

HuMax 3K

| User Manual



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Human

Diagnostics Worldwide

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SYSTEM VERSION

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SERVICE UND SUPPORT



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1 SAFETY INSTRUCTIONS

1.1 Introduction

This manual is considered as a part of the instrument; it has to be at the operator's hand as well as at the maintenance operator's availability. For accurate installation, use and maintenance, please read the following instructions carefully. In order to avoid instrument damage or personal injury, carefully read the "GENERAL SAFETY WARNINGS", describing the suitable operating procedures. In case of breakdowns or any troubles with the instrument, apply to the local Technical Service.

1.2 User Warranty

HUMAN warrants that instruments sold by one of its authorised representatives shall be free of any defect in material or workmanship, provided that this warranty shall apply only to defects which become apparent within one year from the date of delivery of the new instrument to the purchaser.

The HUMAN representative shall replace or repair any defective item at no charge, except for transportation expenses to the point of repair.

This warranty excludes the HUMAN representative from liability to replace any item considered as expendable in the course of normal usage, e.g.: lamps, valves, syringes, glassware, fuses, diskettes, tubing etc.

The HUMAN representative shall be relieved of any liability under this warranty if the product is not used in accordance with the manufacturer's instructions, altered in any way not specified by HUMAN, not regularly maintained, used with equipment not approved by HUMAN or used for purposes for which it was not designed.

HUMAN shall be relieved of any obligation under this warranty, unless a completed installation / warranty registration form is received by HUMAN within 15 days of installation of this product.

This warranty does not apply to damages incurred in shipment of goods. Any damage so incurred shall be reported to the freight carrier for settlement or claim.

1.3 Intended Use of the Instrument

The instrument is intended for diagnostic application by professional users. It has to be used for the expected purposes and in perfect technical conditions, by qualified personnel, in working conditions and maintenance operations as described in this manual, according to the GENERAL SAFETY WARNINGS. This manual contains instructions for professional qualified operators.

1.4 General Safety Warnings

Use only chemical reagents and accessories specified and supplied by HUMAN and/or mentioned in this manual. Place the product so that it has proper ventilation.

The instrument should be installed on a stationary flat working surface, free from vibrations.

Do not operate in area with excessive dust.

Work at room temperature and humidity, according to the specifications listed in this manual.

Do not operate this instrument with covers and panels removed.

Only use the power cord specified for this product, with the grounding conductor of the power cord connected to earth ground.

Use only the fuse type and rating specified by the manufacturer for this instrument, use of fuses with improper ratings may pose electrical and fire hazards. To avoid fire or shock hazard, observe all ratings and markings on the instrument.

Do not power the instrument in potentially explosive environment or at risk of fire.

Prior to cleaning and/or maintaining the instrument, switch off the instrument and remove the power cord.

For cleaning use only materials specified in this manual, otherwise parts may become damaged. It is recommended always to wear protective apparel and eye protection while using this instrument. Respective warning symbols, if appearing in this manual, should be carefully considered.

1.5 Disposal Management Concept

The currently valid local regulations governing disposal must be observed. It is in the responsibility of the user to arrange proper disposal of the individual components.

All parts which may comprise potentially infectious materials have to be disinfected by suitable validated procedures (autoclaving, chemical treatment) prior to disposal. Applicable local regulations for disposal have to be carefully observed.

The instruments and electronic accessories (without batteries, power packs etc.) must be disposed off according to the regulations for the disposal of electronic components.

Batteries, power packs and similar power source have to be dismantled from electric/electronic parts and disposed off in accordance with applicable local regulations.

1.6 Biohazard warning

Analytical instruments for diagnostic application involve the handling of human samples and controls which should be considered at least potentially infectious. Therefore every part and accessory of the respective instrument which may have come into contact with such samples must equally be considered as potentially infectious.

For safety reasons, we have labeled instruments with the „BIOHAZARD“ warning label below.



FIGURE 1

Biological Hazard Symbol

1.7 Instrument Disinfection

Before doing any servicing on the instrument it is very important to thoroughly disinfect all possibly contaminated parts. Before the instrument is removed from the laboratory for disposal or servicing, it must be decontaminated. Decontamination should be performed by authorised well-trained personnel only, observing all necessary safety precautions.

Instruments to be returned have to be accompanied by a decontamination certificate completed by the responsible laboratory manager.

If a decontamination certificate is not supplied, the returning laboratory will be responsible for charges resulting from non-acceptance of the instrument by the servicing centre, or from authority's interventions.

2 DESCRIPTION

The HuMax 3K bench-top centrifuge is especially designed for the separation of blood samples, urine particles sedimentation and for carrying out the other routine applications in microbiology laboratories.

The HuMax 3K is ideal for hospital and research laboratories.

By means of the programmable microprocessor control system, speed, RCF value and time could be programmed and the 'pulse' function allows the operator to run short spins.

The HuMax 3K ensures safe and easy operation by means of a locking system, which does not allow the centrifuge to operate or the rotor to spin if the lid is not closed.

The lid-locking system allows the lid to be opened when the program ends by pressing a single key. There are audible and visible alarms to inform the operator when the lid is open, when the program ends or when any error occurs. In the case of a power failure, the lid can be opened manually by using a screw driver. There is also an observation hole in the lid enabling the user to check the speed of the centrifuge using a tachometer.

The HuMax 3K bench-top centrifuge is manufactured in accordance with the following standards:

EN 61010-1, EN 61326-1, EN 61010-2-020

2.1 Abbreviations

rpm	revolutions per minute
RCF	relative centrifugal force
xg	gravity 9,81 m/s ²
sec	second
min	minute
w	watt
v	volt
Hz	Hertz
kg	kilogram
μl	microliter
mm	milimeter
cm	centimeter
g	gram
ml	mililiter

3 INSTALLATION

3.1 Contents of Package

HuMax 3K incl. Rotor

- 1 Manual lid opener tool
- 1 Screw driver M5
- 18x Adapter Ø15.6mm
- 18x Adapter Ø15.6mm short tubes
- 1 user manual
- 1 power cable

3.2 Mains Supply

The HuMax 3K requires 100-240V 50/60Hz.

The centrifuge should be connected only to a grounded outlet.

3.3 Environmental Conditions

The instrument is designed to operate safely under the following conditions:

- Indoor use only
- Ambient temperature: 5°C - 40°C.
- Maximum relative humidity of 80%.
- Maximum altitude 4000 m.

3.4 Positioning

Place the centrifuge on a bench-top able to support its weight and vibrations, in clean, non-corrosive environment.

Leave a 30 cm space each side of the centrifuge.

3.5 Inspection

Before installation, the rotor should be inspected for damage and cleanliness.

Dirt and particles inside the inserts can cause the breakage of tubes and lead to a major imbalance.

The central hole of the rotor and the motor shaft must also be kept clean and dry at all times.

! When the centrifuge is running, no persons, dangerous substances or objects may be within the safety margin of 30 cm around the centrifuge

! Rotor imbalance may cause major damage to the rotor and centrifuge. Never attempt to introduce liquids into the tube inserts.

3.6 Loading

Each tube insert must be the same weight as the one diametrically opposite for balancing. If the number of tubes to be centrifuged is less than the capacity of the rotor, the tubes must be placed in opposite inserts. If an odd number of tubes is to be centrifuged, a water-filled tube of the same weight must be used for balance.

FIGURE 2

RIGHT LOADING

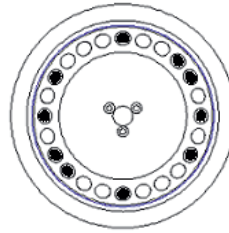
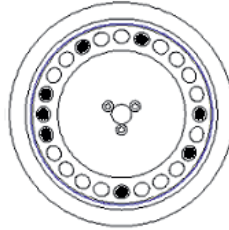


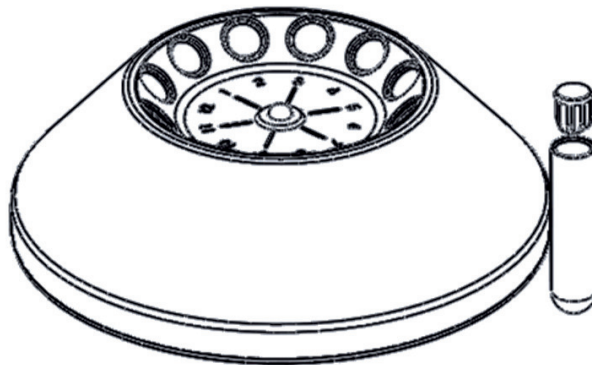
FIGURE 3

WRONG LOADING



3.7 Load and replace the rotor

FIGURE 4



- Load the rotor to the shaft to ensure rotor is in position until it connected with the shaft.
- You should feel a 'click' when the rotor is properly loaded on the shaft. If not, there may be something stuck between the rotor and the shaft. Double check and clean it if necessary.
- Rotate the rotor slightly with your fingers to check if the rotor vibrates, if so attach the rotor again.
- Rotate the nut clockwise using the wrench to tighten the rotor to the shaft firmly.
- put on the rubber cap to protect the nut
- Close the rotor lid, firmly tighten clockwise the lid to the rotor and ensure is in position. Close the door and then start running.
- The method of removing the rotor is as same as the above mentioned by turning the locking nut counterclockwise.


3.8 Manual Lid Opening

In the case of a power cut or any defect, the instrument can be opened manually to access the samples.

To open the lid manually:

- Power off the instrument
- Insert a screw driver into the hole located on the right side of the unit.
- Push the screw driver inward, holding it horizontal until the lid lock releases and the lid can be opened.

3.9 Routine Lid Opening

1. Turn on the power switch, release the door automatically.
2. The door will be released automatically once the operation is finished.
3. It is available to release the door by press  button once the rotor stops.

! Attach the rotor to the rotor shaft. Ensure the rotor is in position and connected with the shaft, tightening the locking nut to secure the rotor with shaft, to prevent the rotor damaging the centrifuge. Ensure the rotor lid is firmly tightened to the rotor.

! Before opening the lid manually, the rotor must be completely stopped. (Observe the rotor while opening the lid carefully by hand; if the rotor is still rotating, close the lid and wait until rotor is stopped.)

! The door just can be opened while the power is on and rotor stops rotating.

4 SPECIFICATIONS

Technical Specifications	HuMax 3K	
Maximum speed	4500 rpm	
Maximum RCF	2490 x g	
Tube capacity	8 x 15 ml or 12 x 10 ml	
Control system	Programmable Microprocessor Control	
Speed set range	300 - 4500rpm	
Speed set step	10 rpm	
Timer set range	30 sec - 99 minutes and hold position	
Timer set step	1 sec	
Motor	Maintenance free brushless induction motor	
Noise level	<56db	
Operation Temperature	5 - 40 °C	
Operation humidity	Max 80%	
Maximum altitude	4000m	
Supply Values	110-240V 50/60Hz	
Power Consumption	150watt	
Dimensions (WxDxH):	Instrument without any components:	25,5 x 24,5 x 14
	Space required for routine use:	35 x 35 x 35
	Packaging:	40 x 40 x 25
Weight:	Gross: 8 kg, Net: 6 kg	

TABLE 1

5 ACCESSORIES

Cat. No.	Description	Max. Tube Diameter (mm)	TABLE 2
15450/10	12 x Adapter \varnothing 15.6 mm	\varnothing 15.6 mm	
15450/11	12 x Adapter \varnothing 15.6 mm Short Tubes for 15450/10	\varnothing 15 mm	

5.1 Rotor instructions

5.1.1 MICROLITER ROTOR

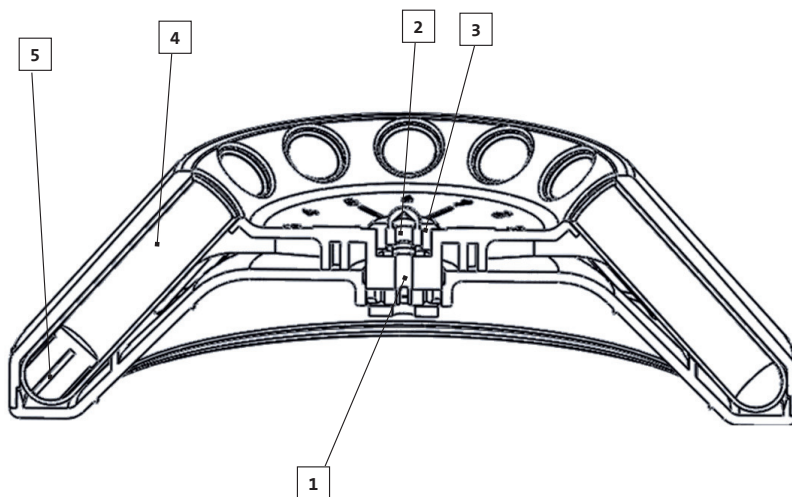


FIGURE 5
The rotor structure

- 1 Spindel hole
- 2 Screw nut
- 3 Rubber cap
- 4 Adapter 15450/10
- 5 Adapter 15450/11

5.1.2 NOTICE

1. The centrifuge rotor can separate samples with a density lower than 2.0g/ml. If the samples density is over 2.0g/ml, please calculate allowable speed depending on the following formula. Allow Speed (rpm)=
Maximum speed $\times(2.0(\text{g/ml})/\text{Sample density (g/ml)})^{(1/2)}$
2. To prevent corrosion, remove the rotor from rotor chamber if not in use for a long term, then detach the rotor lid and place upside down to dry the tube holes.
3. If samples have leaked in the rotor holes, wash the hole with water, apply a thin coat of silicon grease on the rotor surface after drying.
4. It is necessary for a regular rotor maintenance and should be cleaned every 3 months to keep the tube holes and shaft clean. Apply a thin coat of silicon grease
5. All the rotors are made of plastic, they cannot be subjected to high-pressure sterilization and UV irradiation, only ordinary sterilization can be used (see chapter 8).

5.2 Safety Interlock System

The HuMax 3K Centrifuge is equipped with an interlock system that prevents the centrifuge lid from opening when the rotor is spinning.

The centrifuge will not operate until the lid is closed completely. The lid remains closed until the rotor stops spinning. The run can not be started before the lid is correctly closed. In this case the lid-open indicator will light.

! Use rotor and tubes within
• there actual capacities.

! If a power failure occurs, ma-
• nual access to the sample in
the centrifuge is possible see 3.8.

6 INSTRUCTIONS FOR USE

6.1 Schematic Drawing

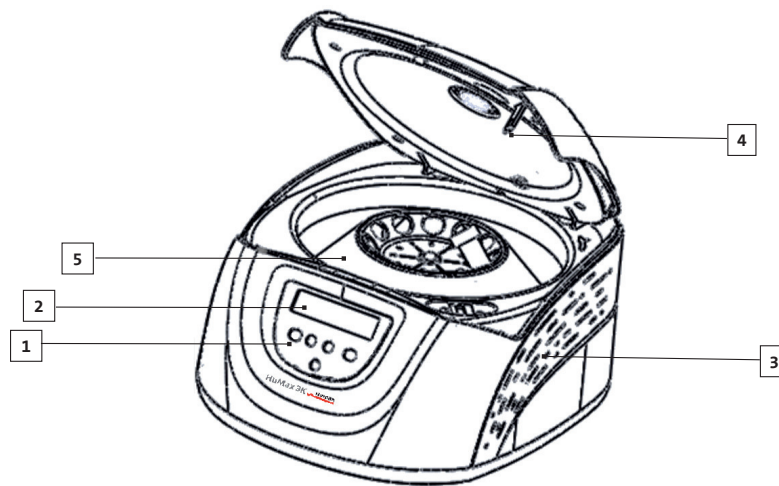


FIGURE 6
Schematic Front

- 1 Operation Panel
- 2 LCD Display
- 3 Door release hole
- 4 Door interlock hook
- 5 Rotor

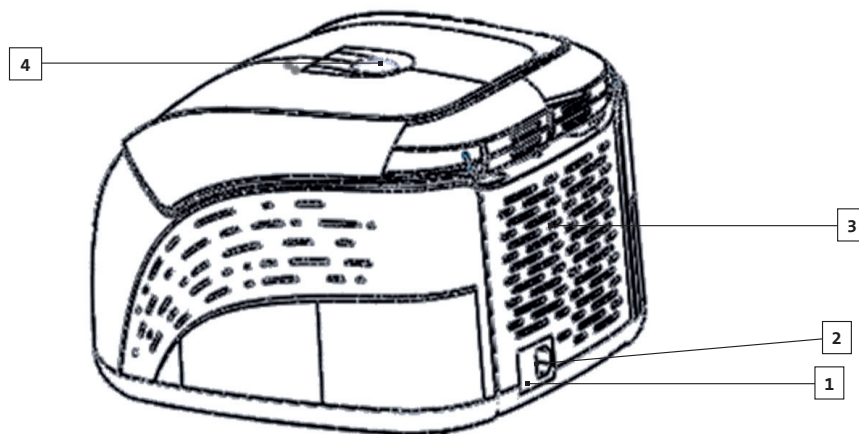


FIGURE 7
Schematic rear

- 1 Power Switch
- 2 Power Inlet
- 3 Air Vent
- 4 View Port

6.2 Controls and Indicators

FIGURE 8

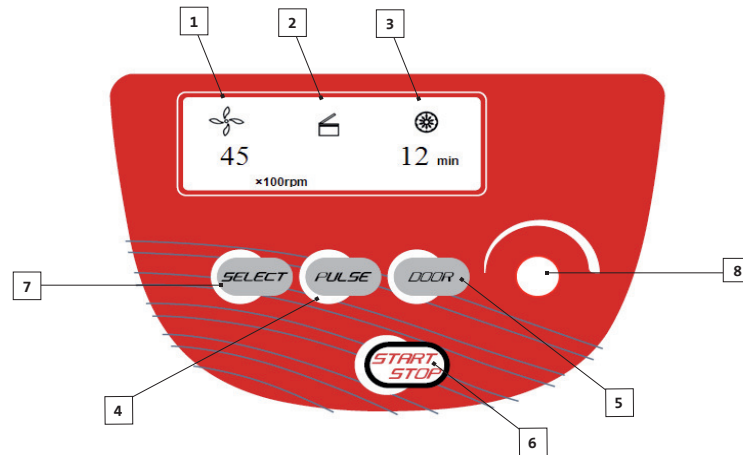








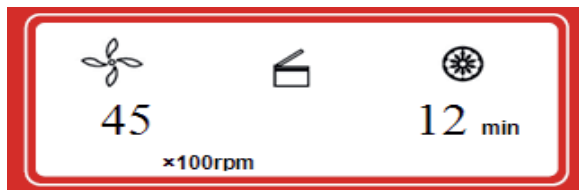


TABLE 3

1	Speed Display 	When speed symbol is rotating, this indicates the centrifuge is running. If the rotation is faster, the speed is higher. The speed is displayed as rpm or RCF.
2	Lid open 	Displays that the door is open
3	Time Display 	The running time is displayed. The Time symbol displays the ratio of working to time setting. The total time setting is divided into 10 sections.
4	Puls button 	When the door closed, press and hold the button to accelerate speed, release the button to stop it.
5	Open/lock button 	Press the button to open the door. The button is not available when the centrifuge is running.
6	Start/Stop button 	Press the button to start running. The centrifuge will brake and stop running if pressed during centrifugation.
7	Select button 	Press the button to choose the program which you want to modify.
8	Program button 	Clockwise rotate to increase program values. Rotate anti-clockwise to decrease program values. Press the button, shift between speed and RCF display.




6.3 Normal operation

Turn on the power switch, centrifuge will start self-diagnostic checks after passing the self-test it shows the last running parameters.







- Speed: 4500rpm; running time 12minutes
- The centrifuge will release the door

6.3.1 SET THE OPERATION PROGRAMS

Press the **SELEC** button to select required program. The parameter can be modified when the program is flashing. Rotate the program button clockwise  to increase parameter value. Rotate the program button counter clockwise  to decrease parameter value. Rotate the program button  faster, and the parameter value will increase faster. The minimum speed increment is 100 rpm, the minimum time increment is 1 second.

1. Set the speed

- Press the select button **SELEC** until the speed rpm is displayed.
- When the speed button is selected, the speed symbol will flash the speed value.
- The minimum speed value you can set 300 rpm, the minimum increment is 100 rpm.
- Rotate program button clockwise  to increase speed value. Rotate the program button counter-clockwise  to decrease speed value.
- You can speed-up set the speed value by rotating program button quickly.
- There is a circulating function to increase/decrease the speed values. Rotate the program button clockwise  to change settings from small → large → maximum → minimum. Rotate the program button counter clockwise  to change settings from large → small → minimum → maximum.

2. Set the time


- Press select button **SELEC**, time value flashes in the time setting mode.
- Rotate the program button  to set running time from 30 seconds to 99 minutes.
- When the time displays HD, this is a continuous running mode.

FIGURE 9

Last running parameters

! When the centrifuge is running, no persons, dangerous substances or objects may be within the safety margin of 30cm around the centrifuge





! For rotors with a attached lid, ensure it is tightened before operation.

! Do not set the speed beyond the allowable maximum speed of the rotor kits (rotor and adapters). Make sure to run it below the allowable maximum speed.



! Do not move or relocate the centrifuge when it is running.

! Do not run the centrifuge when fragments or sample solutions are left in the centrifuge chamber. Always keep the centrifugal chamber clean



6.3.2 START THE OPERATION

1. Press button  to start running
 - The door must be locked before rotor starts spinning.
 - The timer will start once the rotor reached the set speed, the screen displays the remaining run time.
2. View and modify the operation programs
 - Operation programs can be modified after the centrifuge reaches the set speed.
 - Pressing the select button , returns the display to the program interface and displays setting programs. Press the select button  to the desired program. When flashing, rotate parameter button  to modify values. Release the button after 5 seconds, and the centrifuge will return to normal operation mode and run according to the new value.
 - If the set time value has been modified, the operation time is not affected and will continue.
3. Warning display
 - If an error occurs during the operation, the centrifuge will brake to stop automatically, and display the error code on the time/display area. The error code can be checked in the table 6 and corrective actions can be applied accordingly.

6.3.3 END THE OPERATION

1. The centrifuge will brake when it reaches the set time or  button is pressed.
 - When the rotor stops rotating, the centrifuge will start beeping to alert the operation has finished.
2. Open the door
 - The door can be released automatically when the operation has stopped.
 - With the door closed, you are able to press the  button to open it.
 - After ending the operation, the program will store the setting parameters of this operation, and will recall these parameters when restarting the program.
3. Open the door and take out the samples and rotor.

6.4 RCF operation



1. Turn on the power switch
2. Set a RCF (Relative Centrifugal Force) value
 - Press the select button  and choose speed unit $\times g$, the speed symbol will flash into RCF value input status.
 - If no button is pressed after the speed value has flashed after 5 seconds, the input mode will be shut down.
 - Rotate program button  to input a RCF value, RCF increment is $10\times g$.
3. Set operating conditions

The other operation, please refer to the section 6.3.1

! Do not exceed the allowable maximum RCF value of the rotor and adapters

6.5 Pulse operation

This function is used to remove the residual samples adhered to the interior of the tubes or for quick spins.


1. Turn on the power switch and load the rotor to the shaft, tighten the rotor lid and make sure it is in secured position, and then close the door.
2. The centrifuge goes into preparation mode and displays last running values.
3. Press  knob and hold, the centrifuge will speed up to the setting speed. While releasing the  knob during acceleration, the centrifuge will start to decelerate and stop.

! The button work only while the rotor stopped and the door is locked

7 TROUBLESHOOTING

7.1 Possible problems and solutions

This centrifuge has a self-diagnostic function. If a problem occurs, an error/warning code will be displayed on the time display screen, and the operator can determine the malfunction with the alarm code below.

Symptom	Causes	Solutions	TABLE 4 Possible problems and solutions
Nothing appears on the screen when the power is turned on.	Facility power circuit breaker tripped. The fuse has blown.	Correct and turn on the power. Replace the fuse.	
Abnormal vibration	rotor do not match with spindle	Install again rotor	
	Sample are imbalance	install sample symmetrical	
Error code appeared on the time display screen	E-02 Door fault The door opened while running. Press the button  with the door opened.	Close the door immediately.	
	E-06 Set wrong value The setting value exceeds the allowable range.	Modify the set value.	
	E-10~86 Read the service manual.	Contact the service center.	

Alarm codes E-1 E-9 are related to incorrect operation/programming. Running the centrifuge can be continued after implementing corrective procedures.

8 HAZARDS, PRECAUTIONS AND LIMITATIONS OF USE

8.1 Cautions

The following precautions must be observed:

- Never try to bypass the safety lid lock while the rotor is spinning.
- Do not try to open the Lid until display returns to stand by mode
- Only use a correctly grounded mains supply.

Special attention to the following is necessary:

- Installation of the unit: Proper ventilation, levelling of the centrifuge, rigidity and stability of the bench.
- Rotor installation: Check that the rotor tightened firmly.
- Cleaning of the accessories and the rotor chamber.
- Load balancing
- Samples: The cleaning of the accessories is particularly important when using potentially infectious materials.
- This Centrifuge is not explosion-proof. Never use explosive or flammable samples
- Do not install the centrifuge in or near places where inflammable gases are generated or chemicals are stored
- Do not place dangerous materials within 30 cm of the centrifuge.
- Do not centrifuge toxic or radioactive sample or contaminated sample with pathogenic micro-organisms.
- If you require service at site, please decontaminate the centrifuge in advance, and then notify the service center the details of the materials and procedure.
- To avoid electrical shocks, insure hands are dry before handling the power cord or turning on/off the power switch.
- For safety purposes, do not enter within 30 cm around this centrifuge when it is in operation.
- Unauthorized repairs, disassembly, or modifying the centrifuge except by a trained service are strictly prohibited.
- The centrifuge rotor can separate samples with a density lower than 2.0 g/ml. If the samples density is over 2.0 g/ml, please calculate allowable speed depending on the following formula.
- Allowable Speed (rpm)= $\text{Maximum speed} \times (2.0(\text{g/ml}) / \text{Sample density} (\text{g/ml}))^{(1/2)}$

! Rotor and other Accessories must be cleaned if any spillage, specially chemicals, occurs.

! If the recommended instructions for cleaning or disinfecting are not followed this may damage the centrifuge.

! Do not directly pour water, neutral detergent or disinfectant solution into the rotor chamber, otherwise fluids may leak into the drive units and cause corrosion or deterioration to the bearings.

8.2 Cleaning

Disconnect the centrifuge before cleaning. Ideally, the rotor should be washed after every use but at least weekly in warm water containing a few drops of mild liquid soap (domestic washing liquid is ideal) and any time after spillage has occurred.

Each rotor insert must be washed thoroughly using a small nylon brush. **Do not use metal wire brushes.**

Dry the rotor with a soft, absorbent, non-woven cloth or tissue. Drying may be finished off with a warm air jet (e.g. a hair-dryer).

Make sure that no deposits remain in the bottom of the insert holes because the pressure of a flask or tube from above during centrifugation will significantly increase the chances of breakage and corrosion.

- To prevent corrosion, remove the rotor from rotor chamber. If not in use for a long term, then detach the rotor lid and turn upside down to dry the tube holes and keep clean.
- If sample has leaked into the rotor, rinse the rotor with water. Apply a thin coat of silicon grease to the rotor when it is completely dry.
- The rotor should be checked every 3 months to ensure the tube cavities and rotor holes keep are clean and apply a thin coat of silicon grease, to the shaft connection hole.

8.3 Contamination Hazards

Our centrifuges are used in medical research, where hazardous substances, including radioactive chemicals, are frequently found.

Always use the appropriate decontamination procedures where the rotor is exposed to these chemicals.

Examples of commonly used techniques are outlined below. The information is given as a guide only. It is the responsibility of the owner to use the most suitable procedure.

The rotor should always be completely disassembled before being subjected to heat and after external chemical cleaning.

8.4 Disinfection

Alcohol (70% ethanol or 70% isopropanol) applied for 10 minutes is ideal for destroying bacteria and viruses.

8.5 Electrical

High voltage is present behind the panels of the centrifuge.

8.6 Improper Use

- Use only rotors and accessories designed for use in this centrifuges.
- Do not attempt to override the lid interlock assembly.
- Load and lock the rotor only in the recommended way. As the centrifuge starts to spin, an improperly loaded rotor could cause sufficient force to damage the drive shaft and the rotor chamber.

! Do not open the instrument!
• There are no user-servicable parts inside. In the case of a malfunction, please contact your local HUMAN representative.

9 CLEANING AND PREVENTIVE MAINTENANCE

9.1 Daily

No daily cleaning is required, except in the case of accidental glass breakage or a large amount of spillage in the bowl.

! All cleaning should be performed with the centrifuge disconnected from the power outlet.

9.2 Weekly

Clean the bowl and the accessories with a cotton wool pad dipped in 70% alcohol solution.

! Never use metallic implements to clean the rotor or the inserts. After cleaning the accessories, always rinse them with clean water and dry.

9.3 Monthly

Maintenance for drive shaft. You can wipe the drive shaft with soft cloth, and then apply a thin coat of silicon grease.

HUMAN

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The logo graphic consists of a horizontal red bar with a white, stylized 'H' shape cutout in the center, positioned to the left of the word 'Human'.

Human