HAWK

User Manual

Please read this before use

CE IVD

MSE

SIGNS

WARNING!
Warning of potential injury or health risk.

DANGER!
Risk of electric shock with potential for severe injury or death as a consequence.

DANGER!
Biohazard with potential for risk to health or death as a consequence.

DANGER!
Risk of explosion with potential for severe injury or death as a consequence.

This manual was prepared with special care. MSE Centrifuges Ltd may change the manual at any time and without notice because of improvements, typographical errors, inaccuracies of current information or improvements to facilities.

You can find the current version of the user manual on our website under: **www.mseuk.com** **DOWNLOAD** section.

Content

1 Application

The **MSE HAWK** centrifuges are table top laboratory centrifuge for in vitro diagnostic (IVD). Devices are used for separation samples taken from people's, animal's and plant's components of different densities, under the influence of the centrifugal force, to provide information about their biological state.

Its construction ensures easy operation, safe work and wide range of applications at laboratories engaged in routine medical analyses, biochemical research works etc.

This centrifuge is not biotight and therefore during centrifugation of preparations requiring biotightness one has to use closed and sealed containers and rotors. In the centrifuge, it is prohibited to centrifuge caustic, inflammable and explosive preparations.

2 Technical specification

manufacturer	**MSE Centrifuges Ltd, Mytogen House, 11 Browning Road, Heathfield TN21 8DB**				
type	**HAWK**				
mains voltage (L1+N+PE)	230V	100V	110V	120V	127V
	±10%	±5%			
mains frequency	50Hz	60Hz			
connected load (max.)	220W				
current protection [A]	T 8A				
capacity (max.)	500ml				
speed – RPM	90 ÷ 18000 obr/min (step 1 rpm)				
force – RCF	24270 x g (step 1 x g)				
running time	00:00:01 ÷ 99:59:59 – [h. : min : s] (1s step)				
time counting	since start button is pressed / since preselected speed is reached				
short-time operation mode – SHORT	tak				
continuous operation mode – HOLD	tak				
user programmems	100				
acceleration (ACEL)	10 linear curves				
deceleration (DECEL)	10 linear curves				
USB communication	yes				
Electromagnetic compatibility	according to PN-EN 61326-1:2006				
ambient conditions	EN 61010-1 (pkt.1.4.1)				
set-up site	indoors only				
ambient temperature	2° ÷ 40°C				
humidity (maximum relative humidity)	< 80%				
excess-voltage category	II EN 61010-1				
pollution degree	2 EN 61010-1				
strefa ochronna	300 mm				
safety area					
dimensions:	299 mm				
height (H)	357 mm				
width (W)	451 mm				
depth (D)	572 mm				
noise level	≤60dB				
weight 230V	22 kg				
weight 120V	23 kg				
Menu languages: English, French, German, Spanish, Italian, Portuguese, Russian, Swedish, Czech, Polish.					

3 Installation

Open the package. Remove the box containing the accessories. Take out centrifuge from the container. Keep the box and packing materials in case of service shipping.

3.1 *Content of the package*

name	pcs.	cat no.
centrifuge HAWK	1	see name plate
complete clamp	1	17142
spanner for the rotor	1	17099T
spanner for emergency opening of the lid	1	18640
power cord 230V / 120V	1	17149/17150
fuse WTA T8A 1150V	2	17865
vaseline 20ml	1	17201
USB A-A cable	1	16655
user manual	1	HAWK - EN

3.2 *Location*

- The device is heavy, so lifting and carrying the centrifuge can lead to back injuries. Risk of injury while lifting and carrying heavy loads.
- Lifting and transporting of the centrifuge should be done with a sufficient number of helpers. Use a transport aid for transporting the centrifuge.
- The device should be lifted by the underside in the vicinity of its feet and placed directly on a suitable lab table.
- Ensure safe location.
- The centrifuge shall not be located near source of heat and shall not be subjected to direct sunlight.
- Centrifuge should be placed on a stable and flat-levelled table top.
- Centrifuge should be set horizontally on a rigid base.
- It is necessary to ensure a safety zone of the minimum 30cm round the centrifuge from every direction (for ventilation needs). Do not obstruct ventilation holes !
- Passed parameters of the centrifuge are referring to the above named temperatures (see 2.Technical specification).
- If moving the centrifuge from a cold place to a warmer one, condensation will occur inside the centrifuge. It is important then that sufficient time be provided for drying the centrifuge prior to start using the centrifuge (min. 4 hours).

- Do not position the centrifuge so that it is difficult to operate the power switch
- Supply voltage given on the rating plate has to be consistent with local supply voltage. MSE CENTRIFUGES LTD's laboratory centrifuges are 1st class safety devices and they are provided with the three-core cable with the plug resistant to dynamic loadings. Mains socket shall be provided with the safety pin - protective earth (PE).
- It is recommended to install an emergency cut-out that should be located far from the centrifuge, near the exit or beyond the room.

- **Before switching on, check whether the centrifuge is connected to power supply correctly. It is compulsory to use only the power cord recommended by manufacturer (17866 for 230V, 17867 for 120V).**
- **Before using, check whether the device is correctly installed.**

3.3 *Current protection*

The centrifuge is equipped with thermal current protection. Fuse is situated in the plug-in socket unit at the back of the centrifuge.

4 Operating safety

4.1 *Operating personnel*

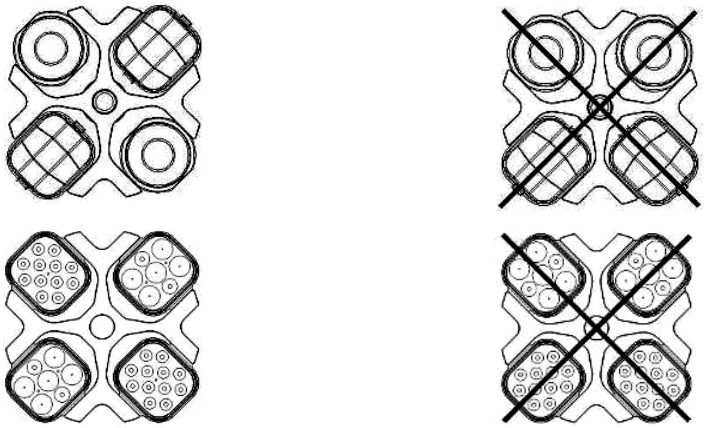
- The laboratory centrifuge can be operated by authorised laboratory personnel after familiarisation with the user manual.
- **User manual shall be always held near the centrifuge.**
- The centrifuge should not be misused.
- If the centrifuge is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

4.2 *Guarantee*

- The warranty period amounts to minimum **24 months** (unless otherwise specified in the purchase documents).
- The service life of the centrifuge specified by the manufacturer amounts to **10 years.**
- After termination of warranty period, it is necessary to carry out yearly technical inspections of the centrifuge.
- The Manufacturer reserves the right to make technical changes in manufactured products.
- The maximum period of storage for centrifuges that are not used is **1 year**. After this period, a technical inspection of the centrifuge should be carried out by service personnel authorised by the manufacturer.

4.3 *Placement of test tubes*

- Fix the rotor firmly on the motor axis.
- Avoid unbalance.
- Load opposite buckets with the same accessories.
- Centrifugation of the test tubes of different sizes:
  - There is a possibility to centrifuge test tubes of different sizes; however, it is absolutely necessary in such cases that opposite buckets and round carriers be the same.
  - The mass of different containers with test tubes spun at the same time has to be comparable. Swing-out rotors must be equipped with all four buckets.
- Lubricate the swing-out rotor journal pins.



CORRECT **WRONG**

CORRECT **WRONG**

- It is necessary to insert test tubes symmetrically on opposite sides.

FILLING TUBES

- Fill test tubes outside the centrifuge.
- Please pay special attention to the quality and proper thickness of the glass test tubes walls. Those must be test tubes for centrifuges.
- Fill test tubes outside the centrifuge.

4.4 *Safety hints*

ROTORS MAINTENANCE

- Lubricate the swing-out rotor journal pins.
- Use only accessories in good condition.
- Protect equipment against corrosion using accurate preventive maintenance.

HS ACCESSORIES MAINTENANCE

- Make sure that rubber O-rings are lightly coated with silicone grease. Use high vacuum grease, e.g. type „C" by LUBRINA.

HAZARDOUS MATERIALS

- MSE Centrifuges are not biotight. For centrifuging infectious materials, it is necessary to use hermetically closed tubes meeting demands of biotightness, in order to prevent germs migration into the centrifuge and beyond it.
- It is not allowed to subject to centrifugation toxic materials with damaged leak proof seals of the rotor or test-tube. Proper disinfection procedures have to be carried out when dangerous substances contaminated the centrifuge or its accessories.

EXPLOSIVE AND COMBUSTIBLE MATERIALS

- It is not allowed to centrifuge explosive and inflammable materials.
- It is not allowed to centrifuge substances prone to reacting in result of supplying high energy during centrifugation. The centrifuge can not be operated in explosion-endangered areas
- It is not allowed to centrifuge materials capable of generating inflammable or explosive mixtures when subjected to air.

4.5 *Maintenance conditions*

START-UP

- Prior to switching the centrifuge on, the user must read carefully all sections of this manual in order to ensure smooth operation and avoid damages of this device or its accessories.
- In order to protect the centrifuge against unbalance, fill in the test tubes up to the same weight.

TRANSPORTATION

- Centrifuge must not be transported with the rotor mounted on the shaft.

GENERAL HINTS

- Only original rotors, tubes and spare parts must be used.
- In case of faulty operation of the centrifuge, please contact MSE CENTRIFUGES LTD Service Department or its authorised representatives.
- It is not allowed to switch the centrifuge on if it is not installed properly or rotor is not fitted correctly.

CENTRIFUGES SUBSTANCES

- It is not allowed to exceed load limit set by the manufacturer. Rotors are intended for fluids of average homogeneous density equal to **1,2 g/cm^3** or smaller when centrifugation is carried out at maximum speed. When fluids of higher density are used, it is necessary to change the density of the centrifuge's sample in **PARAM/DENSITY** field.

INSPECTION PROCEDURES CARRIED OUT BY THE OPERATOR

The user has to pay special attention to the fact that key centrifuge parts are not damaged for safety reasons. This is specifically important for:

- Centrifuge accessories and especially structural changes, corrosion, preliminary cracks, abrasion of metal parts.
- Screw connections.
- Inspection of bioseals of the buckets if such are used. Special attention must be paid to all of the rubber (seals) parts. In the case of damage or visible structural changes defective parts must be replaced for new immediately (Set of seals Cat. No. **18591** available from the manufacturer).
- Yearly technical inspection of the centrifuge (after lapse of guarantee).

Only the manufacturer-specified buckets, included in the equipment list, as well as centrifuge tubes, which diameter, length and durability are suitable, should be used for spinning in this centrifuge. The use of equipment made by other manufacturers should be referred to the manufacturer of the centrifuge.

- It is not permitted to lift or shift the centrifuge during operation or rest on it.
- It is not permitted to stay in the safety zone (30 cm distance around the centrifuge) neither leave objects, e.g. glass vessels within this zone.
- It is not permitted to put any objects on the centrifuge.

LID OPENING

- It is not permitted to open the lid manually in emergency procedure when rotor is still turning.

ROTORS

- It is not permitted to use the rotors and round carriers with signs of corrosion or other mechanical defects.
- It is not permitted to centrifuge highly corrosive substances which may cause material impairment and lower mechanical properties of rotor and round carriers.
- It is not permitted to use rotors and accessories not admitted by the manufacturer. Only use commercial glass and plastic test tubes which are specifically made for centrifuging in this laboratory centrifuge. Do not use poor quality elements. Cracking of glass vessels and test tubes could result in dangerous vibration of the centrifuge.
- It is not permitted to carry out centrifugation with the rotor caps taken off or not screwed tight.

4.6 *Residual risk*

The centrifuge is built according to state-of-the-art and recognised safety regulations. Nevertheless, some level of residual risk still remains in case of improper operation and malfunctions. It is possible to decrease the residual risk by applying strictly to the user manual guidance and correcting swiftly any malfunction which could threaten safety.

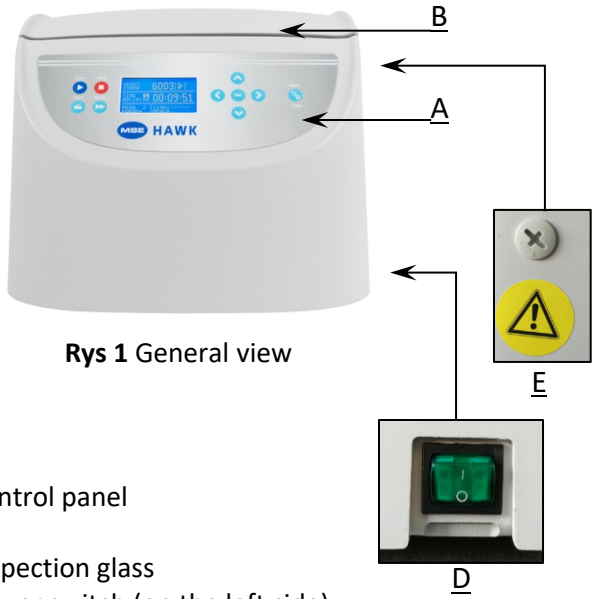
5 Operating

5.1 *Centrifuge description*

The new generation of MSE CENTRIFUGES LTD's laboratory centrifuges is provided with state-of-the-art microprocessor control systems, very durable and quiet asynchronous brushless motors and accessories consistent with requirements of the present-day user.

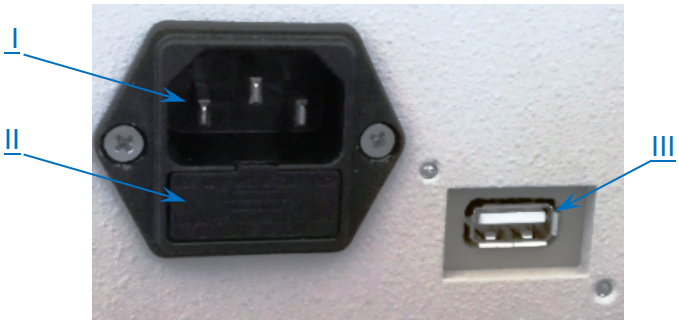
5.2 *Centrifuge overview*

Rys.2. Right side of centrifuge



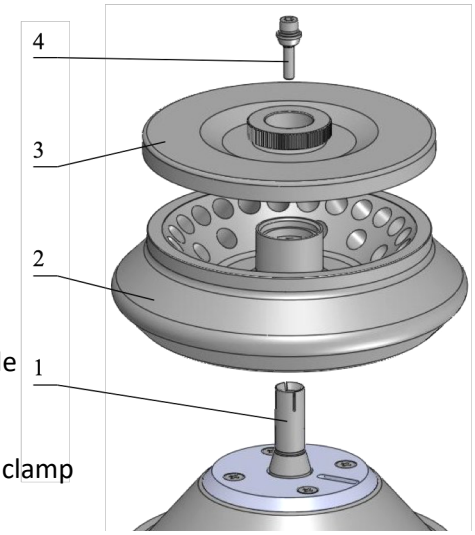
Rys 1 General view

A. Control panel
B. Lid
C. Inspection glass
D. Power switch (on the left side)
E. Power switch Point of emergency lid opening (on the left side at the top)



Rys.4. Back of the centrifuge

I. Main socket
II. Fuse socket
III. USB [M-UNIVERSAL only]



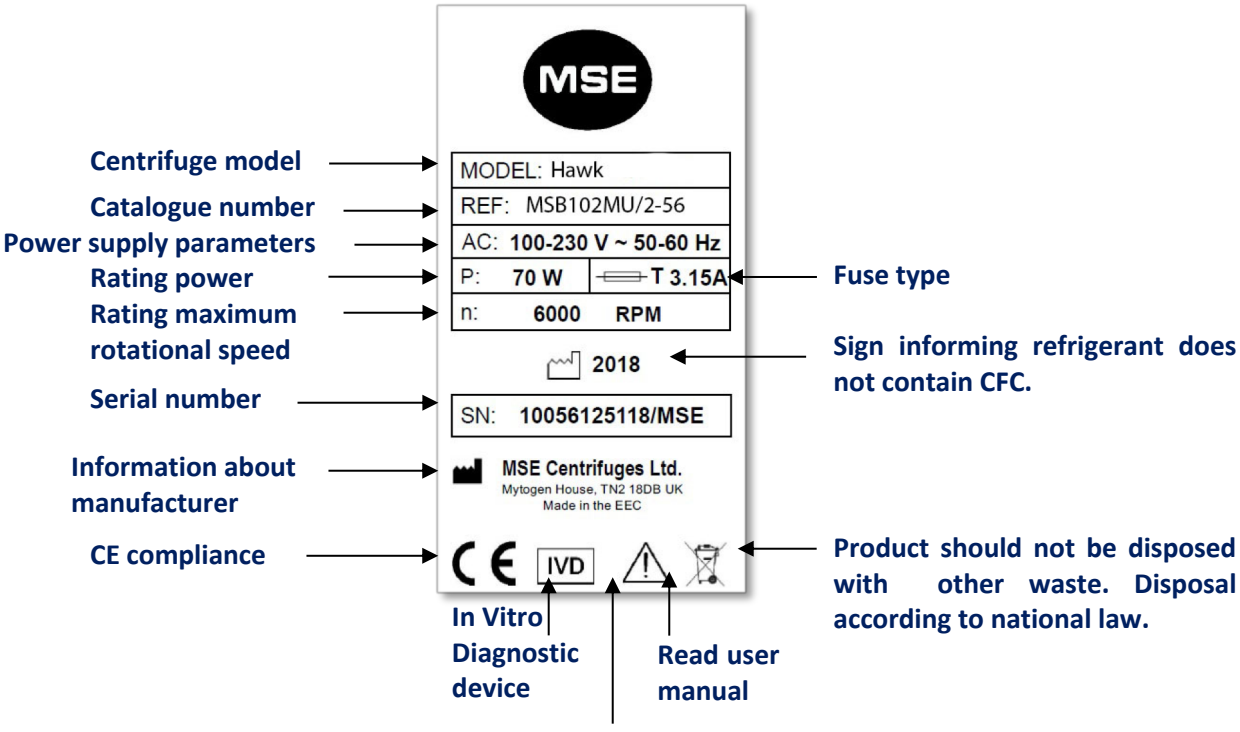
1. Motor axle
2. Rotor
3. Rotor lid
4. Complete clamp

Rys.3. Assembly of angle rotor

5.3 *Construction*

The centrifuge has a rigid self-supporting structure. Front and lid are made of ABS type plastic. The lid is fixed on steel axles hinges and at the front it is locked with two electromagnetic locks blocking any potential opening during centrifugation. The rotation chamber casing is made of thick steel sheeting. The rotation chamber bowl is made of stainless steel sheetinf.

5.4 *Name plate*

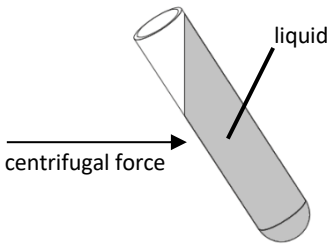


Pay attention when you are seeing this symbol. Operating of centrifuge may be potentially riskful.

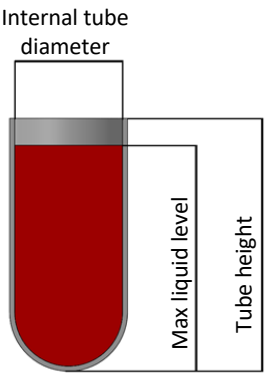
5.5 *Rotor and accessories installation*

- Connect the centrifuge to the mains (master switch on the back side of the centrifuge).
- Turn on the centrifuge (button on the side of the centrifuge).
- Open the lid of the centrifuge by pressing the LID key (see section Centrifuging/Control Panel). Prior to putting the rotor in, one has to check if the rotating chamber is free of impurities, e.g. such as dust, glass splinters, residues of fluids that must be taken away.
- Fit the rotor on the motor shaft driving it home on the cone.
- Screw-in the bolt for fixing the rotor (clockwise) and screw it tightly home with the supplied spanner for the rotor.
- Swing-out rotors have to be provided with the buckets in all seats. One should remember that every buckets swings individually. Bucket suspension studs should be lubricated periodically with petroleum jelly.
- In case of rotors designed with the lid, they must not be used without it. Rotor lids must be closed exactly. Rotor lids ensure smaller drags of the rotors, proper setting of the test-tubes and airtight sealing.
- One should use only buckets intended for selected types of the rotor.
- Fill test tubes outside the centrifuge.
- In case of centrifuging in an angle rotor, test tubes (buckets) have to be filled properly in order to prevent from pouring fluids during centrifuging.

Tubes must be filled so that the material does not escape from the reservoir during centrifugation.



One shall fill tubes according to formula:
Max liquid level < Tube height – Internal tube diameter/2



Observe the manufacturer's restrictions about the filling of the test tube.

It is recommended to equalise vessels loads as much as possible in order to ensure minimal vibrations during operation.

- **In order to prolong lifetime of the rotor and gaskets, rotors will need to be lubricated with the maintenance oil, while gaskets and threaded parts shall be lubricated with the petroleum jelly.**
- For replacement of the rotor, please unscrew clamp and grab the rotor with both hands at opposite sides, taking it away from drive shaft by pulling it up.

5.6 *Control device*

The microprocessor control unit of the centrifuge allows the selecting, programming and registering of the work parameters.Setting parameters

Data setting and read-out system forms hermetically closed keyboard with distinctly accessible operation points. Easily readable displays signalling individual performed operations facilitate operator's programmeming and recording of parameters and condition of the centrifuge.
The centrifuge is provided with the USB (only MPW M-UNIVERSAL) interface that enables connection of the centrifuge to external PC unit with the printer and recording the centrifugation parameters.

5.7 *Safety features*

LID LOCK

The centrifuge can only be started when the lid is properly closed. Similarly, the lid can only be opened once the rotor has stopped. In case of emergency opening of the lid during operation, the centrifuge will be immediately switched-off and the rotor will slow to a complete stop.

UNBALANCE DETECTING

Should loads of opposite buckets or carriers in rotors be unbalanced, the drive will be switched-off during acceleration or operation of the centrifuge and an error message will be displayed.

ROTOR VERIFICATION AND CHECKING COMPATIBILITY WITH LOADED PROGRAMME

Upon starting centrifuging, the unit verifies the type of the rotor installed and in the case of its incompatibility with the type indicated in the application or absence of the rotor, the spinning process will stop with simultaneous displaying of an error message. The conformity of the type of the rotor is signalled with a single audible signal. If the auto-identification (see 9.8 Other) option is checked, the proper rotor will be automatically chosen, without the user input.

REST STATE INSPECTION

Opening of the centrifuge's lid by pressing the **LID** button is possible, but only when the rotor is in a state of rest. Use the inspection glass to ensure the rotor is in the rest state. When the rotor is being stopped, the brake symbol (see 6.2) is visible and goes off when it stops. The opening of the emergency lid during rotor running is prohibited.

5.8 *Increase in temperature*

In uncooled centrifuges, the temperature in the rotor chamber, rotor and sample can increase to above 40°C, based on the run time, g-force (rcf)/speed and ambient temperature.

6 Centrifuging

The switching ON/OFF of the power is carried out via the master switch situated on the right side wall of the centrifuge. All other settings on the centrifuge are done by means of the control panel.

6.1 *Control panel*

The control panel placed on the front casing allows the control of the centrifuge operation.

Control panel

▶▶	**SHORT**[1]	short-time centrifuging
▶	**START**	start centrifugation run
■	**STOP**[2]	end centrifugation run
	**LID**	lid opening
	**BACK**	exit the current menu / cancelling switching between rpm display mode and rcf display mode
▲	**UP**	navigation in menu / increasing values
▼	**DOWN**	navigation in menu / decreasing values
◀	**LEFT**	navigation in menu
▶	**RIGHT**	navigation in menu
SET	**SET**	changing parameters / confirming changes

[1] the centrifuge is working as long as the key is pressed

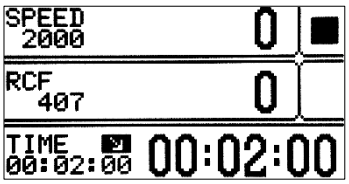
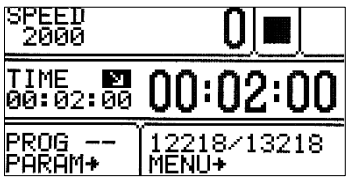
[2] pressing once – will stop the centrifuging with acceleration features set in the current programme, pressing twice – will make the centrifuging as fast as possible (quickest feature). During the setting of parameters, you can use this button for exiting zones on the primary screen without introducing changes.

6.2 *Display*

The display is located in the centre of the control panel. The main screen variants are presented below.

After switching on of centrifuge, the welcome screen will appear. On the next screen, it is then possible to set up parameters.

The user can choose between two types of screen.
The **SIMPLIFIED SCREEN** is set by default.

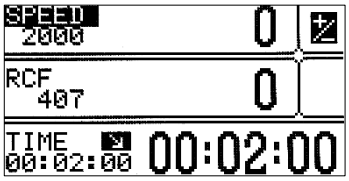
TYPES OF MAIN SCREEN	
SIMPLIFIED DISPLAY (seting default)	**NORMAL DISPLAY**
	

6.2.1 *Setting up RPM, RCF, TIME, temperature on the SIMPLIFIED DISPLAY*

On the screen, it is possible to set:

ROTATING SPEED - RPM	**SPEED**
RELATIVE CENTRIFUGAL FORCE	**RCF**
CENTRIFUGING TIME	**TIME**

Exemple of change of **SPEED** or **RCF** setting:



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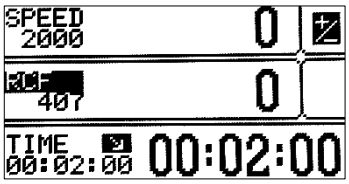
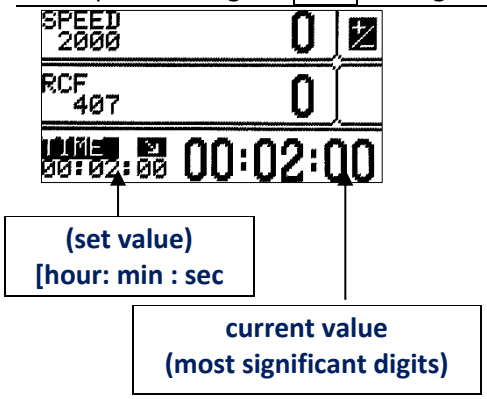


- Press **SET** (to enter edit mode).
- With ▲▼ keys mark **SPEED** or **RCF** (the selected tab will be highlighted).
- Press **SET** (- flashing).
- Choose demanded order of magnitude by pressing ◄►.
- Set demanded value by pressing ▲▼.
  Repeat above two steps for other orders of magnitude.
- Confirm set value by pressing **SET**.
- Leave edit mode by pressing **BACK**.

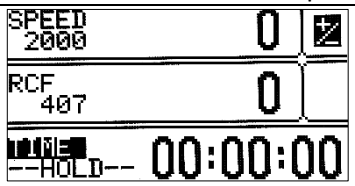
When RPM is changed, RCF is automatically corrected, and vice versa.

Example of change of **TIME** setting:



- Press **SET** (to enter edit mode).
- With ▲▼◄► keys, select **TIME**.
- Press **SET** (- flashing).
- Set required value by pressing ▲▼.
- Choose “hours”, “minutes” or “seconds” by pressing ◄►, e.g.: **00**:02:00**.**
  Repeat above two steps for other orders of magnitude.
- Confirm set value by pressing **SET**.
- Leave edit mode by pressing **BACK**.

HOLD mode - Continuous operation mode. To end centrifuging in HOLD mode press **STOP**.



- To run centrifuging in **HOLD** mode set **00:00:00** time.

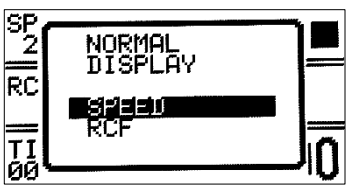
6.2.2 *Switching between the screen*

Switching the **SIMPLIFIED** display to **NORMAL** display:

Method I.

Press the **BACK** button for **1 sec.** to return to the basic display (a short menu is displayed on the screen)

- Via ▲▼ keys select **DISPLAY.**



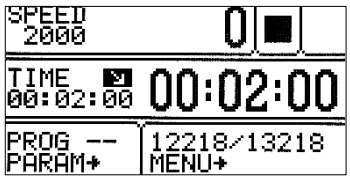
- Via ▲▼ keys select **SPEED/RCF.**

Depending on what you want to appear on the **NORMAL** display.

- Press **SET**

Switching the **NORMAL** display to **SIMPLIFIED** display:

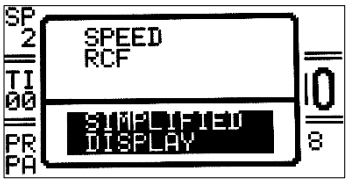
Method I.



- Press **SET** (to enter edit mode).
- Via▲▼◄►keys select **MENU**.
- Press **SET.**
- Via◄► keys select **CONFIGURATION** tab.
- Press **SET.**

- Via▲▼ keys select **SIMPLIFIED DISPLAY** tab.
- Press **SET**.
- Leave menu via **BACK** key **x2**.

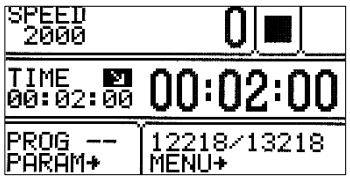
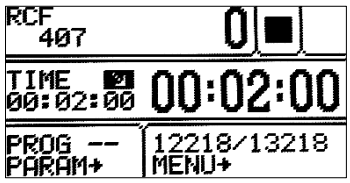
Method II.



Press the **BACK** button for **1 sec.** to return to the basic display (a short menu is displayed on the screen)

- Via▲▼ keys select **SIMPLIFIED DISPLAY** tab.
- Press **SET**.

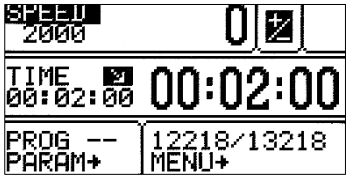
6.2.3 *Setting up RPM, RCF, TIME, temperature on the NORMAL DISPLAY*

NORMAL DISPLAY	
Display mode SPEED	**Display mode RCF**
	

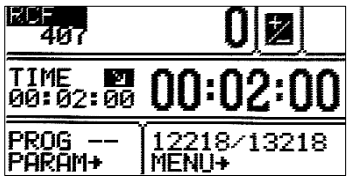
Switching between display **SPEED** and **RCF**:

Switching between **RPM** and **RCF** display mode can be done by pressing and holding the key for **1s**:

Example of change of **SPEED** or **RCF** setting:



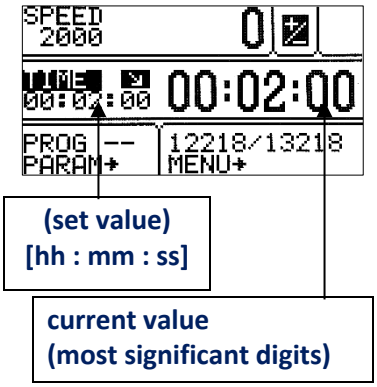
lub



- Press **SET** (to enter edit mode).
- With ▲▼◄► keys mark **SPEED** or **RCF**
- Press **SET** (- flashing).
- Choose requested order of magnitude by pressing ◄►.
- Set preferred value by pressing ▲▼.
  Repeat above two steps for other orders of magnitude.
- Confirm set value by pressing **SET**.
- Leave edit mode by pressing **BACK**.

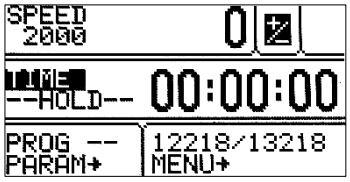
When RPM is changed, RCF is automatically corrected and vice versa.

Example of change of **TIME** setting:



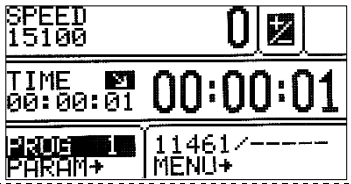
- Press **SET** (to enter edit mode).
- With ▲▼◄► keys, select **TIME**.
- Press **SET** (- flashing).
- Choose "hours", "minutes" or "seconds" by pressing ◄►, e.g.: **00**:02:00**.**
- Set requested value by pressing ▲▼.
  Repeat above two steps for other orders of magnitude.
- Confirm set value by pressing **SET**.
- Leave edit mode by pressing **BACK**.

HOLD mode - Continuous operation mode (to end centrifuging in HOLD mode press **STOP**).

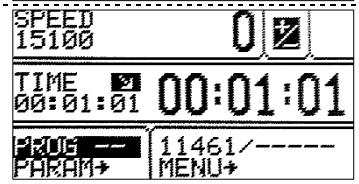


To run centrifuging in **HOLD** mode, set **00:00:00** time.

6.3 *Users programmes*

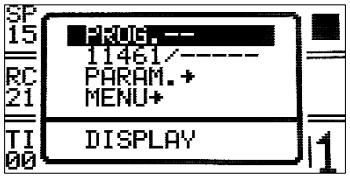


After switching centrifuge on, programme that was used in previous session is being loaded.



Modification during run is represented by **PROG – –** symbol.

6.3.1 *Choosing programme on the SIMPLIFIED DISPLAY.*

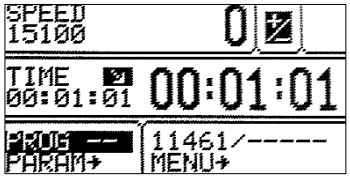


Press the **BACK** button for **1 sec.** to return to the basic display (a short menu is displayed on the screen)

- With ▲▼ keys, select **PROG.**
- Press **SET.**

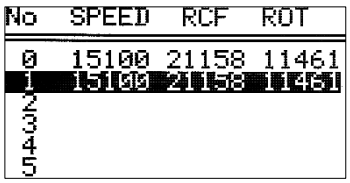
Next, you should proceed in accordance with point 6.3.2.1 Choosing programme**.**

6.3.2 *Choosing programme on the BASIC DISPLAY*



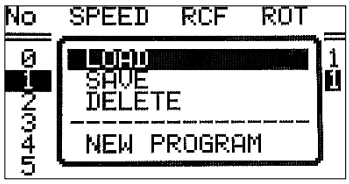
- Press **SET** (to enter edit mode).
- With ▲▼◄► keys mark **PROG.**
- Press **SET**.

6.3.2.1 Choosing programme

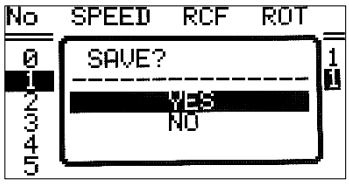


The programme list is displayed

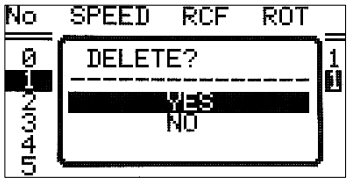
- With ▲▼ keys choose requested programme number.
- Press **SET -** the selection frame will appear.



With ▲▼ keys, choose one of four options
LOAD, SAVE, DELETE:
– current loaded programme.



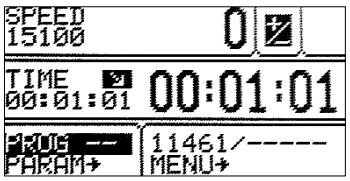
Use the ▲▼ buttons to select:
LOAD – load programme,
SAVE – save settings as a programme
(confirm by selecting **YES** and pressing **SET**).
DELETE – delete programme
(confirm by selecting **YES**).



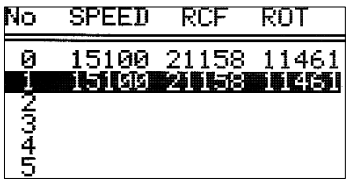
NEW PROGRAM – enter to create new programme mode (as below**).**

- Press **SET.**
- Press **BACK.**

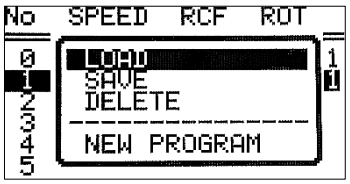
6.3.2.2 Creating a new programme



- Press **SET** (to enter edit mode).
- Via ▲▼◄► keys, select **PROG**. field.
- Press **SET.**
  The programme list appears.



- Press **SET.**
  Selection frame appears.
- Via ▲▼ keys mark **NEW PROGRAM** field.
- Press **SET.**
- Set required parameters for centrifuging
  (look 6.2 Screen).
- Via ▲▼◄► keys mark **PROG** field.
- Press **SET.**



The programme list appears.

- Via ▲▼ **keys,** choose required programme number (0-99)
- Confirm by **SET** pressing.
- Via ▲▼◄► keys, select **SAVE** field.
- Press **SET**.

Choose **SAVE**, a confirmation screen will appear, select **YES** . The new programme has been created.
To set it to work, select **LOAD**.

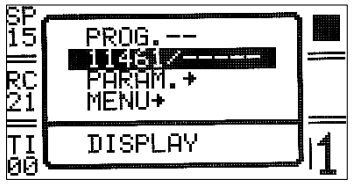
- Press **SET.**
- Via ▲▼ keys mark **LOAD** field.
- Press **SET.**

Changing parameters during run

There is a possibility to change parameters: **SPEED, RCF, TIME, PARAM.** during centrifuging.
Any modification during run is represented by **PROG – –** symbol (instead of the programme number).

6.4 *Choosing rotors and container*

6.4.1 *Choosing rotors and container on the SIMPLIFIED SCREEN*

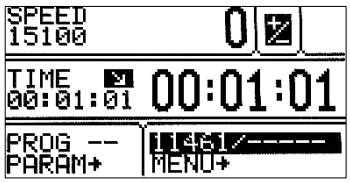


Press the **BACK** button for **1 sec.** to return to the basic display (a short menu is displayed on the screen)

- With ▲▼◄► keys, select **11213 / 13276** zone (rotor no. / container no.).
- Press **SET**

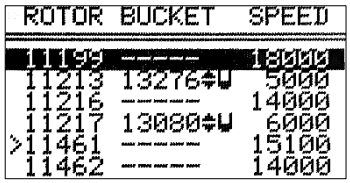
Next, you should follow point 6.4.2.1 Choosing rotors and container.

6.4.2 *Choosing rotors and container on the BASIC DISPLAY*



- Press **SET** (to enter edit mode).
- With ▲▼◄► keys mark **11213/13276** zone (rotor no. / container no.).
- Press **SET**.

6.4.2.1 Choosing rotors and container



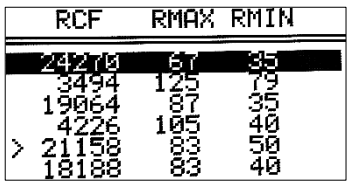
1) Selection of the rotor with a container marked :

- Use the ▲▼ keys to select the desired rotor or rotor number and the container marked .
- Confirm the selection by pressing the **SET** key.
- Press **BACK**.

2) Selection of the rotor with a container marked :

- the ability to change the container.

- Use the ▲▼ keys to select the desired rotor or rotor number and the container marked .



- Press **SET.**
- Use the ▲▼ to select the desired container.
- Confirm the selection by pressing the **SET** key.
- Press **BACK**.
- You can move between screens with rotor parameters using the ◄► keys.

3) Selection of the rotor without container:

- Use the ▲▼ keys to select the desired rotor.
- Press **SET.**

It is possible to set **ROTOR AUTO-IDENTYFICATION**.
The procedure is described in the 8.4.7 Rotor automatic identification chapter.

6.5 *SHORT mode*

In **SHORT** mode, the centrifuge is working as long as the ►►(**SHORT**) key is pressed or when set time is over. Centrifuging ends when the **SHORT** key is released.

6.6 *Terminating centrifugation*

STOPPING CENTRIFUGATION CYCLE

When preselected time is reached, centrifugation will end automatically.

x1

Pressing **STOP** for the first time will stop centrifuging with the charasteristics set in loaded programme. Confirm message by pressing **STOP**.

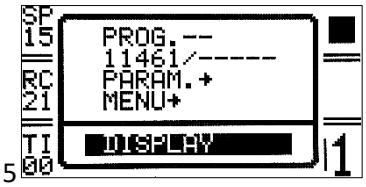
x2

Pressing **STOP** second time will stop centrifuging with the fastest characteristics.

The message may be cancelled with **STOP**, **SET, LID, ▲▼◄► BACK** buttons.

7 Parameters of centrifugation

7.1 *Choosing parameters on the SIMPLIFIED SCREEN*

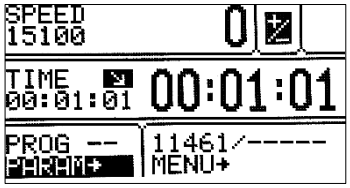


5

Press the **BACK** button for **1 sec.** to return to the basic display (a short menu is displayed on the screen)

- With ▲▼◄► keys mark **PARAM**. field.
- Press **SET.**

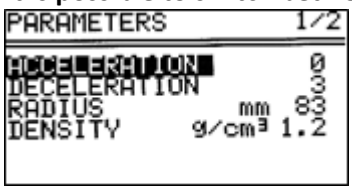
7.2 *Choosing parameters on the BASIC DISPLAY*



- Press **SET** (to enter edit mode).
- With ▲▼◄► keys mark **PARAM**. field.
- Press **SET.**

7.3 *Choosing centrifugation parameters*

It is possible to switch between two different screens Via◄► keys.

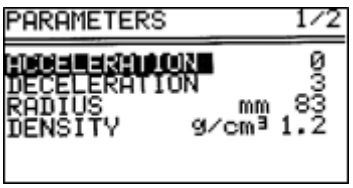


▲▼

ACCELERATION	chosen acc. characteristic (0-the fastest, 9-the slowest)
DECELERATION	chosen dec. characteristic (0-the fastest, 9-the slowest)
RADIUS [mm]	current rotor radius [mm]
DENSITY (g/cm3)	sample density [g/cm^3]
AUT. LID OPEN	Automatic opening of lid after centrifuging
START DELAY	Delay start (after pressing START)

7.3.1 *Accelerating/decelerating – changing characteristics*

ACCELERATION / DECELERATION **PARAM./ ACCELERATION / DECELERATION**



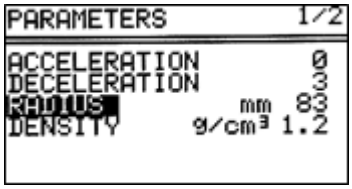
ACCELERATION – 10 linear accelerating characteristics assigned to every rotor. **(0-the fastest, 9-the slowest)**

DECELERATION – 10 linear decelerating characteristics assigned to every rotor (0 ÷ 9). **(0-the fastest, 9-the slowest)**

- With ▲▼◄► keys select **ACCELERATION / DECELERATION** option
- Press **SET** (to enter edit mode).
- Set requested value by pressing ▲▼.
- Press **SET.**
- Press **BACK** x2.

7.3.2 *Radius*

RADIUS [mm] **PARAM./ RADIUS**

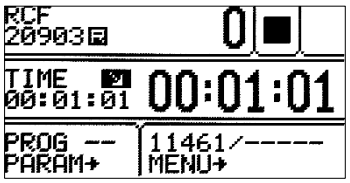


Control of the radius of the rotor within the range from R_{min} to R_{max}. Avalaible values depends on chosen rotor, see ——— / ——— (rotor number / container number)

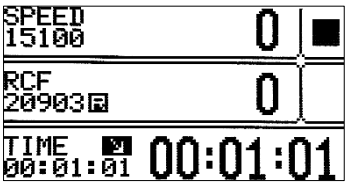
- With ▲▼◄► keys select **RADIUS** option
- Press **SET** (to enter edit mode +/—).
- Set requested value by pressing ▲▼.
- Press **SET.**
- Press **BACK** x2.

When radius change is activated, R symbol is visible on the screen.
Displayed **RCF** will be computed in accordance with the amended radius value.

BASIC DISPLAY

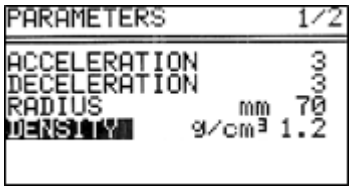


SIMPLIFIED DISPLAY



7.3.3 *Density*

DENSITY (g/cm3)) **PARAM./ DENSITY**



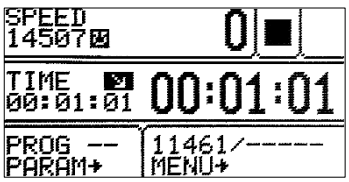
Default density is set to **1,2 g/cm³** (possible values **1,2 ÷ 9,9 g/cm³**).

- With ▲▼ keys, select **DENSITY.**
- Press **SET**-+/— appears.
- Via▲▼ keys choose preferred values.
- Press **SET.**
- Press **BACK** x2.

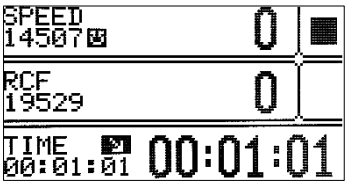
When density is changed, the symbol is visible on the screen. Increasing the density of the sample above **1,2 g/cm³** (and limiting of the maximum speed of centrifuging resulting from it) applies until the switching off of the centrifuge power supply or setting the device back to **1,2 g/cm³**.

Increasing the density reduces the maximum speed of the rotor.

BASIC DISPLAY

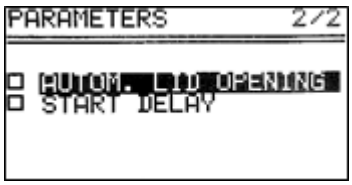


SIMPLIFIED DISPLAY



7.3.4 *Automatic lid opening*

Automatic lid opening **PARAM./ AUTOM. LID OPENING**

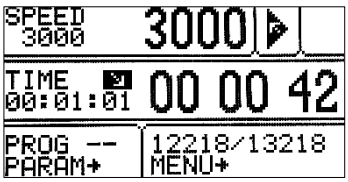


- Via▲▼◄► keys choose **AUTOM. LID OPENING.**
- Press **SET** (to switch off/on).
- Press **BACK** x2.

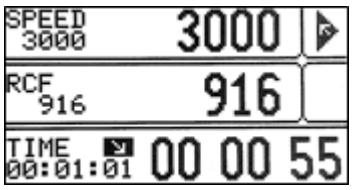
When centrifuge process is finished, lid will open automatically. When centrifuging is terminated by pressing **STOP**, the opening of the lid is possible by pressing **LID**.

symbol means that OPEN LID AFTER RUN is active.

BASIC DISPLAY

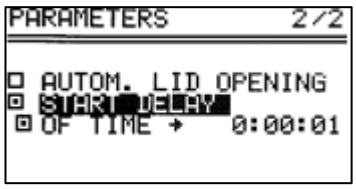


SIMPLIFIED DISPLAY



7.3.5 *STARY DELAY-OF TIME*

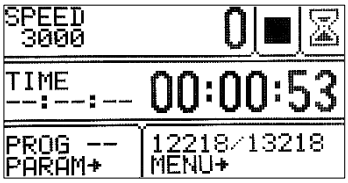
Start centrifuging when preselected delay is reached. PARAM.2/2/ STARY DELAY/OF TIME



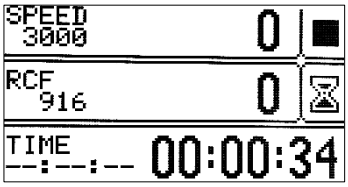
- Via ▲▼ keys, select **START DELAY.**
- Press SET**.**
- Via ▼keys, select **OF TIME**.
- Via ► keys, mark field 0 : 0 0 : 05 (for example).
- Press SET - +/- appears.
- Via ▲▼ keys **SET** demanded values.
- Press **SET**.
- **Confirm** by pressing **SET**.
- Start delay can be set from 0 : 0 0 : 0 1 to 9 : 5 9 : 5 9.
  Press **BACK** x2.

When **START DELAY-OF TIME** function is activated, the symbol is visible on the screen.

BASIC DISPLAY

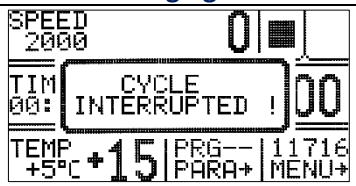


SIMPLIFIED DISPLAY



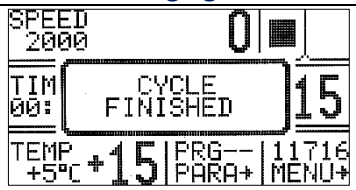
7.3.6 *Screen messages*

End of centrifuging – manual mode



Centrifuging may be stopped at the any time via the **STOP** key. The information message:
CYCLE INTERRUPTED will be displayed

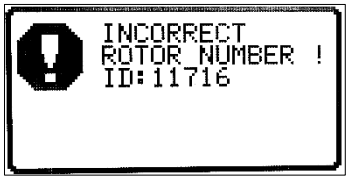
End of centrifuging – manual mode



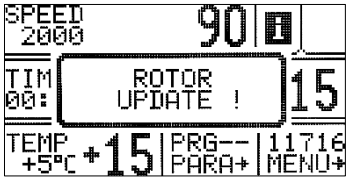
Completion of centrifuging as per the set time will generate a **multiton audible signal** (after the rotor has stopped) and displaying of the following message:
CYCLE FINISHED

Additional messages

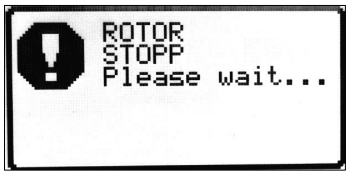
In case of power shortage while centrifuging, after repeated attempts at switching on, the following error screen will be displayed:
SUPPLY DECAY WHILE CENTRIFUGING



Identified number of the installed rotor is not compatible with the number of rotor entered in programme.



The rotor is automatically updated (when auto-identification is enabled).



Rotor is braking (only when centrifuge was switched off during the running of the rotor).

After pressing the **STOP**, **SET, LID, ▲▼◄►** or **BACK** key, the device returns to the main screen.

Screen messages that may occur during operation.

MESSAGE	EXPLANATION
"SPEED OF ROTOR" "IDENTIFICATION <> 90 RPM"	ROTOR IDENTIFICATION SPEED <> 90 RPM
"IMBALANCE FAST STOP !" "PLEASE REMOVE CAUSE" "THEN RESTART"	UNBALANCE DETECTED
"NO ROTOR OR IDENTIFICATION" "SENSOR DAMAGED !"	ROTOR IDENTIFICATION ERROR {LIMIT OF 6SEC. IS OVER}
"INCORRECT ROTOR NUMBER !"	ROTOR'S ID NOT CORRECT
"WRONG DIRECTION OF ROTATION" "OR UNKNOWN ROTOR !"	WRONG DIRECTION OF ROTATION / UNKNOWN ROTOR
"PLEASE CLOSE THE LID" "HAND !"	CLOSING THE LID MANUALLY
"ROTOR STOPPING !" "Please wait..."	INITIALIZING AFTER MAINS FAILURE WITH ROTATING ROTOR
" CYCLE'S ABORTED !"	CENTRIFUGING ENDED BY PRESSING STOP
" CYCLE'S FINISHED"	CENTRIFUGING ENDED {WITHOUT ERRORS}

Emergency messages.
In case of emergency messages (centrifuge is not working properly), contact the manufacturer's authorised service centre.
MESSAGE
"OVERHEATING MOTOR !" "INVERTER ERROR !"
"INVERTER SERIAL BUS ERROR !"
"OPENING LID in RUN!"
"SPEED METER ERROR"
"I2C BUS ERROR"
"ROTOR OVERSPEED !"
"LID LOCK MALFUNCTION !"

7.4 *Unbalance*

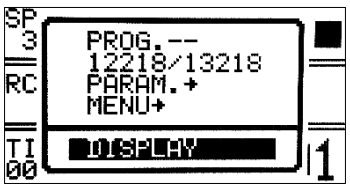
The centrifuge is provided with the rotor unbalance sensor and when activated, the centrifugation process will be stopped through fast braking and at the same time an error message will be displayed. Cancellation of this error is only possible through pressing **BACK, STOP, LID, SET** or using ▲▼◄► keys after the rotor has stopped.

The user must check whether the rotor was correctly loaded, close the lid and restart the programme. In order to protect the rotor against beating in opposite areas of the rotor, it has to be provided with identically filled buckets, carriers, test-tubes etc. for getting the best balance possible.

Unbalance causes noise and vibrations during operation, and adversely affects power transmission system (motor, shock absorbers). The better balance, the smoother will be the centrifuge operation and therefore the longer life of the centrifuge. Moreover, the ideal separation level is then obtained, as already separated constituents would not be moved up by vibration.

8 Screen menu

8.1 *Starting MENU on the SIMPLIFIED DISPLAY*

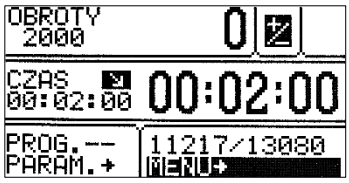


Press the **BACK** button for **1 sec.** to return to the basic display (a short menu is displayed on the screen)

- Via ▲▼ keys, select **MENU**.
- Presss **SET**.

Next, you should proceed in accordance with point 8.3 MENU navigation.

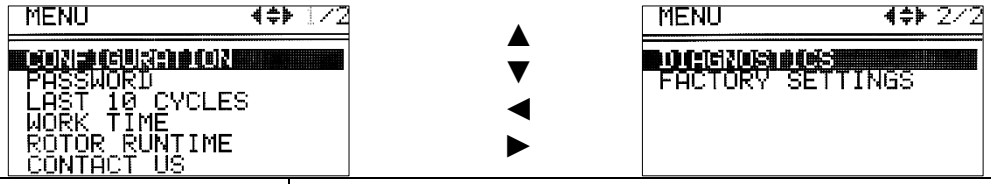
8.2 *Starting MENU on the NORMAL DISPLAY*



- Press **SET** (to enter edit mode).
- Via ▲▼◄► keys, select **MENU**.
- Press **SET**.

8.3 *MENU navigation*

- Moving within the **MENU** is possible via ▲▼◄►keys.
- To open required field, user should select it and press **SET**.



CONFIGURATION	centrifuge configuration
PASSWORD	password protection
LAST 10 CYCLES	10 last centrifugation cycles history
WORK TIME	total working time, working cycles counter
ROTOR RUNTIME	counting time mode
CONTACT US	manufacturer's details
DIAGNOSTICS	error codes (service field)
FACTORY SETTINGS	restore factory settings

8.4 *Configuration*

MENU/CONFIGURATION

- With ▲▼ keys, select **CONFIGURATION**.
- Press **SET**.

8.4.1 *Screen saver*

Setting time of screen saver **MENU / CONFIGURATION / SCREEN**

- With ◄► keys, select **SCREEN 1/6**.
- With ▲▼ keys, select **SCREENSAVER**.
- Press **SET**.
- With ▲▼ keys, choose **15 min**.
- Press **SET** (+/- - activates the editing mode).
- With ▲▼ keys select demanded value from 1 to 60 minutes.
- Mark selection by pressing **SET.**
- Leave the menu by pressing **BACK** x2.

8.4.2 *Visual alarm*

Visual alarm **MENU / CONFIGURATION / SCREEN**

- With ◄► keys, select **SCREEN 1/6**.
- Via ▲▼ keys, choose **VISUAL ALARM**.
- Select it by pressing **SET**.
- Leave the menu by pressing **BACK** x2.

VISUAL ALARM causes the screen to flash after centrifuging has completed or after an error has occurred.

8.4.3 *Counting time*

The method of counting time **MENU/CONFIGURATION/ ROTATING RUNTIME**

- With ◄► keys, select **ROTATING RUNTIME 2/6.**
- Via ▲▼, choose preferred option.
- Select it by pressing **SET**.
- Leave menu via **BACK** key x2**.**

Counting from:

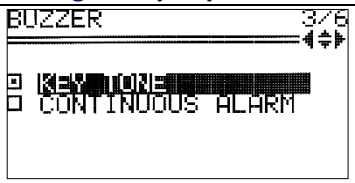
FROM PRESSING START	Counting from rotor is identification
FROM REACHING SPEED	Counting from assigned speed

Presenting mode:

DESCENDING	Counting down
ASCENDING	Counting up

8.4.4 *Buzzer*

Switching ON/OFF of short audible signals accompanying the pressing of any key. **MENU/ CONFIGURATION /BUZZER**

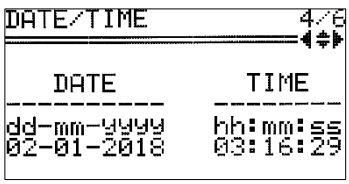


- With ◄► keys, select **BUZZER 3/6.**
- With ▲▼ keys, select preferred option.
- Select by pressing **SET**.
- Leave menu via **BACK** key x2.

Warning signals are always switched on.

8.4.5 *Date/time*

Setting up time and date **MENU/ CONFIGURATION /DATE/TIME**



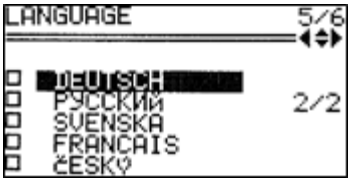
- With ◄► keys, select **DATE/TIME 4/6.**
- Press **SET**.
- Via◄► keys, choose preferred value.
- Press **SET**.
- Via ▲▼ keys, change value.
- Confirm by pressing **SET**.
  Repeat above steps for other values.
- Press **BACK** x2.

Set date and time remain active even after the restart of the centrifuge.

8.4.6 *Language*

Changing menu language **MENU / CONFIGURATION / LANGUAGE**

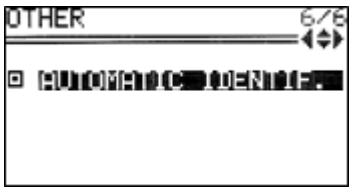
- With ◄► keys, select **LANGUAGE 5/6.**
- Via ▲▼ keys, choose requested menu language.
- Select it by pressing **SET.**
- Press **BACK** x2**.**



8.4.7 *Rotor automatic identification*

Rotor automatic identification **MENU / CONFIGURATION / OTHER**

When selecting **AUTOMATIC IDENTIFICATION**, the centrifuge automatically identifies the rotor in the chamber. Rotor identification is indicated by the message.
When the function is deactivated, it is necessary to manually select the desired rotor as described in 6.4 Choosing rotors.



The AUTOMATIC IDENTIF. is turned on by default.

- With ◄► keys, select **OTHER 6/6.**
- Via ▲▼ keys, choose.
- ☐ AUTOMATIC IDENTiF.
- Press **SET** (☐ change to ⊡).
- Press **BACK** x2.

Warning!
After selecting automatic detection of the rotor, check that the container number is correct, for example 11213/13276 (rotor number / container number).
In the AUTO IDENTIFICATION process, the rotor is automatically detected.
It is necessary to set the container manually in accordance with section 6.4 Choosing rotors and container.

8.5 *Password*

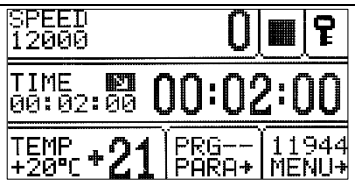
Setting up password **MENU / PASSWORD**

To prevent from unauthorised use, a PASSWORD can be set.
Note: No PASSWORD is set by default.
The PASSWORD can be set as follows when the rotor is at a standstill.

- Press the ▲▼ keys until **PASSWORD** appears**.**
- Press **SET** x2.
- With ▲▼ keys, choose a 4 digit PASSWORD. e.g.: **1234**.
- Press ►.
- With ▲▼ keys, set correct value.
- Repeat above steps for all places.
- Press **SET**.

As a confirmation, you will be ask repeat the steps described above.

When the **PASSWORD** is set, the Key sign is displayed in the **CODE** zone.
It is also displayed in the main menu (in the upper right corner of the screen).



From then on, access to the **MENU** is only possible after entering the password. In case of incorrect password, the following message will appear: **ACCESS DENIED**

To delete the PASSWORD, "**0000**" must be set.
If the **PASSWORD** is forgotten, the emergency code "**7654**" should be used to clear password and remove all locks.

Setting up locks

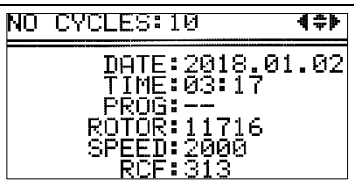
- With ▲▼ keys, choose a lock.
- Mark a lock by pressing **SET**.
- Repeat above steps for desired locks.
- Leave menu with **BACK** key **x2**.

LOCKS*	DESCRIPTION
SAVE PROGRAM	▪ no programmes can be saved.
DELETE PROGRAM	▪ no programmes can be deleted. ▪ saving programmes on position where one was already stored is disabled.
CHANGE PARMETERS Fields: **1.** SPEED **2.** RCF **3.** TIME **4.** PROG **5.** — / –- **6.** PARAM	▪ parameters cannot be modified.
LOAD PROGRAMME	▪ no programmes can be called up.
START KEY	▪ centrifugation can not be started.

***** Executing disabled procedures is only possible after entering the correct password.

8.6 *10 cycles*

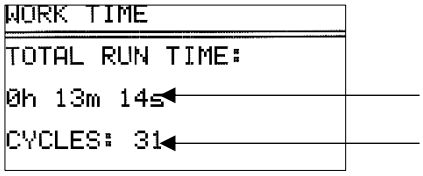
Information concerning parameters of last 10 centrifuging cycles. **MENU / LAST 10 CYCLES**



- Press the ▲▼ keys until **10 CYCLES** appears.
- Press **SET.**
- Number of cycles can be changed by ◄► keys.
- The list can be scrolled through using ▲▼ keys.
- To exit press **BACK** key x3.

8.7 *Work time*

Total working time of centrifuge **MENU/ WORK TIME**



- Press the ▲▼ keys until **WORK TIME** appears**.**
- Press **SET.**

The tab informs the user about the total working time of the centrifuge and number of cycles.

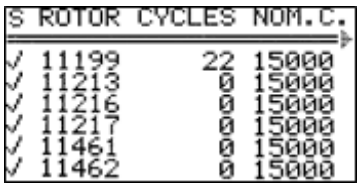
total working (centrifugation) time

working cycles counter

- Press **BACK** x3**.**

8.8 *Rotor cycles*

Information about the centrifuge run time and the quantity of working cycles for each rotor. The table also contains icons warning about the execution of the validation. **MENU / ROTOR RUNTIME**



- Press the ▲▼ keys until **ROTOR RUNTIME** appears.
- Press **SET**.
- The list can be scrolled through using ▲▼ keys.
- To exit press **BACK** key **x2**.

Symbols:

✓ – more than 100 cycles left

– less than 100 cycles left

– worn rotor

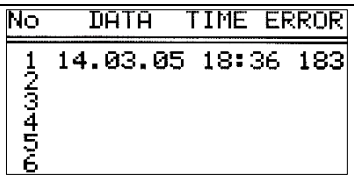
8.9 *Manufacturer's details*

Information about the type of the centrifuge, firmware version, and contact details. **MENU / CONTACT US**

- Press the ▲▼ keys until **CONTACT US.**
- Press **SET**.
- The list can be scrolled through using the ▼►keys.
- To exit press **BACK** key x2.

8.10 *Diagnostics*

Information about errors during the operation of the centrifuge. **MENU / DIAGNOSTICS**



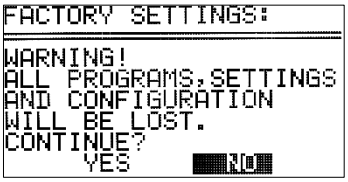
- Press the ▲▼ keys until **DIAGNOSTICS.**
- Press **SET**.

For service staff!

8.11 *Factory settings*

Restoring factory settings. **MENU / FACTORY SETTINGS**

All settings of user programmes will be deleted.



- Press the ▲▼ keys until **FACTORY SETTINGS** appears**.**
- Press **SET**.
- Via ◄► keys, choose **YES** or **NO**.
- Confirm by pressing **SET**.

9 Maintenance

9.1 *Cleaning of the centrifuge*

For cleaning purposes, use water with soap or other water soluble mild detergent. Corrosive and aggressive substances should be avoided.It is prohibited to use alkaline solutions, inflammable solvents or agents containing abrasive particles.

- Do not lubricate the centrifuge motor shaft.
- If unused, the centrifuge should have its lid opened.

Once a week

Using a wiping cloth, remove condensate or residues of the products from the rotor chamber.

Once a month

Check the rotor clamping thread. In case of damage, replace it.

Check the centrifuging chamber for damage. In case of damage, it can no longer be used. Notify an authorised service workshop.

9.2 *Maintenance of centrifuge elements*

To ensure a uniform deflection of the buckets and quiet centrifuge operation:

Cleaning of the accessories

- In order to ensure a safe operation, the user must carry out regular periodical maintenance of the accessories.
- Rotors, buckets and round carriers have to withstand high stresses originating from the centrifugal force. Chemical reactions as well as corrosion (combination of variable pressure and chemical reactions) can cause destruction of metals.
- Hard to observe surface cracks increase gradually and weaken material without visible symptoms.

Wipe the rotor's pins clean and dry with a paper towel after approx. 400 uses, cleaning or/and autoclaving and then lubricate socket with the petroleum jelly (catalog no.**17201**).

- In case of surface damage, crevice or other change, as well as corrosion, the given part (rotor, bucket, etc.) shall be immediately replaced.
- Clamping rotor, containers and reducer inserts must be cleaned regularly to prevent corrosion.
- Cleaning of the accessories shall be carried out outside of the centrifuge at least once weekly or after each use. To clean them, the user should use neutral agent of pH value 6÷8. It is forbidden to use alkaline agent of pH > 8. The parts should then be dried using a soft fabric or in the chamber drier at ca. 50°C.
- The angle rotor should be placed on a fabric with holes facing down, for effective drying.
- Do not use bleach on plastic parts of the rotor.
- Following the above advice will ensure the useful service life of the device is substantially increased and susceptibility to corrosion is diminished. Accurate maintenance increases the service life and protects against premature rotor failures.
- Do not use bleach on plastic parts of the rotor.
- According to laboratory standards, minimize the immersion time in each solution.
- Aluminium parts are especially prone to the corrosion.
- Corrosion and damages resulting from insufficient maintenance may not be subject of claims lodged against the manufacturer.
- The unused rotor should have the lid removed.

HS accessories maintenance:

- Check the general condition of seals.
- Make sure that rubber O-rings are lightly coated with silicone grease. Use high vacuum grease, e.g. type „C" by LUBRINA.
- The rotor pins should always be lubricated with **petroleum jelly**.

9.3 *Sterilization*

Plastics - legend to abbreviations

PS	-	polystyrene	**ECTFE**	-	ethylene/chlorotrifluoroethylene
SAN	-	styrene-acrylonitrile	**ETFE**	-	ethylene/tetrafluoroethylene
PMMA	-	polymethyl methacrylate	**PTFE**	-	polytetrafluoroethylene
PC	-	polycarbonate	**FEP**	-	tetrafluoroethylene/perfluoropropylene
PVC	-	polyvinyl chloride	**PFA**	-	tetrafluoroethylene/perfluoroalkylvinylether
POM	-	acetal polyoxymethylenel	**FKM**	-	fluorcarbon rubber
PE-LD	-	low density polyethylene	**EPDM**	-	ethylene propylene diene
PE-HD	-	high density polyethylene	**NR**	-	natural rubber
PP	-	polypropylene	**SI**	-	silicon rubber
PMP	-	polymethylpentene			

All standard disinfectants may be used. Centrifuges and devices are made of different materials and the user should consider their variety.

	radiation β radiation γ 25 kGy	C_2H_4O (ethylene oxide)	formalin, ethanol
PS	●	○	●
SAN	○	●	●
PMMA	●	○	●
PC	●	●	●
PVC	○	●	●
POM	●	●	●
PE-LD	●	●	●
PE-HD	●	●	●
PP	●	●	●
PMP	●	●	●
ECTFE, ETFE	○	●	●
PTFE	○	●	●
FEP, PFA	○	●	●
FKM	○	●	●
EPDM	○	●	●
NR	○	●	●
SI	○	●	●

● można stosować
○ nie stosować

In the centrifuge, disinfectants and cleaning agents generally used in medical care should be used (e.g. Aerodesina-2000, Lysoformin 3000, Melseptol, Melsept SF, Sanepidex, Cutasept F).

9.4 *Autoclaving*

- Rotors, buckets and round carriers can be sterilized in autoclave with temperature of up to 121°C for 20 min (215 kPa), unless otherwise specified in the OPTIONAL ACCESSORY.
- During sterilization (autoclaved) by means of steam, the user should consider the temperature resistance of individual materials.
- Deformation of the accessories (carriers or lids made of plastic) may occur during autoclaving.
- Do not autoclave disposable materials (e.g. tubes, cyto-container).
- The life of the accessory depends on the frequency of autoclaving and use.
- Autoclaving reduce the lifespan of plastic and mechanical components. PC tubes in particular can become unusable.
- Pressure in closed containers can cause plastic deformation or explosion.
- Prior to autoclaving the rotors and accessories, wash thoroughly and rinse with distilled water.
- Never exceed the permissible autoclaving temperature and time.
- If you want to keep the hermetic seals, replace the sealing rings after each autoclave.

Chemical resistance of plastics

	autoclaving 121 °C, 20 min		autoclaving 121 °C, 20 min
PS	○	PMP	●
SAN	○	ECTFE, ETFE	●
PMMA	○	PTFE	●
PC	●	FEP, PFA	●
PVC	○[1)]	FKM	●
POM	●	EPDM	●
PE-LD	○	NR	○
PE-HD	○	SI	●
PP	●		

● may be used

○ cannot be used

1 Except PVC hoses which are resistant to the steam sterilization in the temperature 121 °C.

9.5 *Chemical resistance*

Chemical resistance of plastics

	aldehydes	cyclic alcohols	esters	ether	ketones	strong or concentrated acids	weak or diluted acids	oxidizing substances	cyclic hydrocarbons	ahs	haloid hydrocarbons	alkalis
PS	○	●	○	○	○	○/●	○/●	○	○	○	○	●
SAN	○	●	○	○	○	○	○/●	○	○	○	○	●
PMMA	○/●	●	○	○	○	○	○/●	○	○/●	○	○	○
PC	○/●	●	○	○	○	○	○/●	○	○/●	○	○	○
PVC	○	●	○	○	○	●	●	○	●	○	○	●
POM	○/●	●	○	●	●	○	○	○	●	●	●	●
PE-LD		●	●	●	○/●	●	●	○	●	●	●	●
PE-HD	●	●	○/●	○/●	○/●	●	●	○	●	○/●	○/●	●
PP	●	●	○/●	○/●	○/●	●	●	○	●	○/●	○/●	●
PMP	○/●	●	○/●		○/●	●	●	○	○/●	○	○	●
ECTFE, ETFE	●	●	●	●	○	●	●	●	●	●	●	●
PTFE, FEP, PFA	●	●	●	●	●	●	●	●	●	●	●	●
FKM	●	○	○	○	○	○	●	○/●	○/●	○/●	○/●	○/●
EPDM	●	●	○/●	○	○/●	●	●	○/●	○	○	○	●
NR	○/●	●	○/●	○	○	○	○/●	○	○	○	○	●
SI	○/●	●	○/●	○	○	○	○/●	○	○	○	○	○/●

● very good	Permanent action of the substance does not cause damage over 30 days. The material is able to be resistant through years of use.
○/● good to limited	Continuous action of the substance causes insignificant and partly reversible damage through the period of 7-30 days (e.g. puffing up, softening, reduced mechanical durability, discolouring).

○ Limited	The material should not have continuous contact with the substance. Immediate damage is possible (e.g. loss of mechanical durability, deformation, discolouring, bursting, dissolving).

Rubber inserts shall be cleaned thoroughly or replaced. Centrifuges and accessories are made of different materials.

DANGER!

- MSE Centrifuges accessorises are not biotight. For centrifuging infectious materials, it is necessary to use hermetically closed tubes meeting demands for biotightness, in order to prevent germs migration into the centrifuge and beyond it.

- User is responsible for proper disinfections of the centrifuge, if some dangerous material is spilled inside or outside of the centrifuge. During the above mentioned procedure, the user must wear safety gloves.

10 Troubleshooting

The majority of faults can be removed by switching the centrifuge OFF and ON. After switching the centrifuge ON, parameters of the last programme will be displayed and sound signals comprising four successive tones will be generated. In case of short-duration power failure, the centrifuge terminates the cycle and displays PROGRAM ERROR code.

PROBLEM	QUESTION	ANSWER
Centrifuge does not start	*Is supply cable plugged into mains?*	*Plugs supply cable correctly.*
	Is master switch ON?	*Switch ON power supply.*
Motor error is displayed		Call service.
Centrifuge does not start (cycle appears to be in progress but motor does not start)	*Is* ▶ *symbol displayed?*	Wait till rotor stops and the ▶ symbol goes off.
	Is ▭ *symbol displayed?*	Close lid ▭ symbol must switch off.
	Is ⋮ *symbol flashing?*	Centrifugation cycle in progress, press **STOP** key or wait till cycle ends.
Centrifuge does not accelerate *(unbalance error)*	*Unequal rotor load.*	Centrifuge load needs to be balanced.
	Inclined centrifuge.	Centrifuge needs to be levelled.
	Faulty drive (mechanical damage).	Call service.
	Was centrifuge displaced during operation.	Switch ON the centrifuge again after opening and closing the lid.
(rotor error)	*After stopping, an error rotor message is displayed*	Check if rotor number in started programme is consistent with the number of the rotor installed in the centrifuge. Check rotor status (if there are coding magnets inserted)
	Centrifuge does not recognize the rotor and does not stop.	Switch the centrifuge OFF, then ON and check that the loaded programme is correct.
It is not possible to open the lid	⋮ *symbol on the display is flashing, after pressing LID key single tone is audible*	Rotor is still rotating. Wait for rotor to stop and the display of the ■ symbol to appear.
	The sensor is connected correctly, and the error still appears	Call service.
Mains failure during run	*The message will appear about the decay of tension.*	Wait for the rotor to stop, clear the error by pressing the SET key.

10.1 Emergency lid release

EMERGENCY LID RELEASE

In case of mains failure, it is possible to open the lid manually. On the right side is the plug, which should be unscrewed (via the key for emergency lid release Ref: 18640 in basic accessories). Then, the user should pull the plug.

It is forbidden to release the lid when the rotor is running!

The user must ensure that the rotor is not in the motion (use glass cover).

11 Guarantee

The Manufacturer grants to the Buyer the guarantee on the conditions specified in the Guarantee Certificate. The Buyer forfeits the right to guarantee repair when using the device inconsistently with the User manual provisions and when damage results from the User's fault.

Repairs should be carried out in authorised service workshops, granted with the MSE Centrifuges Certificate.

The centrifuge shall be sent to repair after decontamination. Information about authorised service workshops can be obtained from the Manufacturer.

12 Disposal

When disposing of the device, the respective statutory rules must be observed pursuant to guideline 2002/96/EC (WEEE).

The device belongs to the 8th group (medical devices) and is categorised in business to business field.

The icon of the crossed-out rubbish bin shows that the device cannot be disposed as part of domestic waste. The waste disposal guidelines of the individual EC countries might vary. If necessary, contact your supplier.

13 Manufacturer's info

MSE Centrifuges Limited

sales (+44) 1435 517000
service (+44) 1435 517005
fax (+44) 1825 700471

sales@mseuk.com

www.mseuk.com

Mytogen House
11 Browning Road
Heathfield
TN21 8DB
UNITED KINGDOM

8:30 - 17:30 GMT (from Monday to Friday)

14 Annexes

Part No	OPTIONAL ACCESSORIES Name	Tube Ref
11199	**Angle rotor 12 x 2/1.5ml. with Hermetically Sealed Lid (angle 45°)** **(max RPM: 18000 max RCF: 24270 x g R max: 6.7 cm)**	15011.15128
14084	Round carrier for 0.5ml tube (O 8mm)	15127
14126	Round carrier for 0.4ml tube (O 5.8mm)	15124
14133	Round carrier for 0.2ml tube (O 6.2mm)	15125
11210C/A	**Angle rotor 24 x 15/10ml. complete with buckets 13080 (O 17x100/120mm) (angle 30°)** **(max RPM: 5000 max RCF: 3996 x g R max: 14.3 cm)**	15048.15050. 15053.15118
14082	Round carrier (O 13.3mm)	15119
11210C/B	**Angle rotor 24 x 10ml. complete with buckets 13081 (O 17x70/85mm) (angle 30°)** **(max RPM: 5000 max RCF: 3996 x g R max: 14.3 cm)**	15053
14082	Round carrier (O 13.3mm)	15054.15120. 15419
11211C/A	**Angle rotor 10 x 50ml for Falcon® tubes. complete with Buckets 13275 or 13278 with PC caps 17151 (angle 30°)** **(max RPM: 5500 max RCF: 4498 x g R max: 13.3 cm)**	15052. 15055. 15117
14248	Round carrier for 30/25ml tube (O 26x102mm)	15055. 15117
11211C/B	**Angle rotor 10 x 50ml for Falcon® tubes. complete with Buckets 13276 (angle 30°)** **(max RPM: 5500 max RCF: 4498 x g R max: 13.3 cm)**	15052
14035	Round carrier for 14ml tube (O 28.5/17x105mm) 25.00	15046
14036	Round carrier for 5ml tube (O 28.5/14x92mm)	
14043	Round carrier for 5ml tube (O 29/13x85mm)	15120. 15419
14071	Round carrier for 30ml tube (O 25x100mm)	15055. 15056. 15117. 15424
14089	Round carrier for 15ml Falcon® tube (O 17x120mm)	15050
14248	Round carrier for 30/25ml tube (O 26x102mm)	15055. 15117

11213C/A	**Angle rotor 8 x 50ml for Falcon® tubes. complete with Buckets 13275 or 13278 with PC caps 17151 (angle 30°)** **(max RPM: 5500 max RCF: 4227 x g R max: 12.5 cm)**	15051. 15052 (z/with 13275)
14248	Round carrier for 30/25ml tube (O 26x102mm)	15055. 15117
11213C/B	**Angle rotor 8 x 50ml for Falcon® tubes. complete with Buckets 13276 (angle 30°)** **(max RPM: 5000 max RCF: 4227 x g R max: 12.5 cm)**	15052
14035	Round carrier for 14ml tube (O 28.5/17x105mm)	15046
14036	Round carrier for 5ml tube (O 28.5/14x92mm)	
14043	Round carrier for 5ml tube (O 29/13x85mm)	15120. 15419
14071	Round carrier for 30ml tube (O 25x100mm)	15055. 15056. 15117. 15424
14089	Round carrier for 15ml Falcon® tube (O 17x120mm)	15050
14248	Round carrier for 30/25ml tube (O 26x102mm)	15055. 15117
11259	**Angle rotor 30 x 2/1.5ml. with Hermetically Sealed Lid (angle 45°)** **(max RPM: 15000 max RCF: 24400 x g R max: 9.7 cm)**	15011. 15128
14084	Round carrier for 0.5ml tube(O 8.0mm)	15127
14126	Round carrier for 0.4ml tube(O 5.8mm)	15124
14133	Round carrier for 0.2ml tube(O 6.2mm)	15125
11273	**Angle rotor 8 x 30ml for Negene tubes. with Hermetically Sealed Lid (angle 30°)** **(max RPM: 12000 max RCF: 14006 x g R max: 8.7 cm)**	15056
11456C/A	**Angle rotor 36 x 15/10ml. complete with buckets 13080 (O 17x100/120mm) (angle 30°)** **(max RPM: 5000 max RCF: 3997 x g R max: 14.3 cm)**	15048.15050. 15053.15118
14082	Round carrier	15119
11456C/B	**Angle rotor 36 x 10ml. complete with buckets 13081 (O 17x70/85mm) (angle 30°)** **(max RPM: 5000 max RCF: 3996 x g R max: 14.3 cm)**	15053
14082	Round carrier	15054.15120. 15419
11741C/A	**Angle rotor 8 x 15/10ml. complete with buckets 13080 (O 17x100/120mm) (angle 30°)** **(max RPM: 6000 max RCF: 4226 x g R max: 10.5 cm)**	15048.15050. 15053.15118
14082	Round carrier (O 13.3mm)	15119

11741C/B	**Angle rotor 8 x 10ml. complete with buckets 13081 (O 17x70/85mm) (angle 30°) (max RPM: 6000 max RCF: 4226 x g R max: 10.5 cm)**	15053
14082	Round carrier (O 13.3mm)	15054.15120. 15419
11743C	**Angle rotor 12 x 30/25ml. complete with buckets 13329 (angle 30°) (max RPM: 85500 ma x RCF: 4058 x g R max: 12 cm)**	15055. 15056
14255	Round carrier for 7ml tube (O 13/100mm)	15054. 15119
14256	Round carrier for 15/10ml tube (O 17/120mm)	15046. 15048. 15053. 15118
11746C	**Angle rotor 6 x 50ml for Falcon® tubes. complete with buckets 13276 (angle 30°) (max RPM: 6000 max RCF: 4427 x g R max: 11 cm)**	15052
14035	Round carrier for 14ml tube (O 28.5/17x105mm)	15046
14036	Round carrier for 5ml tube (O 28.5/14x92mm	
14043	Round carrier for 5ml tube (O 29/13x85mm)	15120. 15419 15055. 15056. 15117. 15424
14071	Round carrier for 30ml tube (O 25x100mm)	15055. 15056. 15117. 15424
14089	Round carrier for 15ml Falcon® tube (O 17x120mm)	15050
14248	Round carrier for 30/25ml tube (O 26x102mm)	15055. 15117
11760	**Angle rotor 24 x 2ml for filter tubes/spin columns. with Hermetically Sealed Lid (angle 45°) (max RPM: 15000 max RCF: 23143 x g R max: 9.2 cm)**	15011. 15128
14084	Round carrier for 0.5ml tube(O 8.0mm)	15127
14126	Round carrier for 0.4ml tube (O 5.8mm)	15124
14133	Round carrier for 0.2ml tube (O 6.2mm)	15125
11944	**Angle rotor 12 x 5ml for Eppendorf® tubes (angle 45°) (max RPM: 15000 max RCF: 21382 x g R max: 8.5 cm)**	
12177	**Swing-out rotor 4 x 250ml (max RPM: 5000 max RCF: 4724 x g R max: 16.9 cm)**	
13174	Bucket 250ml (O 62x107mm)	15175. 15176
14017	Pad (PP) under round bottom bottle 250ml	15017
14120	Round carrier 2x30ml Sterilin® tubes (O 61x80mm)	
14151	Round carrier for 100ml tube (O 46x100mm) and for 14159 round carrier for 50ml round-bottom test tube	15115

14151C	Round carrier 14151 with 14159 round carrier for 50ml round-bottom test tube	
14152	Round carrier 50ml for Falcon® tube (O 30x120mm)	15052
14153	Round carrier 5 x 15ml for conical bottom tubes (O 17/22x120mm)	15050
14154	Round carrier 9 x 5ml (O 13.5x81mm). hermetic type. Short	
14155	Round carrier 12 x 5/7ml (O 13x100mm). open type	15054. 15119. 15120. 15419
14156	Round carrier 8 x 15/10ml (O 17x120mm). hermetic type	15046. 15048. 15118
14157	Round carrier 4 x 15ml (O 61/17x122mm). round-bottom	15053.15118.
14158	Round carrier 12 x 2ml for Eppendorf® tubes (O 61/11x38.5mm)	13174. 13178
14160	Round carrier 3 x 30/25ml (O 61/25.5x100mm)	15116
14175	Pad (PP) under flat-bottom bottle 250ml	
14869	Pad (PP) under 175ml and 225ml FALCON® tubes	
13178C	Bucket 250ml. complete with 17179 cap (Al)	15015. 15017. 15040. 15046. 15048. 15050. 15052. 15053. 15054. 15115.
14017	Pad (PP) under round bottom bottle 250ml	15017
14151	Round carrier for 100ml tube (O 46x100mm) and for 14159 round carrier for 50ml round-bottom test tube	15115
14151C	Round carrier 14151 with 14159 round carrier for 50ml round-bottom test tube	
14152	Round carrier 50ml for Falcon® tube (O 30x120mm)	15052
14153	Round carrier 5 x 15ml for conical bottom tubes (O 17/22x120mm)	15050
14154	Round carrier 9 x 5ml (O 13.5x81mm). hermetic type. Short	
14155	Round carrier 12 x 5/7ml (O 13x100mm). open type	15054. 15119. 15120. 15419
14156	Round carrier 8 x 15/10ml (O 17x120mm). hermetic type	15046. 15048. 15118
14157	Round carrier 4 x 15ml (O 61/17x122mm). round-bottom	15053.15118.
14158	Round carrier 12 x 2ml for Eppendorf® tubes (O 61/11x38.5mm)	13174. 13178
14160	Round carrier 3 x 30/25ml (O 61/25.5x100mm)	15116
14175	Pad (PP) under flat-bottom bottle 250ml	

14869	Pad (PP) under 175ml and 225ml FALCON® tubes	
13180	Bucket 2 x 50ml for Falcon® tubes (O 30x120mm)	15050. 15052
14089	Round carrier for 15ml Falcon® tube (O 17x120mm)	15050
14868C/A	Eppendorf® z zatrzaskiwaną pokrywką lub nakrętką Round carrier 14868 with 14089 round carrier for 5ml Eppendorf® reaction cap or screw cap tube	
12285C	**Microtiter. swing-out rotor head. complete with 2 buckets 13286 for microtiter plates or blocks (85x 130 x 60mm)** **(max RPM: 4500 max RCF: 2626 x g R max: 11.6 cm)**	15102
12300	**Hematocrite rotor for 24 capillaries 75mm** **(max RPM: 13000 max RCF: 16816 x g R max: 8.9 cm)**	15098. 15100
16164	Hematocrite reader – round	
12436	**Swing-out rotor 4 x 200ml** **(max RPM: 5200 max RCF: 4413 x g R max: 14.6 cm)**	
13042	Bucket 2 x 50ml for Falcon® tubes (O 30 x120mm)	15050. 15052
13044	Hanger 4 x 15ml for Falcon® tubes. complete with 13080 buckets (O 17x100/120mm)	15048. 15050. 15053. 15118
14082	Round carrier (O 13.3mm)	15119
13045	Bucket 50ml for Falcon® tube (O 30x120mm)	15051
13437	Bucket 200ml (O 57/100mm)	15440
14072	Round carrier for 50ml tube (O 35x100mm)	15116
14106	Round carrier 7 x 7ml (O 13.5x100mm)	15054. 15119
14108	Round carrier 7 x 10ml (O 17x75mm). short	13437. 13438C
14109	Round carrier 7 x 5ml (O 13.5x75mm). short	15120. 15419
14110	Round carrier 7 x 15/10ml (O 17x110mm)	15046. 15048. 15118
14111	Round carrier 5 x 15ml (O 16.7x110mm)	15048*. 15053. 15118 *- linked only to 13437 and 13438 without lids
14113	Round carrier for 50ml Falcon® tube (O 30x120mm)	15052
14197	Round carrier 100ml (O 46x103.7mm)	15040. 15115
14441	Round carrier 12 x 7ml (O 12.1x100mm)	15119
14446	Round carrier 12 x 5ml (O 12.1x75mm). short	15120. 15419

14447	Round carrier 12 x 1.2ml for S-Monovette® tubes (O 9x66mm)	15016
14449	Round carrier 4 x 12ml (O 56.5/17.1x105). short	15046. 15053. 15118
14450	Round carrier 9 x 2/1.5ml (O 11x38.5mm)	15128
13438C	Round carrier 200ml. complete with lid 17111	15440
14072	Round carrier for 50ml tube (O 35x100mm)	15116
14104	Round carrier 100ml (O 45.5x100mm)	15115
14106	Round carrier 7 x 7ml (O 13.5x100mm)	15054. 15119
14108	Round carrier 7 x 10ml (O 17x75mm). short	13437. 13438C
14109	Round carrier 7 x 5ml (O 13.5x75mm). short	15120. 15419
14110	Round carrier 7 x 15/10ml (O 17x110mm)	15046. 15048. 15118
14111	Round carrier 5 x 15ml (O 16.7x110mm)	15048*. 15053. 15118 *- linked only to 13437 and 13438 without lids
14113	Round carrier for 50ml Falcon® tube (O 30x120mm)	15052
14197	Round carrier 100ml (O 46x103.7mm)	15040. 15115
14441	Round carrier 12 x 7ml (O 12.1x100mm)	15119
14446	Round carrier 12 x 5ml (O 12.1x75mm). short	15120. 15419
14447	Round carrier 12 x 1.2ml for S-Monovette® tubes (O 9x66mm)	15016
14449	Round carrier 4 x 12ml (O 56.5/17.1x105). short	15046. 15053. 15118
14450	Round carrier 9 x 2/1.5ml (O 11x38.5mm)	15128
13593	Bucket 100ml (O 45x94mm)	15040
14181	Round carrier 5 x 2/7ml (O 44.5/12.5x100mm)	13174. 13178
14186	Round carrier 4 x 7ml for Vacutainer® tubes (O 13.1x100mm)	15054. 15119. 15120. 15419
14187	Round carrier 4 x 15/10ml for Vacutainer® tubes (O 16.5x112mm)	15046. 15048. 15053. 15118
14188	Pad (rubber) under 100/50/30/25ml glass tubes	15052. 15115. 15116. 15117

14189C	Round carrier 50ml for Falcon® tube (O 30 x120mm) or Nalgene®. complete with rubber pad 14188	15051. 15052
14190C	Round carrier 30/25ml (O 25.5 x100mm). complete with rubber pad 14188	15055. 15056. 15117
14192C	Round carrier 50ml (O 35 x100mm). complete with rubber pad 14188	15116
14196	PA pad under 100ml PP tube	15040
14226	Round carrier for 50ml conical bottom tube. with skirt - GREINER® (O 13.1x100mm / max height of tube: 117mm)	
12451C	**Microtiter. swing-out rotor head. complete with 2 buckets 13307 for microtiter plates or blocks (85 x 130 x 60mm)** **(max RPM: 3000 max RCF: 1036 x g R max: 10.3 cm)**	15102
12452C	**Cyto rotor. complete with 4 hangers 13606** **(max RPM: 2500 max RCF: 768 x g R max: 10.7 cm)**	
16610	Set of cyto-containers (included positions: 16610.15123.16614. 16616. 16617 - 100 pcs of each)	
12582C	**Swing-out rotor 4 x 40ml for CPT tubes. complete with 13583 buckets and 17185 caps (Al)** **(max RPM: 3200 max RCF: 1809 x g R max: 15.8 cm)**	
14181	Round carrier 5 x 2/7ml (O 44.5/12.5x100mm)	15054. 15119. 15120. 15419
14186	Round carrier 4 x 7ml for Vacutainer® tubes (O 13.1x100mm)	15054. 15119. 15120. 15419
14187	Round carrier 4 x 15/10ml for Vacutainer® tubes (O 16.5x112mm)	15046. 15048. 15053. 15118
14584	Round carrier 4 x 8ml for CPT tubes (O 16 x130mm)	

Item Ref	Name Test tubes
15011	Polypropylene tube 2ml (O 10.8x40mm). round - bottom
15017	Policarbonate bottle 250ml (O 62x122mm). round bottom
15040	Polypropylene tube 100ml with cap (O 44.7/47x103.7mm)
15046	Polypropylene tube 14ml with cap (O 16.8/17.7x106mm)
15048	Polypropylene tube 15ml Nalgene® (O 16x113mm)
15050	Polypropylene tube 15ml with conical bottom
15051	Polypropylene tube 50ml Nalgene® (O 28.8x106.7mm)
15052	Polypropylene tube 50ml with conical bottom. with cap (O 29.5/34x117mm)
15053	Polypropylene tube 10ml with cap (O 16x100mm)
15054	Polypropylene tube 6ml with cap (O 11.7/13.5x95mm)
15055	Polypropylene tube 30ml with cap (O 24.9x103mm)
15056	Policarbonate tube 30ml Nalgene® with cap (O 25.5x94mm)
15067	Polycarbonate tube 85ml Nalgene® with cap (O 37.8x106mm)
15098	Stopper for Capillaries
15100	Capillary tubes heparinized (1.4 x 75mm. 37µl)
15102	Microtiter plate with cap (85.5x127mm)
15115	Glass tube 100ml (O 45x100mm)
15116	Glass tube 50ml (O 35x100mm)
15117	Glass tube 25ml (O 25x100mm)
15118	Glass tube 10ml (O 16x100mm)
15119	Glass tube 7ml (O 12x100mm)
15120	Glass tube 5ml (O 12x75mm)
15122	Polypropylene PCR tube 8x0.2ml with integrated caps (O 6x21mm)
15124	Polypropylene tube 0.4ml with cap (O 5.7x46mm)
15125	Polypropylene tube 0.2ml PCR (O 6x21mm)
15127	Polypropylene tube 0.5ml with cap (O 7.8x30mm)
15128	Polypropylene tube 1.5ml with cap (O 10.8x39mm)
15130	Polypropylene PCR stripe 8x0.2ml (O 6x21mm)
15175	Polypropylene bottle 250ml Herolab (O 62x122mm)
15176	Polycarbonate bottle 250ml Herolab (O 62x122mm)
15419	Polypropylene tube 5ml (O12x85mm) with cap
15424	Polypropylene tube 30ml with cap (O 25.5x94mm)
15440	Polypropylene bottle 200ml with cap (O 56.5x113mm)

DECLARATION OF DECONTAMINATION

(Repair)

In order to protect our employees please fill out the declaration of decontamination fully before sending centrifuge back to MSE (repair).

1. **Device**
   – type: ……
   – serial No.: ……

2. **Description of decontamination**
   (see user manual)
   ……
   ……
   ……
   ……

3. Decontamination carried out by:
   – name: ……

4. **Date and signature** ……

DECLARATION OF DECONTAMINATION

(Return)

In order to protect our employees please fill out the declaration of decontamination fully before sending centrifuge back to MSE (return).

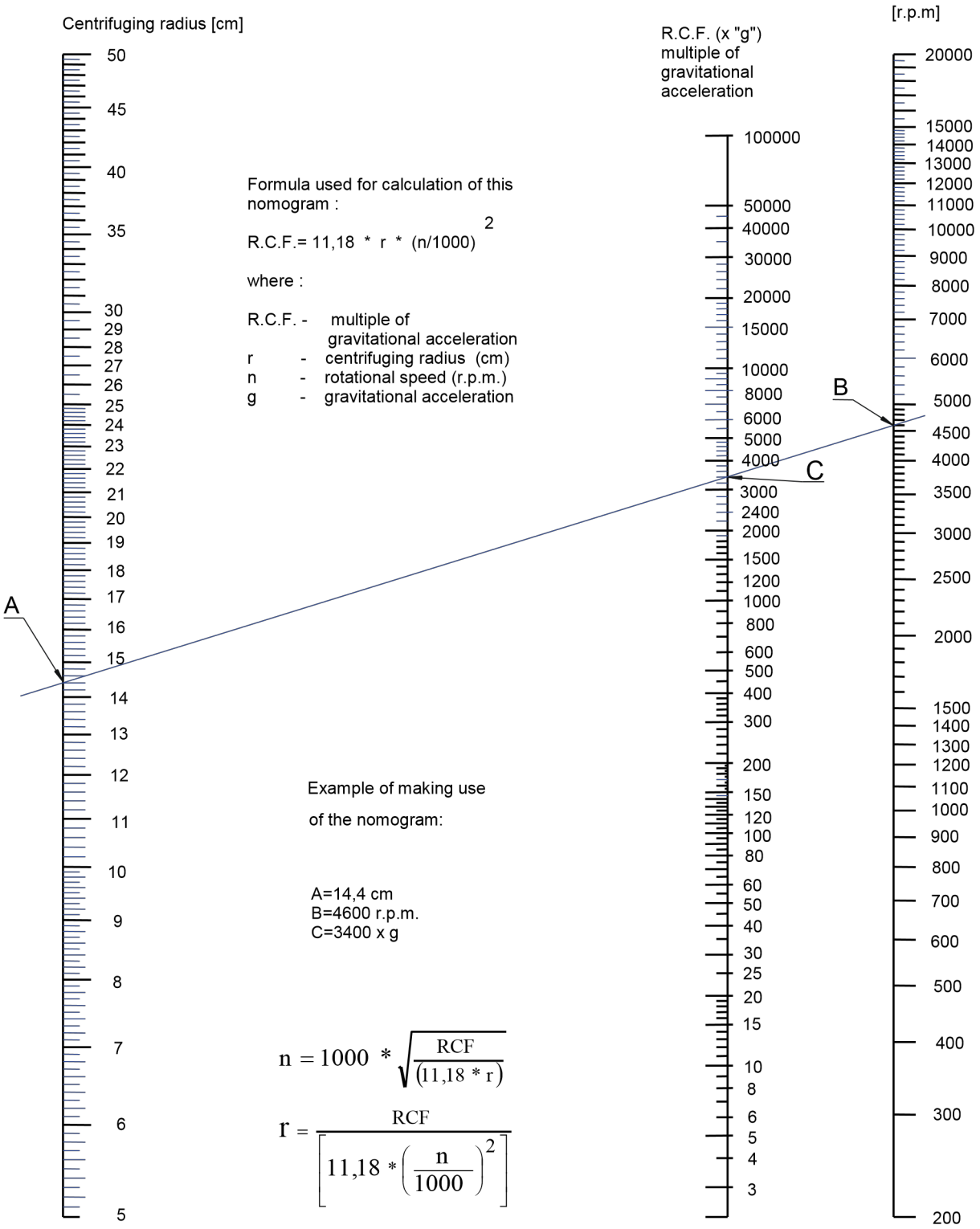
5. **Device**
   – type: ……
   – serial No.: ……

6. **Description of decontamination**
   (see user manual)
   ……
   ……
   ……
   ……

7. Decontamination carried out by:
   – name: ……

8. **Date and signature** ……

NOMOGRAM



$$n = 1000 * \sqrt{\frac{RCF}{(11{,}18 * r)}}$$

$$r = \frac{RCF}{\left[11{,}18 * \left(\frac{n}{1000}\right)^2\right]}$$

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Brand new generation of centrifuges

MICROCENTAUR R

Refrigerated Micro Centrifuge

Maximum speed	**18000** rpm
Maximum RCF	**24270** xg
Maximum Volume	**24 x 2/1.5ml**

HARRIER

General Purpose Centrifuge

Ambient and Refrigerated

Swing Out / Fixed Angle / Microplate

Maximum speed	**18000** rpm
Maximum RCF	**30065** xg
Maximum Volume	**4 x 250ml**

Distributor

11 Browning Road, Heathfield, East Sussex. UK. TN21 8DB
Sales: +44 (0) 1435 517 000
Service : +44 (0) 1435 517 005
www.msecentrifuges.com