Hettich
ZENTRIFUGEN

Operating Instructions

EBA 12 / 12 R

Please enter the following details:

- Stock no. .....
- Monitoring no. .....
- Location .....

This operating instruction has to be used for the centrifuges bearing the following Manufacturing Nos. :
(the Manufacturing No. of a centrifuge can be see from its name plate)

Type of centrifuge	Voltage	Article No.	Manufacturing No
EBA 12	230 V/240 V	1000	XXXX-02
EBA 12	115V	1000-01	XXXX-02
EBA 12 R	230 V	1002	XXXX
EBA 12 R	115V	1002-01	XXXX

Hettich
ZENTRIFUGEN

CE

Certificate of EU - Conformity

as defined by the EU regulations

- for machines 89/392/EWG, amended by regulations 91/368/EWG, 93/44/EWG and 93/68/EWG, appendix II A
- for electro-magnetic compatibility 89/336/EWG, amended by regulations 91/263/EWG, 92/31/EWG and 93/68/EWG
- for low voltage 73/23/EWG, amended by regulation 93/68/EWG

We, Messrs. Andreas Hettich
Gartenstraße 100
D-78532 Tuttlingen,

hereby certify that centrifuge model(s)

EBA 12, EBA 12 R

is (are) manufactured in accordance with the following standards and regulations:

EN 61010 part 1 and 2

EN 55011

in addition the following national standards and regulations are applied:

VBG 1	DIN 58970
VBG 4	BS 4402
VBG 7z	
VBG 20	

Tuttlingen 24.07.1998 Hettich Zentrifugen

H. Pistor

i. V. H. Pistor, sales manager

Contents

1. Intended application

The centrifuge is used for separating substances or mixtures with a density of up to max. 1.2 kg/dm³.
Through the production of centrifugal force it can separate mixtures or alter the proportions in a mixture.
If the substance or mixture to be centrifuged is denser than 1.2 kg/dm³, the rated speed should be reduced (see section "Centrifuging of denser substances").

2. Notes on safety

- This centrifuge is a state-of-the-art piece of equipment which is extremely safe to operate.
  - However, it can lead to danger for users or others if used by untrained staff, in an inappropriate way or for a purpose other than that it was designed for.
- Before the initial operation of your centrifuge you should read and pay attention to the operating instructions.
- Along with the operating instructions and the legal regulations on accident prevention, you should also follow the recognised professional regulations for working in a safe and professional manner.
  These operating instructions should be read in conjunction with any other instructions concerning accident prevention and environmental protection based on the national regulations of the country where the device is to be used.
- The centrifuge should be installed on a good, stable base.
- When setting the equipment up you should pay attention to the following points:
  - A 300 mm safety zone must be established around the centrifuge in accordance with IEC 1010-2-2.
  - This safety zone must be kept clear of both people and hazardous substances at all times when the centrifuge is in operation.
- The centrifuge should always be loaded evenly.
- Centrifuge containers must not be filled beyond the capacity specified by the manufacturer.
  - Centrifuge containers should only be filled outside the centrifuge.
- Standard centrifuge containers of glass will not stand RCF values exceeding 4000 (DIN 58970, part 2).
- No attachments should be used other than those authorised by the manufacturer.
- Centrifuge containers may only be centrifuged with accessories (reducing adapters, frames, suspensions, etc.) authorised by the manufacturer (see section "Rotors and accessories).
- The centrifuge may only be operated when the balance is within the bounds of acceptability.
- The centrifuge must not be operated in areas subject to danger of explosions.
- The centrifuge must not be used with:
  - inflammable or explosive materials
  - materials that react with one another producing a lot of energy.
- If users have to centrifuge hazardous materials or compounds contaminated with toxic, radioactive or pathogenic micro-organisms, they must take appropriate measures.
  In the case of material belonging to risk group II (see the World Health Organisation's "Laboratory Biosafety Manual") they should employ a biosafety system. Under this

system small drips and aerosols are prevented from escaping by a bioseal (packing ring) located between the hanger and the lid. Centrifuge containers with special screw caps, as obtainable through trade suppliers, can also be used for hazardous substances.
In the case of materials from the higher risk groups greater safety provision is required than the arrangements described above. In a biosafety system, centrifuge containers with special screw caps must be used.

- For further details of available biosafety systems see section "Rotors and accessories".
- The centrifuge must not be operated with highly corrosive substances which could impair the mechanical integrity of rotors, hangers and accessories.
- Any rotors, hangers or accessories showing clear signs of corrosion or mechanical defects must not be used for centrifuging.
- In order to prevent corrosion developing through cleaning or disinfectant agents, it is most important that any specific instructions from the manufacturers of such agents should be followed carefully.
  If in doubt, you should obtain relevant information from the manufacturers.
- Only original spare parts and authorised original accessories may be used.
- In case of fault or emergency release, never touch the rotor before it has stopped turning.
- This centrifuge is classified in Germany as a Group 3 device according to the *Medizinische Geräteverordnung MedGV* (the regulations on medical equipment).
- It conforms to safety regulations based on:

  IEC 1010-1/-2
  DIN - EN61010 Parts 1and 2

- The safe operation and reliability of the centrifuge can only be guaranteed if:
  - the centrifuge is operated in accordance with the operating instructions,
  - repairs are carried out by engineers approved by the manufacturer,
  - the electrical installation on the site where the centrifuge is installed conforms to the demands of IEC stipulations,
  - prescribed tests to UVV-VBG7z are carried out by an expert.

No claim under guarantee will be considered by the manufacturer unless the above instructions have been adhered to.

3. Warning symbols

Caution! Follow instructions carefully.

Load centrifuge rotor evenly.
All positions on rotor must be filled.

Do not fill centrifuge containers inside the centrifuge.

4. Delivery checklist

The following items and accessories are delivered with the centrifuge:

			Order no.
1	Connecting cable		
	- 230 V version		4718
	- 115 V version		6083
2	Fuse inserts for mains connection		
	EBA 12		
	- 230 V version	T 3,15 AH; 250 V	5765
	- 115 V version	T 5 AH; 250 V	E848
	EBA 12R		
	- 230 V version	T 5 AH; 250 V	E914
	- 115 V version	T 7 AH; 250 V	E771
1	Hex. pin driver		E613
1	Notes on moving the equipment safely		TS001
1	Operating instructions		B001
1	Rotor instructions		B032

The rotor(s) and associated accessories are included in the delivery in the quantity ordered.

5. Technical specifications

Data table 5–A

Manufacturer	Hettich Zentrifugen D-78532 Tuttlingen			
Model	EBA 12		EBA 12 R	
Product no.	1000	1000-01	1002	1002-01
Mains voltage (± 10%)	230/240 V ac	115 V ac	230 V ac	115 V ac
Mains frequency	50 / 60 Hz	60 Hz	50 / 60 Hz	60 Hz
Current consumption	2.2 A	3.2 A	3 A	6 A
Power consumption	350 W	350 W	420 W	420 W
Fuses:				
Centrifuge	T 3.15 A	T 5 A	T 5 A	T 7 A
Refrigerant	-----		R 134a	
Max. capacity	6 x 50 ml			
Max. density	1.2 kg/dm^3			
Speed RPM	18000			
Force RCF	23900			
Kinetic energy	5700 Nm			
Obligatory inspection	no			
Environment – Ambient temperature – Relative humidity	5°C up to 40°C max. 80% up to 31°C, descending in a linear pattern down to 50% at 40°C			
Sample overtemp.	≤ 15 K		-----	
Class of protection	I			
Radio interference suppression	230 V, 50 / 60 Hz EN 55011 B 115 V, 60 Hz FCC Class B			
Noise level (dependent on rotor)	58 - 68 dB(A)		45 - 58 dB(A)	
Dimensions				
• Width	280 mm		300 mm	
• Depth	326 mm		615 mm	
• Height	263 mm		295 mm	
Weight ca.	11.5 kg		30 kg	

6. Initial operation

- The amount of space required is given under dimensions in the "Technical specifications" section.

The centrifuge should be set up in a suitable position on a good, firm surface.
When setting up the equipment, care should be taken to provide the required safety area of 300 mm around the centrifuge in accordance with IEC 1010-2-2.

> The safety area must be clear of all persons and hazardous substances at all times when the centrifuge is in operation.

- You should check that the mains voltage corresponds to that stipulated on the model plate.
- Using the connecting cable provided, the centrifuge should be connected to a standard mains socket.
- Mains switch "ON" - switch position "I".

The LCD light and the LEDs come on briefly (operational check).
The screen display will now show the centrifuge data (parameters) set the last time the centrifuge was used.

- Wait for the LED to come on, then turn the turning handle for the lid lock to the left.

The LED will now go off.

- Open the lid.

> The lid can only be opened when the centrifuge is switched on and the rotor is at rest. If it cannot be opened under these circumstances, see the section on "Emergency release".

- Remove the transport safety device (see instruction sheet on "Moving the equipment safely.").

7. Installing the rotor and fitting attachments

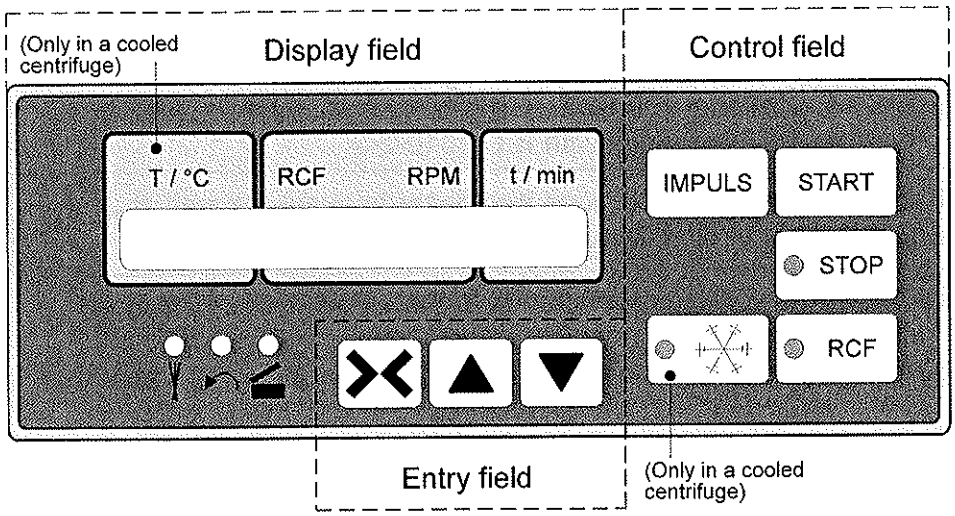
See Rotor Instructions B032 or the section "Changing the rotor".

- All spaces must be filled on rotors with free-swinging hangers. No empty rotor positions are permitted.
- Always fill the centrifuge containers outside the centrifuge.
- Check by eye that each container is filled to the same level.
- Loads must be equal between opposing positions.

For details of allowable combinations see the section "Rotors and accessories" in the appendix.

Close the lid. The LED will come on.

8. Control and display elements



8.1. Entry field

><

Selector key for selecting the individual parameters for numerical input.
The selected parameter is identified in the display by the symbols "**> <**".
The next parameter can be selected by pressing the selector key again.

▲

Pressing the arrow keys has the effect of increasing or decreasing the numerical value of a selected parameter.

▼

By keeping either of these arrow keys pressed down you can increase or decrease the value at an ever-increasing rate.

8.2. Control field

START

Start centrifuging in accordance with the parameters in the display area.
In the display area the rotation light ↶ will come on.

○ STOP

Stop centrifuging.
The rotor will run down with the brake applied according to the parameter defined.
The LED in the key remains lit until the rotor comes to rest.
Pressing the ○ STOP key twice triggers the EMERGENCY STOP.
The brake is applied according to parameter 9 during run-down (shortest run-down time).

○ RCF

Selector key for toggling between RPM and RCF menus.
The chosen menu is confirmed by the cursor " ^ ".

IMPULS

The rotor spins at the predetermined speed or with the predetermined relative centrifugal force (RCF) for as long as this key remains pressed down.

Pre-cooling the centrifuge chamber (cooled centrifuge).
The LED in the key indicates that this function is activated.
○ STOP key terminates the pre-cooling process.

8.3. Display field

When RPM or RCF menus are preselected

t/min Remaining time where time is preset.
Centrifuging time for long or short runs.

Run-up parameter (run-up time).

Run-down parameter (run-down time).

T°C Temperature in centrifuge chamber (cooled centrifuge).
Chosen temperature (SET temperature).
Current temperature (ACTUAL temperature).

When RPM menu is preselected

RPM Chosen rotational speed (RPM) is displayed when rotor is stationary. Current speed (RPM) is displayed while the centrifuge is running.

When RCF menu is preselected

RCF Chosen relative centrifugal force (RCF) is displayed when rotor is stationary. Current RCF is displayed while the centrifuge is running.

mm Chosen radius of centrifuge attachments.

9. Calculating rotational speed RPM and relative centrifugal force RCF

These values are calculated using the formulas below:

$$RCF = \left(\frac{RPM}{1000}\right)^2 \times r \times 1.118 \qquad RPM = \sqrt{\frac{RCF}{r \times 1.118}} \times 1000$$

RCF = Relative centrifugal force
RPM = Rotational speed (revolutions per minute)
r = Radius in mm = Distance from the centre of the axle to the floor of the centrifuge container. For further details on radius see "Rotor and accessories" section.

- In the RCF menu, enter radius into the parameter "**>xxx mm<**".
- Enter the speed RPM and/or the acceleration RCF in the appropriate menu.
- Press the [○ RCF] key; the result will be displayed.
- A calculation can only be performed for speeds between 500 and the rated speed (n_{max}) of the last rotor identified by the sensor.

Calculation

			RPM or RCF
1.	Use key [○ RCF]	to select menu	RCF
2.	Use key [><]	to select parameter	>100 mm <
3.	Use key [▲] or [▼]	to define radius	> xxx mm <

				RCF	RPM
4.	Use key	○ RCF	to select menu		
5.	Use key	⋈	to select parameter	> <	> <
6.	Use key	▲ or ▼	to define RCF or RPM	> xxxxx <	> xxxxx <
7.	Use key	○ RCF	to retrieve result	RPM	RCF

If no radius is entered during initial operation, the calculation is performed using a radius of 100 mm.

10. Symbols (LEDs) on the operating console

Balance error.
If this LED is lit, the rotor must be loaded evenly.

Rotation indicator.
The rotation indicator is lit after the START key is pressed.
It remains lit until the rotor comes to rest.

When this LED is lit, it means:

1. Lid can be opened.
2. Centrifuge is ready for operation.

LED is lit after the lid is closed and locked.

Operating faults or other errors that may arise are represented by symbols in the display (see Troubleshooting).

11. Acoustic signal

When centrifuging has finished and the rotor come to rest, an acoustic signal is emitted at 30 sec. intervals. This acoustic signal can be switched off by opening the lid or pressing any key.

To switch signal **OFF** or **ON**:

1. Hold down the ⋈ key for 8 secs.
1. After 8 secs. the message " **SOUND/BELL** " will be displayed.
1. Press ▲ or ▼ to display **OFF** or **ON1** respectively.
1. Press the START key. *** **OK** *** is displayed to confirm the setting.

If any error condition arises while the centrifuge is running, the signal will be emitted at 3 sec. intervals.

12. Retrieving the number of operating hours

1. Press the ⋈ key and hold it down for 8 secs.
1. After 8 secs. " **SOUND/BELL** " will be displayed on the screen.
1. Use the ⋈ key to select the " **CONTROL Xh** " symbol.
1. The number displayed represents the number of operating hours.

13. Setting the centrifuging parameters

Enter data:

1. Using the [○ RCF] key, select the RPM or the RCF menu.
1. Using the [▷◁] key, select the required parameter "> <".
1. Define the relevant numerical value using the [▲] [▼] keys.
1. Using the [▷◁] key, select the next parameter "> <", and so on...

Optional settings:

RPM Rotational speed.
Numerical value that can be set to any value up to the rated speed.
Lowest speed available 500 RPM.

RCF Relative centrifugal force.
Numerical value that can be set to any value that, after calculation, will produce a speed between 500 RPM and the speed of the last rotor identified by the sensor.

mm Centrifuging radius.
As in the "Rotor and accessories" table in the appendix.

t/min Centrifuging time 1 - 99 min.
Entered in 1 min. steps.

∞ Long run

Run-up levels 1 - 9.
Level 9 relates to the shortest run-up time.

Braking levels 0 - 9.
Level 9 relates to the shortest run-down time.

T°C Temperature in centrifuge chamber (cooled centrifuge).
Temperature range -10 to + 40°C.
Entered in 1°C steps.

Making changes while the centrifuge is running:

- The value to be changed should be selected on the screen using the [▷◁] key.
- Change the number using the [▲] [▼] keys.
- Press [START] key.

When a parameter is modified, the new value is not adopted until the [START] key is pressed.

14. Centrifuging

14.1. - with the time parameter

- Define the required parameters.
- Press the [START] key; the rotation light ↶ will come on.
- The centrifuge will run until the defined time.
- Once the time has expired, the drive switches off.
- The centrifuge will run down at the selected braking level.

The centrifuge can be stopped by pressing the [○ STOP] key.
It will run down at the selected braking level.

14.2. - with the long run parameter

- Define the parameters required.
- Using the [⋈] key, select the parameter " **>t/min<** ".
- Using the [▼] key, display the " ∞ " symbol on the screen.
- Press the [START] key. The rotation light ↶ will come on.
- Press the [○ STOP] key. This will stop the centrifuge.

14.3. - short-term operation

- Define the parameters required.
- Press the [IMPULS] key.

The centrifuge will spin for as long as the key remains pressed.
Time is displayed in seconds up to max. 1 minute.

14.4. - with temperature preselection (cooled centrifuge)

- Define the required parameters.
- Using the [⋈] key, select the parameter " **> T/°C <** ".
- Using the [▲] [▼] keys, set the temperature (-10°C to + 40°C).

For the lowest temperature achievable see the table "Rotor and accessories" in the appendix.

- Press the [START] key.
- Once the temperature setting has been attained the cooling system switches off.

Temperature behaviour

- If the rotor is stationary and the lid is locked, cooling is in progress.
- If the rotor is stationary and the lid is unlocked, cooling is not in progress.

14.5. - with precooling of the centrifuge chamber

- Press the [❄] key.
- The pre-cooling is carried out at a reduced speed.

The rotor turns at 20% of the rated speed.

- Press the [○ STOP] key; this ends the pre-cooling process.

14.6. - of denser substances

The rotors are designed to centrifuge substances up to a maximum mean homogenous density of 1.2 kg/dm^3 when rotating at the stated speed.
Denser substances must be centrifuged at lower speed.

The permissible speed can be calculated using the following formula:

$$\text{Reduced speed } (n_{red}) = \sqrt{\frac{1.2}{\text{Greater density}}} \times \text{Rated speed}$$

e.g.: RPM 4000, density 1.6 kg/dm^3

$$n_{red} = \sqrt{\frac{1.2}{1.6}} \times 4000 = 3464 \text{ RPM}$$

If in doubt you should obtain clarification from the manufacturer.

15. EMERGENCY STOP

- Press [○ STOP] key twice.
- The centrifuge runs down on braking level 9 (the shortest rundown time).

16. Changing the rotor

- Open the lid.
- Loosen the rotor tensioning nut by turning it counter-clockwise with the appropriate spanner (see delivery checklist) until the release point is reached. Once this point is passed, the tension link opens. Turn the nut another half-turn to the left to enable the rotor to be lifted off the motor shaft.
- Clean the motor shaft.
- Place the new rotor vertically on the motor shaft and press it down until it engages. The motor shaft must engage audibly with the spring chuck.
- Tighten the tensioning nut.
- Check that the rotor is seated securely.

16.1. Rotor identification

- When the centrifuge starts it picks up the rotor identification with the aid of a sensor. The speed rating displayed on the rotor can therefore not be exceeded.
- If the new rotor's speed rating is lower than the last speed entered or picked up, the drive will cut out after a few revolutions and the new rotor's speed rating will be displayed.

Press the [START] key.

- If the new rotor's speed rating is higher than the last speed entered or picked up, the drive will cut out after a few revolutions and the new rotor's speed rating will be displayed.

Press the [START] key.

- Any speed up to the rated speed can be entered while the centrifuge is running.

17. Emergency release

If loss of current or a centrifuge fault occurs while the centrifuge is running, the lid remains locked.

To release in an emergency, unplug the centrifuge from the mains.
Wait for the rotor to stop turning before opening the lid.

- Position the centrifuge far enough forward on the workbench so that the emergency-release drill hole is accessible below the turning handle on the bottom of the housing.
- Insert the hexagonal pin driver into this hole, push it upwards and at the same time rotate the lid-lock handle to the left.
- Open the lid.

18. Care / maintenance

Before applying any cleaning or disinfecting procedure other than those recommended by the manufacturer, the user should ensure that the planned process will not damage the equipment.

- The centrifuge should be cleaned regularly for reasons of hygiene, and if necessary should also be cleaned with soap or a mild cleaning agent.
- Any adherent impurities should be removed as they can cause corrosion.
- Humidity in the air or centrifuge containers with no hermetic seal can lead to condensation. The centrifuge chamber (stainless steel) should therefore be cleaned regularly with a cloth or similar.
- For instructions on how to clean the rotor and accessories see the rotor instructions B032.
- In the case of glass breakage, the fragments of glass along with any spilt centrifuge product should be removed carefully from the centrifuge chamber, the containers or container drill holes.

After a glass breakage the rubber inserts for the containers must be replaced because any residual glass fragments in these inserts can cause further glass breakage.

- If any infectious material should find its way into the centrifuge chamber it should be disinfected immediately.
- When a biosafety system is in use (see section "Rotors and accessories"), the bioseal (packing ring) between the hangers and the lid must be checked and cleaned regularly. This routine should be performed at least once a week.

The packing ring should be replaced as soon as any signs of tears, brittleness or wear are shown.

19. Faults

19.1. Notes on faults

If any fault or defect should arise, this is indicated by a symbol on the screen, while at the same time the rotation light will flash on and off and an acoustic signal will be emitted at 3 sec. intervals. In the case of ERROR 11/15 the signal will not be output until 4 mins. later.

- The drive cuts out. Depending on the error message the run-down is either with or without braking. After the rotor has come to rest, clearance for opening the lid is issued.
- Clear fault by: MAINS RESET = mains switch OFF - mains switch ON.
- If the fault cannot be rectified by following the troubleshooting guide and if the error message reappears after performing a MAINS RESET, you should contact Customer Services.

19.2. Troubleshooting

Message / fault		Cause	Remedy
No display	---	Fuses at mains connection defective.	Check fuse inserts in appliance plug.
IMBALANCE	---	Imbalance about motor axis. Weight differential in rotor assembly.	– Open lid. – Correct imbalance.
ERROR	2	Error in measurement of rotational speed.	MAINS-RESET.
ERROR	3 - 5	Control error.	MAINS-RESET.
ERROR	6	Overload current to drive.	– Check whether motor has locked. – MAINS-RESET.
MAINS INTERRUPT	---	Power failure, centrifuging not properly completed.	– Open lid. – Clear error with START button. – *** **OK** *** message.
ERROR	9	Incorrect rotor coding. Motor spinning in wrong direction.	– Check rotor coding and spin direction. – MAINS-RESET.
ERROR	10	Rotation too fast.	– Open lid. – Turn rotor manually. – MAINS-RESET. – When mains is switched ON, rotor should turn.
ERROR	11	Faulty speedometer. Motor brakes for 4 min.	
ERROR	12	Defective catch. Forced to unlatch during centrifuging.Temperature safety device Si 3 defective	
ERROR	13	Storage error (runtime parameter).	MAINS-RESET.
ERROR	14	Faulty lock on drive circuit.	– Open lid. – Turn rotor manually. – MAINS-RESET. – When mains is switched ON, rotor should turn.
ERROR	11/15	Faulty drive or speedometer. Motor brakes for 4 min.	
ERROR	16	Faulty temperature sensor. Damaged cable or loose contact.	MAINS-RESET.
ERROR	18	Temperature in centrifuge chamber >60°C, cooler not operating, faulty temperature sensor.	– Open lid, allow centrifuge chamber to cool. – MAINS-RESET.

20. Repairs

Repairs must only be carried out by personnel authorised to do so by the manufacturer.

20.1. Changing fuses at the mains connection

Centrifuge **must** be unplugged from the mains.

Pull the mains cable out of the appliance plug.
The fuses are located in the appliance plug.

- Open the cover on the appliance plug.
- Press the fuse-holder spring towards the fuse holder and remove the fuse holder along with the fuse.

Replace the faulty fuse with a new one (included in standard delivery).

21. Customer Services / Servicing

Should your centrifuge break down or develop a fault, it should not be touched by anyone except an engineer authorised by the manufacturers.

In such a case you should contact Hettich Customer Services.

Before contacting our Customer Services department you should make a note of the following:

1. Centrifuge model
2. The factory number

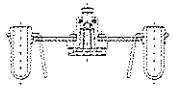
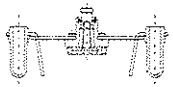
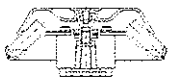
Both of these numbers can be found on the centrifuge's model plate.

Note down any problems experienced.

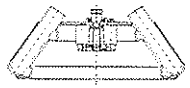
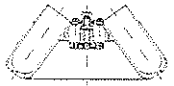
You must follow the steps above in order to return to normal operation as quickly as possible.

22. Spare parts

Spare part			EBA 12		EBA 12R	
			230 V	115 V	230 V	115 V
Motor			E822	E824	E822	E824
Rubber-metal bearing			E343	E343	E343	E343
– Anti-twist device			E604	E604	E604	E604
Carrier flange (speedometer)			E825	E825	E730	E730
Appliance plug			E354	E354	E351	E351
– Fuse holder			E352	E353	E352	E353
Fuse	T 3.15 AH; 250 V		E997	-----	-----	-----
	T 5 A; 250 V		-----	E848	E914	-----
	T 7 A; 250 V		-----	-----	-----	E771
Mains switch			6044	6044	E812	E812
Radio interference suppression filter			E827	E826	E827	E826
Braking resistance			E733	E849	E733	E849
– Thermal fuse for braking resistance			E886	E886	E886	E886
Microswitch (imbalance)			2378	2378	2378	2378
Lid lock			E425	E530	E425	E530
Turning handle			E608	E608	E427	E427
– Leaf spring			E609	E609	E727	E727
Frequency converter			E831-1	E845-1	E831-1	E845-1
Electronic control panel			E1104	E1105	E1106	E1107
Supply board			E832	E846	E834	E847
Control line	10-pole	SSTEU	E842	E842	E890	E890
	16-pole	St2	E835	E835	-----	-----
	16/10-pole	St1, St3	-----	-----	E889	E889
Covering foil			E837	E837	E892	E892
Packing ring (on control panel)			E816	E816	E816	E816
Packing ring (between chamber and lid)			E838	E838	E893	E893
Centrifuge chamber			E627	E627	-----	-----
bellows			-----	-----	E707	E707
Motor hood			E839	E839	E881	E881
Rubber foot			E605	E605	1260	1260
Lid			E900	E900	E1206	E1206
Lid moulding			E901	E901	E1207	E1207
Hook (lid)			E532	E532	E532	E532
Leg spring (lid)			E611	E611	-----	-----
Insert			E610	E610	-----	-----
Hinge (lid)	right		-----	-----	E894	E894
	left		-----	-----	E894-1	E894-1
Temperature sensor (centrifuge chamber)			-----	-----	E895	E895
Temperature protection (cooling)			-----	-----	E896	E896
Compressor			-----	-----	E897	E898
Fan			-----	-----	E874	E877
Hexagonal pin-type spanner			E613	E613	E613	E613
Mains cable			4718	6083	4718	6083

Rotor Sales-No.	Hanger	Reduction	Capacity per Frame	Measurements Ø x L (mm)	Number p. Frame	Number p. Rot.	RPM	RCF	Run-up time 97% in sec.	Run-down time ⑨/⑩ in sec.	Radius (mm)	Temp. in °C cooled ⓧⓧⓧ
6-times	1123	———	15 ml	17 x 100	1	6	5000	2879	16	16/117	103	-6
	———											
1115												
8-times	1127	———	5 ml	13 x 75	----	8	5000	2879	17	17/118	103	-5,5
	1122		10 ml	17 x 70	----	8	5000	2879	17	17/118	103	-5,5
1114												
12-times	1127	———	5 ml	13 x 75	----	12	5000	2879	21	18/191	103	-5,5
		———										
1126												
12-times (with decanter aid)		———	5 ml	13 x 75	----	12	5000	2879	21	18/169	103	-5,5
		———	7 ml	13 x 100	----	12	5000	2879	21	18/169	103	-5,5
1118												
	———	———		Capillaries	----	24	15000	20879	20	20/200	83	10
	1455 : Evaluation disc with adjustable zero point											
	1456 : Evaluation disc with adjustable and fixable zero point											
1423 Haematocrite												
Angle 12-times	———	———	1,5-2,2 ml	Reaction Receptacles	----	12	18000	23907	22	22/220	66	11
		2023	0,5 ml / 0,8 ml	Reaction R. / Bec.-Dick. T	----	12	18000	23907	22	22/220	66	11
		2024	0,4 ml	Beckman	----	12	18000	23907	22	22/220	66	11
1112												

ⓧⓧⓧ the lowest possible temperature during the highest revolutions and 1 hour running time

Rotor Sales-No.	Hanger	Reduction	Capacity p. Frame	Measurements Ø x L (mm)	Number p. Frame	Number p. Rot.	RPM	RCF	Run-up time 97% in sec.	Run-down time ⑨/⓪ in sec.	Radius (mm)	Temp. in °C cooled ⓧⓧⓧ
Angle 24-times	———	———	1,5-2,2 ml	Reaction Receptacles	----	24	14000	20160	34	34/275	92	15
		2023	0,5 ml 0,8 ml	Reaction R. Bec.-Dick. T	----	24	14000	20160	34	34/275	92	15
		2024	0,4 ml	Beckman	----	24	14000	20160	34	34/275	92	15
1412												
Angle 12-times	———	———	15 ml	17 x 100	----	12	6000	4025	26	26/200	100	-6
		1056	5 ml	13 x 75	----	12	6000	3421	26	26/200	85	-6
1416												
Angle 6-times	———	———	50 ml	34 x 100	----	6	6000	3904	38	38/440	97	-4,5
		1634	50 ml	28,5 x 104	----	6	6000	3783	38	38/440	94	-4,5
		1633	25 ml 30 ml	24 x 100 25,5 x 92	----	6	6000	3622	38	38/440	90	-4,5
		1635	15 ml	17 x 100	----	6	6000	3703	38	38/440	92	-4,5
			10 ml	16,5 x 92 Sarstedt	----	6	6000	3703	38	38/440	92	-4,5
		1631	15 ml	17 x 120 Falcon	----	6	6000	3743	38	38/440	93	-4,5
1116		1632	7 ml	12 x 100	----	18	6000	3824	38	38/440	95	-4,5

ⓧⓧⓧ The lowest possible temperature during the highest revolutions and 1 hour running time