



Frontier™ Centrifuge
FC5714, FC5718, FC5718R,
FC5720R, FC5816, FC5816R,
FC5830R, FC5916, FC5916R
Instruction Manual

Front and rear view of the centrifuge: FC5714, FC5718, FC5816, FC5916

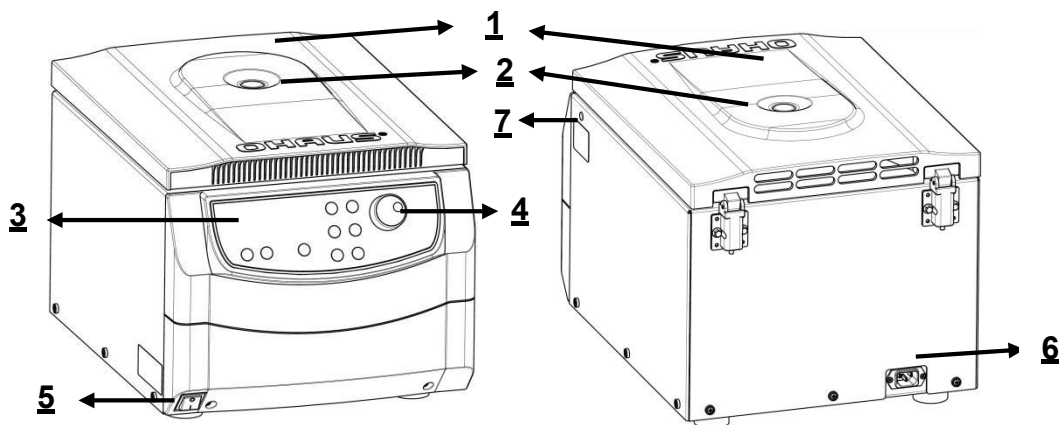


Figure.1

Front and rear view of the centrifuge: FC5718R, FC5720R

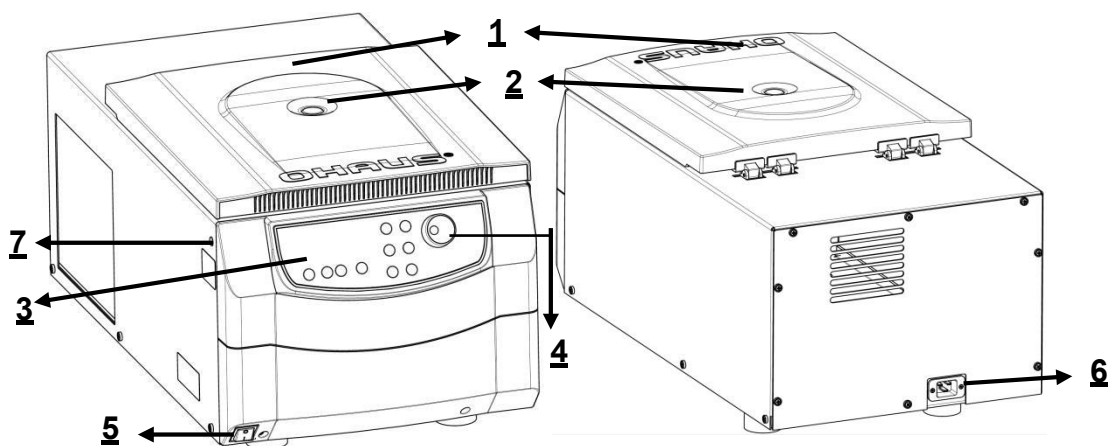


Figure.2

Front and rear view of the centrifuge: FC5816R, FC5830R, FC5916R

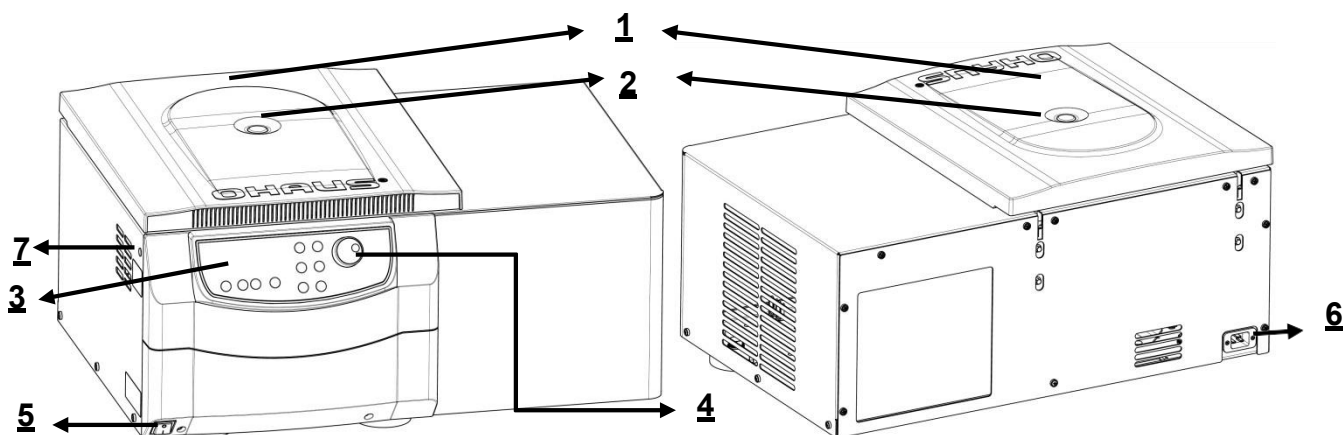


Figure.3

| | |
|---------------------|--------------------|
| 1 Centrifuge Lid | 2 Rotor Window |
| 3 Display | 4 Function Label |
| 5 Main Power Switch | 6 Power Connection |
| 7 Emergency Release | |

Function Label for FC5714, FC5718, FC5718R, FC5720R, FC5816, FC5816R, FC5830R, FC5916, FC5916R

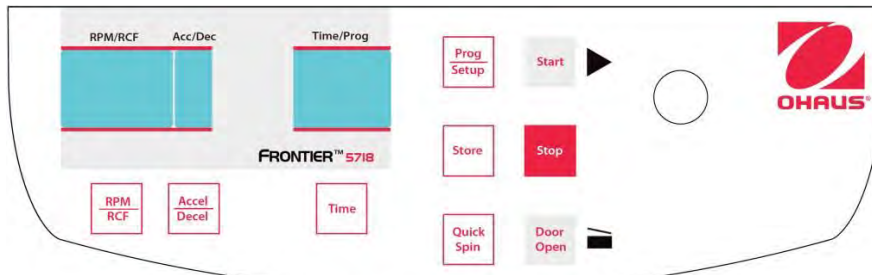


Figure.4

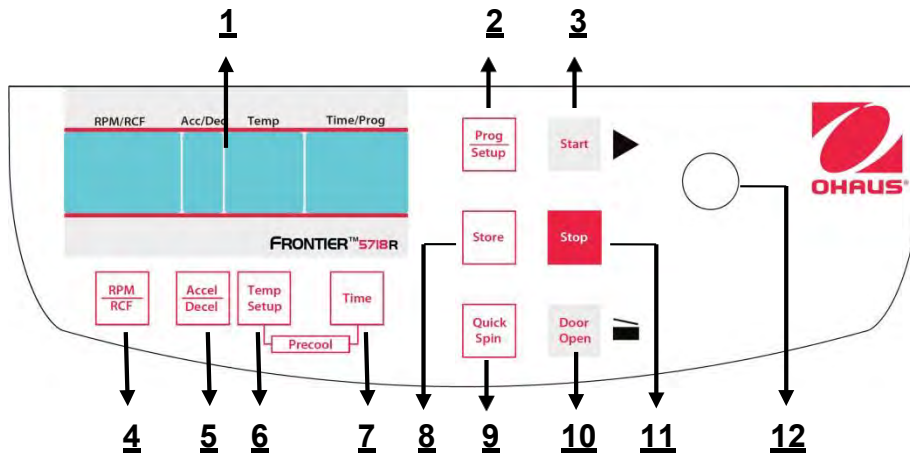


Figure.5

| | |
|---|--|
| 1. LCD Display | 2. Program setup model |
| 3. Start centrifugation | 4. RPM/RCF model and select |
| 5. Acceleration/Deceleration intensity model and select | 6. Temperature setup model (Only FC5515R) |
| 7. Time setup model | 8. Store setup information |
| 9. Short/quick spin centrifugation | 10. Release lid |
| 11. Stop centrifugation / setup | 12. Adjusting knob/Dial: Change the number |

LCD Display

The following picture shows the individual elements of the LCD-display.



Figure.6

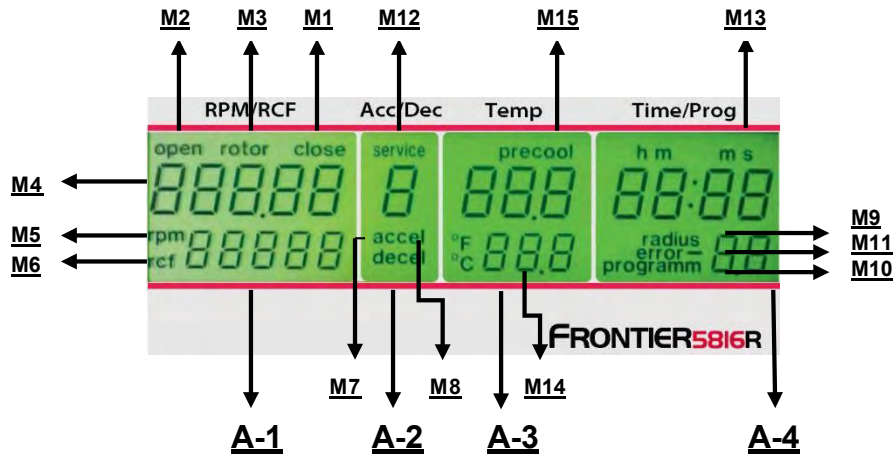


Figure.7

Display fields:

- A-1 Display field – "RPM/RCF"
- A-2 Display field – "Acc/Dec" "Service"
- A-3 Display field – "Time/Prog"
- A-4 Display field – "Temp"

Messages/logos of the display fields

| | | | | | |
|-----|-------------|-----|---------------|-----|-----------|
| M1 | "close" | M2 | "open" | M3 | "rotor" |
| M4 | "Rotor-No." | M5 | "rpm" | M6 | "rcf" |
| M7 | "accel" | M8 | "decel" | M9 | "radius" |
| M10 | "program" | M11 | "error" | M12 | "service" |
| M13 | "h m s" | M14 | "temperature" | M15 | "precool" |

Rotor Information Table

| Rotor No. display | Order No. | Description | Compatible | | | | | | | | |
|-------------------|-----------|---|------------|--------|---------|---------|--------|---------|---------|--------|---------|
| | | | FC5714 | FC5718 | FC5718R | FC5720R | FC5816 | FC5816R | FC5830R | FC5916 | FC5916R |
| 10 | 83041010 | Rotor Angle 12x5ml FA ID Sealable | • | • | • | | | | | | |
| 11 | 83041011 | Rotor Swing out 4x200ml ID Sealable | • | • | • | • | | | | | |
| 18 | 30372718 | Rotor Angle 44x1.5/2.0ml ID V1 | | • | • | • | • | • | | | • |
| 20 | 30314820 | Rotor Swing out 4x290ml ID | | | | | | • | • | • | |
| 21 | 30314821 | Rotor Angle 6x250ml FB ID | | | | | | • | • | • | • |
| 22 | 30314822 | Rotor Swing out 4x145ml ID | • | • | • | • | | | | | |
| 23 | 30314823 | Rotor Swing out 4x100ml ID Sealable | • | • | • | | | | | | |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | • | • | • | • | • | • | • | • | • |
| 25 | 30314825 | Rotor Angle 6x85ml RB ID Hi | | • | • | • | | | | | |
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | | • | • | • | • | • | • | • | • |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | | • | • | • | • | • | • | • | • |
| 28 | 30314828 | Rotor Swing out 4x250ml ID | | | | | | • | • | | |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | | • | • | • | • | • | • | • | • |
| 30 | 30314830 | Rotor Angle 6x50ml RB/FA ID | • | • | • | • | | | | | |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | | • | • | • | • | • | • | • | • |
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | • | • | • | • | • | • | • | | |
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | | • | • | • | • | • | • | • | • |
| 34 | 30314834 | Rotor Angle 12x15ml RB/FA ID | • | • | • | • | | | | | |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | • | • | • | • | | | | • | • |
| 38 | 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | • | • | • | • | • | • | | | • |
| 39 | 30314839 | Rotor Angle 12x1.5/2.0ml ID | | • | • | | | | | • | |
| 41 | 30314841 | Rotor Angle 4x8-Place PCR Stripes ID | | • | • | • | | | | | • |
| 61 | 30304361 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS | | | | • | | | | | |
| 85 | 30553085 | Rotor Swing out 4x750ml ID Sealable | | | | | | | | | • |
| 86 | 30553086 | Rotor Angle 4x500ml ID | | | | | | | | | • |

IMPORTANT!

• There is a change in Serial Numbers and Software Version. OLD Versions of the FC5714, FC5718, FC5718R will not accept new rotors! NEW versions of the models below:

| | FC5714 | FC5718 | FC5718R |
|----------------------------|-----------------------|-----------------------|------------------------|
| Serial Number/ Software | 117xxxxxxxx / FC5714A | 118xxxxxxxx / FC5718A | 119xxxxxxxx / FC5718RA |

Table Of Contents

| | |
|---|-----------|
| 1. Introduction | 1 |
| 1.1 Description And Intended Purpose | 1 |
| 1.2 Brief Description | 1 |
| 1.3 Definition Of Signal Warnings And Symbols | 1 |
| 1.4 Safety Precautions | 2 |
| 1.4.1 User | 2 |
| 1.4.2 Rotor And Accessories | 2 |
| 1.4.3 Measures For Your Protection | 2 |
| 1.4.4 Exclude The Following Environmental Influences | 2 |
| 1.4.5 Measures For Operational Safety | 3 |
| 1.4.6 Danger And Precautions | 3 |
| 1.4.7 Abbreviations Used In This Manual | 3 |
| 2. Installation | 4 |
| 2.1 Unpacking | 4 |
| 2.1.1 Delivery Package | 4 |
| 2.2 Selecting The Location | 4 |
| 2.3 Installation | 4 |
| 2.4 Safety Precautions During Operation And Warranty | 5 |
| 3. Operation | 5 |
| 3.1 Mounting And Loading Rotor | 5 |
| 3.1.1 Installation Of Rotors | 5 |
| 3.1.2 Loading Angle Rotors | 6 |
| 3.1.3 Loading Swing Out Rotors | 6 |
| 3.1.4 Loading And Overloading Of Rotors | 7 |
| 3.1.5 Removing The Rotor | 7 |
| 3.2 Lid Control | 7 |
| 3.2.1 Lid Open | 7 |
| 3.2.2 Lid Lock | 8 |
| 3.3 Preselection | 8 |
| 3.3.1 Preselection Of Speed / Rcf-Value | 8 |
| 3.3.2 Preselection Of Running Time | 9 |
| 3.3.3 Preselection Of Brake Intensity And Acceleration | 9 |
| 3.3.4 Pre-Selection Of Temperature (Only Refrigerated Models) | 10 |
| 3.3.5 Pre-Cooling (Only Refrigerated Models) | 10 |
| 3.4 Radius Correction | 10 |
| 3.5 Program | 11 |
| 3.5.1 Storage Of Programs | 11 |
| 3.5.2 Recall Of Stored Programs | 12 |
| 3.5.3 Leaving Program Mode | 12 |
| 3.6 Starting And Stopping The Centrifuge | 12 |
| 3.6.1 Starting The Centrifuge | 12 |
| 3.6.2 The "Stop" Key | 13 |
| 3.7 Imbalance Detection | 13 |
| 4. Setting | 14 |
| 4.1 Basic Adjustments | 14 |
| 4.1.1 Access To Mode "Operating Data" | 14 |
| 4.1.2 Temperature Indication | 14 |
| 4.1.3 Signal Turn On / Off | 15 |
| 4.1.4 Volume Pre-Selection Of Sound Signal | 15 |
| 4.1.5 Song Selection For Sound Signal - End Of Run | 16 |
| 4.1.6 Keyboard Sound Turn On / Off | 16 |
| 4.1.7 Call Up Operating Data | 16 |
| 5. Maintenance | 18 |
| 5.1 Maintenance And Cleaning | 18 |
| 5.1.1 General | 18 |
| 5.1.2 Cleaning And Disinfection Of The Unit | 18 |
| 5.1.3 Cleaning And Disinfection Of The Rotor | 18 |
| 5.1.4 Disinfection Of Aluminum Rotors | 18 |
| 5.1.5 Disinfection Of Pp-Rotors | 19 |
| 5.1.6 Glass Breakage | 19 |

| | | |
|-------|--|----|
| 5.2 | Service life of rotors, buckets, accessories | 20 |
| 6. | Troubleshooting | 21 |
| 6.1 | Error Message: Cause / Solution | 21 |
| 6.2 | Survey Of Possible Error Messages And Their Solutions | 21 |
| 6.2.1 | Lid Release During Power Failure (Emergency Lid Release) | 21 |
| 6.2.2 | Description Of The Error Message System | 22 |
| 7. | Receipt Of Centrifuges To Repair | 23 |
| 8. | Transport, Storage And Disposal | 23 |
| 8.1 | Transport | 23 |
| 8.2 | Storage | 23 |
| 8.3 | Transporting, Installing, Transferring And Disposing Of The Centrifuge FC5714, FC5718, FC5718R, FC5720R, FC5816, FC5816R, FC5830R, FC5916, FC5916R | 23 |
| 8.3.1 | Transport | 23 |
| 8.3.2 | Installation | 23 |
| 8.3.3 | Packing | 24 |
| 8.3.4 | Passing On The Device | 24 |
| 9. | Technical Data | 25 |
| 9.1 | Specifications | 25 |
| 9.1.1 | Centrifuge FC5714 | 25 |
| 9.1.2 | Centrifuge FC5718 | 26 |
| 9.1.3 | Centrifuge FC5718R | 27 |
| 9.1.4 | Centrifuge FC5720R | 28 |
| 9.1.5 | Centrifuge FC5816 | 29 |
| 9.1.6 | Centrifuge FC5816R | 30 |
| 9.1.7 | Centrifuge FC5830R | 31 |
| 9.1.8 | Centrifuge FC5916 | 32 |
| 9.1.9 | Centrifuge FC5916R | 33 |
| 9.2 | Drawings And Dimensions | 34 |
| 10. | Compliance | 35 |
| 11. | Appendix | 37 |
| 11.1 | Table 1: Permissible Net Weight | 38 |
| 11.2 | Table 2: Lowest Temperatures At Max. Speed (Only Refrigerated Models) | 39 |
| 11.3 | Table 3: Max. Speed And Rcf-Values For Permissible Rotors | 41 |
| 11.4 | Table 4: Acceleration And Deceleration Times | 44 |
| 11.5 | Table 5: Error Messages | 47 |
| 11.6 | Table 6: Radius Correction And Adapter Specifications | 48 |
| 11.7 | Table 7: Table of the service life of rotors | 53 |
| 11.8 | Table 8: Redemption Form / Decontamination Certificate | 54 |

1. INTRODUCTION

1.1 Description and Intended Purpose

Thank you for choosing this OHAUS product.

All symbols indicate safety instructions and points to potential dangerous situations. Please read the manual completely before using the Frontier™ Multi Pro Centrifuges to avoid incorrect operation.

Frontier™ Multi Pro Centrifuges were designed for the separation of materials or mixtures with different densities. OHAUS centrifuges are intended exclusively for indoor use and for use by qualified personnel.

1.2 Brief description

The models FC5714, FC5718, FC5816, FC5916 are non-refrigerated universal centrifuges.

The models FC5718R, FC5720R, FC5816R, FC5830R, FC5916R are refrigerated universal centrifuges.

All models are offered in two voltage variations, 230V or 120V. The centrifuges can be used with swing-out and angle rotors. All parameters are accessible via buttons and selected with the central adjuster.

All pre-selected and current values will be shown permanently on the LCD-display. The centrifuge is powered by a maintenance-free induction motor. Detailed technical data are in the "Technical data" section.

1.3 Definition of Signal Warnings and Symbols







Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions, and false results.

The degree of danger is a part of a safety note and distinguishes the possible results of non-observance from each other.

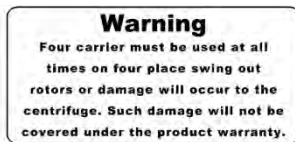
Signal Words

| | |
|------------------|--|
| DANGER | Will lead to severe injuries or death if not avoided. |
| WARNING | For a hazardous situation with medium risk, possibly resulting in injuries or death if not avoided. |
| CAUTION | For a hazardous situation with low risk, resulting in damage to the device or the property or in loss of data, or injuries if not avoided. |
| ATTENTION | For important information about the product. May lead to equipment damage if not avoided |
| NOTE | For useful information about the product |

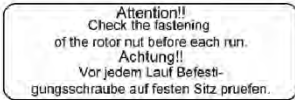
Warning Symbols

| | | | |
|---|---------------------|---|-------------------------|
|  | General Hazard |  | Electrical Shock Hazard |
|  | Alternating Current |  | Biohazard |
|  | Explosion |  | Crushing |

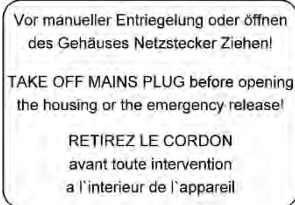
Warning and information signs on the surface of centrifuge



Four carriers must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.



Attention! Check the fastening of the rotor nut before each run.



Take off mains plug before opening the housing or the emergency release.



Direction of rotation – clockwise rotation for the rotor drive



Reference for loading rotors

1.4 Safety Precautions

1.4.1 User

OHAUS centrifuges are intended exclusively for indoor use and for use by qualified personnel. This device may only be operated by trained specialist staff. They must have carefully read the operating manual and be familiar with the functions of the device.

1.4.2 Rotor and accessories

Only OHAUS original rotors and accessories shall be used. Any other use or intended use is considered improper. OHAUS is not liable for damage resulting from improper use.



CAUTION:

Read all safety warnings before installing, making connections, or servicing this equipment. Failure to comply with these warnings could result in personal injury and/or property damage. Retain instructions for future reference.

1.4.3 Measures for your protection



WARNING: Never work in an environment subject to explosion hazards! The housing of the instrument is not gas tight. (Explosion hazard due to spark formation, corrosion caused by the ingress of gases)



WARNING: When using chemicals and solvents, comply with the instructions of the producer and the general lab safety rules.



WARNING: The centrifuge is not sealed. Use suitable protection measures when using the centrifuge for infectious and pathogenic samples. Follow appropriate safety precautions when handling these samples.

1.4.4 Exclude the following environmental influences

- Powerful vibrations
- Direct sunlight
- Atmospheric humidity greater than 80%
- Corrosive gases present
- Temperatures below 2 °C and above 35 °C
- Powerful electric or magnetic fields:

**WARNING:**

Electrical shock hazards exist within the housing. The housing should only be opened by authorized and qualified personnel. Remove all power connections to the unit before opening.

1.4.5 Measures for operational safety

- Do not unscrew the two halves of the housing
- Dry off any liquid spills immediately! The instrument is not watertight
- Verify that the equipment's input voltage range and plug type are compatible with the local power supply.
- Only connect the power cord to a properly grounded power receptacle.
- Only use a power cord with a rating that exceeds the specifications on the equipment label.
- Do not position the equipment such that it is difficult to disconnect the power cord from the power receptacle.
- Make sure that the power cord does not pose a potential obstacle or tripping hazard.
- The equipment is for indoor use only. Use the equipment only in dry locations.
- Use only approved accessories.
- Operate the equipment only under ambient conditions specified in these instructions.
- Disconnect the equipment from the power supply when cleaning.
- Do not operate the equipment in hazardous or unstable environments.
- Service should only be performed by authorized personnel.

1.4.6 Danger and precautions

To protect people and environment the following precautions should be observed:

- During centrifugation, the presences of people and the setting up of hazardous materials are prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- FC5714/FC5718/FC5718R/FC5816/FC5816R/FC5916/FC5916R are not explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes with missing or defective hermetic sealing is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the general laboratory precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.4.7 Abbreviations used in this manual

| Symbol/Abbreviations | Unit | Description |
|----------------------|-----------------------------|----------------------------|
| RPM | [min ⁻¹] rpm | revolutions per minute |
| RCF | [x g] | relative centrifugal force |
| PCR | | Polymerase chain reaction |
| PP | - | Polypropylene |
| PC | - | Polycarbonate |
| accel | - | acceleration |
| decel | - | deceleration |
| prog | - | program |

2. INSTALLATION

2.1 Unpacking

Carefully remove your centrifuge and each of its components from the package. The included components vary depending on the centrifuge model (see table below). Save the packaging to ensure safe storage and transport. The instruction manual must always be kept with the centrifuge!

Rotor(s) / Accessories will be packed separately.



WARNING: Lifting Hazard. Single person lift could cause injury. Use a mechanical lifting device or team lifting procedures when lifting or moving the equipment.

Please refer to section 8.3 for details about lifting the equipment out of the packaging.

2.1.1 Delivery package

| Quantity | Description |
|----------|--|
| 1 | Centrifuge FC5714, FC5718, FC5718R, FC5720R, FC5816, FC5816R, FC5830R, FC5916, FC5916R |
| 1 | Power Cable |
| 1 | Warranty Card |
| 1 | Instruction Manual/Quick Guide |
| 1 | Rotor Key |

2.2 Selecting the Location



NOTE!

Avoid excessive vibrations, heat sources, air current, or rapid temperature changes.

- The centrifuge should be installed on an even, solid and level surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.
- During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.
- Do not place the centrifuge next to a window or a heater, where it could be exposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

2.3 Installation

Follow these steps:

- Check whether the power supply corresponds with the one specified on the manufacturer's rating label, which is located on the rear panel.
- For FC5714, FC5718, FC5816 the power line should be protected by a 10 A rating circuit breaker (type K).
- For FC5718R, FC5816R, FC5916, FC5916R, the power line should be protected by a 16 A rating circuit breaker (type K).
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply from the unit.
- Connect the centrifuge to a grounded power receptacle.
- Connect the centrifuge with the mains. (The socket for the power cord must be easy to reach for disconnection)
- Turn the instrument on using the mains power switch.
- Open the lid by using the Door Open button.
- Remove the transport securing device of the motor.

2.4 Safety precautions during operation and warranty

- Do not operate the centrifuge in case it is not installed correctly.
- Do not lean on the centrifuge during operation.
- Do not stay within the 30 cm clearance envelope longer than necessary for operational reasons.
- Do not place any potentially hazardous materials within the 30 cm clearance envelope.
- Do not operate the centrifuge when disassembled (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical components have been tampered with.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by OHAUS Corporation, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may damage or weaken the materials.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.
- The manufacturer is responsible for safety and reliability of the centrifuge, only if:
 - 1) The unit is operated in accordance with this instruction manual.
 - 2) Modifications, repairs or other adjustments are performed by OHAUS authorized personnel and the electrical installation complies with the relevant electrical code.



NOTE! Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

3. OPERATION

3.1 Mounting and loading rotor

3.1.1 Installation of rotors

Clean the drive shaft as well as the collet with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (See figure **below**). Take care that the rotor is fully installed onto the motor shaft.



Motor shaft and chamber

Figure.8



Nut for Rotor



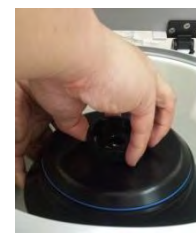
Tool for rotor with nut



Tool for rotor without nut



Snap-on lid



Screw-on lid

Figure. 9

Figure.10

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten the fixing nut with enclosed rotor key (See figures 9-10)
We will provide a tool for none-nut rotor with centrifuge, the tool for nut-rotor will be provided with rotor.



ATTENTION!

Check that the fixing screw is properly installed before each run. (See figure 9-10)
Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.
Do not operate with extremely corrosive substances, which could damage the rotor, buckets and materials.
In case of any questions, please contact the manufacturer!

3.1.2 Loading angle rotors

Rotors must be loaded symmetrically and with equal weight (See figure below). The adapter may only be loaded with the appropriate vessels. The weight differences between the filled vessels should be kept as low as possible. Therefore we recommend weighing them with a balance. This reduces the wear of the drive and the acoustic operating noise.

The maximum load per hole is stated on each rotor.

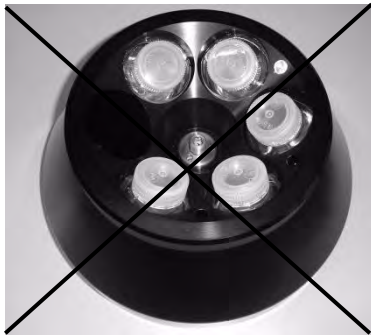


Figure.11 WRONG



Figure.12 CORRECT (6 tubes)

3.1.3 Loading swing out rotors

Loading of the buckets / vessels must be made in accordance to the figure below.

It is allowed to operate e.g. a 4-place-rotor with 2 loaded buckets only. But the loaded buckets must be opposite to each other. Make sure that the unloaded buckets also be put inside the rotor (see below).

In principle swing out rotors may not be taken into operation until all buckets or racks are put into the rotor.

The bolts at the rotor must be greased with the "High TEF oil". The sample tubes have to be filled evenly by eye and put into the drillings or tube racks. The weight difference of the loaded buckets should not exceed approx. 1.0 g.



ATTENTION!

Swing out rotors may be taken in operation only if all locations are filled in with either four buckets or four carriers – do not mix buckets and carriers together!!



ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.
Do not operate with extremely corrosive substances, which could damage the rotor and buckets.
In case of any questions, please contact the manufacturer!

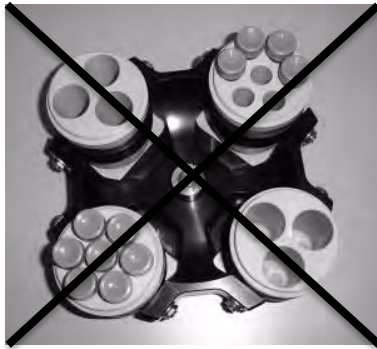


Figure.13 WRONG



Figure.14 CORRECT

3.1.4 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in **"table 2 permissible net weight"** (See APPENDIX).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (See label on rotor), must not be exceeded. The liquids the rotors are loaded with should have a maximum homogeneous density of 1.2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

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

Example:

$$n_{\text{red}} = \sqrt{\frac{1,2}{1,7}} \times 4.000 = 3.360 \text{ rpm}$$

To determine the relative centrifugal force(RCF/G-force) for a specific adapter, you can calculate per DIN 58 970 using the attached formula:

$$\text{RCF} = 1.117862 \cdot 10^{-5} \cdot n^2 \cdot r_{\text{max}}$$

n: revolutions per minute (RPM)

r_{max}: max centrifuging radius in cm by using the bottom of tubes

3.1.5 Removing the rotor

Untighten the rotor fixing nut completely (screw over the stiff point) and lift the rotor vertically out of the centrifuge. (See figure 9 and 10).

3.2 Lid control

3.2.1 Lid open

After the run, when the lid of the centrifuge is closed, the word **"close"** (M1) appears in the display **"RPM | RCF"** (A-1). Additionally, if there is a rotor in the centrifuge, the word **"rotor"**(M3) appears as well as the code number of the respective rotor, which is in the centrifuge system **"71"** (M4). If there is no rotor in the centrifuge, the word **"rotor"** (M3) flashes and additionally the word **"no"** (M4) appears. By pressing the key **"Door Open"** (7) you can release the lid of the centrifuge. As soon as the electromagnetic lid is completely released, the word **"open"** (M2) appears. Now you can open the lid of the centrifuge.

Please refer to figure 15 below for reference.

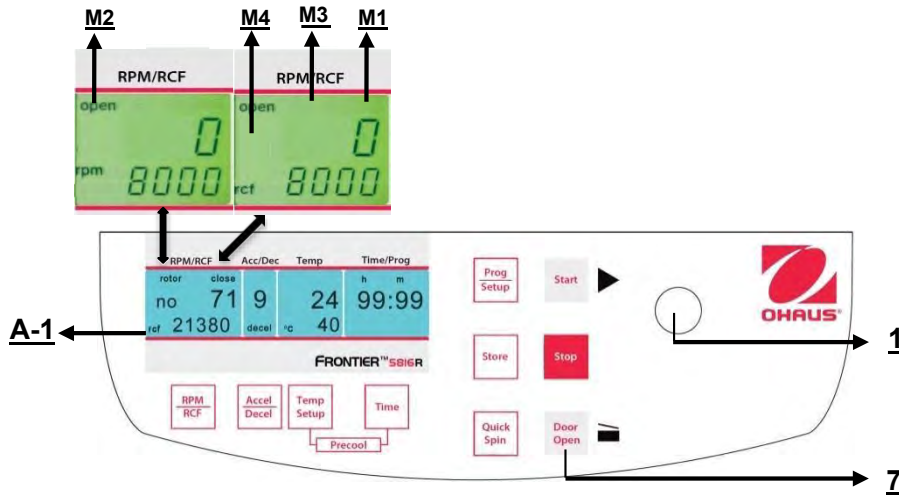


Figure. 15

During the run you can call up the rotor type at any time by pressing the key **"Door Open" (7)**.

3.2.2 Lid lock

The lid should only be put down slightly. An electromagnetic lid lock closes the lid, at the same time the word **"open" (M2)** disappears (refer to figure 15).

As a sign that the centrifuge is ready for starting, in the display **"RPM | RCF" (A-1)** the word **"close" (M1)** appears. Simultaneously the word **"rotor" (M3)** is displayed, as well as the code number of the rotor, which is in the centrifuge system, **"no 71" (M4)**. With that, all rotor specific data, like e. g. max. speed, acceleration etc., are adopted.



ATTENTION:

Don't grip your fingers between lid and device or locking mechanism when closing the lid!

3.3 Preselection

3.3.1 Preselection of speed / RCF-value

This pre-selection is activated through the key **"RPM | RCF" (4)** (refer to figure 16 below). By pressing the key once the word **"rpm" (M5)** flashes. By pressing the key twice the pre-selection of the centrifugal forces can be selected. Then the flashing word **"rcf" (M6)** appears. You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

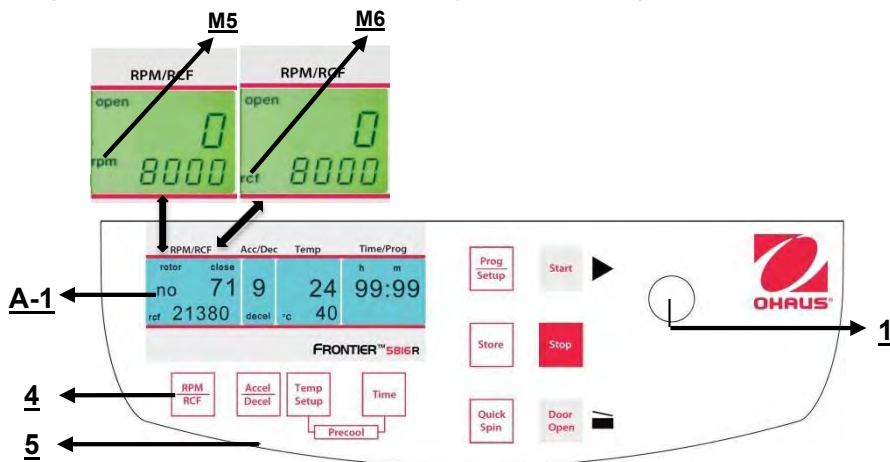


Figure. 16

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge. If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between the centrifugal force at 200 rpm and the maximum permissible centrifugal force of the rotor.

See **"Table 3: max. speed and RCF-values for permissible rotor"** (See APPENDIX). All important values are listed there.



ATTENTION:

Please also check the maximum permissible revolutions of your test tubes with the manufacturer.

3.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minute.
3. The continuous run "cont", which can be interrupted by the key "Stop"(10) (refer to figure 17).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key "Time" (6).

In the display "Time/Prog" (A-3) flashes the indication "m : s" or "h : m", depending on the previous setting.

To set the desired value, use the adjusting knob (1). After exceeding 59 min 50 sec the indication changes automatically into "h : m". After exceeding 99 hours 59 min the word "cont" appears in the display "Time/Prog" (A-3). That continuous run can only be interrupted by pressing the key "Stop" (10). The time countdown starts as soon as the set speed is reached.

The display always shows the remaining running time. (See figure 17)

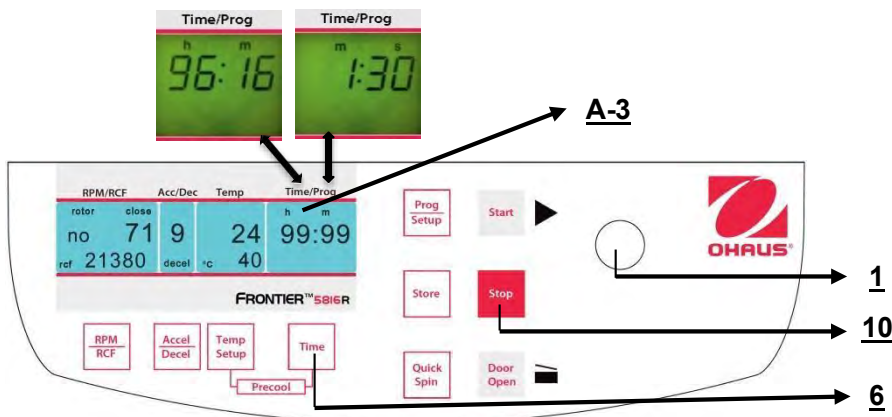


Figure. 17

3.3.3 Preselection of brake intensity and acceleration

This function is activated through the key "Accel/Decel" (5) (refer to figure 18).

By pressing the key once the word "accel" (M7) flashes in the display "Acc/Dec" (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key "Accel/Decel" (5) twice, the display "Acc/Dec" (A-2) indicates the word "decel"(M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

See "**table 5: acceleration and deceleration times**" (APPENDIX). There the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors are shown.

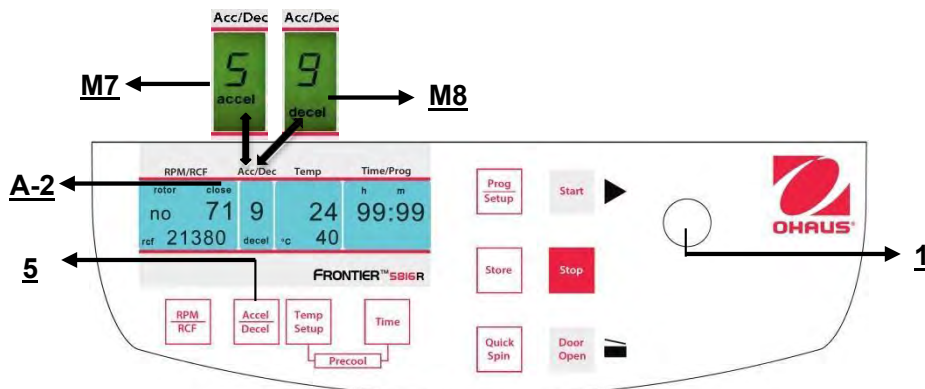


Figure. 18

3.3.4 Pre-selection of temperature (Only Refrigerated Models)

This function is activated by the key **"Temp/Setup"** (13). After pressing this key in the display **"Time/Prog"** the indication **"°C"** (A-4) flashes. By the adjusting knob (1) the desired test temperature can be pre-selected in steps of 1°C in a range from -20°C up to +40°C.

The value is indicated permanently in the display (figure 19) - before, during and after the run. Please notice the respective lowest temperatures of the rotors at maximum speed!

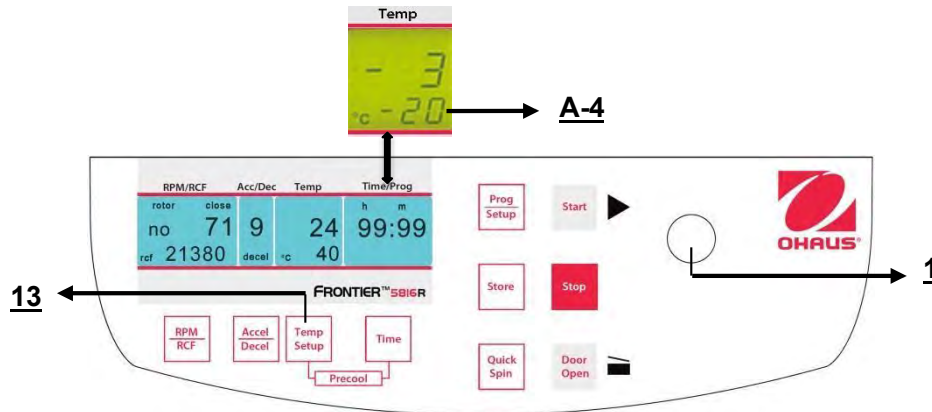


Figure. 19

3.3.5 Pre-cooling (Only Refrigerated Models)

If the samples are temperature-sensitive it is useful to pre-cool the centrifuge, the rotor and eventually the buckets to the required working temperature. Therefore, insert the desired rotor and pre-set the respective temperature. By simultaneous pressing the keys **"Temp/Setup"** (13) (refer to figure 20) and **"Time"** (6) you start the run. While running, the unit chooses automatically a rotational speed that is equivalent to 20 % of the permitted rotational speed of the respective rotor. After the pre-set temperature is reached you can leave the pre-cooling run with the **"Stop"** key (10).

Depending on the inserted rotor the pre-cooling goes between approx. 10 and 20 min.

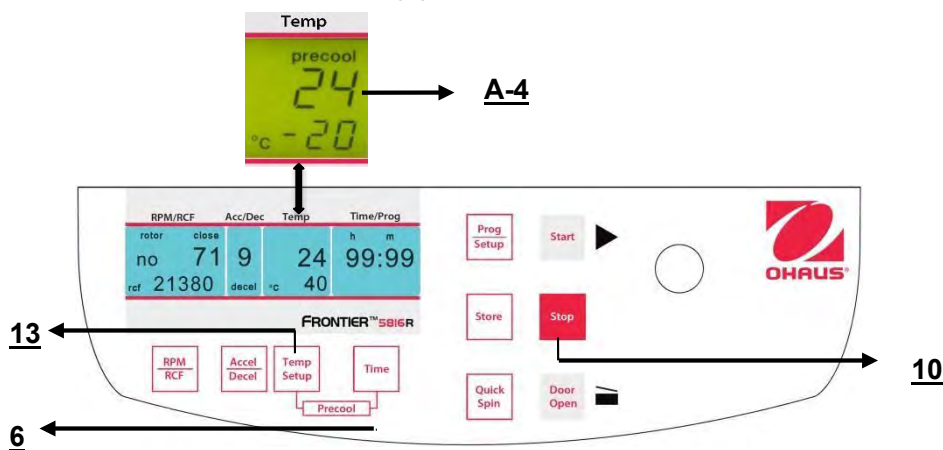


Figure. 20

3.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Close the lid, then press the key **"Time"** (6) (refer to figure 21) and the key **"Prog/Setup"** (11) at the same time and hold them.

In the display **"Time/Prog"** (A-3) the word **"radius"** (M9) appears. By the adjusting knob (1) you can preselect the respective radius correction (See Table 7, APPENDIX) in steps of 0.1 cm. As soon as you have set a radius correction the word **"radius"** (M9) appears. This word will be visible until you put the radius correction back to 0 again.

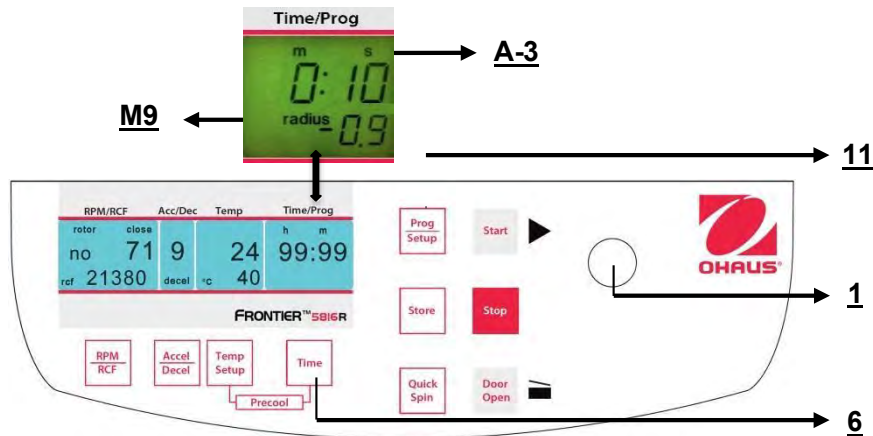


Figure. 21

3.5 Program

3.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, including the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key **"Prog/Setup"** (11) in the display **"Time/Prog"** (A-3) the word **"programm"** appears. With the adjusting knob (1) you can chose the desired program number. If a program number is already occupied, in the display **"RPM | RCF"** (A-1), the words **"rotor"** (M3) and **"xx"** (M4) will appear. In case of free program numbers, 0 appears.

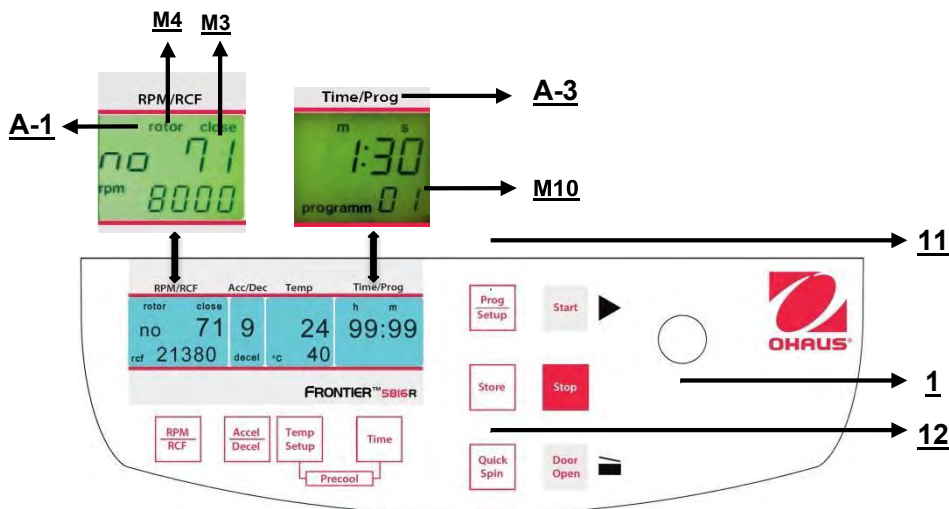


Figure. 22

Close the lid of the centrifuge. Now proceed as described previously to set all important run parameters. If the lid isn't closed when storing the program, in the display **"RPM/RCF"** (A-1), the words **"FirSt"** and **"CLOSE Lid"** (See figure 23) flashes alternately. If you want to start the run without storing the program, in the display **"RPM/RCF"** (A-1), the words **"First"** and **"PrESS StoreE"** (See figure 24) flashes alternately.

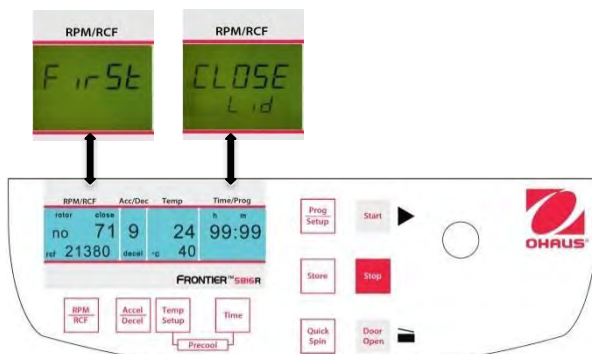


Figure. 23

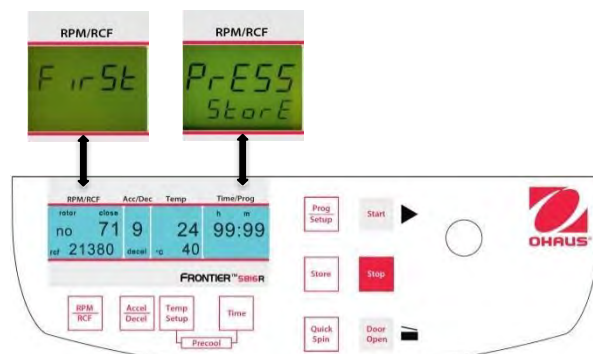


Figure. 24

For adaption of data press the key **"Store"** (12) (refer to figures 23 and 24) for approx. 1 second. If the program is stored correctly, the word **"StorE"** appears in the display **"RPM/RCF"** (A-1). As a result, the word **"programm"** (M10) disappears.

As soon as the key **"Store"** (12) is released, the word "programm xx" (M10) reappears – the (xx) stands for the chosen program location.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

3.5.2 Recall of stored programs

To recall stored programs press the key **"Prog/Setup"** (11) (refer to figure 25) while the lid is already closed. Inside the display **"Time/Prog"** (A-3), **"programm --"**(M10) appears. The desired program number can be pre-selected with the adjusting knob (1).

In the respective displays the stored values for that program will appear.

If the wrong rotor is inside the centrifuge for the pre-selected program, in the display **"RPM | RCF"** (A-1), the word **"rotor"** (M3) flashes. At the same time the word **"FALSE"** and the stored rotor number **"xx"** (M4) will flashing by turns.

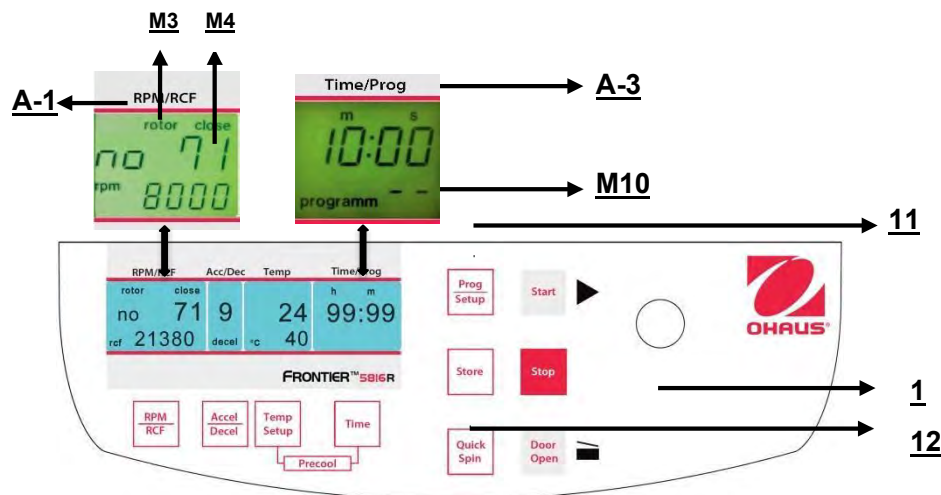


Figure. 25

3.5.3 Leaving program mode

To leave the program mode just press the key **"Prog/Setup"** (11) (refer to figure 25). Then inside the display **"Time/Prog"** the word **"programm"** appears.

Set the display to **"programm--"** (M10) with the adjusting knob (1).

3.6 Starting and stopping the centrifuge

3.6.1 Starting the centrifuge

You can start the centrifuge either with the **"Start"** key (9) (refer to figure 26) or the **"Quick Spin"** key (8).

By the **"Start"** key (9) you can start stored runs or runs with manually pre-selected parameters.

When the respective pre-selected running time has ended the centrifuge will stop automatically.

By the **"Quick Spin"** key (8) you can start runs, which will last just a few seconds.

By pressing the **"Quick Spin"** key (8) the centrifuge accelerates up to the pre-selected revolution.

In the display **"Time/Prog"** (A-3) the passed running time is indicated from the date of pressing the **"Quick Spin"** key (8).

By releasing the **"Quick Spin"** key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

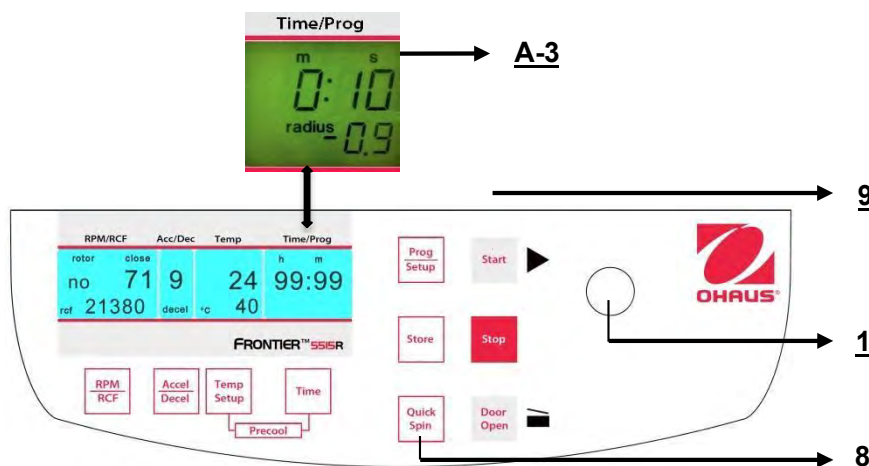


Figure. 26

3.6.2 The "STOP" key

By the **"Stop"** key (10) (See figure 27) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.



Figure. 27

3.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.

When in the display **"Time/Prog"** (A-3) the word **"error"** (M11) together with the number **"01"** appear, the weight difference of the samples is too large. Distribute the weight evenly.

Load the rotor as described in chapter 3.1.2 and 3.1.3.

When inside the display **"Time/Prog"** (A-3) the word **"error"** together with the number **"02"** (See figure 28) appear, it could be due to the following reason: The imbalance switch is defective.

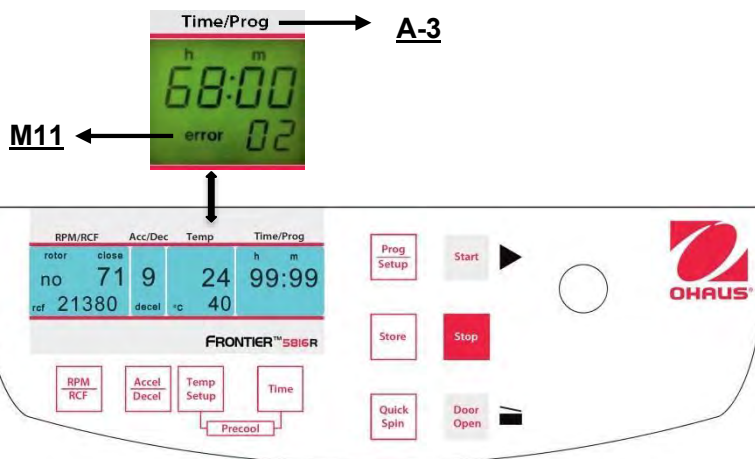


Figure. 28

4. SETTING

4.1 Basic adjustments

4.1.1 Access to mode "Operating Data"

When using the centrifuge, the following parameters can be set:

- Temperature indication °C or °F
- Acoustic signal turn on/off
- Keyboard sound turn on/off
- Volume pre-selection of sound signal
- Song selection of sound signal **"end of run"**

While the centrifuge is turned off, press simultaneously the keys **"Time"**(6) and **"Door Open"** (7) and turn on the main switch of the centrifuge. Now release both keys and as a result a display test is executed for approx. 5 seconds. All indicators will appear at the same time (See figure 29).

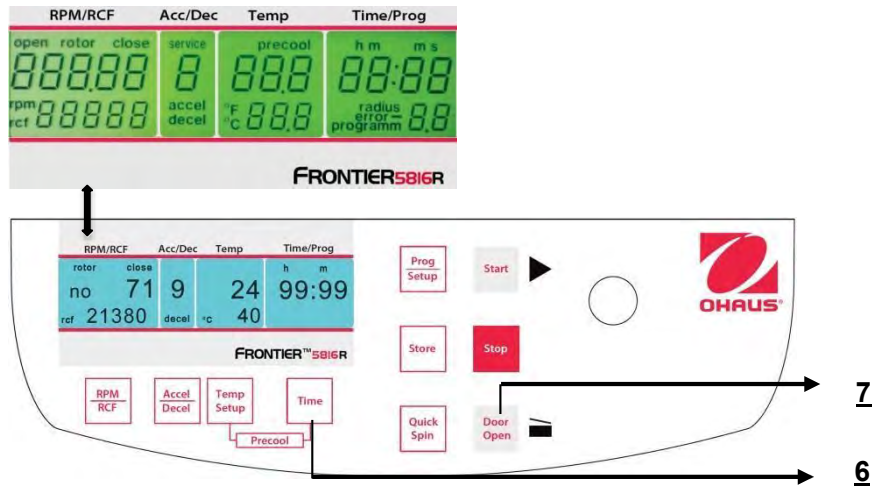


Figure. 29



ATTENTION:

Please notice that you must enter the program as described under point 4.1.1 to change the adjustments of the points 4.1.2 → **A-1** ter you have stored the settings you can change to normal program mode again by switching off the centrifuge for a short while.

All changed settings must be confirmed by the key **"Start"**(9). The word **"Store"**(12) appears in the display **"RPM | RCF"**(A-1) - Only then the pre-selections are valid!

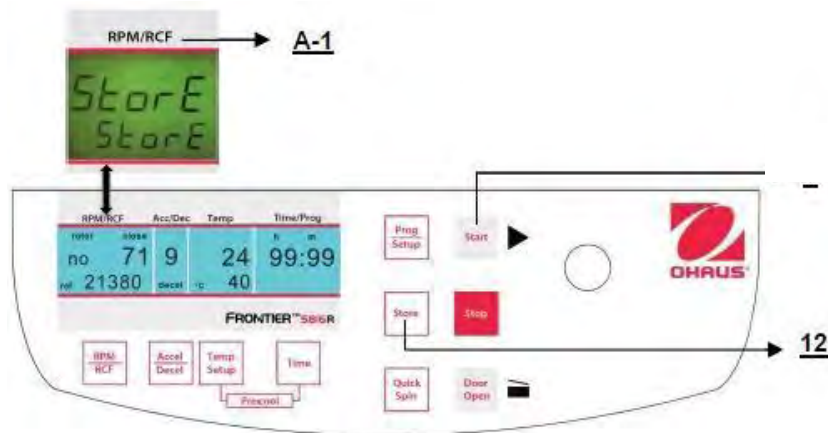


Figure. 30

4.1.2 Temperature indication

Proceed as described under point 4.1.1 to enter this program mode and then press the key **"Accel/Decel"** (5). In the display **"Acc/Dec"** (A-2) the word **"Service"** appears. Now select the letter **"C"** with the adjusting knob (1). As a result, in the display **"RPM | RCF"** (A-1), the words **"CELSI/temp"** appear. If you press the key **"RPM | RCF"** (4),

the word **"CELSI"** flashes and you can change the display into Fahrenheit **"FAREN"**, with the adjusting knob (1) (See figure 31).

After you have stored the settings (See 4.1.1) you change back to the normal program mode again by switching off the centrifuge for a short while.

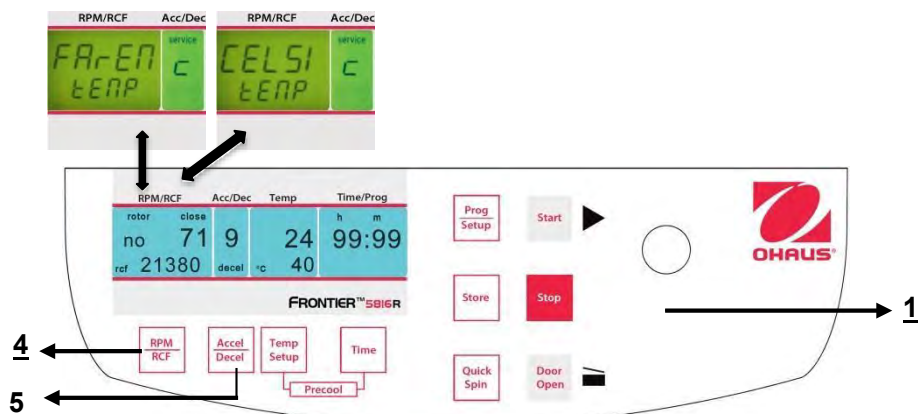


Figure. 31

4.1.3 Signal turn on / off

Proceed as described under point 4.1.1 to enter this program mode and then press the key **"Accel/Decel"** (5). In the display **"Acc/Dec"** (A-2) the word **"Service"** flashes. Now select the letter **"L"** with the adjusting knob (1). As a result, the words **"On Sound"** appears in the display **"RPM | RCF"** (4). If you press the key **"RPM | RCF"** (4) now, the word **"On"** flashes and you can switch off the sound with the adjusting knob (1) (See figure 32).

After you have stored the settings (See 4.1.1) you change back to the normal program mode again by switching off the centrifuge for a short while.

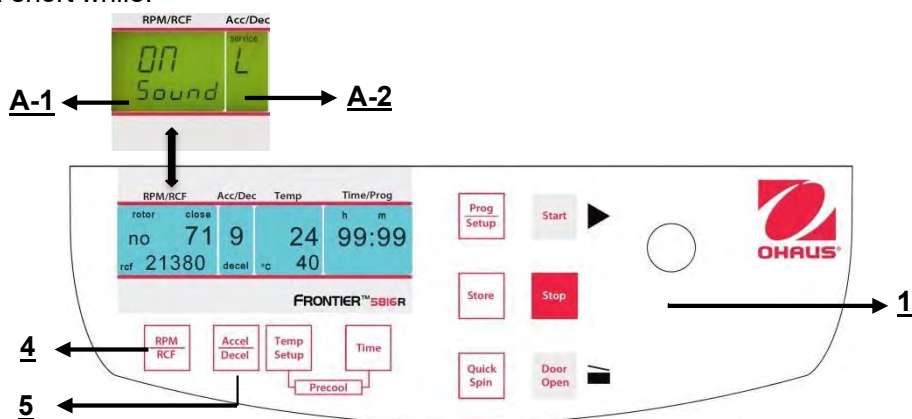


Figure. 32

4.1.4 Volume pre-selection of sound signal

Proceed as described under point 4.1.1 to enter this program mode and then press the key **"Accel/Decel"** (5). In the display **"Acc/Dec"** (A-2) the word **"Service"** flashes. Now select the letter **"U"** with the adjusting knob (1). As a result, in the display **"RPM | RCF"** (A-1) the words **"Vol=0- 9/Sound"** appear. After pressing the key **"RPM | RCF"** (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (See figure 33).

After you have stored the settings (see 4.1.1) you can change back to the normal program mode again by switching off the centrifuge for a short period.

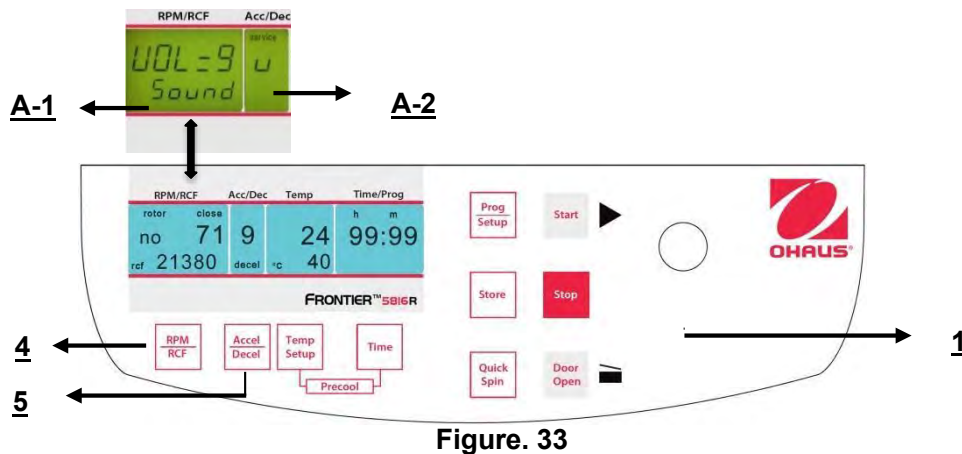


Figure. 33

4.1.5 Song selection for sound signal - end of run

Proceed as described under point 4.1.1 to enter this program mode and then press the key "**Accel/Decel**" (5). In the display "**Acc/Dec**" (A-2) the word "**Service**" flashes. Now select the letter "**G**" with the adjusting knob (1). As a result, in the display "**RPM | RCF**" (A-1), the word "**SonGo/Sound**" appears. After pressing the key "**RPM | RCF**" (4), you can select a song with the adjusting knob (1). (See figure 34).

After you have stored the settings (see 4.1.1) you can change back to the normal program mode again by switch off the centrifuge for a short while.

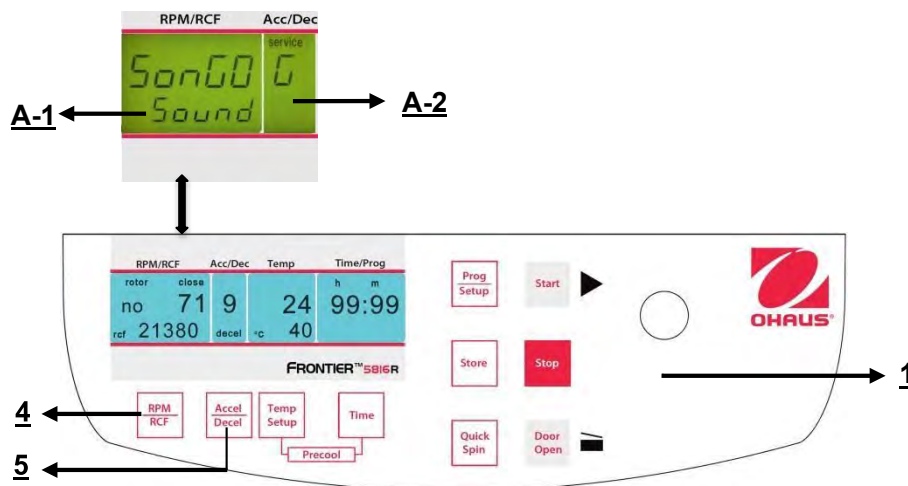


Figure. 34

4.1.6 Keyboard sound turn on / off

Proceed as described under point 4.1.1 to enter this program mode and then press the key "**Accel/Decel**" (5). In the display "**Acc/Dec**" (A-2) the word "**Service**" flashes. Now select the letter "**B**" with the adjusting knob (1). As a result, in the display "**RPM | RCF**" (A-1), the word "**ON/BEEP**" appears. After pressing the key "**RPM | RCF**" (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (See figure 35).

After you have stored the settings (see 4.1.1) you can change back to the normal program mode again by switch off the centrifuge for a short while.

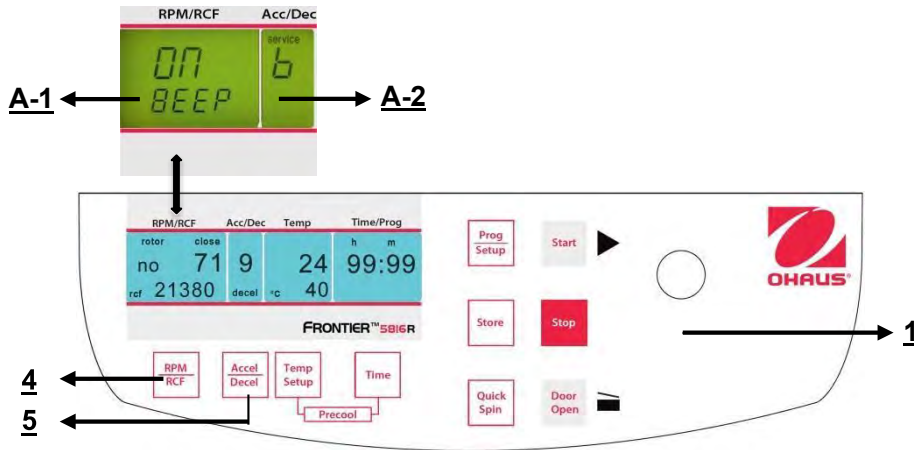


Figure. 35

4.1.7 Call up operating data



ATTENTION:

This should only be performed by advanced user or service engineer.

In the mode **"Basic Adjustments"** you can call up the operating data of the centrifuge. Please proceed as described under point 4.1.2 to enter this program mode. Press the key **"Accel/Decel"** (5). In the display **"Acc/Dec"** (A-2) the word **"Service"** flashes.

With the adjusting knob (1) the different information can be accessed:

- A= previous starts of the centrifuge
- H= previous operating hours S= software version
- r= converter software
- E= list of previous error messages
- h= running time of the motor
- N= Previous and remaining cycles of the installed rotor

The list of the last 99 error messages can be looked over by pressing the key **"RPM | RCF"** (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display **"RPM | RCF"** (A-1). Please refer to **"Table 6: error messages"** (see APPENDIX).

To change back to normal program mode again, switch off the centrifuge for a short period.

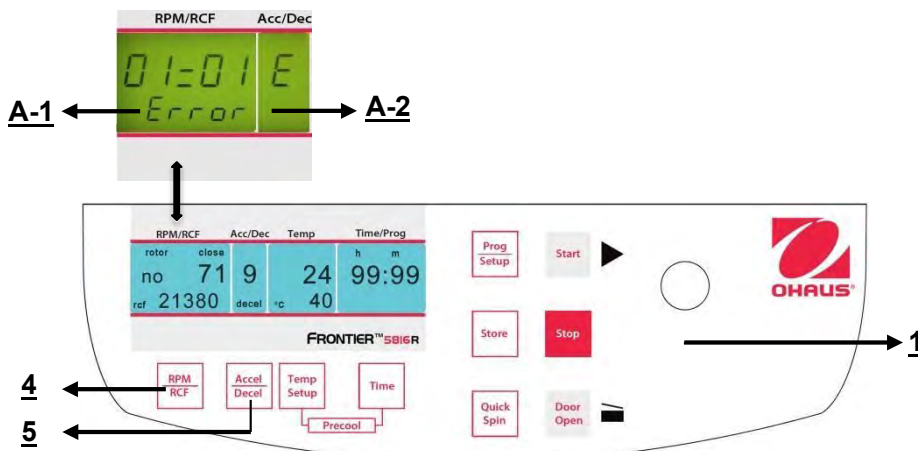


Figure. 36

5. MAINTENANCE

5.1 Maintenance and cleaning

5.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

The most suitable lubricant is the High TEF oil.

Lubricants containing molycote and graphite are not allowed.

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

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents and saline solutions. e.g. salt water, phenol, halogenated hydrocarbons.



Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do not spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion due to pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used. After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminum parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.



The maintenance procedure has to be repeated every 10 to 15 runs, or at least once a week.

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and **cannot** be autoclaved at 134°C.

5.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber use the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must not be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Make sure that the centrifuge is turned off the unit and disconnect the unit from the power supply. Then remove adherent dust from the ventilation slots in the centrifuge by using a soft brush. Do this at least every six months.

5.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particularly the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

5.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected directly after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

5.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)



ATTENTION:

The sterilization time of 20 min. must not be exceeded. Repeated sterilization will cause reduction of the mechanical resistance of the plastic material

Before autoclaving the PP-rotor and adapter must be thoroughly cleaned to avoid the burning in of dirty residues. You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures during autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly rinsed with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. Make sure to air out the items after the sterilization and before using them again.



ATTENTION:

Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed and must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.



ATTENTION:

Before applying any other cleaning or decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

5.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will significantly pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damage. Check the rotor bores regularly for residues and damage.



ATTENTION:

Please check the relevant specifications of the tubes centrifuges with the manufacturer.

5.2 Service life of rotors, buckets, accessories

Rotors and rotor lids made of aluminum or stainless steel have a maximum operating time service life of **7 years** from first use. Transparent rotor lids and caps made of PC or PP, as well as rotors, tube racks, and adapters of PP, have a maximum operating time service life of up to **3 years** from first use. The condition for the operating time is proper use, damage-free condition, recommended care, and no sign of corrosion or cracks.

For high-speed centrifuges that can achieve between 20,000 and 30,000 rpm, there is an additional safety feature. For rotors used with **FC5720R** and **FC5830R** Centrifuges, apart from the limited-service time provided in years, the software will also count the number of cycles. After reaching a given number of centrifugation cycles, the usage of a particular rotor will no longer be possible for safety reasons. There will be a warning with an Error 90 message.

Error 90 indicates that the maximum life cycles of the installed rotor will be reached soon, and the rotor should be replaced in time. This message occurs for the first time when there are 500 cycles of the affected rotor remaining. In the display "rpm/rcf" (A-1), the message "500 LEFT" is shown (See figure 37).

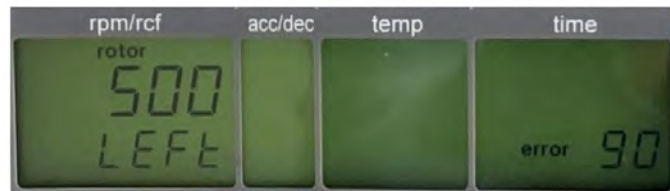


Figure. 37

This error can be acknowledged using the "stop" button (10), and from now on, it occurs every 50 cycles for the affected rotor. If the maximum permitted cycles of a rotor are reached, error 91 occurs. The rotor can no longer be operated and must be replaced. Please refer to Table 8, "Table of the service life of rotors," for details regarding service time in years and in cycles. The maximum number of cycles is defined by the manufacturer and cannot be changed.

6. TROUBLESHOOTING

6.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnosing referred to in this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information are we able to improve this operation manual.

Many thanks in advance for your support.

6.2 Survey of possible error messages and their solutions

6.2.1 Lid release during power failure (Emergency Lid Release)

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

For FC5718/FC5718R/FC5816/FC5816R/FC5916/FC5916R (motor driven lock)

Please proceed as follows:

1. Switch off the centrifuge and unplug the power cord, wait until the rotor has come to a standstill (this may take several minutes)
2. On the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.
3. Take the included box spanner, put it in the hole and lock the box spanner with the hexagon nut (See figure 38).
4. Now turn the box spanner to the right side (clockwise) up to the limit.



ATTENTION: 3

- a) Just turn to the limit, don't tighten the nut.
- b) Now open the lid of the centrifuge.
- c) Switch the centrifuge on again, to resume work.



Figure. 38

For 5714

Please proceed as follows (see Figure 39):



ATTENTION:

- Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes). At the right side of the centrifuge there is a plastic stopper (Figure 38). Remove this stopper, which is connected to the lid lock, horizontally from the housing until the centrifuge lid opens.

- Now open the lid of the centrifuge



Figure. 39

6.2.2 Description of the error message system

The error message **"error"** (M11) is shown in the **"Time/Prog"** (A-3) display (See figure 40). Detailed information about possible error messages are in **"table 6: error messages"** (See Appendix).

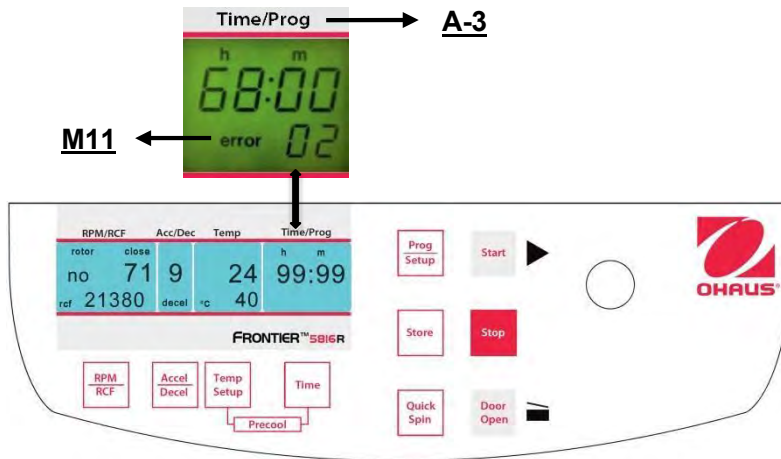


Figure. 40

7. RECEIPT OF CENTRIFUGES TO REPAIR



Health risk from contaminated equipment, rotors and accessories.
In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge **must** be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (See APPENDIX)

We reserve the right to not accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account.



8. TRANSPORT, STORAGE AND DISPOSAL

8.1 Transport

Before transporting, take out the rotor.

Only transport the unit in the original packaging.

Install the transport protection material to secure the motor shaft, when transporting over longer distances.

| | Air temperature | rel. humidity | Air pressure |
|------------------------|-----------------|---------------|---------------|
| General transportation | -25 to 60 °C | 10 to 75 % | 30 to 106 kPa |

8.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

| | Air temperature | rel. Humidity | Air pressure |
|------------------------|-----------------|---------------|---------------|
| in transport packaging | -25 to 55 °C | 10 to 75 % | 70 to 106 kPa |



8.3 Transporting, Installing, Transferring and Disposing of the Centrifuge FC5714, FC5718, FC5718R, FC5720R, FC5816, FC5816R, FC5830R, FC5916, FC5916R

These instructions complement the previous general instructions in chapter 8 and do not replace them.

8.3.1 Transport

- Please transport the device in the original packaging.
- The centrifuge should always be transported using a mechanical transport device.



8.3.2 Installation

➤ Opening the carton and lifting out the device.

1. Cut the adhesive tape.
2. Open all 4 flaps of the carton.
3. Remove the accessories.
4. Carefully lift the centrifuge from the carton.



WARNING: Lifting Hazard. Single person lift could cause injury. Use a mechanical lifting device or team lifting procedures when lifting or moving the equipment.

- Place the device on a stable, horizontal and non-resonant lab bench
 1. Remove the front and back transport protection material.
 2. Remove the plastic sleeve.
 3. Observe a minimum distance of 30 cm to adjoining devices at the sides and from the rear side to the wall.
 4. Install the device in a well-ventilated location which is protected from direct sunlight to prevent it from overheating.

 - Connect the device
 1. After installation, wait for four hours before switching the centrifuge on in order to avoid damage to the compressor.
 2. Check that the mains voltage and frequency match the requirements on the device name plate(see rear side of the device) and then connect the device to the power supply.

 - Remove the transport protection material from the rotor chamber
 1. Switch on the device at the mains power switch.
 2. Open the centrifuge lid using the open button.
 3. Remove the transport protection material.
 4. Place the rotor vertically onto the motor shaft.
 5. Turn the rotor nut using the rotor key clockwise until the rotor nut is tightened.

 - The device is now ready to use
- Retain the packaging and all transport protection material for shipping the device at a later date.



8.3.3 Packing

Pack the centrifuge in reverse order.

8.3.4 Passing on the Device

When passing the equipment on to third parties, please make sure to also include this instruction manual.

9. TECHNICAL DATA

9.1 Specifications

9.1.1 Centrifuge FC5714

| | | |
|--|--|------------------|
| Model | FC5714 | |
| Speed Range | 200 rpm -14000 rpm;10 rpm/set | |
| Maximum RCF | 18624 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 4 x 200 ml | |
| Temperature range (N/A) | Air cool | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 63 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 5595 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 1.3 A | 2.4 A |
| Power consumption | 240 W | 300 W |
| Dimensions (W × D × H) | 362 x 493 x 330 mm | |
| | 14.3 x 19.4 x 13.0 in | |
| Net Weight (without rotor) | 30 kg | |
| | 66 lb | |
| Shipping Dimensions (W × D × H) | 580 x 490 x 460 mm | |
| | 22.8 x 19.3 x 18.1 in | |
| Shipping Weight (without rotor) | 32.5 kg | |
| | 72 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | For indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.2 Centrifuge FC5718

| | | |
|--|---|------------------|
| Model | FC5718 | |
| Speed Range | 200 rpm -18000 rpm;10 rpm/set | |
| Maximum RCF | 23542 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 4 x 200 ml | |
| Temperature range (N/A) | Air cool | |
| Running Time Noise level | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 60 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 16672 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 2.0 A | 4.0 A |
| Power consumption | 455 W | 475 W |
| Dimensions (W × D × H) | 408 x 499 x 351 mm 16.1 x 19.7 x 13.8 in | |
| Net Weight (without rotor) | 43 kg 95 lb | |
| Shipping Dimensions (W × D × H) | 650 x 520 x 490 mm 25.6 x 20.5 x 19.3 in | |
| Shipping Weight (without rotor) | 53 kg 117 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.3 Centrifuge FC5718R

| Model | FC5718R | |
|--|--|------------------|
| Speed Range | 200 rpm -18000 rpm;10 rpm/set | |
| Maximum RCF | 23542 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 4 x 200 ml | |
| Temperature range (Digital) | -20° to 40°C/1°C increments | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤60 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 25111 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 3.0 A | 6.0 A |
| Power consumption | 660 W | 660 W |
| Dimensions (W × D × H) | 407 x 731 x 359 mm | |
| | 16.0 x 28.8 x 14.1 in | |
| Net Weight (without rotor) | 60 kg | |
| | 132 lb | |
| Shipping Dimensions (W × D × H) | 840 x 640 x 590 mm | |
| | 33.1 x 25.2 x 23.2 in | |
| Shipping Weight (without rotor) | 77 kg | |
| | 170 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.4 Centrifuge FC5720R

| Model | FC5720R | |
|---|--|------------------|
| Speed Range | 200 rpm -20000 rpm;10 rpm/set | |
| Maximum RCF | 38007 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 4 x 200 ml | |
| Temperature range (Digital) | -20° to 40°C/1°C increments | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤60 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 24367 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 5.9 A | 10.5 A |
| Power consumption | 1.2 kW | 1.1 kW |
| Dimensions (W × D × H) | 407 x 712 x 361 mm | |
| | 16.0 x 28.0 x 14.2 in | |
| Net Weight (without rotor) | 61 kg | |
| | 157 lb | |
| Shipping Dimensions (W × D × H) | 840 x 640 x 590 mm | |
| | 33.1 x 25.2 x 23.2 in | |
| Shipping Weight (without rotor) | 83 kg | |
| | 183 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.5 Centrifuge FC5816

| Model | FC5816 | |
|---|--|------------------|
| Speed Range | 200 rpm -15000 rpm;10 rpm/set | |
| Maximum RCF | 21379 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 6 x 250 ml | |
| Temperature range(N/A) | Air cool | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 61 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 34363 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 2.4 A | 4.2 A |
| Power consumption | 530 W | 520 W |
| Dimensions (W × D × H) | 446 x 538 x 354 mm | |
| | 17.6 x 21.2 x 13.9 in | |
| Net Weight (without rotor) | 52 kg | |
| | 115 lb | |
| Shipping Dimensions (W × D × H) | 840 x 640 x 590 mm | |
| | 33.1 x 25.2 x 23.2 in | |
| Shipping Weight (without rotor) | 77 kg | |
| | 170 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.6 Centrifuge FC5816R

| Model | FC5816R | |
|---|--|------------------|
| Speed Range | 200 rpm -16000 rpm;10 rpm/set | |
| Maximum RCF | 24325 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 6 x 250 ml | |
| Temperature range (Digital) | -20° to 40°C/1°C increments | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 63 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 34363 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 3.7 A | 7.8 A |
| Power consumption | 785 W | 850 W |
| Dimensions (W × D × H) | 723 x 538 x 354 mm | |
| | 28.5 x 21.2 x 13.9 in | |
| Net Weight (without rotor) | 77 kg | |
| | 170 lb | |
| Shipping Dimensions (W × D × H) | 840 x 640 x 590 mm | |
| | 33.1 x 25.2 x 23.2 in | |
| Shipping Weight (without rotor) | 87 kg | |
| | 192 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.7 Centrifuge FC5830R

| Model | FC5830R | |
|---|--|------------------|
| Speed Range | 200 rpm -30000 rpm;10 rpm/set | |
| Maximum RCF | 65395 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 6 x 250 ml | |
| Temperature range (Digital) | -20° to 40°C/1°C increments | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 60 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 30241 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 7.2 A | 15.8 A |
| Power consumption | 1.6 kW | 1.8 kW |
| Dimensions (W × D × H) | 723 x 519 x 413 mm | |
| | 28.5 x 20.4 x 16.3 in | |
| Net Weight (without rotor) | 91 kg | |
| | 201 lb | |
| Shipping Dimensions (W × D × H) | 840 x 640 x 590 mm | |
| | 33.1 x 25.2 x 23.2 in | |
| Shipping Weight (without rotor) | 101 kg | |
| | 223 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

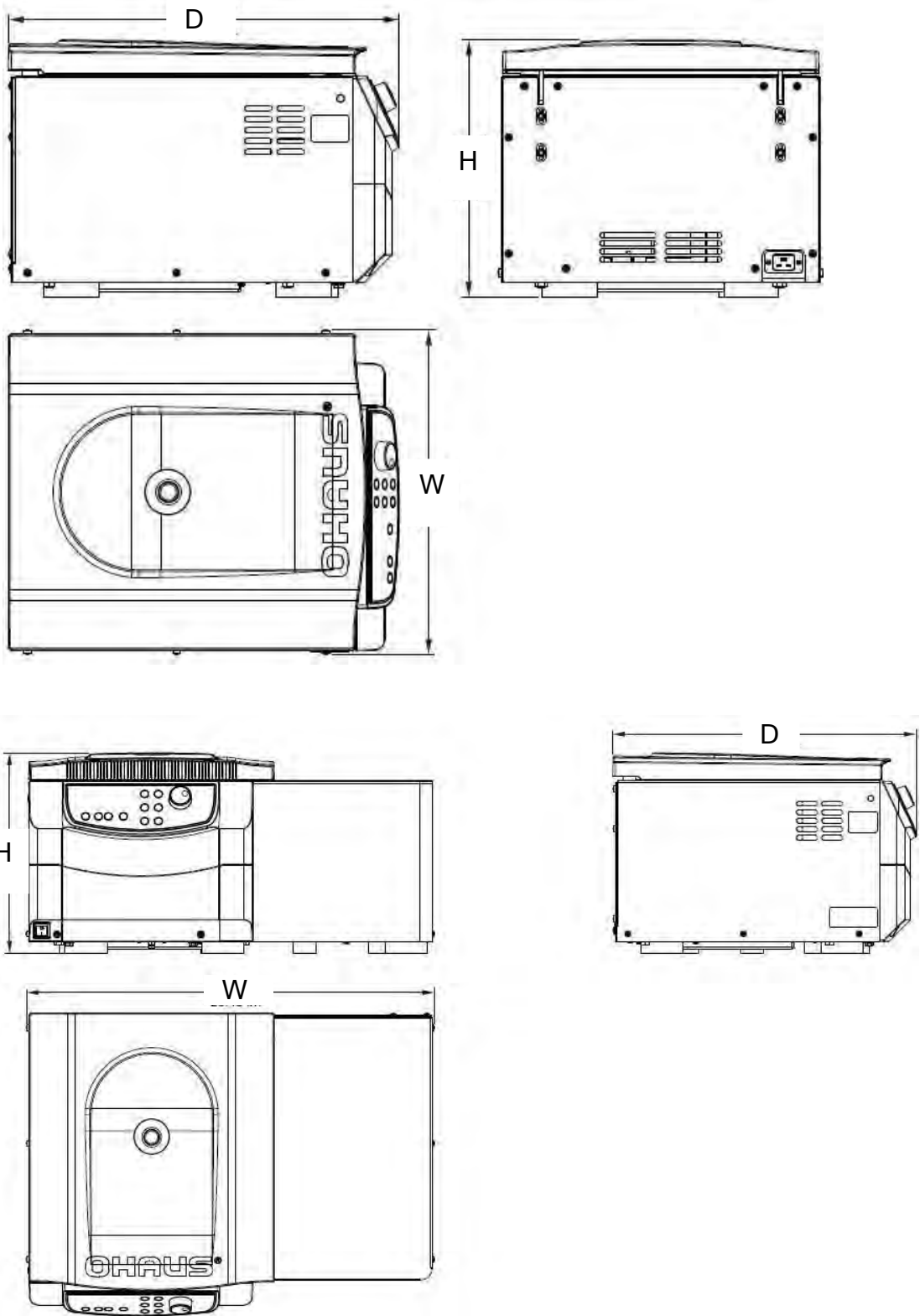
9.1.8 Centrifuge FC5916

| Model | FC5916 | |
|--|--|------------------|
| Speed Range | 200 rpm -16000 rpm;10 rpm/set | |
| Maximum RCF | 24325 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 4 x 750 ml | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 63 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 60629 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 2.8 A | 5.6 A |
| Power consumption | 640 W | 680 W |
| Dimensions (W × D × H) | 540 x 670 x 390 mm | |
| | 21.3 x 26.4 x 15.4 in | |
| Net Weight (without rotor) | 85 kg | |
| | 187 lb | |
| Shipping Dimensions (W × D × H) | 780 x 670 x 590 mm | |
| | 30.7 x 26.4 x 23.3 in | |
| Shipping Weight (without rotor) | 98 kg | |
| | 216 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |

9.1.9 Centrifuge FC5916R

| Model | FC5916R | |
|---|--|------------------|
| Speed Range | 200 rpm 16000 rpm;10 rpm/set | |
| Maximum RCF | 26331 x g;10 x g/set | |
| Maximum Capacity (Rotor) | 4 x 750 ml | |
| Temperature range (Digital) | -20° to 40°C/1°C increments | |
| Running Time | 10 sec to 99 hr 59 min 59 sec or continuous | |
| Noise level (depending on the rotor) | ≤ 63 ± 2 dB(A) | |
| Allowable density at maximum speed | 1.2 g/ml | |
| Allowable kinetic energy | 54458 Nm | |
| Mains power connection AC | 230 V ~ 50/60 Hz | 120 V ~ 50/60 Hz |
| Voltage fluctuation | ± 10 % | ± 10 % |
| Current consumption | 7.2 A | 20 A |
| Power consumption | 1630 W | 1750 W |
| Dimensions (W × D × H) | 730 x 670 x 390 mm | |
| | 28.7 x 26.4 x 15.4 in | |
| Net Weight (without rotor) | 118 kg | |
| | 260 lb | |
| Shipping Dimensions (W × D × H) | 900 x 750 x 560 mm | |
| | 40.0 x 29.5 x 22.0 in | |
| Shipping Weight (without rotor) | 137 kg | |
| | 302 lb | |
| Ambient conditions (EN/IEC 61010-1) | | |
| Environment | for indoor use only | |
| Altitude | Use up to an altitude of 2000 m | |
| Ambient temperature | 2°C up to 35 °C | |
| Max. relative humidity | Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C. | |
| Overvoltage category (IEC 60364-4-443) | II | |
| Degree of contamination | 2 | |
| Class of protection | I | |
| Not suitable for use in hazardous environments. | | |


9.2 Drawings and dimensions




| Model | W (mm / in.) | D (mm / in.) | H (mm / in.) |
|---------|--------------|--------------|--------------|
| FC5714 | 362 / 14.3 | 493 / 19.4 | 330 / 13.0 |
| FC5718 | 408 / 16.1 | 499 / 19.7 | 351 / 13.8 |
| FC5718R | 408 / 16.1 | 731 / 28.8 | 359 / 14.1 |
| FC5720R | 407 / 16.0 | 712 / 28.0 | 361 / 14.2 |
| FC5816 | 446 / 17.6 | 538 / 21.2 | 354 / 13.9 |
| FC5816R | 723 / 28.5 | 538 / 21.2 | 354 / 13.9 |
| FC5830R | 723 / 28.5 | 519 / 20.4 | 413 / 16.3 |
| FC5916 | 540 / 21.3 | 670 / 26.4 | 390 / 15.4 |
| FC5916R | 730 / 28.7 | 670 / 26.4 | 390 / 15.4 |

10. COMPLIANCE

Compliance to the following standards is indicated by the corresponding mark on the product.

| Marking | Standard |
|---|---|
|  | This product complies with the applicable harmonized standards of EU Directives 2011/65/EU (RoHS), 2014/30/EU (EMC) and 2014/35/EU (LVD) and 2014/31/EU (NAWI). The EU Declaration of Conformity is available online on the OHAUS website |

| | |
|---|--|
|  | <p>Disposal</p> <p>In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.</p> <p>Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.</p> <p>If you have any questions, please contact the responsible authority or the distributor from which you purchased this device.</p> <p>Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.</p> <p>For disposal instructions in Europe, refer to the OHAUS website</p> <p>Thank you for your contribution to environmental protection.</p> |
|---|--|

11. APPENDIX

TABLE 1: PERMISSIBLE NET WEIGHT

TABLE 2: LOWEST TEMPERATURES AT MAX. SPEED

TABLE 3: MAX. SPEED AND RCF-VALUES FOR PERMISSIBLE ROTORS

TABLE 4: ACCELERATION AND DECELERATION TIMES

TABLE 5: ERROR MESSAGES

TABLE 6 (PART 1): RADIUS CORRECTION

TABLE 7: TABLE OF THE SERVICE LIFE OF ROTORS

TABLE 8: REDEMPTION FORM / DECONTAMINATION CERTIFICATE

11.1 Table 1: Permissible net weight

| Rotor No. display | Order No. | Description | Permissible weight |
|-------------------|-----------|---|--------------------|
| 10 | 83041010 | Rotor Angle 12x5ml FA ID Sealable | 12 x 9,5 g |
| 11 | 83041011 | Rotor Swing out 4x200ml ID Sealable | 4 x 560 g |
| 18 | 30372718 | Rotor Angle 44x1.5/2.0ml ID V1 | 44 x 3,4 g |
| 20 | 30314820 | Rotor Swing out 4x290ml ID | 4 x 355 g |
| 21 | 30314821 | Rotor Angle 6x250ml FB ID | 4 x 533 g |
| 22 | 30314822 | Rotor Swing out 4x145ml ID | 4 x 340 g |
| 23 | 30314823 | Rotor Swing out 4x100ml ID Sealable | 4 x 465 g |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | 2 x 310 g |
| 25 | 30314825 | Rotor Angle 6x85ml RB ID Hi | 6 x 140 g |
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | 6 x 140 g |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | 4 x 140 g |
| 28 | 30314828 | Rotor Swing out 4x250ml ID | 4 x 557 g |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | 10 x 76 g |
| 30 | 30314830 | Rotor Angle 6x50ml RB/FA ID | 6 x 72 g |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | 6 x 94 g |
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | 30 x 32 g |
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | 20 x 18 g |
| 34 | 30314834 | Rotor Angle 12x15ml RB/FA ID | 12 x 25 g |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | 30 x 3,4 g |
| 38 | 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | 24 x 3,4 g |
| 39 | 30314839 | Rotor Angle 12x1.5/2.0ml ID | 12 x 3,4 g |
| 41 | 30314841 | Rotor Angle 4x8-Place PCR Stripes ID | 4 x 3,5 g |
| 61 | 30304361 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS | 24 x 3,4 g |
| 85 | 30553085 | Rotor Swing out 4x750ml ID Sealable | 4 x 995 g |
| 86 | 30553086 | Rotor Angle 4x500ml ID | 4 x 708 g |

11.2 Table 2: Lowest temperatures at max. speed (Only Refrigerated Models)

| Rotor No. display | Order No. | Description | Model | Max Speed | N-max |
|-------------------|-----------|-------------------------------------|---------|------------|-------|
| 10 | 83041010 | Rotor Angle 12x5ml FA ID Sealable | FC5718R | 15,000 rpm | 2°C |
| 11 | 83041011 | Rotor Swing out 4x200ml ID Sealable | FC5718R | 5,000 rpm | 6°C |
| | | | FC5720R | 5,000 rpm | -8°C |
| 18 | 30372718 | Rotor Angle 44x1.5/2.0ml ID V1 | FC5718R | 15,000 rpm | 3°C |
| | | | FC5720R | 15,000 rpm | -6°C |
| | | | FC5816R | 16,000 rpm | 4°C |
| | | | FC5916R | 16,000 rpm | -3°C |
| 20 | 30314820 | Rotor Swing out 4x290ml ID | FC5816R | 4,500 rpm | 1°C |
| | | | FC5830R | 4,000 rpm | -20°C |
| 21 | 30314821 | Rotor Angle 6x250ml FB ID | FC5816R | 8,000 rpm | 6°C |
| | | | FC5830R | 10,000 rpm | 1°C |
| | | | FC5916R | 8,000 rpm | -5°C |
| 22 | 30314822 | Rotor Swing out 4x145ml ID | FC5718R | 4,500 rpm | -2°C |
| | | | FC5720R | 4,500 rpm | -13°C |
| 23 | 30314823 | Rotor Swing out 4x100ml ID Sealable | FC5718R | 5,000 rpm | 2°C |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | FC5718R | 4,500 rpm | -5°C |
| | | | FC5720R | 4,500 rpm | -14°C |
| | | | FC5816R | 4,500 rpm | -3°C |
| | | | FC5830R | 4,500 rpm | -15°C |
| | | | FC5916R | 4,500 rpm | -15°C |
| 25 | 30314825 | Rotor Angle 6x85ml RB ID Hi | FC5718R | 13,500 rpm | 15°C |
| | | | FC5720R | 13,500 rpm | 4°C |
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | FC5718R | 9,000 rpm | 1°C |
| | | | FC5720R | 13,000 rpm | 5°C |
| | | | FC5816R | 13,000 rpm | 15°C |
| | | | FC5830R | 13,000 rpm | -10°C |
| | | | FC5916R | 13,000 rpm | 2°C |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | FC5718R | 12,000 rpm | 3°C |
| | | | FC5720R | 15,000 rpm | 1°C |
| | | | FC5816R | 12,000 rpm | 5°C |
| | | | FC5830R | 20,000 rpm | 18°C |
| | | | FC5916R | 16,000 rpm | 4°C |
| 28 | 30314828 | Rotor Swing out 4x250ml ID | FC5816R | 4,500 rpm | 2°C |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | FC5718R | 7,500 rpm | 0°C |
| | | | FC5720R | 9,000 rpm | -6°C |
| | | | FC5816R | 10,500 rpm | 9°C |
| | | | FC5830R | 10,500 rpm | -4°C |
| | | | FC5916R | 10,500 rpm | 0°C |
| 30 | 30314830 | Rotor Angle 6x50ml RB/FA ID | FC5718R | 6,000 rpm | -6°C |
| | | | FC5720R | 6,000 rpm | -18°C |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | FC5718R | 12,000 rpm | 4°C |
| | | | FC5720R | 16,000 rpm | -3°C |
| | | | FC5816R | 13,000 rpm | 0°C |
| | | | FC5830R | 21,000 rpm | 10°C |
| | | | FC5916R | 13,000 rpm | -9°C |

| Rotor No. display | Order No. | Description | Model | Max Speed | N-max |
|-------------------|-----------|---|---------|------------|-------|
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | FC5718R | 4500 rpm | -7°C |
| | | | FC5720R | 4,500 rpm | -17°C |
| | | | FC5816R | 4500 rpm | -8°C |
| | | | FC5830R | 4,500 rpm | -20°C |
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | FC5718R | 12,000 rpm | 4°C |
| | | | FC5720R | 14,000 rpm | -1°C |
| | | | FC5816R | 12,000 rpm | 0°C |
| | | | FC5830R | 16,000 rpm | 6°C |
| | | | FC5916R | 12,000 rpm | -7°C |
| 34 | 30314834 | Rotor Angle 12x15ml RB/FA ID | FC5718R | 6,000 rpm | -9°C |
| | | | FC5720R | 6,000 rpm | -20°C |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | FC5718R | 14,000 rpm | 6°C |
| | | | FC5720R | 17,000 rpm | 7°C |
| | | | FC5830R | 20,000 rpm | 8°C |
| | | | FC5916R | 15,000 rpm | -3°C |
| 38 | 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | FC5718R | 15,000 rpm | 3°C |
| | | | FC5720R | 16,000 rpm | -1°C |
| | | | FC5816R | 16,000 rpm | 5°C |
| | | | FC5916R | 16,000 rpm | -5°C |
| 39 | 30314839 | Rotor Angle 12x1.5/2.0ml ID | FC5718R | 18,000 rpm | -2°C |
| | | | FC5830R | 30,000 rpm | 6°C |
| 41 | 30314841 | Rotor Angle 4x8-Place PCR Stripes ID | FC5718R | 15,000 rpm | 2°C |
| | | | FC5720R | 15,000 rpm | -7°C |
| | | | FC5916R | 15,000 rpm | -2°C |
| 61 | 30304361 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS | FC5720R | 20,000 rpm | 13°C |
| 85 | 30553085 | Rotor Swing out 4x750ml ID Sealable | FC5916R | 4,500 rpm | 2°C |
| 86 | 30553086 | Rotor Angle 4x500ml ID | FC5916R | 8,000 rpm | 7°C |

All temperature indications refer to a room temperature of 23°C. By exceeding this value or direct solar radiation to the centrifuge, these values can't be kept up.

11.3 Table 3: Max. speed and RCF-values for permissible rotors

| Rotor No. display | Order No. | Description | Model | Max Speed | Max RCF |
|-------------------|-----------|-------------------------------------|---------|------------|------------|
| 10 | 83041010 | Rotor Angle 12x5ml FA ID Sealable | FC5714 | 14,000 rpm | 18,624 x g |
| | | | FC5718 | 14,000 rpm | 18,624 x g |
| | | | FC5718R | 15,000 rpm | 21,379 x g |
| 11 | 83041011 | Rotor Swing out 4x200ml ID Sealable | FC5714 | 4,500 rpm | 3,350 x g |
| | | | FC5718 | 5,000 rpm | 4,136 x g |
| | | | FC5718R | 5,000 rpm | 4,136 x g |
| | | | FC5720R | 5,000 rpm | 4,136 x g |
| 18 | 30372718 | Rotor Angle 44x1.5/2.0ml ID V1 | FC5718 | 15,000 rpm | 21,379 x g |
| | | | FC5718R | 15,000 rpm | 21,379 x g |
| | | | FC5720R | 15,000 rpm | 21,379 x g |
| | | | FC5816 | 15,000 rpm | 21,379 x g |
| | | | FC5816R | 16,000 rpm | 24,325 x g |
| | | | FC5916 | 16,000 rpm | 24,325 x g |
| 20 | 30314820 | Rotor Swing out 4x290ml ID | FC5816 | 4,500 rpm | 3,780 x g |
| | | | FC5816R | 4,500 rpm | 3,780 x g |
| | | | FC5830R | 4,000 rpm | 2,987 x g |
| 21 | 30314821 | Rotor Angle 6x250ml FB ID | FC5816 | 8,000 rpm | 10,016 x g |
| | | | FC5816R | 8,000 rpm | 10,016 x g |
| | | | FC5830R | 10,000 rpm | 15,650 x g |
| | | | FC5916 | 8,000 rpm | 10,016 x g |
| | | | FC5916R | 8,000 rpm | 10,016 x g |
| 22 | 30314822 | Rotor Swing out 4x145ml ID | FC5714 | 4,500 rpm | 3,350 x g |
| | | | FC5718 | 4,500 rpm | 3,350 x g |
| | | | FC5718R | 4,500 rpm | 3,350 x g |
| | | | FC5720R | 4,500 rpm | 3,350 x g |
| 23 | 30314823 | Rotor Swing out 4x100ml ID Sealable | FC5714 | 4,000 rpm | 2,611 x g |
| | | | FC5718 | 5,000 rpm | 4,080 x g |
| | | | FC5718R | 5,000 rpm | 4,080 x g |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | FC5714 | 4,500 rpm | 2,716 x g |
| | | | FC5718 | 4,500 rpm | 2,716 x g |
| | | | FC5718R | 4,500 rpm | 2,716 x g |
| | | | FC5720R | 4,500 rpm | 2,716 x g |
| | | | FC5816 | 4,500 rpm | 2,716 x g |
| | | | FC5816R | 4,500 rpm | 2,716 x g |
| | | | FC5830R | 4,500 rpm | 2,716 x g |
| | | | FC5916 | 4,500 rpm | 2,716 x g |
| | | | FC5916R | 4,500 rpm | 2,716 x g |
| 25 | 30314825 | Rotor Angle 6x85ml RB ID Hi | FC5718 | 11,000 rpm | 13,932 x g |
| | | | FC5718R | 13,500 rpm | 20,984 x g |
| | | | FC5720R | 13,500 rpm | 20,984 x g |

| Rotor No. display | Order No. | Description | Model | Max Speed | Max RCF |
|-------------------|-----------|------------------------------|---------|------------|------------|
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | FC5718 | 9,000 rpm | 10,413 x g |
| | | | FC5718R | 9,000 rpm | 10,413 x g |
| | | | FC5720R | 13,000 rpm | 21,726 x g |
| | | | FC5816 | 11,000 rpm | 15,555 x g |
| | | | FC5816R | 13,000 rpm | 21,726 x g |
| | | | FC5830R | 13,000 rpm | 21,726 x g |
| | | | FC5916 | 11,000 rpm | 15,555 x g |
| | | | FC5916R | 13,000 rpm | 21,726 x g |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | FC5718 | 12,000 rpm | 14,809 x g |
| | | | FC5718R | 12,000 rpm | 14,809 x g |
| | | | FC5720R | 15,000 rpm | 23,140 x g |
| | | | FC5816 | 12,000 rpm | 14,809 x g |
| | | | FC5816R | 12,000 rpm | 14,809 x g |
| | | | FC5830R | 20,000 rpm | 41,137 x g |
| | | | FC5916 | 15,000 rpm | 23,140 x g |
| | | | FC5916R | 16,000 rpm | 26,328 x g |
| 28 | 30314828 | Rotor Swing out 4x250ml ID | FC5816 | 4,500 rpm | 3,735 x g |
| | | | FC5816R | 4,500 rpm | 3,735 x g |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | FC5718 | 7,500 rpm | 8,174 x g |
| | | | FC5718R | 7,500 rpm | 8,174 x g |
| | | | FC5720R | 9,000 rpm | 11,771 x g |
| | | | FC5816 | 9,000 rpm | 11,771 x g |
| | | | FC5816R | 10,500 rpm | 16,022 x g |
| | | | FC5830R | 10,500 rpm | 16,022 x g |
| | | | FC5916 | 10,000 rpm | 14,532 x g |
| | | | FC5916R | 10,500 rpm | 16,022 x g |
| 30 | 30314830 | Rotor Angle 6x50ml RB/FA ID | FC5714 | 6,000 rpm | 4,427 x g |
| | | | FC5718 | 6,000 rpm | 4,427 x g |
| | | | FC5718R | 6,000 rpm | 4,427 x g |
| | | | FC5720R | 6,000 rpm | 4,427 x g |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | FC5718 | 12,000 rpm | 13,522 x g |
| | | | FC5718R | 12,000 rpm | 13,522 x g |
| | | | FC5720R | 16,000 rpm | 24,039 x g |
| | | | FC5816 | 13,000 rpm | 15,869 x g |
| | | | FC5816R | 13,000 rpm | 15,869 x g |
| | | | FC5830R | 21,000 rpm | 41,410 x g |
| | | | FC5916 | 13,000 rpm | 15,869 x g |
| | | | FC5916R | 13,000 rpm | 15,869 x g |
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | FC5714 | 4,500 rpm | 2,830 x g |
| | | | FC5718 | 4,500 rpm | 2,830 x g |
| | | | FC5718R | 4,500 rpm | 2,830 x g |
| | | | FC5720R | 4,500 rpm | 2,830 x g |
| | | | FC5816 | 4,500 rpm | 2,830 x g |
| | | | FC5816R | 4,500 rpm | 2,830 x g |
| | | | FC5830R | 4,500 rpm | 2,830 x g |

| Rotor No. display | Order No. | Description | Model | Max Speed | Max RCF |
|-------------------|-----------|---|---------|------------|------------|
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | FC5718 | 12,000 rpm | 15,775 x g |
| | | | FC5718R | 12,000 rpm | 15,775 x g |
| | | | FC5720R | 14,000 rpm | 21,472 x g |
| | | | FC5816 | 12,000 rpm | 15,775 x g |
| | | | FC5816R | 12,000 rpm | 15,775 x g |
| | | | FC5830R | 16,000 rpm | 28,045 x g |
| | | | FC5916 | 12,000 rpm | 15,775 x g |
| | | | FC5916R | 12,000 rpm | 15,775 x g |
| 34 | 30314834 | Rotor Angle 12x15ml RB/FA ID | FC5714 | 6,000 rpm | 4,427 x g |
| | | | FC5718 | 6,000 rpm | 4,427 x g |
| | | | FC5718R | 6,000 rpm | 4,427 x g |
| | | | FC5720R | 6,000 rpm | 4,427 x g |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | FC5714 | 12,000 rpm | 15,131 x g |
| | | | FC5718 | 13,000 rpm | 17,758 x g |
| | | | FC5718R | 14,000 rpm | 20,595 x g |
| | | | FC5720R | 17,000 rpm | 30,368 x g |
| | | | FC5830R | 20,000 rpm | 42,032 x g |
| | | | FC5916 | 15,000 rpm | 23,643 x g |
| | | | FC5916R | 15,000 rpm | 23,643 x g |
| 38 | 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | FC5714 | 14,000 rpm | 18,624 x g |
| | | | FC5718 | 15,000 rpm | 21,379 x g |
| | | | FC5718R | 15,000 rpm | 21,379 x g |
| | | | FC5720R | 16,000 rpm | 24,325 x g |
| | | | FC5816 | 15,000 rpm | 21,379 x g |
| | | | FC5816R | 16,000 rpm | 24,325 x g |
| | | | FC5916 | 16,000 rpm | 24,325 x g |
| | | | FC5916R | 16,000 rpm | 24,325 x g |
| 39 | 30314839 | Rotor Angle 12x1.5/2.0ml ID | FC5718 | 18,000 rpm | 23,643 x g |
| | | | FC5718R | 18,000 rpm | 23,643 x g |
| | | | FC5830R | 30,000 rpm | 65,395 x g |
| 41 | 30314841 | Rotor Angle 4x8-Place PCR Stripes ID | FC5718 | 15,000 rpm | 15,343 x g |
| | | | FC5718R | 15,000 rpm | 15,343 x g |
| | | | FC5720R | 15,000 rpm | 15,343 x g |
| | | | FC5916 | 15,000 rpm | 15,343 x g |
| | | | FC5916R | 15,000 rpm | 15,343 x g |
| 61 | 30304361 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS | FC5720R | 20,000 rpm | 38,007 x g |
| 85 | 30553085 | Rotor Swing out 4x750ml ID Sealable | FC5916 | 4,000 rpm | 3,452 x g |
| | | | FC5916R | 4,500 rpm | 4,369 x g |
| 86 | 30553086 | Rotor Angle 4x500ml ID | FC5916 | 8,000 rpm | 10,374 x g |
| | | | FC5916R | 8,000 rpm | 10,374 x g |

11.4 Table 4: Acceleration and deceleration times

| Rotor No. display | Order No. | Description | Model | Acceleration * Time in sec | | Deceleration * Time in sec | |
|-------------------|-----------|-------------------------------------|---------|----------------------------|---------|----------------------------|---------|
| | | | | level 0 | level 9 | level 0 | level 9 |
| 10 | 83041010 | Rotor Angle 12x5ml FA ID Sealable | FC5714 | 238 | 27 | 206 | 22 |
| | | | FC5718 | 206 | 24 | 436 | 20 |
| | | | FC5718R | 220 | 26 | 420 | 21 |
| 11 | 83041011 | Rotor Swing out 4x200ml ID Sealable | FC5714 | 97 | 17 | 256 | 14 |
| | | | FC5718 | 104 | 23 | 322 | 13 |
| | | | FC5718R | 102 | 21 | 387 | 12 |
| | | | FC5720R | 104 | 15 | 373 | 12 |
| 18 | 30372718 | Rotor Angle 44x1.5/2.0ml ID V1 | FC5718 | 256 | 33 | 446 | 21 |
| | | | FC5718R | 256 | 31 | 441 | 21 |
| | | | FC5720R | 222 | 25 | 447 | 23 |
| | | | FC5816 | 256 | 28 | 328 | 24 |
| | | | FC5816R | 275 | 33 | 536 | 26 |
| | | | FC5916 | 236 | 25 | 324 | 25 |
| | | | FC5916R | 235 | 25 | 500 | 25 |
| 20 | 30314820 | Rotor Swing out 4x290ml ID | FC5816 | 309 | 34 | 458 | 36 |
| | | | FC5816R | 309 | 34 | 458 | 36 |
| | | | FC5830R | 160 | 18 | 383 | 22 |
| 21 | 30314821 | Rotor Angle 6x250ml FB ID | FC5816 | 664 | 130 | 2906 | 92 |
| | | | FC5816R | 664 | 130 | 2906 | 83 |
| | | | FC5830R | 709 | 148 | 2010 | 132 |
| | | | FC5916 | 573 | 66 | 1903 | 84 |
| | | | FC5916R | 573 | 66 | 1903 | 84 |
| 22 | 30314822 | Rotor Swing out 4x145ml ID | FC5714 | 110 | 13 | 158 | 18 |
| | | | FC5718 | 91 | 14 | 243 | 13 |
| | | | FC5718R | 93 | 12 | 226 | 12 |
| | | | FC5720R | 93 | 12 | 328 | 11 |
| 23 | 30314823 | Rotor Swing out 4x100ml ID Sealable | FC5714 | 110 | 14 | 170 | 17 |
| | | | FC5718 | 100 | 15 | 150 | 15 |
| | | | FC5718R | 155 | 22 | 518 | 16 |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | FC5714 | 220 | 24 | 339 | 24 |
| | | | FC5718 | 150 | 23 | 473 | 17 |
| | | | FC5718R | 155 | 22 | 518 | 16 |
| | | | FC5720R | 158 | 18 | 644 | 18 |
| | | | FC5816 | 452 | 43 | 616 | 38 |
| | | | FC5816R | 432 | 43 | 616 | 38 |
| | | | FC5830R | 180 | 20 | 530 | 23 |
| | | | FC5916 | 249 | 27 | 488 | 23 |
| 25 | 30314825 | Rotor Angle 6x85ml RB ID Hi | FC5718 | 399 | 65 | 988 | 38 |
| | | | FC5718R | 495 | 98 | 1.068 | 47 |
| | | | FC5720R | 495 | 61 | 1407 | 46 |
| | | | FC5916 | 463 | 48 | 1654 | 46 |
| | | | FC5916R | 549 | 69 | 1307 | 67 |

| Rotor No. display | Order No. | Description | Model | Acceleration* Time in sec | | Deceleration* Time in sec | |
|-------------------|-----------|------------------------------|---------|------------------------------|---------|------------------------------|---------|
| | | | | level 0 | level 9 | level 0 | level 9 |
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | FC5718 | 417 | 61 | 1.446 | 35 |
| | | | FC5718R | 412 | 62 | 1.310 | 34 |
| | | | FC5720R | 515 | 62 | 1869 | 51 |
| | | | FC5816 | 697 | 85 | 2313 | 70 |
| | | | FC5816R | 825 | 118 | 1630 | 76 |
| | | | FC5830R | 500 | 60 | 1374 | 67 |
| | | | FC5916 | 463 | 48 | 1654 | 46 |
| | | | FC5916R | 549 | 69 | 1307 | 67 |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | FC5718 | 307 | 69 | 1.131 | 35 |
| | | | FC5718R | 307 | 68 | 1.102 | 34 |
| | | | FC5720R | 511 | 58 | 1460 | 51 |
| | | | FC5816 | 506 | 60 | 1745 | 49 |
| | | | FC5816R | 506 | 60 | 1745 | 44 |
| | | | FC5830R | 508 | 115 | 1046 | 124 |
| | | | FC5916 | 448 | 50 | 1251 | 45 |
| | | | FC5916R | 448 | 50 | 1251 | 45 |
| 28 | 30314828 | Rotor Swing out 4x250ml ID | FC5816 | 34 | 311 | 36 | 387 |
| | | | FC5816R | 307 | 34 | 487 | 35 |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | FC5718 | 381 | 72 | 1.435 | 36 |
| | | | FC5718R | 374 | 59 | 1.698 | 35 |
| | | | FC5720R | 458 | 65 | 2006 | 68 |
| | | | FC5816 | 753 | 115 | 2395 | 72 |
| | | | FC5816R | 753 | 115 | 2395 | 65 |
| | | | FC5830R | 740 | 86 | 1801 | 107 |
| | | | FC5916 | 480 | 60 | 1747 | 68 |
| | | | FC5916R | 480 | 60 | 1747 | 68 |
| 30 | 30314830 | Rotor Angle 6x50ml RB/FA ID | FC5714 | 102 | 14 | 304 | 11 |
| | | | FC5718 | 110 | 17 | 416 | 11 |
| | | | FC5718R | 102 | 15 | 486 | 11 |
| | | | FC5720R | 119 | 13 | 522 | 17 |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | FC5718 | 358 | 44 | 772 | 26 |
| | | | FC5718R | 358 | 44 | 772 | 26 |
| | | | FC5720R | 412 | 50 | 1087 | 37 |
| | | | FC5816 | 446 | 48 | 1323 | 49 |
| | | | FC5816R | 446 | 48 | 1323 | 42 |
| | | | FC5830R | 760 | 85 | 870 | 78 |
| | | | FC5916 | 264 | 28 | 921 | 32 |
| | | | FC5916R | 264 | 28 | 921 | 32 |
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | FC5714 | 155 | 18 | 369 | 18 |
| | | | FC5718 | 113 | 17 | 572 | 9 |
| | | | FC5718R | 114 | 17 | 632 | 11 |
| | | | FC5720R | 115 | 15 | 777 | 15 |
| | | | FC5816 | 149 | 25 | 985 | 20 |
| | | | FC5816R | 149 | 25 | 985 | 19 |

| Rotor No. display | Order No. | Description | Model | Acceleration * Time in sec | | Deceleration* Time in sec | |
|-------------------|-----------|---|---------|----------------------------------|---------|---------------------------------|---------|
| | | | | level 0 | level 9 | level 0 | level 9 |
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | FC5718 | 358 | 56 | 920 | 29 |
| | | | FC5718R | 357 | 54 | 842 | 29 |
| | | | FC5720R | 412 | 50 | 1186 | 37 |
| | | | FC5816 | 512 | 54 | 1439 | 47 |
| | | | FC5816R | 512 | 54 | 1439 | 42 |
| | | | FC5830R | 406 | 56 | 868 | 78 |
| | | | FC5916 | 305 | 32 | 988 | 37 |
| | | | FC5916R | 305 | 32 | 988 | 37 |
| 34 | 30314834 | Rotor Angle 12x15ml RB/FA ID | FC5714 | 101 | 13 | 285 | 11 |
| | | | FC5718 | 103 | 18 | 356 | 12 |
| | | | FC5718R | 103 | 18 | 356 | 12 |
| | | | FC5720R | 121 | 13 | 428 | 17 |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | FC5714 | 244 | 26 | 349 | 33 |
| | | | FC5718 | 189 | 31 | 504 | 20 |
| | | | FC5718R | 205 | 35 | 465 | 22 |
| | | | FC5720R | 251 | 31 | 642 | 32 |
| | | | FC5830R | 674 | 69 | 515 | 72 |
| | | | FC5916 | 221 | 23 | 561 | 30 |
| | | | FC5916R | 221 | 23 | 561 | 30 |
| 38 | 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | FC5714 | 207 | 23 | 215 | 34 |
| | | | FC5718 | 221 | 26 | 367 | 17 |
| | | | FC5718R | 222 | 25 | 261 | 17 |
| | | | FC5720R | 259 | 31 | 490 | 28 |
| | | | FC5816 | 251 | 25 | 610 | 26 |
| | | | FC5816R | 231 | 26 | 392 | 23 |
| | | | FC5916 | 204 | 21 | 421 | 30 |
| | | | FC5916R | 204 | 21 | 421 | 30 |
| 39 | 30314839 | Rotor Angle 12x1.5/2.0ml ID | FC5718 | 232 | 26 | 331 | 21 |
| | | | FC5718R | 232 | 25 | 308 | 20 |
| | | | FC5830R | 438 | 45 | 328 | 70 |
| 41 | 30314841 | Rotor Angle 4x8-Place PCR Stripes ID | FC5718 | 127 | 15 | 160 | 15 |
| | | | FC5718R | 126 | 14 | 154 | 15 |
| | | | FC5720R | 104 | 13 | 212 | 9 |
| | | | FC5916 | 100 | 12 | 201 | 12 |
| | | | FC5916R | 100 | 12 | 201 | 12 |
| 61 | 30304361 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS | FC5720R | 259 | 31 | 490 | 28 |
| 85 | 30553085 | Rotor Swing out 4x750ml ID Sealable | FC5916 | 483 | 47 | 1287 | 49 |
| | | | FC5916R | 483 | 47 | 1287 | 49 |
| 86 | 30553086 | Rotor Angle 4x500ml ID | FC5916 | 575 | 73 | 2317 | 82 |
| | | | FC5916R | 575 | 73 | 2317 | 82 |

*Note: accelerates from 0 to Vmax; decelerates from Vmax to

11.5 Table 5: Error messages

| Error-No.: | Description |
|------------|--|
| 1 | Imbalance arose |
| 2 | Imbalance sensor is defective |
| 4 | Imbalance switch has been activated for longer than 5 seconds |
| 8 | Transponder in the rotor is defective |
| 11 | Temperature sensor is defective |
| 12 | Chamber over temperature |
| 14 | Leap of speed is too big between two measurements |
| CLOSE lid | |
| 33 | Open lid while motor is running |
| 34 | Lid contact defective |
| 38 | Lid motor is blocked |
| 40 | Communication with frequency converter disturbed during start |
| 41 | Communication with frequency converter disturbed during stop |
| 42 | Short circuit in the frequency converter |
| 43 | Undervoltage frequency converter |
| 44 | Overvoltage frequency converter |
| 45 | Over temperature frequency converter |
| 46 | Over temperature motor |
| 47 | Over current frequency converter |
| 48 | Timeout between control unit and frequency converter |
| 49 | Other error frequency converter |
| 55 | Overspeed |
| 70 | Timeout between controller and RS232 interface |
| 90 | Max. life cycles of the installed rotor will soon be reached. Error appears for the first time when 500 cycles remain. |
| 91 | Max. life cycles of the installed rotor reached. |
| 99 | Rotor is not allowed in this centrifuge |
| FALSE | Inserted rotor does not exist in the program |
| rotor no | Rotor is not detected |

11.6 Table 6: Radius correction and adapter specifications

| Rotor Order No. | Description | Adapter Order No. | Radius (cm) | Correction (cm) |
|-----------------|-----------------------------------|-------------------|-------------|-----------------|
| 83041010 | Rotor Angle 12x5ml FA ID Sealable | None | 8.5 | 0.0 |
| | | 30130886 | 7.0 | 1.5 |
| | | 30130887 | 7.3 | 1.2 |
| | | 30130888 | 7.5 | 1.0 |
| | | 83041012 | 14.8 | 0.0 |
| | | 83041013 | 14.8 | 0.0 |
| | | 83041005 | - | - |
| | | 83041015 | - | - |
| | | 83041016 | 14.8 | 0.0 |
| | | 83041017 | 14.6 | 0.2 |
| | | 83041018 | 14.6 | 0.2 |
| | | 83041019 | 14.6 | 0.2 |
| | | 83041020 | 14.6 | 0.2 |
| | | 83041021 | 14.7 | 0.1 |
| | | 83041022 | 14.6 | 0.2 |
| | | 83041023 | 14.6 | 0.2 |
| | | 83041024 | 14.6 | 0.2 |
| | | 83041025 | 14.7 | 0.1 |
| | | 83041026 | 14.8 | 0.0 |
| | | 83041027 | 14.6 | 0.2 |
| | | 83041028 | 14.6 | 0.2 |
| | | 83041029 | 14.7 | 0.1 |
| 83041030 | 14.7 | 0.1 | | |
| 83041031 | 14.8 | 0.0 | | |
| 30372718 | Rotor Angle 44 x 1.5/2.0 ml ID V1 | None | 8.5 | 0.0 |
| | | 30130885 | 8.3 | 0.2 |
| | | 30130884 | 7.7 | 0.8 |
| 30314820 | Rotor Swing out 4x290 ml ID | None | - | - |
| | | 30314901 | - | - |
| | | 30314902 | - | - |
| | | 83041037 | 16.7 | 0.0 |
| | | 30314903 | 15.9 | 0.8 |
| | | 30314904 | 16.1 | 0.6 |
| | | 30314907 | 16.1 | 0.6 |
| | | 30314905 | 16.3 | 0.4 |
| | | 30314906 | 16.4 | 0.3 |
| | | 30314908 | 16.3 | 0.4 |
| | | 30314909 | 16.1 | 0.6 |
| | | 30314910 | 16.1 | 0.6 |
| | | 30314911 | 15.5 | 1.2 |
| | | 83041032 | | |
| | | 30314912 | 16.3 | 0.4 |
| 30314913 | 16.3 | 0.4 | | |
| 30314914 | 16.1 | 0.6 | | |

| | | | | |
|----------|--|----------|------|-----|
| 30314820 | Rotor Swing out 4x290 ml ID | 30314915 | 16.3 | 0.4 |
| | | 30304367 | 16.3 | 0.4 |
| | | 30314916 | 15.9 | 0.8 |
| | | 30314917 | 15.9 | 0.8 |
| | | 30304368 | 15.7 | 1.0 |
| 30314821 | Rotor Angle 6x250 ml FB ID | None | 14.1 | 0.0 |
| | | 30559414 | 12.8 | 2.3 |
| | | 30304373 | 12.0 | 2.1 |
| | | 30304374 | 11.7 | 2.4 |
| | | 30304372 | 12.5 | 1.6 |
| | | 83041032 | | |
| | | 30304371 | 13.0 | 1.1 |
| | | 30304370 | 13.3 | 0.8 |
| | | 30304369 | 13.2 | 0.9 |
| | | 30559412 | | |
| 30314822 | Rotor Swing out 4 x 145 ml ID | None | 14.8 | 0.0 |
| | | 83041035 | 13.9 | 0.9 |
| | | 30314842 | 13.8 | 1.0 |
| | | 30314843 | 14.0 | 0.8 |
| | | 30314844 | 14.1 | 0.7 |
| | | 30314845 | 14.1 | 0.7 |
| | | 30314846 | 14.5 | 0.3 |
| | | 30314847 | 14.2 | 0.6 |
| | | 30314848 | 13.7 | 1.1 |
| | | 30314849 | 14.3 | 0.5 |
| | | 30314852 | 14.4 | 0.4 |
| | | 30314850 | 14.8 | 0.0 |
| | | 30314851 | 14.4 | 0.4 |
| | | 30314858 | 14.3 | 0.5 |
| | | 30314853 | 13.5 | 1.3 |
| | | 30314856 | 11.5 | 3.3 |
| | | 30314857 | 14.1 | 0.7 |
| | | 30314855 | 13.9 | 0.9 |
| 30314854 | 9.3 | 5.5 | | |
| 30314823 | Rotor Swing out 4 x 100 ml ID Sealable | None | 14.6 | 0.0 |
| | | 30314860 | 14.2 | 0.4 |
| | | 30314861 | 14.2 | 0.4 |
| | | 30314862 | - | - |
| | | 30314863 | - | - |
| | | 30314864 | 13.7 | 0.9 |
| | | 30314865 | 14.0 | 0.6 |
| | | 30314866 | 14.0 | 0.6 |
| | | 30314867 | 14.0 | 0.6 |
| | | 30314868 | 14.2 | 0.4 |
| | | 30314881 | 14.6 | 0.0 |
| | | 30314869 | 13.9 | 0.7 |
| | | 30314870 | 13.1 | 1.5 |

| | | | | |
|----------|--|----------|------|-----|
| 30314823 | Rotor Swing out 4 x 100 ml ID Sealable | 83041032 | | |
| | | 30314871 | 14.0 | 0.6 |
| | | 30314872 | 14.1 | 0.5 |
| | | 30314873 | 14.1 | 0.5 |
| | | 30314874 | 14.0 | 0.6 |
| | | 30314875 | 14.0 | 0.6 |
| | | 30314882 | 14.6 | 0.0 |
| | | 30314878 | 14.0 | 0.6 |
| | | 30314880 | 14.0 | 0.6 |
| | | 30314876 | 14.0 | 0.6 |
| | | 30314879 | 14.0 | 0.6 |
| | | 30314877 | 14.0 | 0.6 |
| 30314824 | Rotor Swing out 2 x 3 MTP w/ bucket ID | None | 12.0 | 0.0 |
| | | 30314890 | - | - |
| | | 30314891 | 12.0 | 0.0 |
| 30314825 | Rotor Angle 6 x 85 ml RB ID Hi | None | 10.3 | 0.0 |
| | | 30314895 | 10.0 | 0.3 |
| | | 30314896 | 9.8 | 0.5 |
| | | 83041033 | 9.6 | 0.7 |
| | | 30314894 | 9.6 | 0.7 |
| | | 83041032 | | |
| | | 30314899 | 9.5 | 0.8 |
| | | 30314897 | 9.3 | 1.0 |
| | | 30314898 | 10.3 | 0.0 |
| | | 83041034 | 9.4 | 0.9 |
| | | 30314893 | 9.6 | 0.7 |
| 30314826 | Rotor Angle 6 x 85 ml RB ID | None | 11.5 | 0.0 |
| | | 30314895 | 10.9 | 0.6 |
| | | 30314896 | 10.6 | 0.9 |
| | | 30314894 | 10.4 | 1.1 |
| | | 83041032 | 10.6 | 0.9 |
| | | 30314899 | 10.4 | 1.1 |
| | | 30314897 | 10.4 | 1.1 |
| | | 30314898 | 11.1 | 0.4 |
| | | 30314893 | 10.4 | 1.1 |
| 30314827 | Rotor Angle 4 x 85 ml RB ID Hi | None | 9.2 | 0.0 |
| | | 30314895 | 8.9 | 0.3 |
| | | 30314896 | 8.6 | 0.6 |
| | | 30314894 | 8.4 | 0.8 |
| | | 30314899 | 8.3 | 0.9 |
| | | 30314897 | 8.3 | 0.9 |
| | | 30314898 | 7.5 | 1.7 |
| | | 30314893 | 8.5 | 0.7 |
| 30314828 | Rotor Swing out 4x250ml ID | None | 16.5 | 0.0 |
| | | 83041039 | 15.6 | 0.9 |
| | | 30304375 | 16.5 | 0.0 |

| | | | | |
|----------|--|----------|------|-----|
| 30314828 | Rotor Swing out 4×250ml ID | 83041032 | | |
| | | 30314583 | 16.5 | 0.0 |
| | | 30314585 | 15.6 | 0.9 |
| | | 30314584 | 15.9 | 0.9 |
| | | 83041038 | 15.8 | 0.7 |
| 30314829 | Rotor Angle 10 x 50 ml FA ID | None | 13.0 | 0.0 |
| | | 83041032 | | |
| | | 30472300 | 12.7 | 0.3 |
| | | 30472307 | 12.8 | 0.2 |
| | | 30130889 | 12.2 | 0.8 |
| | | 30130890 | 10.4 | 2.6 |
| | | 30130886 | 8.9 | 4.1 |
| 30314830 | Rotor Angle 6 x 50 ml RB/FA ID | None | 11.0 | 0.0 |
| | | 30130891 | 10.7 | 0.3 |
| | | 83041032 | | |
| | | 30130892 | 10.3 | 0.7 |
| | | 30130893 | 10.6 | 0.4 |
| | | 30130894 | 10.6 | 0.4 |
| | | 30130889 | 10.2 | 0.8 |
| | | 30130890 | 8.3 | 2.7 |
| | | 30130886 | 6.7 | 4.3 |
| 30314831 | Rotor Angle 6 x 50 ml RB ID Hi | None | 8.4 | 0.0 |
| | | 30130891 | 8.2 | 0.2 |
| | | 30130892 | 7.9 | 0.5 |
| | | 30314892 | 7.7 | 0.7 |
| | | 30130893 | 8.0 | 0.4 |
| 30314832 | Rotor Angle 30 x 15 ml RB/FA ID | None | 12.5 | 0.0 |
| | | 30130889 | 12.2 | 0.3 |
| | | 30130890 | 10.5 | 2.0 |
| | | 30130886 | 9.0 | 3.5 |
| 30314834 | Rotor Angle 12 x 15 ml RB/FA ID | None | 11.0 | 0.0 |
| | | 30130889 | 10.6 | 0.4 |
| | | 30130890 | 9.1 | 1.9 |
| | | 30130886 | 7.7 | 3.4 |
| 30314836 | Rotor Angle 30 x 1.5/2.0 ml ID Sealable | None | 9.4 | 0.0 |
| | | 30130885 | 8.4 | 1.0 |
| | | 30130884 | 9.1 | 0.3 |
| 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | None | 8.5 | 0.0 |
| | | 30130885 | 8.3 | 0.2 |
| | | 30130884 | 7.7 | 0.8 |
| 30314839 | Rotor Angle 12 x 1.5/2.0 ml ID | None | 6.5 | 0.0 |
| | | 30314900 | 6.4 | 0.1 |
| | | 30130885 | 5.6 | 0.9 |
| | | 30130884 | 6.3 | 0.2 |
| 30642361 | Rotor Angle 24 x 1.5/2.0 ml ID BIOSEALS V1 | None | 8.5 | 0.0 |
| | | 30130885 | 8.3 | 0.2 |
| | | 30130884 | 7.7 | 0.8 |

| | | | | |
|----------|--|----------|------|-----|
| 30553085 | Rotor Swing out 4 x 750 ml ID Sealable | None | | |
| | | 30553104 | - | - |
| | | 30553105 | - | - |
| | | 30553117 | - | - |
| | | 30553118 | - | - |
| | | 30553119 | - | - |
| | | 30602502 | 19.3 | 0.0 |
| | | 30553122 | - | - |
| | | 30553123 | - | - |
| | | 30553124 | 18.8 | 0.5 |
| | | 30553125 | 18.9 | 0.4 |
| | | 30772866 | 19.3 | 0.0 |
| | | 30553126 | 19.1 | 0.2 |
| | | 30553127 | 19.1 | 0.2 |
| | | 30553128 | 19.1 | 0.2 |
| | | 30553129 | | |
| | | 30553130 | 19.1 | 0.2 |
| | | 30553131 | 19.1 | 0.2 |
| | | 30553132 | 19.1 | 0.2 |
| | | 83041032 | | |
| | | 30553133 | 19.2 | 0.1 |
| | | 30553134 | 19.0 | 0.3 |
| | | 30553135 | 18.8 | 0.5 |
| | | 30553136 | 18.9 | 0.4 |
| | | 30553138 | 18.7 | 0.6 |
| | | 30553139 | 18.8 | 0.5 |
| | | 30553140 | 19.0 | 0.3 |
| 30559377 | 18.9 | 0.4 | | |
| 83041040 | 18.8 | 0.5 | | |
| 30553086 | Rotor Angle 4 x 500 ml ID | None | 14.5 | 0.0 |
| | | 30559416 | 12.6 | 1.9 |
| | | 30564850 | 13.7 | 0.8 |
| | | 30559417 | 13.4 | 1.1 |
| | | 30559419 | 12.4 | 2.1 |
| | | 30559420 | 14.3 | 0.2 |
| | | 30559421 | 14.3 | 0.2 |
| 30559422 | 13.8 | 0.7 | | |

11.7 Table 7: Table of the service life of the rotors

FC5720R

| Rotor No. display | Order No. | Description | Cycles | Service life |
|-------------------|-----------|---|--------|--------------|
| 11 | 83041011 | Rotor Swing out 4x200ml ID Sealable | 25,000 | 7 years |
| 18 | 30372718 | Rotor Angle 44x1.5/2.0ml ID V1 | 60,000 | 7 years |
| 22 | 30314822 | Rotor Swing out 4x145ml ID | 25,000 | 7 years |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | 25,000 | 7 years |
| 25 | 30314825 | Rotor Angle 6x85ml RB ID Hi | 60,000 | 7 years |
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | 60,000 | 7 years |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | 30,000 | 7 years |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | 30,000 | 7 years |
| 30 | 30314830 | Rotor Angle 6x50ml RB/FA ID | 25,000 | 3 years |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | 30,000 | 7 years |
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | 25,000 | 3 years |
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | 60,000 | 7 years |
| 34 | 30314834 | Rotor Angle 12x15ml RB/FA ID | 25,000 | 3 years |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | 60,000 | 7 years |
| 38 | 83041238 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS V1 | 60,000 | 7 years |
| 41 | 30314841 | Rotor Angle 4x8-Place PCR Stripes ID | 25,000 | 3 years |
| 61 | 30304361 | Rotor Angle 24x1.5/2.0ml ID BIOSEALS | 60,000 | 7 years |

FC5830R

| Rotor No. display | Order No. | Description | Cycles | Service life |
|-------------------|-----------|--------------------------------------|--------|--------------|
| 20 | 30314820 | Rotor Swing out 4x290ml ID | 15,000 | 7 years |
| 21 | 30314821 | Rotor Angle 6x250ml FB ID | 30,000 | 7 years |
| 24 | 30314824 | Rotor Swing out 2x3MTP w/ bucket ID | 25,000 | 7 years |
| 26 | 30314826 | Rotor Angle 6x85ml RB ID | 60,000 | 7 years |
| 27 | 30314827 | Rotor Angle 4x85ml RB ID Hi | 30,000 | 7 years |
| 29 | 30314829 | Rotor Angle 10x50ml FA ID | 30,000 | 7 years |
| 31 | 30314831 | Rotor Angle 6x50ml RB ID Hi | 30,000 | 7 years |
| 32 | 30314832 | Rotor Angle 30x15ml RB/FA ID | 25,000 | 3 years |
| 33 | 30314833 | Rotor Angle 20x10ml RB ID Hi | 60,000 | 7 years |
| 36 | 30314836 | Rotor Angle 30x1.5/2.0ml ID Sealable | 60,000 | 7 years |
| 39 | 30314839 | Rotor Angle 12x1.5/2.0ml ID | 60,000 | 7 years |