

HuMax HCT

| User Manual



CE

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Human

Diagnostics Worldwide

REVISION LIST OF THE MANUAL

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01/2012-05	First Edition
02/2015-03	Correction section 6.6.3 "Specimen Collection"
03/2020-11	Change of haematocrit rotor from plastic to aluminium
04/2022-05	Intended Purpose for HuMax HCT

SYSTEM VERSION

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SERVICE AND SUPPORT

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CONTENTS

1 SAFETY INSTRUCTIONS

1.1 Introduction

This manual is considered part of the instrument and must be available to the operator and the maintenance personnel. For accurate installation, use and maintenance, please read the following instructions carefully.

In order to avoid damage to the instrument or personal injury, carefully read the "GENERAL SAFETY WARNINGS", describing the appropriate operating procedures. Please contact your HUMAN authorised local Technical Service in the event of instrument failure or other difficulties with the instrument.

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 within this warranty period 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, 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.

1.3 Intended use of the instrument

The instrument must be used for its intended purpose (see chapter 2). It must be operated in perfect technical conditions, by qualified personnel, in such working conditions and maintained as described in this manual, in the GENERAL SAFETY WARNINGS. This manual contains instructions for qualified professional operators.

IVD

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 flat, stationary working surface, that is free of vibrations.

Do not operate in area with excessive dust.

Operate at temperature and at a humidity level in accordance with the specifications listed in this manual.

Do not operate this instrument with covers and panels removed.

Use only 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.

The 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 environments that are potentially explosive or at risk of fire.

Prior to cleaning and/or performing maintenance on the instrument, switch off the instrument and remove the power cord.

Only cleaning materials described in this manual may be used, as other materials may damage parts. It is recommended to always wear protective clothing and eye protection while using this instrument.

All warning symbols that appear in this manual must be carefully observed.

1.5 Disposal management concept

The applicable local regulations governing disposal must be observed. It is the user's responsibility to arrange for proper disposal of the individual components. All parts which may contain potentially infectious materials must be disinfected by suitable, validated procedures (autoclaving, chemical treatment) prior to disposal. Applicable local regulations for disposal must be carefully observed. The instruments and electronic accessories (without batteries, power packs etc.) must be disposed of according to the applicable local regulations for the disposal of electronic components.

Batteries, power packs and similar power sources must be removed from electric/electronic parts and disposed of in accordance with applicable local regulations.

1.6 Biohazard warning

Analytical instruments for in vitro 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.

The „BIOHAZARD“ warning label must be affixed to the instrument prior to first use with biological material!



FIGURE 1
Biological hazard symbol

1.7 Instrument disinfection

Before performing 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 must be performed by authorised well-trained personnel, and in observance of all necessary safety precautions.

2 DESCRIPTION

2.1 Intended purpose

HuMax HCT bench-top multi-purpose centrifuge is designed for the separation of blood samples, urine particles sedimentation and other routine applications in microbiology laboratories. With its microlitre rotor it is used in laboratories to centrifuge liquid for medical and biological research and quality control. In combination with the haematocrit rotor it performs the centrifugation step of a haematocrit test, which is used as an aid in the diagnosis of anemia or polycythemia. For laboratory professional use only.

2.2 General description

The HuMax HCT is a compact centrifuge that can be used both as a microlitre and as a haematocrit centrifuge.

With its microlitre rotor it holds tubes up to 2 ml, the HuMax HCT is ideal for hospitals and research laboratories, as well as applications such as pelleting DNA and protein, centrifugation of cells, yeast and microorganisms at high speed.

Use HuMax HCT with its haematocrit rotor to measure haematocrit volume by centrifugation of blood samples in capillary tubes. The programmable microprocessor control system allows to program the speed, RCF value and time. In addition, the Pulse function allows to do short spin cycles.

The HuMax HCT ensures safe and easy operation by means of a locking system, to prevent operation of the centrifuge or the rotor if the lid is not closed. The lid locking system allows to open the lid at the end of the program by pressing a single key.

Audible and visible alarms inform the user when the lid is open, when the program ends or any error occurs. In the case of a power failure, the user can open the lid manually with a screwdriver. There is also an observation opening in the lid which allows to check the speed of the centrifuge with a tachometer.

The HuMax HCT bench-top centrifuge is manufactured in accordance with the following standards: EN 61010-1, EN 61326-1, EN 61010-2-020

3 INSTALLATION

3.1 Contents of package

- HuMax HCT
- 1 User manual
- 1 Power cable
- 1 HeamtoCrit rotor, nut & cover [IVD]
- 1 Read disc [IVD]
- Nut screwdriver
- 2 Spare fuses
- 1 Rotor pin

3.2 Mains supply

The HuMax HCT requires 230 V, 50/60 Hz or 110 V, 50/60 Hz depending to the version. 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: 2 °C - 40 °C.
- Maximum relative humidity of 80 %.
- Maximum performance is obtained between 20 ± 5 °C
- 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 50 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.

! Note: When the centrifuge is running, no persons, dangerous substances or objects may be within the safety margin of 50 cm around the centrifuge

! Note: 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

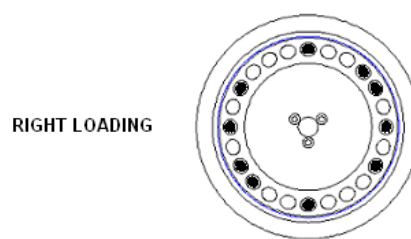
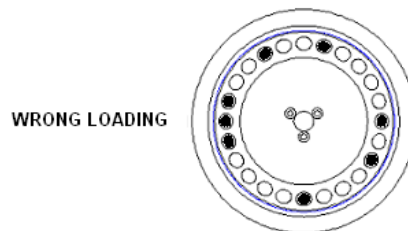
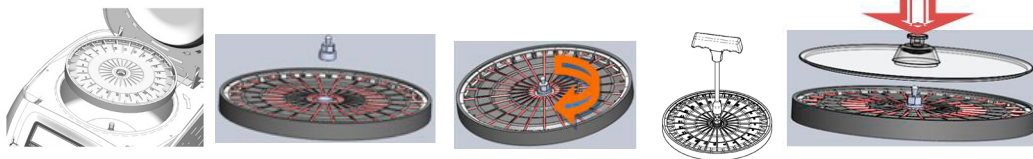


FIGURE 3



3.7 Load and replace the rotor

FIGURE 4
Load the rotor



Load the rotor to the shaft

Locking nut

Load the rotor lid

- Place the rotor pin to the rotor shaft.
- 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.
- 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 counter-clockwise.

! Note: 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.


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 left and right side of the unit.
- Push the screw driver inward, holding it horizontal until the lid lock releases and the lid can be opened.

! Note: 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.)

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.

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

4 SPECIFICATIONS

Technical specifications	HuMax HCT		TABLE 1
Rotor	[REF] 15502, Microliter	[REF] 15501, Haematocrit	
Maximum speed	14000 rpm	12000 rpm	
Maximum RCF	18.264 xg	13.680 xg	
Tube capacity	24 x 2 ml	24 capillary tubes	
Control system	Programmable microprocessor control		
Speed set range	200 - 14.000 rpm		
Speed set step	10 rpm		
Timer set range	30 sec - 99 minutes and hold position		
Timer set step	1 sec		
Motor	Induction Motor		
Supply values	230 V / 50 Hz or 110 / 60 Hz		
Power consumption	450 W		
Dimensions (WxDxH):	Instrument without any components:	28 x 36.4 x 26.6 cm	
	Space required for routine use:	38 x 47x 55 cm	
	Packaging:	51x 47x 40 cm	
Weight:	Gross: 15 kg, Net: 12 kg		

5 ACCESSORIES & CONSUMABLES

Accessories

Cat. No.	Description	Capacity	RPM	RCF	TABLE 2
IVD 15501	Haematocrit rotor	24 Capillaries tubes	12000 rpm	13.680 xg	
15502	Fix angle rotor	24 x / 2 ml	14000 rpm	18.264 xg	

Cat. No.	Description	Max. tube diameter (mm)	TABLE 3
15503	24 x Adapter 200 µl	Ø 6.3 mm	
15504	24 x Adapter 500 µl	Ø 8 mm	

Consumables

Cat. No.	Description	Unit/ size	TABLE 4
749311	Micro haematocrit tubes Na-hep	10 x 100 pcs.	
749321	Micro haematocrit tubes	10 x 100 pcs.	
749510	Haematocrit Sealing Compound	10 plates	

5.1 Rotor instructions

5.1.1 Microliter rotor

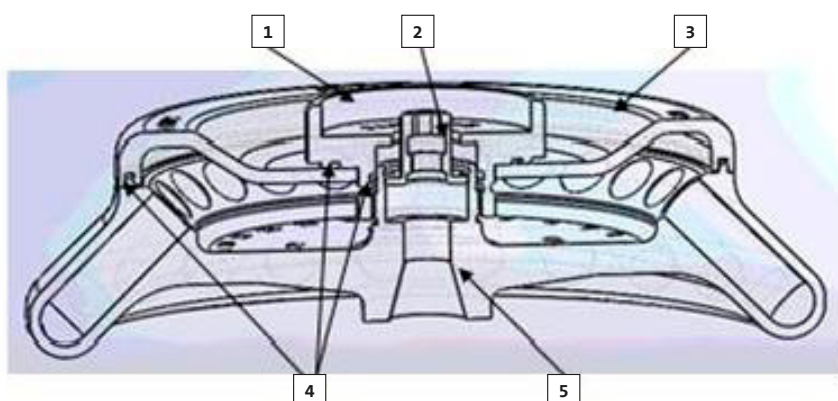


FIGURE 5
The rotor structure

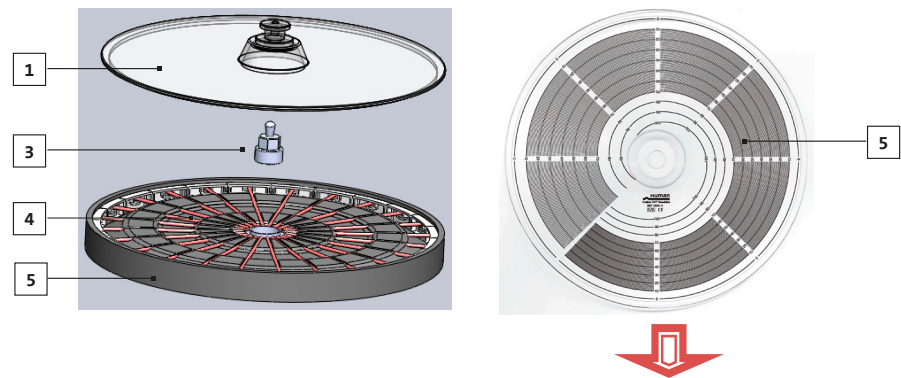
- 1 Knob
- 2 Locking nut
- 3 Rotor lid
- 4 Seal rings
- 5 Shaft hole

5.1.2 Haematocrit rotor

1. Introduction

FIGURE 6

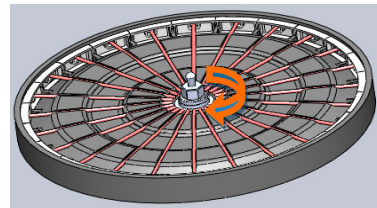
FIGURE 7



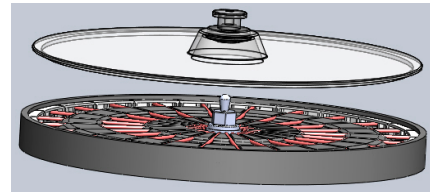
2. Installation

FIGURE 8

FIGURE 9



Tight the screw nut



The lid installation

5.1.3 Notice

1. 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, calculate allowable speed depending on the following formula. Allow Speed (rpm) = Maximum speed $\times (2.0 \text{ (g/ml) / Sample density (g/ml)})^{(1/2)}$
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. The haematocrit rotor REF 15501 is made of solid aluminium so it is very robust. The other available rotor REF 15502 is made of plastic and 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 HCT 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.

! Note: Use rotor and tubes within their actual capacities.

! Note: If a power failure occurs, manual access to the sample in the centrifuge is possible see chapter 3.8.

6 INSTRUCTIONS FOR USE

6.1 Schematic drawing

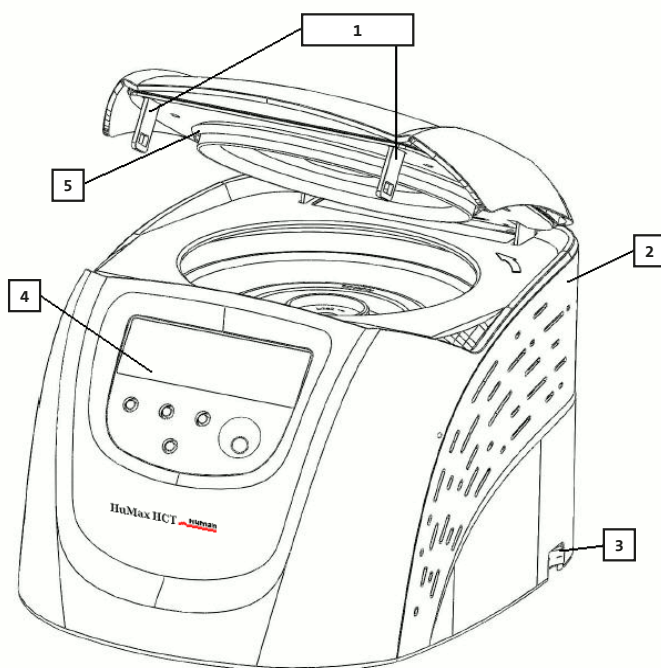


FIGURE 10

- 1 Door lock hook
- 2 Cover
- 3 Power Switch
- 4 Operation panel
- 5 Door seal ring

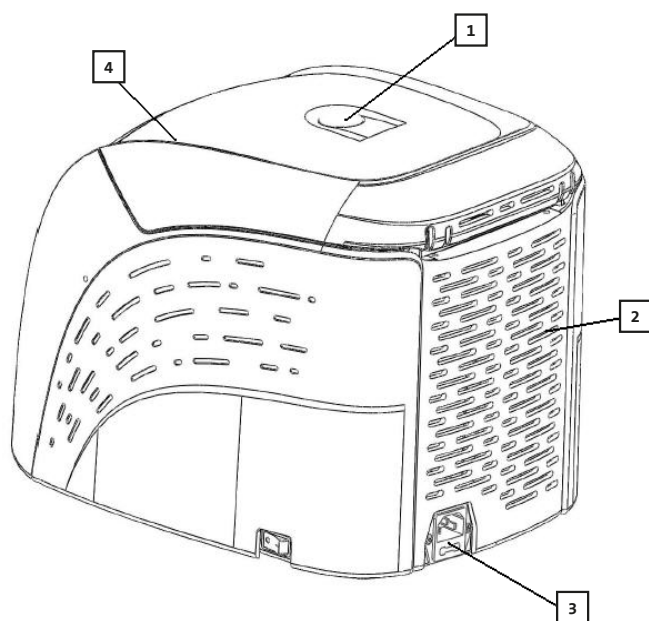


FIGURE 11

- 1 View port
- 2 Air vents
- 3 Power connector
- 4 Door

6.2 Controls and indicators

FIGURE 12

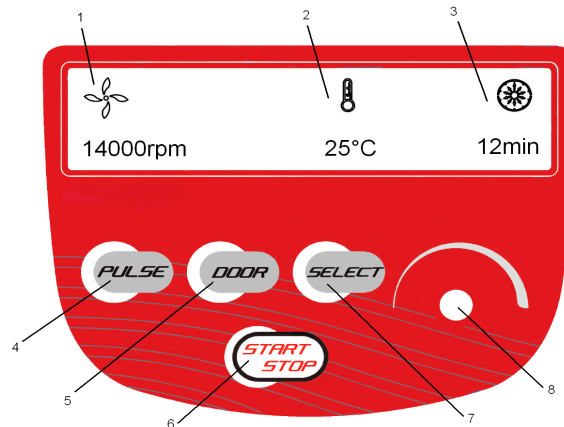









TABLE 5

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	Temperature display	Displays the chamber temperature in °C.
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	Pulse 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, see Figure 13 below:

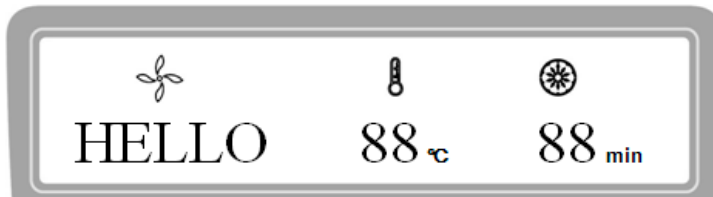


FIGURE 13
Self-checking

After self-diagnostics, the centrifuge will display the accumulative running time, see Figure 14 below:

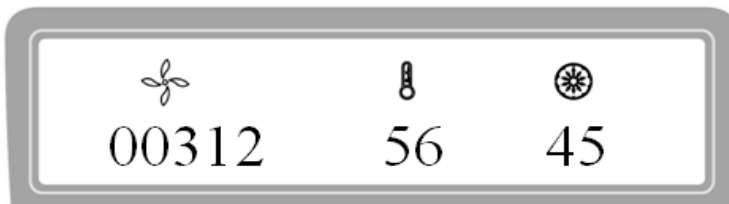


FIGURE 14
Accumulative running

Figure 14 indicates the centrifuge has accumulated running time 312 hours 56 minutes and 45 seconds, and then the centrifuge displays the last running parameters, see Figure 15 below:

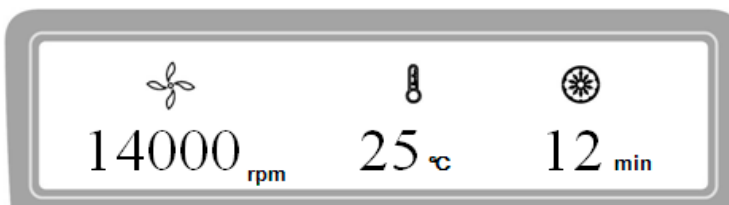


FIGURE 15
Last running parameters




- Speed: 14000 rpm; running time: 12 minutes; centrifugal chamber temperature: 25 °C
- The centrifuge will release the door.

! Note: When the centrifuge is running, no persons, dangerous substances or objects may be within the safety margin of 50 cm around the centrifuge.





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

Note: 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.


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 10 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 200 rpm, the minimum increment is 10 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.

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 and corrective actions can be applied accordingly, see chapter 6.6.7, Table 6.

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

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 **SELEC** 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.

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 **PULSE** knob and hold, the centrifuge will speed up to the setting speed. While releasing the **PULSE** knob during acceleration, the centrifuge will start to decelerate and stop.

6.6 Haematocrit measurement **IVD**

The Haematocrit-rotor 15501 contains three parts, the rotor, the rotor cover and the read disc.

6.6.1 Intended use

Procedure for determining the volume fraction of erythrocytes also called packed Cell volume (PCV) or erythrocyte volume fraction (EVF) in blood. The method based on centrifugation acc DIN 58933-1¹.

6.6.2 Test principle

The Haematocrit value is determined by using EDTA whole blood in a haematocrit capillary and centrifuging it until the blood cells are sedimented to the end of the capillary tube. Then the tube is measured with the read disc and the ratio of liquid column to erythrocytes column is the haematocrit value.

Note: The button works only while the rotor stopped and the door is locked

6.6.3 Specimen collection

For capillary blood: Use Micro haematocrit capillaries [REF] 749311, red colour code heparinised with sodium heparinate over internal surface.

For venous blood: Non-heparinised [REF] 749321, Blue colour code, immediately mix blood with anticoagulant as heparin or EDTA. Avoid foaming the specimen. Fresh sample need to be measured within 4h when stored at 21 +/- 3°C.

6.6.4 Specimen processing

Fill micro haematocrit capillar tubes with sample blood to approx. ~75 %, and seal at the dry end. Insert the capillary tube vertically into the seal up to the point where the end of the capillary touches the bottom of the seal plate recommend [REF] 749510 Haematocrit sealing compound. Slightly tilt the capillary tube to the side and remove it from the seal.

Place the capillary tubes with the lute side facing outwards in the haematocrit rotor, make sure it is properly balanced. Screw on the rotor lid. Centrifuge with rotor [REF] 15501 for minimum 7.5 minutes at 12.000 rpm.

6.6.5 Calculate the centrifuge time

The centrifuge time needed to get a result can be calculated according the following rule: 100.000 divided by the relative centrifuge force (RCF). Increased centrifuge time (up to 30 %) will not influence the result.

$$\frac{100.000}{RCF} = \text{Time [min]} \text{ e. G. for HuMax HCT at 12.000 RPM} = RCF 13.680 \times g \quad \frac{100.000}{13.680} = 7,3 \text{min}$$

7.5 minutes will give good results.

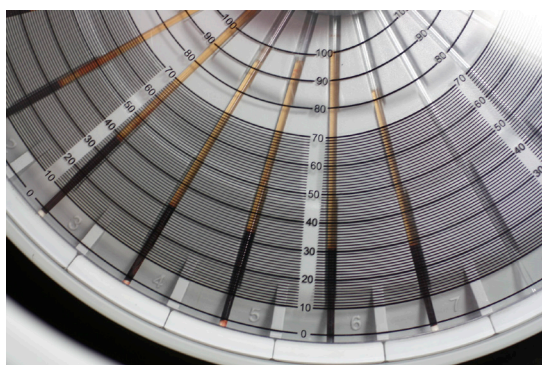


FIGURE 16
Haematocrit measurement

6.6.6 Reading the haematocrit value

1. Take off the rotor LID.
2. Hold the rotor in position.
3. Place the read disc and turn it until the 100 %-line of the read disk is in line with the upper margin of the liquid column (see Figure 16).
4. Read the haematocrit value at the upper margin of the erythrocyte column.

Repeat steps 2 to 3 until all capillaries have been analysed.

Normal range

When Haematocrit was evaluated in a normal population, the following results were obtained:

Normal Range ²	
Male	34- 53 %
Female	34- 48 %
Panic value ³	>20 <60

6.6.7 Problems in HCT determination

Problems	Cause of fault	Remedy
Red colour liquid in the rotor	Improper sealing	Clean the rotor *, Seal according specimen processing.
	Lud site facing inwards	Clean the rotor, place according specimen processing.
Zero line of the read disc cannot be matched with lower margin of liquid.	Too little sealing material	Move the capillaries a bit to the centre of the rotor to be able to match the zero line to the lower margin of the liquid.
No clear partition of cells and liquid	RPM, RCF to low or time too short	Run at correct speed and time.
Capillary is completely red	No centrifugation	Check that centrifuge is working.
	Too fast centrifugation	When the RCF is to high the RBC will burst and the plasma will get red. Reduce the centrifuge speed and run again with new sample.

* The haematocrit rotor contains 24 white insets. If a sealing was insufficient the corresponding Inset can be taken out for cleaning.



FIGURE 17
Plastic inset

Performance characteristics

www.human.de/data/gb/vr/HuMaxHCT.pdf

www.human-de.com/data/gb/vr/HuMaxHCT.pdf

References

¹DIN 58933-1 Hematology – Procedure for determining the volume fraction of erythrocytes in blood Part 1 Reference method based on centrifugation
Labor and Diagnose Thomas Auflage 7

²Clinical chemistry and Molecular diagnostics Tietz 4th Edition

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
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.
Error code appeared E-02 on the time display screen Door fault	The door opened while running. Press the button  with the door opened.	Close the door immediately.
E03 Rotor identify fault	The centrifuge cannot identify the rotor.	Use the correct rotor. Replace rotor identify connection.
E-04 Temperature fault	The air vents are blocked. Radiator fan is damaged.	Clean air vents. Replace radiator fan.
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 centre.

TABLE 7

Possible problems and solutions

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 nut is 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 50 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 centre 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 50 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)= Maximum speed $\times (2.0 \text{ (g/ml)} / \text{Sample density (g/ml)})^{(1/2)}$

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

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

! Note: 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 three 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.

! Note: Do not open the instrument! There are no user-serviceable parts inside. In the case of a malfunction, 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.

! Note: 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.

! Note: 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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