

**EBA 270**



**Repair instructions**

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## 1 Introduction

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



Interventions and modifications at centrifuges, which have been conducted by persons not authorized by the Andreas Hettich GmbH & Co. KG company, are at their own risk and entail the loss of all guarantee and liability claims. In such an event any guarantee claim or liability claim against the Andreas Hettich GmbH & Co. KG company expires.

- Only original spare parts and original accessories licensed by the Andreas Hettich GmbH & Co. KG company are allowed to be utilised.



If no original spare parts or no original accessories are used, any guarantee claim or liability claim against the Andreas Hettich GmbH & Co. KG company ceases to exist.

- Information about the operation of the centrifuge please see operating instructions.
- We reserve all rights for these technical documents.

## 2 Symbol meanings



Symbol on the device:

Attention, general hazard area.

Before using the device, make sure you read the operating instructions and observe the safety information!



Symbol in this document:

Attention, general hazard area.

This symbol refers to safety relevant warnings and indicates possibly dangerous situations.

The non-adherence to these warnings can lead to material damage and injury to personal.



Symbol in this document:

Warning! Danger for human lives by electric shock.



Symbol in this document:

This symbol refers to important circumstances.



Symbol on the machine and in this document:

Symbol for the separate collection of electric and electronic devices according to the guideline 2002/96/EG (WEEE). The device belongs to Group 8 (medical devices).

Applies in the countries of the European Union, as well as in Norway and Switzerland.

### 3 Description of the centrifuge

This microprocessor controlled centrifuge mainly consists of the following components:

- Control panel (A2)
- Electronics (A1)
- Motor (M1) with speed sensor (B1)
- Lid lock system (A4)
- Imbalance switch (S1)



**All electronic components are on mains, due to the DC-coupling.**

#### 3.1 Control panel (A2)

The control panel (A2) have only restricted control tasks, it disposes of the following characteristics:

- Keys for input of the operation parameters
- Indication elements
- Transmission of the signals to the electronics (A1) via the interface.
- Storing the machine version and the brake setting.  
By means of the machine version the electronics (A1) is informed which kind of centrifuge has to be controlled. Then the electronics (A1) takes the corresponding values from the ROM.  
e.g. Max. Speed  
Acceleration and deceleration ramps
- Communication with the electronics (A1) via TTL interface

The power supply for the control panel (A2) is transmitted from the electronics (A1) via the flat ribbon cable:

- Pin 1 GND
- Pin 4 +5V

### 3.2 Electronics (A1)

The electronics (A1) is a combination of:

- Control panel
- Voltage supply
- Frequency converter

#### **The electronics (A1) carries out the following tasks:**

- Power supply 15 V, DC for imbalance switch (S1) and speed sensor (B1)
- Power supply 5 V, DC for control panel (A2)
- Generating the motor power supply  
(three-phase current with variable frequency and voltage)

Functional description: The mains supply is rectified, smoothed and chopped into a pulse width pattern in three bridge elements with a microprocessor.

- Slot for the motor (M1) with integrated overtemperature switches
- Monitoring the motor current
- Evaluating the overtemperature switches in the motor (M1)
- Slot for imbalance switch (S1)
- Evaluating the imbalance switch (S1)
- Slot for speed sensor (B1)
- Evaluating the speed sensor pulses (1 pulse per revolution)
- Slot for lid lock (A4)
- Evaluating the message line lid lock open/closed
- Communication with the control panel (A2) via TTL interface
- Error evaluation
- Status indication with a green LED:

Standby, centrifugation run: The green LED lights up

Case of error: The green LED flashes with specific errors

### 3.3 Motor (M1)

- The motor is a 2-pole three-phase asynchronous motor (1 pair of poles).
- The motor is protected against overheating by three overtemperature switches.
- The electronics (A1) evaluates the overtemperature switches.
- The motor is controlled by the electronics (A1) with a three-phase current with variable frequency and voltage.

### 3.4 Speed sensor (B1)

- The speed sensor (B1, speedometer) is screwed to the bottom of the motor. The speed signal (1 pulse per revolution) will be triggered by a magnet located in the motor axle.
- The speed of the rotor is monitored and controlled by the electronics (A1).

### 3.5 Lid lock (A4)

- The lid can be opened only if the electronics (A1) has detected rotor standstill.
- After pressing the key **OPEN** the magnet at the lid lock is energized for a short time and the lid opens.
- The centrifugation run can only be started when the lid is closed. A microswitch on the lid lock detects the position of the lid lock (open/closed) and report it to the electronics (A1).

### 3.6 Imbalance switch (S1)

- A switch (break contact) detects any imbalance.
- Imbalance can only be detected in running mode (starting, centrifuging and braking).
- If impermissible imbalance is detected, the drive switches off and the rotor slows down braked until it stops.

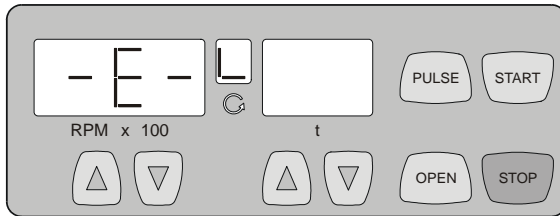
## 4 Troubleshooting procedures

- Fuses in installation in which centrifuge is installed are intact.
- Mains input fuses of centrifuge are intact.
- Supply voltage present at (see connecting diagram):
  - Connecting cable
  - Appliance plug/mains switch
  - Electronics (A1), plug S102L and S102N
- Look for the displayed error code in the chapter "Error messages".
- Remedy the error according to the instructions.
- Carry out a functional check after every repair and whenever a component is replaced, see chapter "Functional check after a repair".



## 5 Error messages

The error messages will be indicated in the speed display of the control panel.  
e.g. :



### 5.1 Perform a MAINS RESET

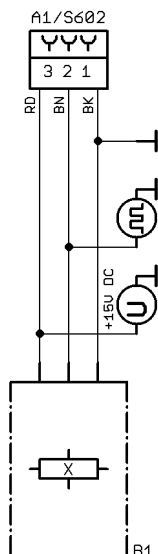
- Switch off the mains switch (switch position "0").
- Wait at least 10 seconds and then switch on the mains switch again (switch position "I").

### 5.2 Brief description

Display.	Fault	Brief description	Page
- 1 -	Tacho error	Tacho pulses break down during the run	10
- 2 -	Mains interrupt	Mains interrupt	10
- 3 -	Imbalance	Imbalance on the motor axle	11
- 4 -	Communication	Communication error	11
- 5 -	Overload	Fault in the motor or the motor control	11
- 6 -	Overvoltage	Mains is out of the tolerance	12
- 7 -	Overspeed	Overspeed detected	12
- 8 -	Undervoltage	Mains is out of the tolerance	12
- 9 -	Overtemperature	Overtemperature in the motor	13
	Versions Error	No speed indication	14
		False machine version adjusted	
- b -	Speed error	Speed too low	13
- c -	Controller-Watchdog	Fault in electronics (A1)	13
- d -	Lid lock error	Fault in lid lock system	14
- E -	Short circuit	Short circuit in electronics (A1)	14

### 5.3 Description and elimination of errors

#### – 1 – Tacho error



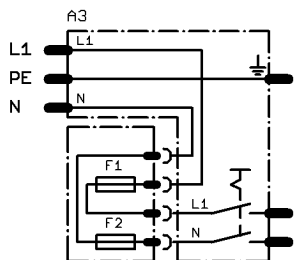
Speedometer pulses break down during the centrifugation run.

The rotor slows down without braking until it stops.

No further user operation possible.

- Reset error code:  
Wait 2 minutes until the safety time is passed and the rotation indicator has stopped to turn. Then perform a MAINS RESET.
- Speed sensor (B1) is defective or has loose contact on plug. Measure supply voltage on plug S602 / Electronics (A1) pin 1 – pin 3 (+15 VDC). Measure speedometer pulses on plug S602 / Electronics (A1) pin 1 – pin 2 (signal, 1 pulse per revolution).
- Electronics (A1) is defective.

#### – 2 – Mains interrupt



Mains interrupt during the centrifugation run.

During the interruption of the mains supply the rotor slows down without braking until it stops.

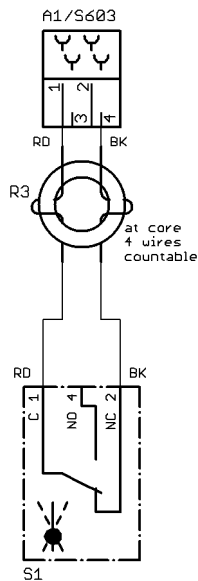
After the interruption of the mains supply the rotor slows down braked until it stops.

After the rotor is at standstill the lid can be opened.

No further user operation possible.

- Reset error code:  
Open the lid and press the **START** key or perform a MAINS RESET.
- Power failure.
- Loose contact in the mains cable or in the appliance plug (A3) or in the internal electrical wiring.
- Electronics (A1) is defective.

### – 3 – Imbalance



Imbalance on the motor axle.

The rotor slows down braked until it stops.  
After the rotor is at standstill the lid can be opened.

- Reset error code:  
Open the lid or perform a MAINS RESET.
- Weight difference in rotor components.
- Imbalance switch (S1) disadjusted (Adjustment see chapter 6.5, pg. 18).
- Imbalance switch (S1) is defective or not connected.  
Remove plug S603 and measure between pin 1 and pin 4 (switch is a break contact).  
Switch closed:  $\approx 0 \Omega$   
Switch opened:  $\infty \Omega$
- Electronics (A1) is defective.

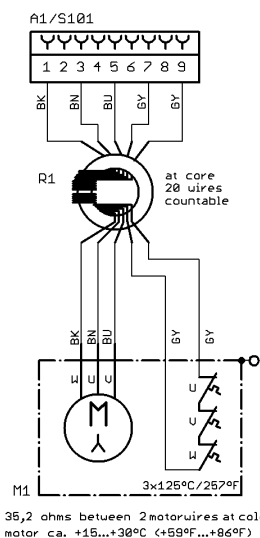
### – 4 – Communication

Communication error between control panel (A2) and electronics (A1).

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Loose contact in flat ribbon cable (W1).
- Control board (A2) is defective.
- Electronics (A1) is defective.

### – 5 – Overload



Electronics detects overload.

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Motor is defective (Ball bearings of the motor defective or resistance of the motor coils too low).  
Check the ball bearings of the motor for easy movement.  
Remove plug S101 and check at the plug pin1, pin 2, pin 3 the resistance ( $\approx 35,2 \Omega$ ) of the motor coils.
- Electronics (A1) is defective.

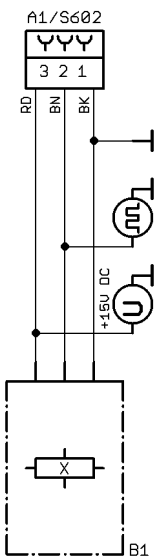
### – 6 – Overvoltage

#### Overvoltage

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Mains voltage is too high. Admissible mains voltage see chapter 10.3, pg. 29.
- Electronics (A1) is defective.

### – 7 – Overspeed



Overspeed. The speed measured by the speed sensor (B1) is 250 RPM higher than the maximum speed of the rotor.

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Speed sensor (B1) defective.  
Measure supply voltage on plug S602 / Electronics (A1) pin 1 – pin 3 (+15 VDC).  
Measure speedometer pulses on plug S602 / Electronics (A1) pin 1 – pin 2 (signal, 1 pulse per revolution).
- Electronics (A1) is defective.

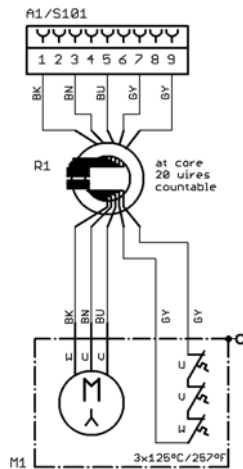
### – 8 – Undervoltage

#### Undervoltage

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Mains voltage is too less. Admissible mains voltage see chapter 10.3, pg. 29.
- Electronics (A1) is defective.

### – 9 – Overtemperature



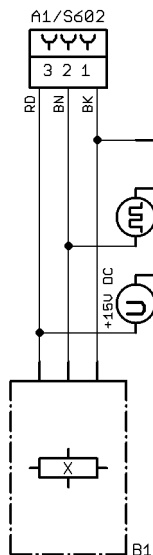
Overtemperature in the motor. Temperature > 125°C / 257°F.

The rotor slows down without braking until it stops.

No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Motor is defective.  
Temperature in the motor is higher than 125°C / 257°F.
- Overtemperature switches in the motor are defective.  
Remove plug S101 and measure at the plug pin 7 – pin 9 :  
Switch closed:  $\approx 0 \Omega$   
Switch open:  $\infty \Omega$
- Electronics (A1) is defective.

### – b – Speed error



The set speed is not reached.

The rotor slows down without braking until it stops.

No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Speed sensor (B1) is defective or has loose contact on plug.  
Measure supply voltage on plug S602 / Electronics (A1)  
pin 1 – pin 3 (+15 VDC).  
Measure speedometer pulses on plug S602 / Electronics (A1) pin 1 – pin 2 (signal, 1 pulse per revolution).
- Motor is defective (Ball bearings of the motor defective or resistance of the motor coils too low).  
Check the ball bearings of the motor for easy movement.  
Remove plug S101 and check at the plug pin1, pin 2, pin 3 the resistance ( $\approx 35,2 \Omega$ ) of the motor coils.
- Electronics (A1) is defective.

### – c – Controller-Watchdog

Watchdog in electronics.

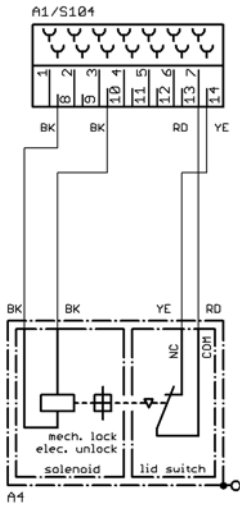
Discrepancy in program procedure.

The rotor slows down without braking until it stops.

No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Electronics (A1) is defective.

### – d – Lid lock error



The microswitch at the lid lock has opened during the centrifugation run.

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- An emergency unlocking was performed during the centrifugation run.
- Microswitch at the lid lock (A4) is defective or has loose contact on plug.  
Remove plug S104 and measure at the plug pin 7 – pin 14:  
Lid closed:  $\approx 0 \Omega$   
Lid open:  $\infty \Omega$
- Mechanical defect at the lid lock.
- Electronics (A1) is defective.

### – E – Short circuit

Current consumption of the motor is too high.

The rotor slows down without braking until it stops.  
No further user operation possible.

- Reset error code:  
Perform a MAINS RESET.
- Electronics (A1) is defective.

## 5.4 Defects without Error indications

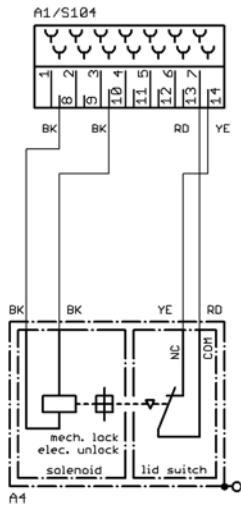
### No speed indication / Machine-Version-Error

Wrong machine version adjusted.

After switching on the centrifuge the speed indicator extinguish and in the time indicator appears the set machine version.

- Set the machine version C as described in chapter 6.1, pg. 16.

### The lid can not be opened

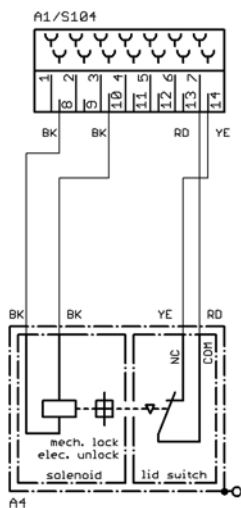


The lid can not be opened.

With the closed lid the symbol "L" (lid open) illuminates in the rotation indicator ☉.

- Open the lid by using the emergency release.
- Microswitch at the lid lock (A4) is defective or has loose contact on plug.  
Remove plug S104 and measure at the plug pin 7 – pin 14:  
Lid closed:  $\approx 0 \Omega$   
Lid open:  $\infty \Omega$
- Electronics (A1) is defective.

### The lid can not be opened

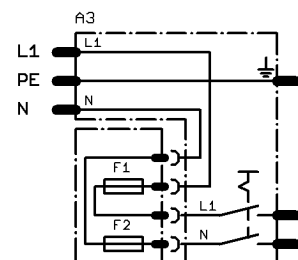


The lid can not be opened.

With the closed lid the symbol "—" (lid closed) illuminates in the rotation indicator ☉

- Open the lid by using the emergency release.
- Magnet at the lid lock (A4) is defective or has loose contact.  
Remove plug S104 and measure at the plug pin 8 – pin 10:  
Magnet faultless:  $\approx 1 \text{ K}\Omega$ .
- Electronics (A1) is defective.

### No display



No mains supply on control panel.

No operation possible.

- No mains supply. Check the mains supply.
- Mains input fuses F1, F2 are defective. Check the mains input fuses.
- Electronics (A1) is defective.  
Measure the mains voltage on electronics (A1), plug S102L – S102N.  
If the green LED on the electronics (A1) lights up, the supply voltage for the control panel at plug S601 / Electronics (A1) pin 1 (GND) – pin 4 (+5V) will be present.
- Control panel (A2) is defective.
- Flat ribbon cable to control panel (A2) is defective.

## 6 Settings and enquiries

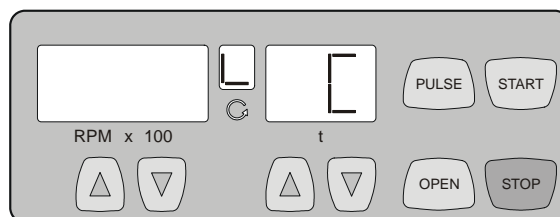
### 6.1 Setting the machine version

The machine version stored in the control panel must correspond to the centrifuge model. Control panels supplied as spare part are not yet set to machine version C (EBA 270).

 It is important to set the machine version C.

The machine version C (EBA 270) must be set as follows:

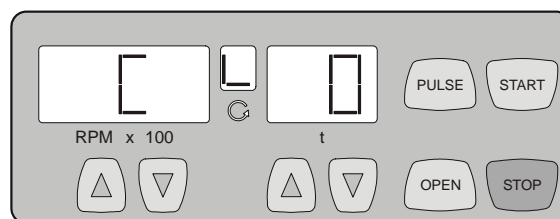
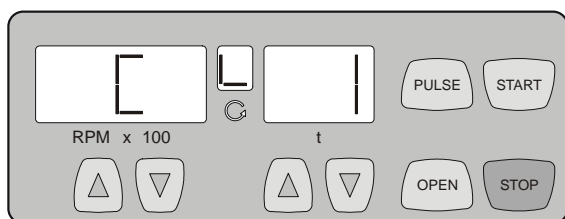
1. Set the machine version C by using the ▲ and ▼ keys beneath the time indicator.



2. Press the key **STOP** in order to store the set machine version.
3. Switch off the mains switch. Wait at least 10 seconds and then switch on the mains switch again.

### 6.2 Enquiry the machine version

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key **PULSE** pressed simultaneously.
3. Switch on the mains switch and release the keys again.  
The speed indicator shows the machine version and the time indicator shows the set brake step: e.g.:



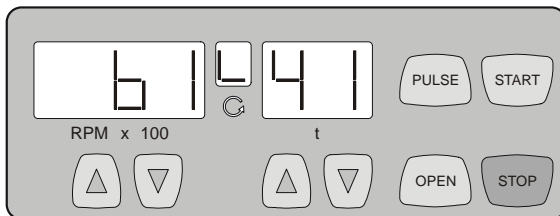
If the machine version and brake step are not displayed, press the ▲ key under the speed indicator until they are displayed.

4. To exit the machine version display press the key **STOP**.

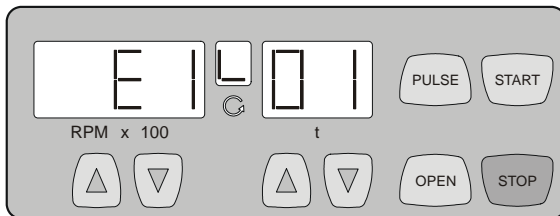


### 6.3 Enquiry the programme versions

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key [PULSE] pressed simultaneously.
3. Switch on the mains switch and release the keys again.
4. Press the key ▲ beneath the speed indicator so often until the programme version of the control panel (e.g. b1.41) is displayed.



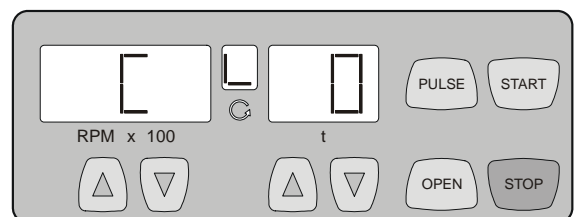
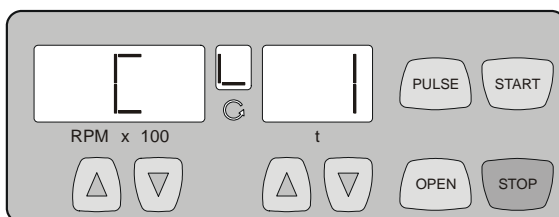
5. Press the key ▲ beneath the speed indicator again. The programme version of the electronics (e.g. E1.01) is displayed.



6. To exit the machine version display press the key [STOP] .

### 6.4 Setting the brake step

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key [PULSE] pressed simultaneously.
3. Switch on the mains switch and release the keys again. The speed indicator shows the machine version and the time indicator shows the set brake step: e.g.:



If the machine version and brake step are not displayed, press the ▲ key under the speed indicator until they are displayed.

4. Set the desired brake step with the keys ▲ ▼ beneath the time indicator. Step 1 = short run-down time, Step 0 = long run-down time. For run-down times, see chapter "Anhang/Appendix, Rotoren und Zubehör/Rotors and accessories".
5. Press the key [STOP] to save the setting.

## 6.5 Imbalance switch-off

The imbalance switch-off is specified by the indication of the difference in weight of opposite rotor positions.

When having a difference in weight within the range of 4 g to 6 g during run-up, the drive has to switch off before reaching a speed of 2000 RPM.

The imbalance switch-off is adjusted by changing the distance of the imbalance switch.

By a test run with empty rotor, and the specified weight in one rotor place the imbalance switch-off is checked.

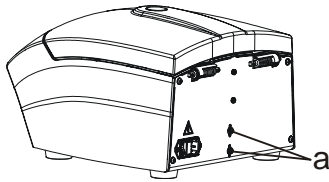


Fig. 1

Adjusting the imbalance switch:

- Loosen both screws (Fig. 1, a) at the angle bracket of the imbalance switch on the rear side of the device until you can shift the angle bracket.
- Set the permissible imbalance by shifting the angle bracket.  
Shift the angle bracket downwards: Switch-off takes place at a higher weight.  
Shift the angle bracket upwards: Switch-off takes place at a lower weight.
- Tighten both screws (Fig. 1, a) at the angle bracket of the imbalance switch again.
- Check the imbalance switch-off with a test run.

## 7 Functional check after a repair

After a repair a functional check of the unit must be carried out. For functional check a test run with the loaded rotor must be performed.

During the test run the followings must be checked:

- Function of the keys and the display.
- Run-up and slow-down time, max. speed of the rotor. Values see operating instructions chapter "Anhang/Appendix, Rotoren und Zubehör/Rotors and accessories".
- Sample temperature. Values see operating instructions chapter "Anhang/Appendix, Rotoren und Zubehör/Rotors and accessories".
- Imbalance switch-off. Values see chapter "Imbalance switch-off".
- Current consumption. Values see chapter "Technical specification".

After the test run a safety test must be carried out. Check the following values:

- Insulation resistance > 2 M $\Omega$
  - Protective conductor resistance < 0.2  $\Omega$
  - Leakage current < 3.5 mA \*
- \* limit according to EN 61010-1

A laboratory centrifuge do not belong to those medical appliances which may be tested according to the regulation IEC 60601-1 or corresponding national medical electronic standards. Laboratory centrifuges are classified as laboratory equipment.

The regulations applying to laboratory equipment are IEC 61010-1 or European standard EN 61010-1.

## 8 General arrangement of the components

Item	Designation
1	Lid
2	Housing
3	Leg spring
4	Sealing ring
5	Centrifuge chamber
6	Motor cover
7	Motor
8	Speed sensor
9	Rubber-metal bearing
10	Upper anti-twist device
11	Lower anti-twist device
12	Imbalance switch
13	Lid lock complete
14	Appliance plug (without fuse holder)
15	Fuse holder
16	Fuse
17	Electronics (230V version)
18	Electronics (120V version)
19	Control panel
20	Flat ribbon cable (4-pole)
21	Cover foil
22	Rubber foot

spare part list 01.12.2010

Material: 104.01.00.00 EBA 270, 100-127V, 50-60Hz Alternative: 1

Lev	Item	Componet	Description	Quantity	Un	Old material no.	Suggested stock levels for 100 field installed units
2	30	103.00.10.05	Lower anti twist device	3,000	PC.	E604	
2	40	104.01.16.00	Lid Lock assy complete	1,000	PC.	E3368	3
2	50	104.01.91.00	Main Electronics board	1,000	PC.	E3306	3
2	60	104.00.10.09	Rubber foot	4,000	PC.	E3352	
2	70	205.200.00.06	Upper anti twist device	3,000	PC.	E2648	
2	100	902.20.26	Rubber-metal-bearing M6 (20x30) 45Sh	3,000	PC.	E2111	
2	110	905.10.132	Motor	1,000	PC.	E3303	3
3	9000	905.10.132.02	Speed sensor	1,000	PC.	E3307	3
2	120	905.19.97.01	Connector plug, combination	1,000	PC.	E3329	3
2	130	905.19.97.02	Fuse holder for E3329	1,000	PC.	E3330	
2	140	905.07.16.05	Fuse T3,15AH (5x20)	2,000	PC.	E997	
3	10	902.32.45	Self-adhesive label - Read	1,000	PC.	L037	
2	20	103.10.70.05	Outer sight-glass and gluing ring	1,000	PC.	E1323	
2	9000	VP.06.300.158	Labels "scratched out waste container"	1,000	PC.	E3010	
2	150	104.00.15.00	Imbalance switch kpl. EBA 270	1,000	ST	E3358	3
2	20	102.85.92.01	Control panel - LED	1,000	ST	E1422	3
2	60	905.55.06.56	Ribbon cable 170mm/4-conductor	1,000	ST	E3357	
2	20	103.10.70.05	View window in lid	1,000	ST	E1323	
1	70	104.00.00.05	bowl seal	1,000	ST	?	3



## 9 Assembling and disassembling components



Before mounting and removing components the mains switch must be switched off and the centrifuge must be disconnected from the mains supply.

### 9.1 Removing the centrifuge chamber

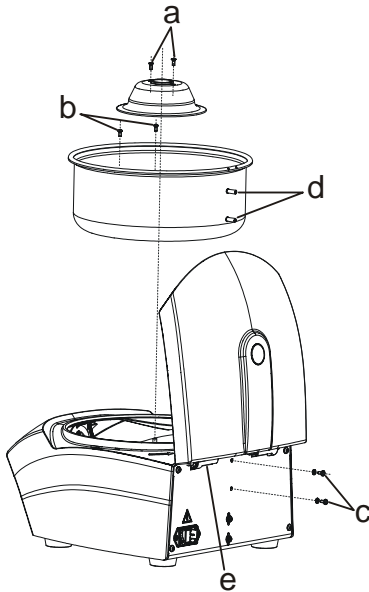


Fig. 3

- Open the lid.
- Switch off the mains switch and disconnect the centrifuge from the mains supply.
- Remove the rotor.
- Undo both screws (Fig. 3, a) on the motor cover and remove the motor cover.
- Undo both screws in the centrifuge chamber (Fig. 3, b) and both screws at the rear panel (Fig. 3, c).
- Turn the centrifuge chamber about 45° to the left, so that both threaded bolts (Fig. 3, d) will be located side of the leg spring (Fig. 3, e).
- Take the centrifuge chamber out.

### 9.2 Removing the upper part of the centrifuge housing

- Remove the centrifuge chamber as described in chapter 9.1, pg. 22.
- Pull the plug S601 on the electronics (A1), see pg. 27, chapter 10.2.
- Unscrew both fastening screws (pg. 21, Fig. 2, b) of the lid lock.
- Unscrew the fastening screws of the upper part of the centrifuge housing at the bottom plate (pg. 21, Fig. 2, a) and at the rear side (pg. 21, Fig. 2, c) of the device.
- Remove the upper part of the centrifuge housing.
- To mount the upper part of the housing, carry out these steps in opposite order.

### 9.3 Motor (M1) / Rubber-metal bearings / Speed sensor (B1)



Wait at least 2 minutes after disconnecting the centrifuge from the mains, until the intermediate circuit capacitors of the frequency converter are unloaded.

- Remove the centrifuge chamber as described in chapter 9.1, pg. 22.
- Use a socket spanner to loosen and remove the three fastening screws (pg. 21, Fig. 2, e) of the motor.
- Lift the mass ring (pg. 21, Fig. 2, k) at the rear and remove it.
- Pull the plugs S101 and S602 on the electronics (A1), see pg. 27, chapter 10.2.
- Remove the fixations at both motor cables.
- Unplug the ground wire of the motor and lift the motor (pg. 21, Fig. 2, item 7) out of the centrifuge.
- Unscrew the speed sensor (pg. 21, Fig. 2, item 8) at the bottom of the motor (2 screws, pg. 21, Fig. 2, f).
- Before mounting the motor, check the 3 rubber-metal bearings (pg. 21, Fig. 2, item 9) for possible wear or cracks and replace them if necessary. If one rubber-metal bearing is damaged all 3 rubber-metal bearings must be replaced. To replace the rubber-metal bearing unscrew them from the bottom plate. While mounting the rubber-metal bearings, make sure that there is an anti-twist device (pg. 21, Fig. 2, item 10, 11) on both sides of the bearing to prevent it from turning.
- To mount the rubber-metal bearings, the speed sensor and the motor, carry out these steps in opposite order.
- After mounting the motor the imbalance switch-off must be checked as described in chapter 6.5, pg. 18.

### 9.4 Lid lock (A4)

- Remove the upper part of the centrifuge housing as described in chapter 9.2, pg. 22.
- Pull the plug S104 on the electronics (A1), see pg. 27, chapter 10.2.
- Remove the two fastening screws (pg. 21, Fig. 2, d) at the lid lock (pg. 21, Fig. 2, item 13).
- Exchange the lid lock.
- To mount the lid lock, carry out these steps in opposite order.



## 9.5 Electronics (A1)



Wait at least 2 minutes after disconnecting the centrifuge from the mains, until the intermediate circuit capacitors of the frequency converter are unloaded.

- Remove the centrifuge chamber as described in chapter 9.1, pg. 22.
- Pull all plugs on the electronics (pg. 21, Fig. 2, item 17/18), see pg. 27, chapter 10.2.
- Remove the four fastening screws of the electronics.
- Exchange the electronics.
- To mount the electronics, carry out these steps in opposite order.  
Before the installation of the electronics it must be noted that there is sufficient heat-conducting paste between the metal surface of the electronics and the centrifuge housing floor.



The heat conduction from the electronics to the centrifuge housing floor must be ensured.

## 9.6 Control panel (A2)

- Remove the upper part of the centrifuge housing as described in chapter 9.2, pg. 22.
- Remove the three fastening screws (pg. 21, Fig. 2, j) at the lid lock (pg. 21, Fig. 2, item 19).
- To mount the control panel, carry out these steps in opposite order.

## 9.7 Flat ribbon cable (W1)

- Remove the upper part of the centrifuge housing as described in chapter 9.2, pg. 22.
- Remove the control panel (A2) as described in chapter 9.6, pg. 24.
- Unplug the flat ribbon cable (pg. 21, Fig. 2, item 20) from the control board.
- Exchange the flat ribbon cable.
- To mount the flat ribbon cable, carry out these steps in opposite order.

## 9.8 Appliance plug (A3)

- Remove the centrifuge chamber as described in chapter 9.1, pg. 22.
- Pull all cables from the appliance plug (pg. 21, Fig. 2, item 14).
- Remove the two fastening screws (pg. 21, Fig. 2, h) of the appliance plug and take the appliance plug out from the housing.
- Remove the fuse holder from the appliance plug.
- Exchange the appliance plug.
- To mount the appliance plug, carry out these steps in opposite order.

### **9.9 Imbalance switch (S1)**

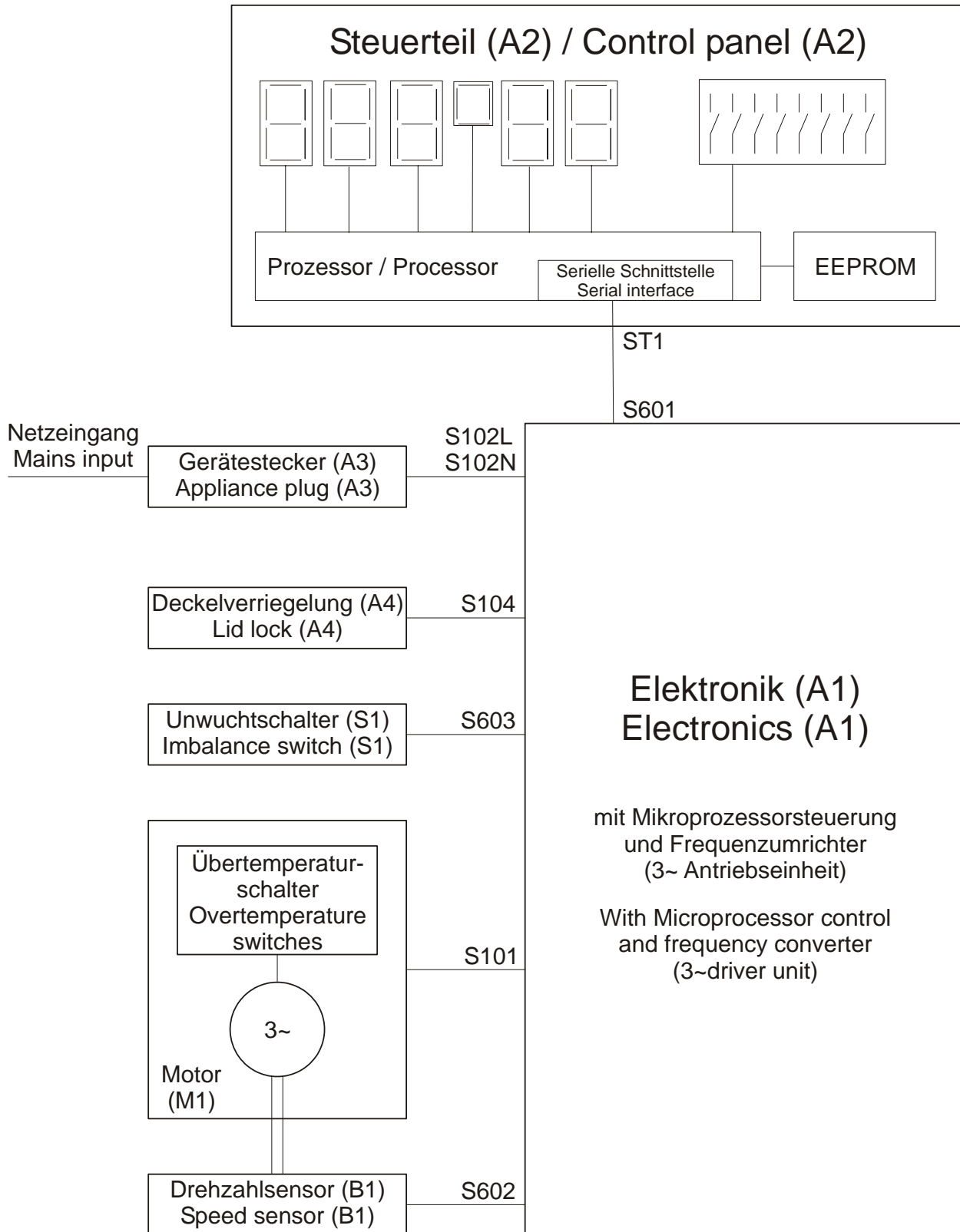
- Remove the centrifuge chamber as described in chapter 9.1, pg. 22.
- Pull the plug S603 on the electronics (A1), see pg. 27, chapter 10.2.
- Remove the fixations at the imbalance switch cable.
- Unscrew the two fastening screws (pg. 21, Fig. 2, m) of the imbalance switch (pg. 21, Fig. 2, item 12).
- Exchange the imbalance switch.
- To mount the imbalance switch, carry out these steps in opposite order.  
After mounting the imbalance switch the imbalance switch-off must be adjusted as described in chapter 6.5, pg. 18.

### **9.10 Leg spring**

- Remove the upper part of the centrifuge housing as described in chapter 9.2, pg. 22.
- Hold the lid and unscrew the four screws (pg. 21, Fig. 2, n) at the hinge pins.
- Remove the lid upwards.
- Unscrew the four screws (pg. 21, Fig. 2, o) and remove the upper part of the lid.
- Pull both hinge pins out and exchange the leg spring (pg. 21, Fig. 2, item 3).
- To mount the leg spring, carry out these steps in opposite order.

10 Technical documents

10.1 Block diagram of the control

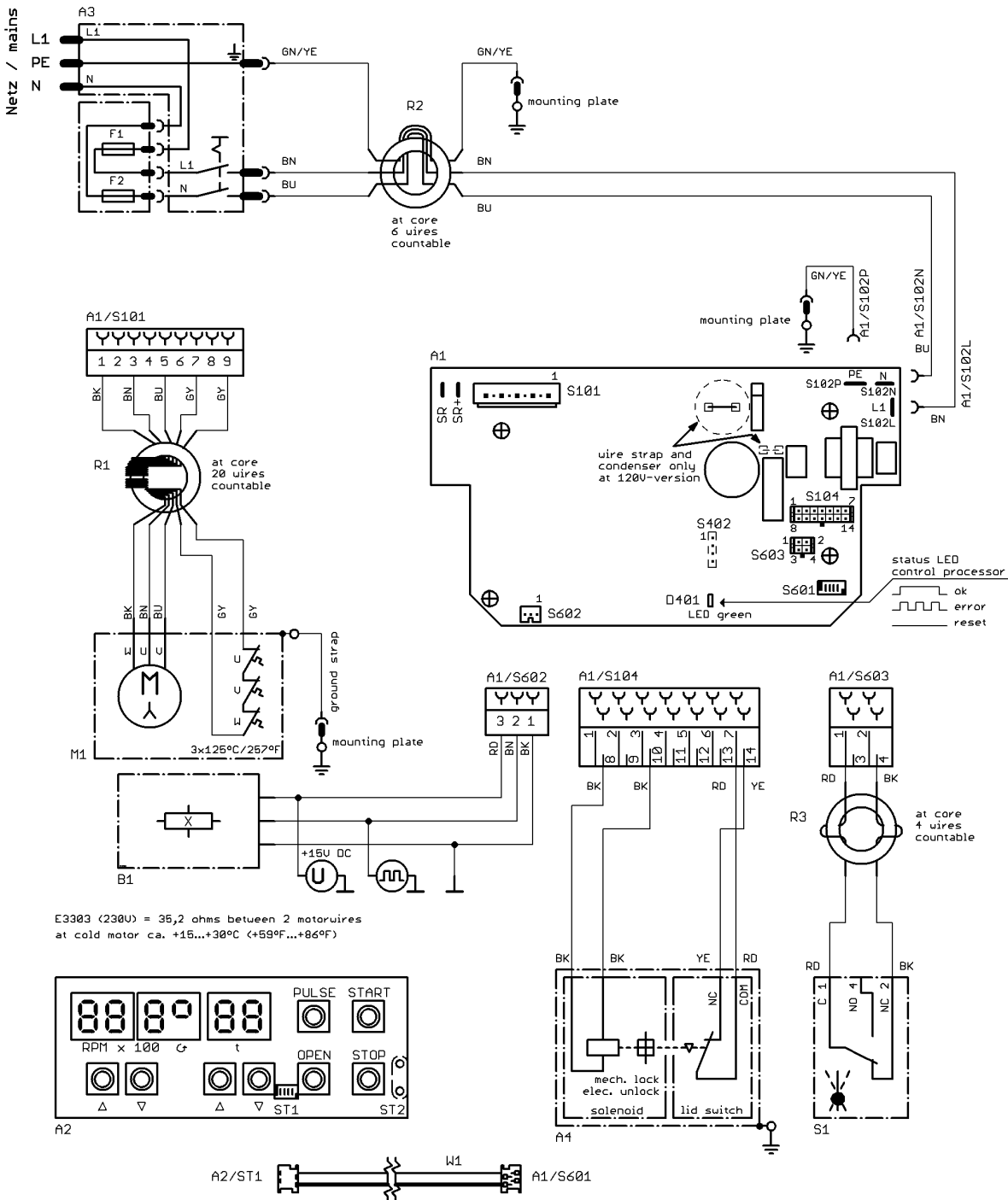


## 10.2 Connecting diagrams

### 10.2.1 Abbreviations of the cable colours

Abbreviation	Colour
BK	black
BN	brown
BU	blue
GD	gold
GN	green
GNYE	green-yellow
GY	grey
OG	orange
PK	pink
RD	red
SR	silver
TQ	turquoise
Transp.	transparent
VT	violet
WH	white
YE	yellow

### 10.2.2 Connecting diagram EBA 270



A1	electronic 200 VA	Elektronik 200 VA
A2	control panel E (LED)	Steuerteil E (LED)
A3	appliance plug with on/off switch and fuse	Gerätestecker mit EIN-/AUS-Schalter und Gerätesicherung
A4	lid locking	Deckelverschluss
B1	speed sensor	Drehzahlsensor
F1	fuse	Gerätesicherung
F2	fuse	Gerätesicherung
M1	motor of centrifuge	Motor der Zentrifuge
R1	interference coil motor	Entstördrossel Motor
R2	interference coil electronic 200 VA	Entstördrossel Elektronik 200 VA
R3	interference coil imbalance switch	Entstördrossel Unwuchtschalter
S1	imbalance switch	Unwuchtschalter
W1	flat cable to control panel	Flachbandleitung zum Steuerteil

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### 10.3 Technical specifications

Manufacturer	Andreas Hettich GmbH & Co. KG D-78532 Tuttlingen	
Model	EBA 270	
Type	2300	2300-01
Mains voltage ( $\pm 10\%$ )	200 - 240 V 1~	100 - 127 V 1~
Mains frequency	50 - 60 Hz	50 - 60 Hz
Connected load	130 VA	125 VA
Current consumption	0.7 A	1.25 A
Max. capacity	6 x 15 ml	
Allowed density	1.2 kg/dm <sup>3</sup>	
Speed (RPM)	4000	
Force (RCF)	2254	
Kinetic energy	250 Nm	
Obligatory inspection (BGR 500)	no	
Ambient conditions (EN / IEC 61010-1)	<ul style="list-style-type: none"> <li>- Set-up site</li> <li>- Altitude</li> <li>- Ambient temperature</li> <li>- Humidity</li> <li>- Excess-voltage category (IEC 60364-4-443)</li> <li>- Pollution degree</li> </ul>	
	<p style="text-align: center;">Indoors only</p> <p style="text-align: center;">Up to 2000 m above sea level</p> <p style="text-align: center;">2°C to 40°C</p> <p style="text-align: center;">Maximum relative humidity 80% for temperatures up to 31°C, linearly decreasing to 50% relative humidity at 40°C.</p>	
Device protection class	I	
	Not suitable for use in explosion-endangered areas.	
EMC		
- Emitted interference, Interference immunity	EN / IEC 61326-1, Class B	FCC Class B
Noise level (dependent on rotor)	$\leq 50$ dB(A)	
Dimensions		
- Width	326 mm	
- Depth	389 mm	
- Height	239 mm	
Weight	approx. 13 kg	