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**CLEMENTS**

proven through performance

**Orbital 460  
Benchtop Centrifuge**

**CEN 92300  
240V 50/60Hz**



**User Manual**

Manual No. CEN 92300 035  
Issue 4

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## **Safety**

Thank you for purchasing this Clements Orbital 460 Centrifuge. For your safety it is imperative that this unit only be operated by authorised personnel in accordance with the instructions as described in this manual. Operated in this way, the Orbital 460 Centrifuge will provide the standard of service specified.

Due to continual improvements in product design, the Orbital 460 Centrifuge may vary in detail from the descriptions in this manual. In the event of further questions please contact your local distributor or BMDi TUTA Healthcare direct.

User Manual Orbital 460 Centrifuge

Manual Number CEN 92300 035 Issue 4

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## **Description**

The Orbital 460 Centrifuge is a reliable, versatile, large capacity benchtop centrifuge. It is designed for high throughput clinical and laboratory applications where precise digital control of speed and time is required.

## **Features**

- Brushless inverter motor technology for low maintenance operation
- Accurate digital control of speed and time for repeatable processing
- High visibility backlit LCD display with touch control panel
- Intuitive user interface
- Electronic lid interlock to ensure that centrifuge can be started and run only with lid locked
- Stainless steel bowl
- Adjustable acceleration and deceleration for sensitive samples
- 25 user programs
- Simultaneous display of all parameters
- Previous parameters maintained through power off/on

**Specifications**

Speed Range	100 to 5500 rpm (Subject to rotor selection)
Maximum RCF	5310 x g (Subject to rotor selection)
Speed Accuracy	±1% (500 - 5000 rpm)
Time Range	1 to 99 minutes
Angle Rotor	12 x 10 ml
Swing-out Rotor No. 3	4 x 24 x 1.5 ml 4 x 28 x 5 ml 4 x 20 x 10 ml 4 x 10 x 15 ml Round bottom 4 x 10 x 15 ml Falcon® style 4 x 4 x 50 ml Round bottom 4 x 4 x 50 ml Falcon® style 4 x 250 ml
Swing-out Rotor No. 4	4 x 2 50 ml 4 x 2 100 ml 4 x 8 15 ml 4 x 8 15 ml / 10 ml / 7 ml 4 x 18 x 7 ml 4 x 12 5 ml / 10 ml
Microtitre rotor	4 x 2 x 96
Power Requirement	220-240V 50/60Hz 5A
Electrical Protection	Class I (Earthed)
Noise	< 65dB(A)
Dimensions	470 (W) x 380 (H) x 560 (D) mm
Weight	42kg
Environment	Indoor 10 to 35°C, RH < 85%

## **Warnings and Cautions**

For safe operation ensure that users read, understand and observe the instructions and recommendations in this user manual.

### **Power**

Ensure that the mains power supply matches that shown on the rating label of the centrifuge.

### **Flammable Samples**

The centrifuge is not flameproof. Do not use flammable samples in the centrifuge. Do not store flammable or volatile material within 300mm of the centrifuge.

### **Biohazardous Samples**

Local protocols must be observed when handling potentially biohazardous materials. Carriers with aerosol protection are to be used.

### **Fluid Spill**

Do not allow fluids to enter the centrifuge. If a spill occurs wipe clean, paying attention to the nature of the material.

### **Balancing**

The centrifuge must always be run with a full complement of buckets or carriers. Balance samples either *by eye* or by weighing. Fill unused tubes with an equivalent amount of fluid as in sample tube.

### **Operating**

Do not stand within 300mm of centrifuge while it is running.  
Do not move centrifuge while the rotor is spinning.  
Do not open lid while rotor is spinning.  
Do not attempt to stop rotor by hand.

## **Installation**

### **Unpacking**

Keep centrifuge horizontal while removing it from carton. Retain packaging for transporting centrifuge. With power off, release lid lock by inserting manual release tool in small hole on top right hand side of centrifuge. Keep tool parallel to front of panel and press release plate. Remove tool.

Remove packing, carriers etc from centrifuge bowl. Ensure that bowl is clean.

### **Location**

The centrifuge should be placed on a solid level surface in a well ventilated area. The back of the centrifuge must be at least 10cm away from any wall or vertical surface.

### **Power Requirements**

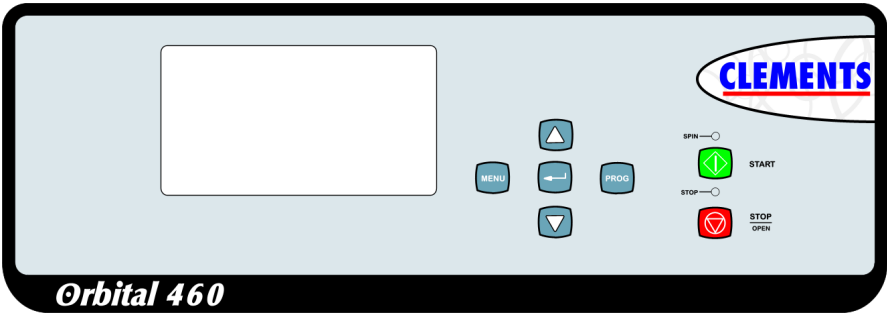
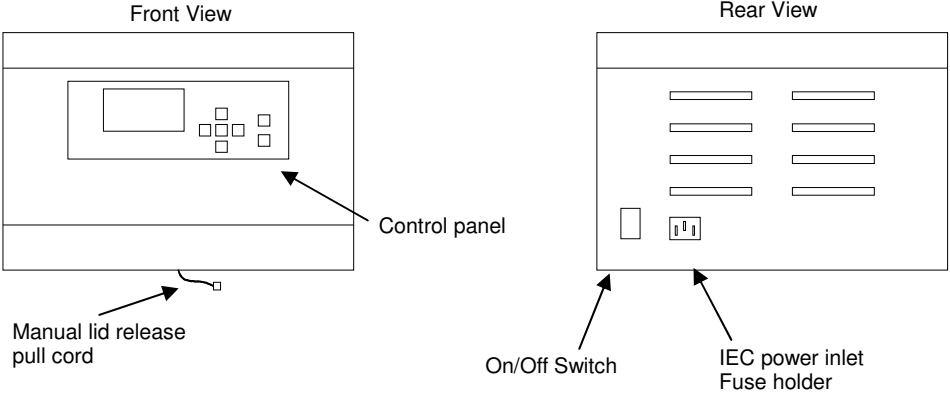
Before connecting the centrifuge to the mains power supply, ensure that the electricity supply conforms to the requirements for voltage and frequency shown on the rating label on the back of the unit.

The power supply should be stable, clean and free of surges and brownouts.

Connect the centrifuge to the mains power supply using the supplied earthed power cable.

For extended periods of non-use, switch off main power switch on rear panel of centrifuge.




**Controls**



Condition	LCD Display Shows
In Spin Cycle	Actual and Set Values of Speed / RCF and Time Remaining
Setting Mode	Set Values of Parameters
Error	Error code n of form En



## Controls

Item	Function
On/Off Switch	Switches mains power to centrifuge.
IEC Inlet	Mains power inlet. Also contains fuse holder.
Lid release pull cord	Manual lid release pull cord. Centrifuge must be disconnected from power.
LCD Display	Shows actual and set parameters.
<b>STOP / OPEN</b> Button	Stops spin cycle. When rotor has stopped acts as lid release button. Cancels error condition.
<b>START</b> Button	Starts spin cycle.
<b>ENTER</b> Button 	Enters and saves changed parameters. Exits parameter setting mode. Selects user program. Exits program mode.
<b>INC</b> Button 	Increases value of set parameters.
<b>DEC</b> Button 	Decreases value of set parameters.
<b>PROG</b> Button	Enters user program mode. Times out after 5 seconds.
<b>MENU</b> Button	Steps through parameter change menu in circular fashion. Times out after 5 seconds.
<b>SPIN</b> LED (Green)	Indicates that spin cycle is in progress.
<b>STOP</b> LED (Red)	Flashing - indicates that spin cycle is stopping. Continuous - indicates that rotor has stopped.

## **Operation**

### **Rotor Fitting**

1. Open lid and switch off centrifuge.
2. Remove carriers from rotor.
3. While supporting rotor with one hand, unscrew (CCW) rotor-retaining domed nut.
4. Lift off rotor being careful not to bend or apply side load to motor shaft.
5. Select a compatible rotor, ensuring that tapered shaft and matching bore are clean, and fit together.
6. Fit domed nut and washer to rotor.
7. While supporting rotor with one hand, hand tighten (CW) rotor-retaining cap screw - again being careful not to bend or apply side load to motor shaft..
8. Confirm that rotor rotates smoothly and evenly by hand.

### **Carrier Fitting** (swing-out style rotors)

1. Fit a full complement of compatible carriers to the rotor.
2. Ensure that carriers are fully seated and can swing freely.
3. Switch centrifuge power on.

### **Tube Fitting**

Select a full complement of compatible tubes with an RCF rating in excess of the maximum RCF of the centrifuge.

### **Balancing of Samples**

It is important that the samples are correctly balanced within the centrifuge prior to starting the unit. For correct balance there are two requirements:

1. Balance the weight of the samples
2. Balance the location of the samples

### **1. Balance the weight of the samples**

For every sample in the centrifuge there must be a balancing sample of equal weight. The samples may be balanced 'by eye' i.e. two samples appear to contain the same volume and are therefore approximately the same weight.

Where delicate samples are involved, it is recommended that the samples be placed in Tube Carriers and balanced by weighing them. This will ensure that vibration during the centrifugation process will be kept to a minimum.

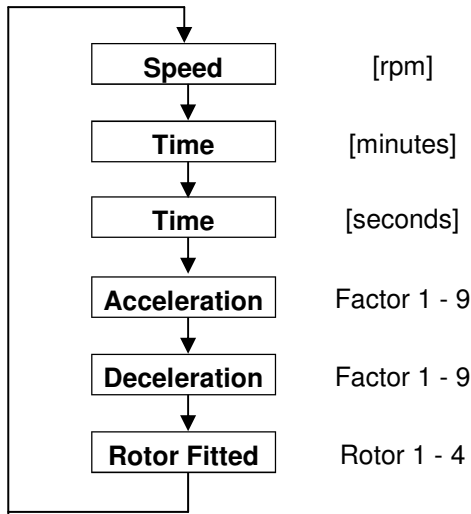
### **2. Balance the location of the samples**

The samples must be placed on the Rotor so that the weight of the samples is equally distributed. To do this the equally weighted samples must be placed in diametrically opposite positions on the rotor.

**Note:** Even though the Orbital 460 is designed to absorb considerable out-of-balance forces, running the centrifuge with out-of-balance samples will cause excessive vibration. This will disturb the samples, affect the overall performance of the unit and may lead to mechanical damage.

## Parameter Setting Menu

Press **MENU** to select parameter setting mode.  
Each press of the **MENU** button advances to the next parameter.  
Press **ENTER** to save the parameters and exit the parameter setting mode.  
Parameter setting mode is automatically cancelled after a 5 second timeout with no button pressed.



## Set Rotor Fitted

**Note: It is essential that the rotor setting matches the rotor fitted. Otherwise the rotor could be subject to speeds in excess of its rating leading to damage to the rotor.**

1. Ensure the rotor is stopped.
2. Press the **MENU** button until the rotor field is highlighted.
3. Press the **INC** or **DEC** buttons until the rotor number matches the rotor that is fitted to the centrifuge. See table page 14.
4. Press the **ENTER** button to save the setting.

### **Set Speed**

1. Press **MENU** button until speed field is highlighted.
2. Press **INC** or **DEC** to select required speed. Note that speed changes in steps of 100rpm and will auto-increment or auto-decrement if the **INC** or **DEC** button is held down. (The speed will be limited to the maximum permitted for the selected rotor.)
3. Press the **ENTER** button to save the setting.

### **Set Time**

1. Press **MENU** button until minutes or seconds of time field is highlighted.
2. Press **INC** or **DEC** to select required time. Note that time changes in steps of 1 and will auto-increment or auto-decrement if the **INC** or **DEC** button is held down.
3. Press the **ENTER** button to save the setting.

### **Set Acceleration Profile**

1. Press the **MENU** button until the acceleration field is highlighted.
2. Press the **INC** or **DEC** buttons to select the required acceleration profile. Acceleration profiles range from a minimum of 1 to a maximum of 9. The default acceleration profile is 6.
3. Press the **ENTER** button to save the setting.

### **Set Deceleration Profile**

1. Press the **MENU** button until the deceleration field is highlighted.
2. Press the **INC** or **DEC** buttons to select the required deceleration profile. Deceleration profiles range from a minimum of 1 to a maximum of 9. The default deceleration profile is 5.
3. Press the **ENTER** button to save the setting.

## **User Programs**

There are 15 user programs available that each store a complete set of parameters (i.e. speed, time, acceleration, deceleration and rotor) for a particular centrifugation process.

User programs are *viewed* or *selected* in program mode which is accessed via the **PROG** button.

User programs are *altered* in parameter setting mode which is accessed via the **MENU** button. Alterations are made to the *currently selected* user program.

### **View User Program**

1. Press **PROG** button. Press **INC** or **DEC** buttons to increment or decrement program number. (Holding **INC** or **DEC** buttons down will auto-increment or auto-decrement the selected value.)
2. With no button pressed for 5 seconds unit will time out and revert to previously selected user program.

### **Select User Program**

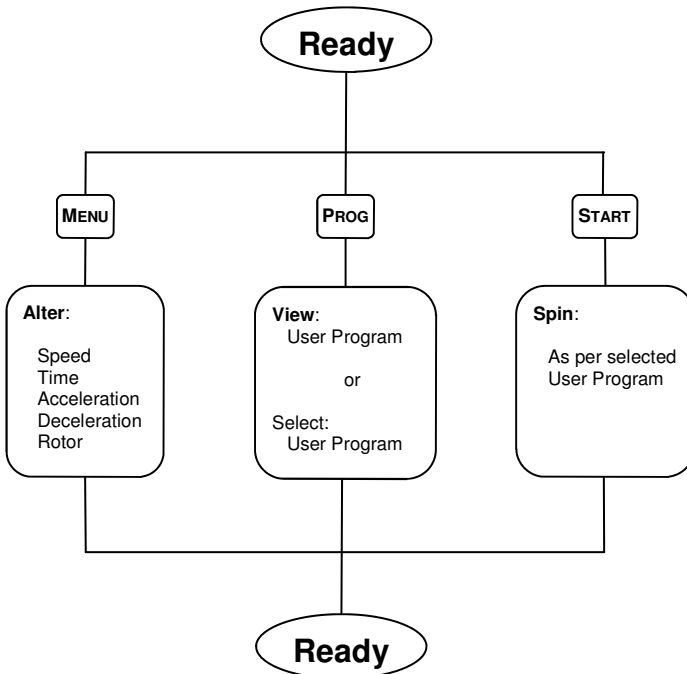
1. Press **PROG** button. Press **INC** or **DEC** buttons to increment or decrement program number. (Holding **INC** or **DEC** buttons down will auto-increment or auto-decrement the selected value.)
2. Press **ENTER** to make the displayed user program the currently selected user program.

### **Alter User Program**

1. Select the required user program using the steps in *Select User Program* above.
2. Press **MENU** to select parameter setting mode.
3. Each press of the **MENU** button advances to the next parameter.
4. Alter the required parameters as described on the previous page.
5. Press **ENTER** to save the parameters and exit the parameter setting mode.
6. Parameter setting mode is automatically cancelled after a 5 second timeout with no button pressed.

**Warning**  
**Rotor selected must match rotor fitted.**

Pay particular attention to ensuring that the rotor set in the user program selected matches the actual rotor fitted. Otherwise the rotor could be subject to speeds in excess of its rating leading to damage to the rotor.



## Operation Summary

See previous sections for details of individual steps.

1. Confirm that correct rotor is selected.
2. Load a balanced and evenly distributed set of sample tubes.
3. Close lid.
4. Confirm acceleration and deceleration profiles.
5. Set required speed.
6. Set required spin time.
7. Press START button.
  - The rotor will automatically accelerate to the set speed using the set acceleration profile.
  - The rotor will spin for the set time with the time display counting down to zero.
  - The rotor will automatically decelerate to zero using the set deceleration profile.
  - When the rotor has stopped the beeper will signal the end of the spin cycle.
8. Press the STOP / OPEN button to unlock the lid.

**Note: For repeat operations using the same settings, the only steps required are to load the samples, close the lid and press the START button.**

**The previous settings are automatically restored at power-on.**

## Rotor Setting

Rotor	Type	Max rpm	Max x g	Rotor Setting
CEN 92300 001	Angle	5500	5310	1
CEN 92300 004	Swing No. 3	4000	3040	3
CEN 92300 013	Swing No. 4	4200	3100	4
CEN 92300 032	Microtitre	4000	2260	6



**Angle Rotor CEN 92300 001**

**24 x 10ml Tubes**

**Max rpm: 5500**

**Max RCF: 5310**

**Rotor Setting: 1**

**Swing Rotor CEN 92300 004**

**Multi-adaptor**

**Max Speed: 4200rpm**

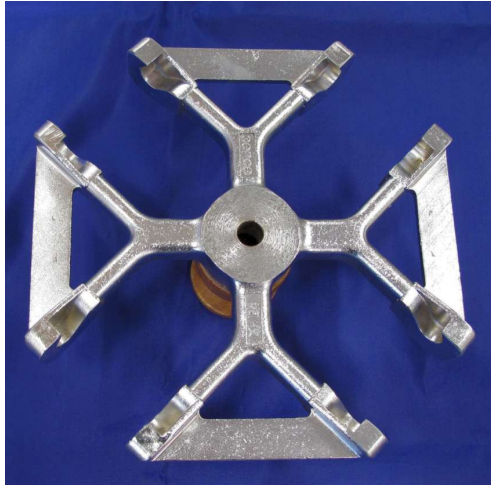
**Max RCF: 3100**

**Rotor Setting: 3**



**Swing Rotor CEN 92300 003**

**Machined buckets**  
**Max Speed: 4200rpm**  
**Max RCF: 3100**  
**Rotor Setting: 4**



**Microtitre Rotor CEN 92300 032**

**4 x 2 x 96 well microplate**  
**Max Speed: 4000rpm**  
**Max RCF: 2200**  
**Rotor Setting: 6**

**Bucket**

**CEN 92300 009**

**10 x 15ml Round Bottom**

**Max Speed: 4000rpm**

**Max RCF: 3040**



**Bucket**

**CEN 92300 010**

**10 x 15ml Falcon style**

**Max Speed: 4000rpm**

**Max RCF: 3040**



**Bucket**

**CEN 92300 008**

**20 x 10ml**

**Max Speed: 4000rpm**

**Max RCF: 3040**



**Bucket**

**CEN 92300 006**

**28 x 5ml**

**Max Speed: 4000rpm**

**Max RCF: 3040**



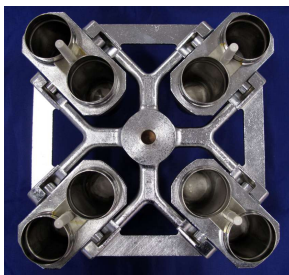
**Bucket**  
**CEN 92300 011**  
4 x 50ml Round Bottom  
Max Speed: 4000rpm  
Max RCF: 3040



**Bucket**  
**CEN 92300 012**  
4 x 50ml Falcon style  
Max Speed: 4000rpm  
Max RCF: 3040



**Bucket**  
**CEN 92300 017**  
4 x 2 x 100ml  
Max Speed: 4200rpm  
Max RCF: 3100  
(Rotor not included)



**Bucket**  
**CEN 92300 018**  
4 x 8 x 15ml / 10ml / 7ml  
Max Speed: 4200rpm  
Max RCF: 3100  
(Rotor not included)



**Accessories**

CEN 92300 001	Angle Rotor for 460 (24 x 10ml)
CEN 92300 004	Swing Rotor No. 3 for 460 suit multi-adaptor open buckets (excludes buckets)
CEN 92300 017	Bucket (4 x 2 x 100ml) for Rotor No. 3
CEN 92300 018	Bucket (4 x 8 x 15ml) for Rotor No. 3
CEN 92300 013	Swing Rotor No. 4 for Orbital 460 (excludes buckets)
CEN 92300 005	Multi-adaptor open buckets for Orbital 460 (Set of 4)
CEN 92300 007	Multi-adaptor (4 x 24 x 1.5 ml)
CEN 92300 006	Multi-adaptor (4 x 28 x 5 ml)
CEN 92300 008	Multi-adaptor (4 x 20 x 10 ml)
CEN 92300 009	Multi-adaptor (4 x 10 x 15 ml) Round bottom
CEN 92300 010	Multi-adaptor (4 x 10 x 15 ml) Falcon® style
CEN 92300 011	Multi-adaptor (4 x 4 x 50 ml) Round bottom
CEN 92300 012	Multi-adaptor (4 x 4 x 50 ml) Falcon® style
CEN 92300 003	Multi-adaptor (4 x 250 ml)

**Spares**

CEN 92300 025	LCD / Control PCB for Orbital 460
CEN 92300 027	AC Brushless Motor for Orbital 460
CEN 92300 028	Hinge set for Orbital 460
CEN 92300 031	Lid Gas Spring for Orbital 460
CEN 92300 029	Electronic Lid Lock for Orbital 460
CEN 92300 036	Lid Release Solenoid for Orbital 460
CEN 92300 030	Power Transformer for Orbital 260/460 (240V)
CEN 92300 024	AC Inverter Module for Orbital 460
CEN 92300 037	Fan for Orbital 460
CEN 92300 035	User Manual for Orbital 460

<b>ROTORS / BUCKETS</b>	
<b>Rotor</b>	<b>Buckets</b>
Angle Rotor for 460 (12 x 10 ml) CEN 92300 001	
Swing Rotor No 3 for 460 suit multi-adaptor open buckets (excludes buckets) CEN 92300 004	Multi-adaptor open buckets for 460 (Set of 4) CEN 92300 005
	Microtitre buckets for 460 (4 x 2 x 96) CEN 92300 032
Swing Rotor No 4 for 460 (excludes buckets) CEN 92300 013	Bucket (4 x 2 x 50 ml) CEN 92300 016
	Bucket (4 x 2 x 100 ml) CEN 92300 017
	Bucket (4 x 8 x 15 ml/ 10 ml/ 7 ml) Adaptors included CEN 92300 018
	Bucket (4 x 18 x 7 ml) CEN 92300 019
	Bucket (4 x 12 x 5 ml / 10 ml) CEN 92300 020

	Multi-adaptor	Maximum speed [rpm]	Maximum RCF [g]	Tube dimensions [mm]
		500	5,310	Ø 16 x 83
	Multi-adaptor (4 x 24 x 1.5 ml) CEN 92300 007	4000	3040	Ø 11 x 43
	Multi-adaptor (4 x 28 x 5 ml) CEN 92300 006			Ø 14 x 80-100
	Multi-adaptor (4 x 20 x 10 ml) CEN 92300 008			Ø 14 x 100
	Multi-adaptor (4 x 10 x 15 ml) Round Bottom CEN 92300 009			Ø 17 x 105
	Multi-adaptor (4 x 10 x 15 ml) Falcon® style CEN 92300 010			Ø 17 x 121
	Multi-adaptor (4 x 4 x 50 ml) Round Bottom CEN 92300 011			Ø 35 x 100-130
	Multi-adaptor (4 x 4 x 50 ml) Falcon® style CEN 92300 012			Ø 30 x 116
	Multi-adaptor (4 x 250 ml) CEN 92300 003			Ø 62 x 136
		4000	2200	
		4200	3100	Ø 30 x 116
				Ø 37 x 124
				Ø 17 x 105
				Ø 13 x 70
				Ø 13-14 x 70-100

## **Cleaning**

The centrifuge should be regularly cleaned to maintain its appearance and to ensure that dust or other damaging materials do not build up and affect the performance of the unit.

- Before cleaning the centrifuge disconnect it from the mains power supply.
- Clean the exterior surfaces using a proprietary furniture polish.
- Wipe the bowl and Rotor with a clean soft cloth *dampened* in a solution of warm water and a mild detergent.
- Most sterilising agents can be used on the interior bowl but avoid flooding the interior and never operate the centrifuge with disinfectant in the bowl.
- Solvent-based cleaning agents and abrasive cleaning agents should never be used on the Orbital 460.

## **Maintenance**

The Orbital 460 is designed to provide extended and reliable operation. To ensure proper operation and maximise the life of the centrifuge the following requirements must be observed:

- The centrifuge should be inspected by authorised service personnel every six months as part of your routine maintenance plan
- Confirm that lid interlock prevents starting when lid is unlocked and also prevents opening lid before rotor has stopped
- Using an optical tachometer confirm that the speed remains within specification
- Use only genuine Clements spare parts



**Fuse Replacement**

1. Switch off mains power to centrifuge using switch on rear panel.
2. Remove power cable from centrifuge IEC mains power inlet.
3. Slide out fuse holder and remove blown fuse from U-shaped holder.
4. Replace fuse with one matching fuse rating on rating label. (A spare fuse is normally fitted to the fuse holder.)

## **Error Conditions**

<b>Error Code</b>	<b>Fault</b>	<b>Action</b>
E4	Lid not closed when <i>START</i> button pressed	Close lid. Adjust <i>Lid Closed</i> limit switch.
E6	Overspeed condition: Incorrect rotor setting Incorrect inverter parameters	<b>++ SWITCH OFF ++</b> Verify correct rotor setting Reset inverter parameters
E7	Underspeed condition: Shaft locked Mains power fault Power control PCB fault Tachometer circuit fault	<b>++ SWITCH OFF ++</b> Check motor bearings Check transformer Replace power control PCB Check tachometer circuit
E8	Attempt to Start while stopping Incorrect setup or operation	<b>++ SWITCH OFF ++</b> Check parameters
E9	Communication fault: Over-current, over-voltage or overheat condition in inverter Fault in cable between display PCB and power control PCB	<b>++ SWITCH OFF ++</b> Allow to cool  Check cable and connections

**Note:**

**When error conditions E6, E8 or E9 occur, the centrifuge must be SWITCHED OFF and the fault corrected before proceeding.**

## Troubleshooting

Symptom	Possible Cause	Action
LCD display not lit when power switched on.	Power cable not plugged in securely.	Plug in power cable.
	No power supply.	Confirm power supply.
	Fuse has blown.	Replace fuse.
	Loose connecting cables.	Check and re-seat connectors.
Rotor does not spin when <i>START</i> button pressed.	Lid not closed.	Close lid.
	Loose connecting cables.	Check and re-seat connectors.
	Power transformer fault.	Replace power transformer.
	Motor fault.	Replace motor.
	PCB fault.	Replace PCB.
Excessive vibration.	Imbalanced carriers or sample tubes.	Rebalance.
	Broken sample tube.	Clean and replace sample tube.
	Unequal weight samples.	Make samples equal weight.
	Damaged platform shock absorber.	Replace shock absorber.

**Notes**

**Notes**

## **Warranty**

BMDi TUTA Healthcare Pty Ltd warrants that this product is free from defects in workmanship and materials for a period of 12 months from the date of shipment by BMDi TUTA Healthcare or its authorised agent to the purchaser. Subject to the conditions of this warranty, if the product fails to operate for any reason within the warranty period and the product is returned to the place of purchase at the purchaser's expense, BMDi TUTA Healthcare will repair or replace the product free of charge.

If a valid warranty claim is made within 30 days from the date of shipment, then BMDi TUTA Healthcare will also reimburse the purchaser for reasonable freight costs in returning the product to the place of purchase.

## **Conditions of Warranty**

1. The product must be returned to the place of purchase with proof of purchase.
2. This warranty is only available to the original purchaser of the product.
3. The product must not have had its serial number removed, defaced or changed, its casing opened, its power supply altered or have been tampered with in any other way.
4. This warranty does not cover :
  - inadequate or incorrect site preparation;
  - improper installation;
  - connection to the wrong voltage;
  - failure of the product due to misuse;
  - the use or operation of the product outside of the physical, electrical or environmental specifications of the product;
  - use in a manner or environment in which the product is not designed to be used;
  - improper adjustment, calibration or operation by the purchaser;
  - the use of accessories including consumables, hardware or software which were not manufactured or approved in writing by BMDi TUTA Healthcare ;

- any modifications of the product which were not authorised in writing by BMDi TUTA Healthcare ;
  - any contamination or leakages caused or induced by the purchaser; and
  - inadequate or improper maintenance of the product.
5. This warranty does not cover normal wear and tear.
  6. BMDi TUTA Healthcare will not be responsible for damage or loss caused during shipping.
  7. In Australia, apart from any warranties implied by the Trade Practices Act 1974 all other warranties expressed or implied and whether arising by virtue of statute or otherwise are hereby excluded.
  8. Outside Australia, all other warranties expressed or implied and whether arising by virtue of statute or otherwise (including any warranties implied by the Vienna Convention) are hereby excluded.
  9. BMDi TUTA Healthcare ' obligations under this warranty are limited to the repair or replacement of the product, within the terms of this warranty and the total liability of BMDi TUTA Healthcare for loss or damage of every kind whether arising pursuant to the terms of the sale of the product or otherwise in connection with the product is limited to the amount paid by the purchaser to BMDi TUTA Healthcare for the product.
  10. Apart from any liability imposed by Part VA of the Trade Practices Act, BMDi TUTA Healthcare accepts no other liability for any loss or damage occasioned (including consequential loss or damages) in any way as a result of the use of the product.
  11. The warranty does not extend to cover damage to the following parts as they are inherently prone to wear :
    - motor brushes
  12. This warranty does not extend to cover corrosion due to any cause nor to any damage to painted or anodised surfaces.
  13. BMDi TUTA Healthcare will give the purchaser the benefit of any manufacturer's warranty in respect of any components in the product which were not manufactured by BMDi TUTA Healthcare , if such a manufacturer's warranty is available.

