***immediately*** using a neutral cleaning liquid. This is particularly important for the bores of the fixed-angle rotor and for the buckets.

Please clean your rotor regularly using a ***neutral*** cleaning liquid (e.g. Extran® neutral or RBS neutral). This will protect the rotor and prolong its service life.

The buckets (5498 000.012) of the swing-bucket rotor A-8-11 (5490 060.008) and the rotor lids made of aluminium have an operating life of three years. The date of production is engraved in the form of a clock or in a month/year format (10/98).

Do not use rotors, lids or buckets which have been subjected to chemical or mechanical damage or which have exceeded their maximum operating life!

Declaration concerning the ATEX directive (94/9/EC)
The present design and ambient conditions inside Eppendorf centrifuges mean that they are not suitable for use in a potentially explosive atmosphere. The centrifuges must therefore only be used in a safe environment such as the open environment of a ventilated laboratory or a fully-extracted fume hood. The use of substances which may contribute to a potentially explosive atmosphere is not permitted. The final decision on the risks in connection with the use of such substances is the responsibility of the user of the centrifuge.

3 Operation

3.1 Operating controls

Please open up the fold-back cover at the front and back of this manual.

Fig. 1: Front of 5417 C with emergency lid release E (see 3.14)

Fig. 2: Rear of 5417 C with switch and fuse insert

Fig. 3: Display and control panel of 5417 C

Fig. 4: Display and control panel of 5417 R

Fig. 5: Fixed-angle rotor for 30 / 24 positions

Fig. 6: Swing-bucket rotor

Fig. 7: Rotor for 8-tube strips for PCR test tubes

3.2 Rotor description

Standard rotor F-45-30-11

The standard rotor ***F -45-30-11*** is a ***F***ixed-angle, ***45 degree*** rotor with ***30*** positions of ***11 mm*** diameter each. 1.5 ml and 2.0 ml tubes can be inserted directly. With adapters, 0.5 ml and 0.4 ml centrifuge tubes as well as 0.2 ml PCR tubes can be used.
The standard rotor can be operated up to a maximum of 14,000 rpm, with an rcf of 20,800.
The O-ring inserted into the rotor reduces the noise made by the centrifuge; it is not a sealing ring.
A replacement O-ring is included in the delivery package.

The rotor lid, which should always be attached during centrifugation, is fastened by pressing down the button and rotating to the right.

Aerosol-tight rotor FA-45-30-11

The aerosol-tight rotor ***FA-45-30-11*** has the same technical data as the standard rotor. The rotor lid is made of aluminium and is tightened with a threaded knob.
The rotor lid and the lid screw are provided with a silicone seal which prevents the escape of aerosols from the rotor chamber. The sealing ring must be kept clean and the lid must be properly fastened.

Aerosol-tight rotor F-45-24-11

This rotor can accommodate 24 tubes for 1.5 ml or 2.0 ml and can produce an rcf of 25,000 (16,400 rpm). The aerosol-tightness of the aluminium rotor lid can be guaranteed by tightening the threaded knob.

Rotor lid and seals are subject to natural wear and tear and should be replaced when worn.

Aerosol-tightness has been tested and approved in accordance with the procedure of Bennett *et al*. from the Centre for Applied Microbiology & Research, CAMR, Porton Down, Great Britain, and according to Annex AA of the IEC 1010-2-020 safety standard. (Certificate http://www.eppendorf.com).
The lid of aerosol-tight rotors must not be fastened tightly during storage!

Swing-bucket rotor A-8-11

Swing-bucket rotor A-8-11 contains eight swing buckets for 1.5 or 2.0 ml tubes. Adapters allow 0.5 ml, 0.4 ml or 0.2 ml tubes to be used.

The maximum permitted speed is 10,500 rpm (5417 R), effecting a relative centrifugal force of 11,700 x g. Maximum speed on the 5417 C: 10,000 rpm, corresponding to a relative centrifugal force of 10,600 x g.

Speed is limited automatically on Centrifuge 5417 C / R (see Item 3.10).

Please check that all swing buckets are properly suspended and can swing freely with the tubes.

PCR-tube strip rotor F-45-48-PCR

This rotor can accommodate six 8-tube strips or six 5-tube strips for 0.2 ml PCR test tubes or 48 individual PCR test tubes.

The maximum permitted speed is 10,500 rpm (5417 R), effecting a relative centrifugal force of 11,700 x g. Maximum speed on the 5417 C: 10,000 rpm, corresponding to a relative centrifugal force of 10,600 x g.

⚠ 3.3 Mounting / dismounting the rotors

Clean the motor axle and the rotor bores with a cloth before attaching the rotor.

- When fastening the rotor onto the motor axle, ensure that the temperature of the rotor and the motor axle is between 10 °C and 30 °C.
- Mount the rotor onto the motor axle and tighten the rotor nut by turning it clockwise using the hexagonal key supplied.
- To dismount the rotor, turn the rotor nut counterclockwise using the hexagonal key.
- The aerosol-tight rotor can also be removed from the centrifuge when the lid is closed; this is done by inserting the hexagonal key into the opening in the lid screw. This can be useful when the tubes are removed on a clean-room bench.
- Do not centrifuge using rotors and buckets with visible corrosion or mechanical defects.

⚠ 3.4 Loading the rotors

The rotors and buckets must always be loaded symmetrically. The adapters may only be loaded with the test tubes recommended.

Differences in the weight of the filled sample tubes should be kept as low as possible in order to prolong the lifetime of the drive and to minimize running noise.

The maximum permitted weight of a filled bucket is stated on each rotor. This weight must not be exceeded when the buckets are filled completely (see Section 2, "Safety regulations and applicational limitations").

Swing-bucket rotor:
For reasons of mechanical stabilization, ***all*** positions must be loaded with buckets of the same type.
Ensure that the grooves are clean before inserting the buckets.
Unclean grooves and pivots prevent the buckets from swinging freely. The plastic buckets should not be lubricated.

3.5 Routine centrifugation with preset time / rcf display

Switch on the mains supply. The nominal values of the last run appear in the display.

Load the rotor ***symmetrically*** and close the centrifuge lid. The green lamp in the ***Open*** key lights up. If "LID" lights up in the display field, close the lid again.

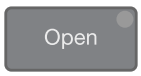
▼▲ To modify the values for the rotational speed / rcf (relative centrifugal force), time and temperature: The new nominal value appears in the display.

▼ Speed ▲ When both arrow keys are pressed simultaneously, the centrifuge switches from "rpm" (rotational speed) to "rcf". The rcf symbol appears in the display.

▼ Time ▲ To set the run time (minutes / seconds). The remaining centrifugation time is displayed in minutes, with the last minute being counted down in seconds. When the time is changed during the run, the time which has elapsed is included in the calculation of the new actual value.

▼ Temp ▲ To set the temperature preselection.

To start or end the run. ■ flashes for as long as the rotor is spinning.



To open the lid when the control lamp in the key is lit up. The symbol shows that the rotor is not moving.

During the run, the rotational speed of the rotor or the appropriate rcf value, the sample temperature and the remaining spin time in minutes are displayed. During the run, all parameters can be modified.

After the end of a run, or after a run has been interrupted by pressing the ***Stop*** key, the rotor is braked and brought to a standstill. During the braking process, the time display flashes and the elapsed spin time is displayed.

3.6 Continuous operation

The continuous operation function is set above 99 min or below 10 sec using the ***arrow keys***. In the time display, "oo" indicates continuous operation.
During the run, the actual values for temperature, rpm/rcf and the elapsed time (in minutes) are displayed. If the centrifuge runs for longer than 99 minutes, "99" flashes.

To start / end the run.

3.7 Short spin centrifugation

This key should be held down for the intended duration of the run. The time which has elapsed is displayed in seconds. A run which has already been interrupted can be restarted by pressing the key again, provided that the centrifuge has not come to a standstill.

Runs with a duration of 10, 20 or 30 seconds may be set using the time selection.

If the ***Short*** key is pressed when the lid is open, one of the following six status displays appears:

"10 t" or "1-10 t" / "14 t" or "1-14 t"/"16 t" or "1-16 t".

If the key is held down for longer than three seconds, the device switches to the other status and displays this for two seconds. The way which was last set is retained and appears in the display.

The meaning of the status displays is as follows:

"10 t": The swing-bucket rotor runs to its maximum speed of 10,500 rpm (5417 R)
"14 t": The 30-position fixed-angle rotor runs to its maximum speed of 14,000 rpm
"16 t": The 24-position fixed-angle rotor runs to its maximum speed of 16,400 rpm

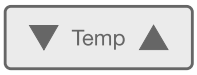
"1-10 t": The speed can be selected with the cursor keys (swing-bucket rotor)
"1-14 t": The speed can be selected with the cursor keys (30-position fixed-angle rotor)
"1-16 t": The speed can be selected with the cursor keys (24-position fixed-angle rotor)

3.8 Centrifugation with Soft start / stop

When this key is pressed before or during acceleration, the acceleration and braking phase is extended to approximately 60 sec. This is indicated by the control lamp in the key.

The Soft mode cannot be switched off after acceleration has finished.

3.9 Refrigeration (for 5417 R only)



The nominal temperature can be set from – 9 °C to + 40 °C. It can also be modified during the run.

Once the nominal temperature set has been reached, a deviation greater than ± 3 °C is indicated by a flashing temperature display.

If the temperature deviates by more than 5 °C, the centrifuge switches off with a periodic warning signal.

To start a temperature-control run at a rotor-specific speed.
Refrigeration enables the new, preset temperature ***in the rotor*** to be reached rapidly. The run ends automatically or by pressing the ***Stop*** key. A periodic warning signal is emitted. Cooling from RT to 4 °C lasts approximately 20 minutes.

Standby-refrig-eration

When the lid is closed, the rotor chamber is refrigerated to the preselected nominal temperature before or after a run as long as this value is below ambient temperature. The rotor does not spin during this procedure and the temperature is adjusted more slowly. The nominal temperature appears in the display.

To protect the device, refrigeration switches off automatically if the centrifuge is not used for longer than six hours or if the lid is not opened. ***Standby off*** and the actual temperature in the chamber appears in the display. The desired temperature can be reached again quickly via ***Fast Cool***.

Please empty and clean the tray for condensation water (located below the device) at regular intervals. This tray can be removed by pulling it out towards the front.

Please remove condensation water or ice (by thawing) from the rotor chamber at regular intervals. This should be carried out using a soft, absorbent cloth.

Note: If room temperature is lower than 18 °C, a warm-up time of approximately one hour is necessary to guarantee problem-free operation.

3.10 Automatic rotor recognition

Rotor recognition occurs at the beginning of every run. If the maximum rotational speed of the rotor is lower than the nominal rotational speed after a rotor has been exchanged, the run is interrupted. ***SPEED*** appears in the display.

The new maximum rotational speed appears in the display. New nominal values up to this rotational speed may be set.

3.11 Display of nominal value during the run

If an arrow key is pressed when the centrifuge is running, all nominal values are displayed for three seconds. The nominal value changes each time the key is pressed within this period.

3.12 Display of elapsed spin time

If both ***Time*** arrow keys are pressed simultaneously, the total run time of the centrifuge (in hours) appears in the display. This function can only be called up when the lid is open.

3.13 Control via serial interface (optional)

With special centrifuge models (ordered in advance), all centrifuge functions can be operated via the serial interface (RS 232 C).

Only devices which have been tested in accordance with IEC 950 may be connected via the serial interface.

3.14 Opening the centrifuge in the case of a power failure

If the magnetic lid latch cannot be activated because of a power failure, the emergency lid release can be activated manually:

⚠ Turn off the main switch. Wait until the rotor has come to a standstill. Open the lid carefully, as the rotor may continue spinning for some time. Disengage the lid latch by pressing the lid down slightly.

A plastic knob is situated at the left front edge of the base plate (see Fig. 1, E). After this knob has been pulled out and then downwards, the emergency lid release can be activated. The lid latch is disengaged by pressing down the lid lightly. The knob must be then reinserted.

3.15 Fuses

The red fuse holder is located next to the main cable port in the connection unit. If necessary, the fuse holder can be removed and the two fuses can be replaced (see "Ordering information").

Only use fuses which have the nominal values printed on the identification plate of the device (current intensity, slow).

						Order no.
For ***5417 R***	230 V:	2 x	6.3 A	T	5 x 20	22 37 583-1
	120 V:	1 x	10.0 A	T UL	6.3 x 32	22 66 410-7
	100 V:	1 x	12.0 A	mTUL	6.3 x 32	22 66 184-1
For ***5417 C***	230 V:	2 x	6.3 A	T	5 x 20	22 37 583-1
	120 V:	1 x	8.0 A	T UL	6.3 x 32	22 37 597-1
	100 V:	1 x	10.0 A	T UL	6.3 x 32	22 66 410-7

4 Maintenance and cleaning

4.1 Device

The outside of the centrifuge and the rotor chamber should be cleaned regularly with neutral detergent. This is for hygiene purposes as well as to prevent contamination caused by residual contamination.

The user is responsible for cleaning or decontaminating the centrifuge in the event of decontamination caused by high-risk substances.

Open the lid of the centrifuge and disconnect the main plug. Unscrew the rotor with the hexagonal key provided and clean separately. Only ***neutral*** agents may be used for cleaning and disinfection (e.g. diluted Extran® ***neutral***, RBS ***neutral*** or 70 % isopropanol/water mixture or an alcohol-based disinfectant). The rotor chamber should only be cleaned with a moist cloth.

After cleaning with detergent, the rubber seals in the rotor chamber should be rinsed ***well with water*** and lubricated with glycerine.

The user must consult the manufacturer before cleaning or decontaminating the centrifuge using methods not recommended by the manufacturer in order to ensure that the centrifuge is not damaged.

To ensure that the centrifuge functions correctly and safely in the long-term, please note that aggressive chemicals can damage the rotor, buckets and boiler. Please check the centrifuge regularly for damage caused by corrosion.

4.2 The rotors

The rotor and buckets must be cleaned regularly to prevent contamination caused by residue. Check the rotor and housing ***monthly*** for residue and corrosion. This applies in particular to the rotor bores. Please clean your rotor using a neutral cleaning liquid. This will protect the rotor and maintain its service life. As a reminder, the message "CLEAn ro" appears in the display of the centrifuge three times after every 200 runs.

The magnetic ring on the base of the rotor is for rotor recognition and rotational speed monitoring. If damaged, it must be replaced by a service technician.

Do not carry out centrifugation using damaged rotors.

4.3 Aerosol-tight rotors

The lid of the aerosol-tight rotors FA-45-30-11 and FA-45-24-11 should be replaced in the event of excessive wear and tear. To protect the rotor, please ensure that the sealing rings are maintained regularly.

The lid of the aerosol-tight rotor must not be fastened tightly during storage!

4.4 Rotor sterilization

All rotors are autoclavable (121 °C, 20 min).
After the rotor has been autoclaved a maximum of ten times, the lids of the aerosol-tight rotors must be replaced.

4.5 Refrigerated centrifuges

Please remove any condensation water in the rotor chamber using a soft, absorbent cloth.

Switch off the centrifuge after use, leave the lid open and empty the tray for condensation water, located below the device. The tray is pulled out towards the front.

4.6 Glass breakage

When centrifuging glass tubes, be aware that as speed/rcf increases, so the risk of glass breaking becomes greater. Please note the manufacturer's instructions pertaining to maximum load for centrifuge tubes. In the event of glass breakage, carefully remove all splinters and all ground glass from the rotor, the buckets, the adapters and the rotor chamber. You may need to replace the rubber plates and adapters to prevent further damage.

Fine splinters of glass may otherwise scratch the surface of the rotors and buckets, reducing their resistance to chemicals. The air eddies in the rotor chamber produce a very fine black cloud of abraded metal which, in addition to causing damage to the rotor chamber, rotor, buckets and adapters, also results in samples becoming contaminated.

Check the rotor bores regularly for residues and damage.

4.7 Return of the devices

When returning centrifuges, please ensure that the devices have been decontaminated and thereby do not present a health risk to our Service staff.

You will find additional information and a blank of the decontamination confirmation at www.eppendorf.com. Do also consult your laboratory safety officer about a suitable decontamination method.

Please fill out the decontamination confirmation and place it together with the device when it is to be sent back to Eppendorf.

5 Troubleshooting

Centrifuges 5417 C / R

Error	*Display*	*Cause*	*Solution*
No display.	***None***	No main connection.	Check power supply cable.
		Power failure.	Check main power fuse on the device and in the laboratory.
	CLEAn ro	200 runs.	Clean rotor and lubricate axle.
Centrifuge does not start up.	***Error 3***	No rotor.	Insert rotor.
	Error 23	Error in the drive or rotor recognition.	Switch off the device and switch it on again.
Lid cannot be opened.	***None***	Power failure.	Bring rotor to a standstill, activate emergency lid release.
Lid not closed completely.	***LID***	Lid latch not engaged.	Press down lid again.
Centrifuge shakes during acceleration and switches off.	***InbAL***	Rotor not loaded symmetrically.	Check rotor loading.
	rotor	Rotor not fastened.	Fasten rotor correctly.
	SPEEd	Nominal speed too high.	Enter new nominal speed.
	Int	Power failure during the run.	Repeat run.
	Error 1	Rotor is not recognized.	Repeat run. If error recurs, test with another rotor.
	Error 2	Imbalance sensor defective.	Repeat run.
	Error 3	No rotor.	Insert rotor.
		Errors in rotational speed measuring system.	Leave device ***switched on*** for 8 min, then open the device. Repeat run.
	Error 5	Unauthorized opening of lid or lid switch defective.	Repeat run.
	Error 6	Converter overloaded. Brake defective.	Restart device after 5 min.
		Rotor loose.	Tighten rotor.
	Error 7	Overspeed.	Repeat run.
	Error 8	Rotor loose.	Tighten rotor.
		Drive error; motor defective.	⇒ SERVICE.
	Error 9–25	Electronics error.	⇒ SERVICE.
Flashing temperature display.		Temperature deviation from nominal value > 3 °C.	
Warning signal.	***Error 18***	Temperature deviation from nominal value > 5 °C.	The nominal value which has been set is too low or refrigeration is defective.

If the above solutions are unsuccessful, please contact SERVICE.
When an error display appears, press the Soft key and the Speed key above it at the same time and record the values displayed for servicing via remote diagnosis.

6 Technical data

Centrifuge 5417 C

Power supply:	230 V / 50–60 Hz 120 V / 50–60 Hz 100 V / 50–60 Hz See identification plate
Power requirement:	400 W
Max. rotational speed:	16,400 rpm
Max. centrifugal force:	25,000 rcf
Max. load:	30 x 2.0 ml Safe-Lock Microcentrifuge Tubes
Max. density of material to be centrifuged:	1.2 g/ml
Permitted ambient temperature during operation:	2 °C – 35 °C
Permitted maximum relative air humidity:	75 %
Max. kinetic energy:	6,100 Nm
Dimensions (H x W x D):	228 x 310 x 430 mm
Weight:	17 kg
Degree of pollution	2
Overvoltage category	II

Centrifuge 5417 R

Power supply:	230 V / 50 Hz or 60 Hz 120 V / 50 Hz or 60 Hz 100 V / 50 Hz or 60 Hz See identification plate
Power requirement:	
Centrifuge	400 W
Compressor	300 W
Max. rotational speed:	16,400 rpm
Max. centrifugal force:	25,000 rcf
Max. load:	30 x 2.0 ml Safe-Lock Microcentrifuge Tubes
Max. density of material to be centrifuged:	1.2 g/ml
Range of control for refrigeration:	– 9 °C to + 40 °C
Refrigeration time for "Fast Cool"	from 20 °C to 4 °C: approx. 20 min.
Permitted ambient temperature during operation:	10 °C–35 °C
Permitted maximum relative air humidity:	75 %
Max. kinetic energy:	6,100 Nm
Dimensions (H x W x D):	250 x 310 x 597 mm
Weight:	34.8 kg
Degree of pollution	2
Overvoltage category	II

Technical specifications subject to change!

7 Ordering information

Centrifuge 5417 C, Microcentrifuge, Rotational speed regulation from 500 rpm to 16,400 rpm 120 V / 60 Hz, without rotor Other voltage versions available on request!	22 62 170-0
Centrifuge 5417 R, Refrigerated microcentrifuge, Rotational speed regulation from 500 rpm to 16,400 rpm Temperature control from – 9 °C to 40 °C, 120 V / 60 Hz, without rotor Other voltage versions available on request!	22 62 180-7
Fixed-angle rotor F-45-30-11 incl. aluminium lid, 30 x 1.5/2 ml, max. rcf: 20,800	22 63 600-6
Fixed-angle rotor FA-45-30-11 incl. aerosol-tight, aluminium rotor lid, 30 x 1.5/2 ml, max. rcf: 20,800	22 63 605-7
Fixed-angle rotor FA-45-24-11 incl. aerosol-tight, aluminium rotor lid, 24 x 1.5/2 ml, max. rcf: 25,000	22 63 657-0
Swing-bucket rotor A-8-11 incl. aluminium lid, 8 x 1.5/2 ml	22 63 613-8
PCR-tube strip rotor F-45-48-6-PCR 6 x 8-tube strips 6 x 5-tube strips 48 x 0.2 ml PCR test tubes	22 63 614-6

Accessories

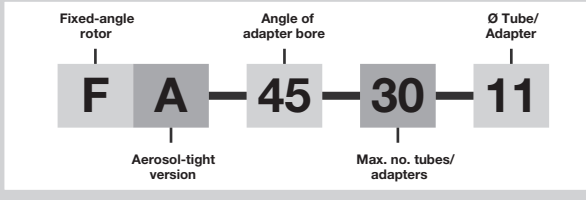
Adapter for 0.5 ml micro test tubes and B-D Microtainer (set of 6) for F-45-30-11 and FA-45-30-11 (5 sets required) for swing-bucket rotor A-8-11 (2 sets required)	22 63 622-7
Adapter for 0.4 ml centrifuge tubes (set of 6) for F-45-30-11 and FA-45-30-11 (5 sets required) for swing-bucket rotor A-8-11 (2 sets required)	22 63 624-3
Adapter for 0.2 ml PCR test tubes (set of 6)	22 63 626-0
Buckets for swing-bucket rotor 8 x 1.5/2.0 ml (set of 12)	22 37 978-0
Rotor lid for F-45-30-11 (aluminium)	22 37 672-1
Rotor lid for aerosol-tight rotor FA-45-30-11	22 66 913-3
Rotor lid for aerosol-tight rotor FA-45-24-11	22 63 678-2
Rotor lid for A-8-11	22 37 974-7
O-ring for rotor F-45-30-11	22 37 976-3
Magnetic ring for fixed-angle rotor F-45-30-11/FA 45-30-11	22 37 963-1
Magnetic ring for swing-bucket rotor	22 37 964-0
Magnetic ring for fixed-angle rotor F-45-24-11	22 37 966-6

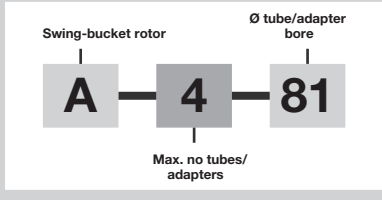
Microfuses (set of 2)	
for 5417 R 230 V / 2 x 6.3 A, T	22 37 583-1
for 5417 R 120 V / 10.0 A, T UL	22 66 410-7
for 5417 R 100 V / 12.0 A, mT UL	22 66 184-1
for 5417 C 230 V / 2 x 6.3 A, T	22 37 583-1
for 5417 C 120 V / 8.0 A, T UL	22 37 597-1
for 5417 C 100 V / 10.0 A, T UL	22 66 410-7
Hexagonal key	22 63 430-5
Main cable (230 V)	15 00 665-0
Main cable (US 115 V)	22 66 499-9

Important note:
Please use the original accessories recommended by Eppendorf. Using spare parts or disposables which we have not recommended can reduce the precision, accuracy and life of the centrifuges.
We do not honor any warranty or accept any responsibility for damage resulting from such action.

Rotor code

All Eppendorf rotors are designated according to a simple, logical system which describes the technical specifications as a uniform series of numbers and letters e.g.:





8 Appendix

Calculation of rcf

The maximum relative centrifugal force (rcf) stated as a multiple of the gravitational force "g" can be calculated for each tube from the rotational speed n (rpm) and the maximum radius of centrifugation r (cm).

$$rcf = 11.18 \times r \times (n/1.000)^2$$

In rotor F-45-30-11, the following maximum radii of centrifugation and rcf are valid for the various micro test tubes:

Tube type	*at n (rpm)*	*r (cm)*	*rcf*
2.0 ml Safe-Lock Microcentrifuge Tube	14,000	9.5	20,800
1.5 ml Safe-Lock Microcentrifuge Tube, 3810	14,000	9.2	20,200
0.5 ml Safe-Lock Microcentrifuge Tube	14,000	8.3	18,200
0.4 ml Centrifuge Tube	14,000	9.2	20,200
1.7 ml Safe-Twist Screw Cap Tube	14,000	9.2	20,200

This conversion table is valid for 2.0 ml Safe-Lock Microcentrifuge Tubes in a fixed-angle rotor:

rpm	*in*	*rcf*
1 000		110
2 000		420
3000		960
4 000		1 700
5 000		2 700
6 000		3 800
7 000		5 200
8 000		6 800
9 000		8 600
10 000		10 600
11 000		12 900
12 000		15 300
13 000		17 900
14 000		20 800

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OTHER COUNTRIES
Internet:
www.eppendorf.com/worldwide

Fig. 5

Fig. 6

Fig. 7

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