ROTOFIX 32 A

Repair instructions

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Contents

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 off all guarantee and liability claims. In such an event any guarantee claim or liability claim against the Andreas Hettich GmbH & Co. KG company expire.

- 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 machine:

Attention, general hazard area.
Before using the centrifuge implicitly read the operating instructions and pay attention to the safety relevant references!

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).

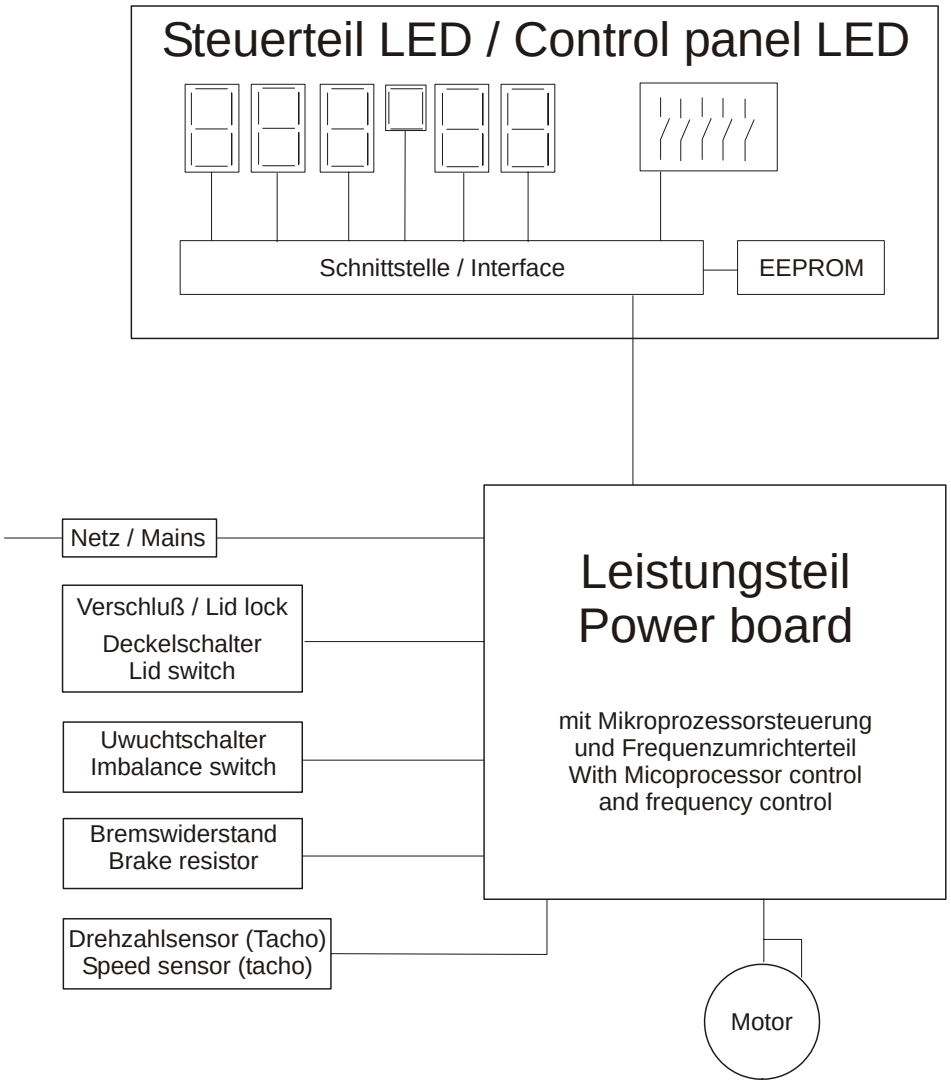
Applies in the countries of the European Union, as well as in Norway and Switzerland.

3 Description of the centrifuge

The ROTOFIX 32 A is a microprocessor-controlled centrifuge which is comprised of the following electrical components:

- Control panel
- Power board
- Motor
- Speed sensor (Tacho)
- Brake resistor with overtemperature fuse
- Lid lock system
- Imbalance switch

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



3.1 Control panel A3

The control panel 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 power board via the interface.
- Storing the machine version and the brake setting.
  By means of the machine version the power board is informed which kind of centrifuge has to be controlled. Then the power board takes the corresponding values from the ROM.
  e.g. Max. Speed
  Acceleration and deceleration ramps
- Communication with the power board via TTL interface.

The power supply for the control panel is transmitted via the flat ribbon cable:
Pin 1 GND
Pin 4 +5V

3.2 Power board A1

The power board is a combination of:

- Control panel
- Voltage supply
- Frequency converter

The power board carries out the following tasks:

- Power supply 15 V, DC for imbalance switch and speed sensor
- Power supply 5 V, DC for control panel
- Generating the motor power supply.
  (three-phase current with variable frequency and voltage)
  Functional description: The mains supply is rectified, smoothened and chopped into a pulse width pattern in three bridge elements with a microprocessor.
- Slot for motor with integrated overtemperature switch
- Monitoring the motor current
- Evaluating the overtemperature switch in the motor
- Slot for imbalance switch
- Evaluating the imbalance switch
- Slot for brake resistor
- Triggering the brake resistor
- Slot for speed sensor
- Evaluating the speed sensor pulses (6 per revolution)
- Evaluating the rotor code information
- Slot for lid lock
- Triggering the lid lock magnet at stand still of the rotor
- Evaluating the message line lid lock open/closed
- Communication with the control panel via TTL interface
- Error evaluation

3.3 Motor M1

- The motor is a three- phase asynchronous motor with two pairs of poles.
- The motor is protected against overheating by an overtemperature switch.
- The power board evaluates the overtemperature switch.
- The motor is controlled by the power board with a three-phase current with variable frequency and voltage.

3.4 Speed sensor B3

- The speed sensor (speedometer) which is screwed onto the motor receives
  - the rotor code information and
  - the speed information (6 pulses per revolution)

  from the magnets of the tacho ring attached to the rotor.
- The speed of the rotor is monitored and controlled by the power board

3.5 Brake resistor (R1) and overtemperature fuse (F3)

- The braking copper which is integrated on the power board transfers the electrical energy produced during braking, from a voltage of 380 V with the 230 V version and 203 V with the 120 V version, to the brake resistor in a controlled manner.
- An overtemperature fuse protects the brake resistor against overheating. When the overtemperature fuse (F3) blows, the power board will be separated from the power supply.

3.6 Lid lock Y1

- Opening of the lid lock is prevented by a latch. The lid lock can only be opened when the relay REL 602 on the power board is energised. This occurs when the rotor is at standstill and mains power is applied. The solenoid is energized and releases the latch.
- The centrifuge 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 power board.

3.7 Imbalance switch S 2

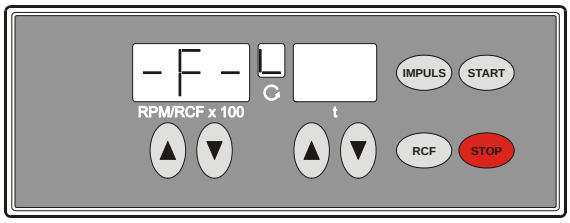
- A switch (break contact) detects any imbalance.
- Imbalance can only be detected in running mode (starting, centrifuging and braking).
- If any imbalance is detected, the drive is changed over to braking.

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 circuit diagram):
  - Connecting cable
  - Appliance plug
  - Mains switch
  - Power board A1, plug S402L and S402N
- 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 message will be indicated in the speed display of the front 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	11
- 2 -	System reset	Mains interrupt	11
- 3 -	Imbalance	Imbalance on the motor axis	11
- 4 -	Communication	Communication error	12
- 5 -	Overload	Fault in the motor or the motor control	12
- 6 -	Overvoltage	Mains is out of the tolerance	12
- 7 -	Overspeed	Overspeed detected	13
- 8 -	Undervoltage	Mains is out of the tolerance	13
- 9 -	overtemperature	Overtemperature switch in the motor release	13
	Versions Error	No speed indication Machine version misadjusted.	16
- c -	Controller-Watchdog	Fault in power board	13
- d -	Lid lock error	Fault in lid lock system	14
- E -	Short circuit	Short circuit in power board	14
- F -	Rotor code	No speed sensor pulses	15
rot…	New rotor identified	New rotor was installed	15

5.3 Description and elimination of errors

– 1 – Tacho error

Error	Tacho pulses break down during the run.
Error consequence	Drive switch off and brakes with the adjusted brake level.
Error cause	• Speed sensor (tacho) defective • Power board (A1) defective • Loosen contact in plug S502
Measurement	1. A1 / S502 pin 2 (GND) to pin 3 ($+U_B$) 2. Speed sensor plug S502 , pin 4 – pin 2 GND (6 pulses per revolution). See also section 10.3.1
Error code reset	Wait for a time duration of 120 sec. and after this perform a MAINS RESET.

– 2 – System reset

Error	Mains interrupt during a run
Error consequence	Drive switches off and brakes with the adjusted brake level.
Error cause	• Power supply has failed • Loosen contact in electrical connections
Error code reset	1. Wait for rotor stand still 2. Open the lid and press key START or perform a MAINS RESET

– 3 – Imbalance

Error	Imbalance on motor axle
Error consequence	Drive switch off and brakes with the adjusted brake level
Error cause	• Weight difference in rotor components. • Supporting lugs not greased. • Imbalance switch is defective or not connected. • Imbalance switch disadjusted (Adjustment see chapter "Imbalance switch-off"). • Loose contact in cable or plug S503 • Power board (A1) is defective
Measurement	Plug S503 Pin 1 to Pin 4 of imbalance switch Switch is a break contact. See also chapter "10.3.5".
Error code reset	Open the lid after standstill

– 4 – Communication

Error	Communication error between control board and power board
Error consequence	Drive switch off . No brake effective
Error cause	• Loose contact in flat ribbon cable • Control board (A3) defective • Power board (A1) defective
Error code reset	Perform a MAINS RESET after stand still. If the MAINS RESET performed before stand still, the target speed will be indicated in the display until standstill.

– 5 – Overload

Error	Power board detects overload
Error consequence	Drive switches off. No brake effective
Error cause	• Power board (A1) defective • Motor defective (to low impedance or motor bearings are defective)
Measurement	Measure motor coil, see chapter 10.3.2.
Error code reset	Perform a MAINS RESET after standstill

– 6 – Overvoltage

Error	Overvoltage in intermediate circuit. This error normally only occur when the drive is being braked
Error consequence	Drive switches off. No brake effective
Error cause	• Power board (A1) defective • Brake resistor defective
Measurement	Measure intermediate voltage, see chapter 10.3.6
Error code reset	Perform a MAINS RESET after standstill.

– 7 – Overspeed

Error	Overspeed. The speed measured by the speed sensor B3 is 250 RPM higher than the maximum speed of the rotor.
Error consequence	Drive switches off. No brake effective
Error cause	• Speed sensor (B3) defective • Power board (A1) defective
Measurement	Check the speed sensor, see section 10.3.1
Error code reset	Perform a MAINS RESET after standstill.

– 8 – Undervoltage

Error	Mains voltage less than 20% as nominal voltage.
Error consequence	Drive switches off. No brake effective
Error cause	• Mains voltage too less • Power board (A1) defective
Measurement	Check the mains voltage Measure intermediate voltage, see chapter 10.3.6
Error code reset	Perform a MAINS RESET after standstill.

– 9 – Overtemperature

Error	Overtemperature in the motor indicated.
Error consequence	Drive switches off. No brake effective
Error cause	• Motor defective • Power board (A1) defective • Overtemperature switch in motor defective • Loosen contact in plug S401 Pin 4 or 5
Measurement	Remove plug S401 and measure between Pin 4 and 5 : Switch closed: $\approx 0\ \Omega$ OK Switch open: $\infty\ \Omega$ defective See also chapter 10.3.2.
Error code reset	Perform a MAINS RESET after standstill.

– c – Controller-Watchdog

Error	Watchdog in power board Discrepancy in program procedure
Error consequence	Drive switches off. No brake effective
Error cause	• Power board (A1) defective
Error code reset	Perform a MAINS RESET after standstill.

– d – Lid lock error

Error	Lid lock is open during centrifugation.
Error consequence	Drive switches off. No brake effective
Error cause	• Micro switch on lid lock is defective. • Power board (A1) defective. • Loosen contact in Plug S404 Pin 5 and 6. • Mechanical defect at the lid lock • Emergency release has been carried out during run.
Measurement	Remove plug S404 and measure between Pin 5 and 6 : Lid closed: $\approx 0\ \Omega$ Lid open: $\infty\ \Omega$ See also section 10.3.4.
Error code reset	Perform a MAINS RESET after standstill.

– E – Short circuit

Error	Power board detects short circuit Current consumption too high.
Error consequence	Drive switches off. No brake effective
Error cause	• Power board (A1) defective
Error code reset	Perform a MAINS RESET after standstill.

– F – Rotor code

Error	No rotor code after start-up.
Error consequence	Drive switches off after 15 sec. No brake effective
Error cause	• Start-up took place without the rotor. • Motor is defective. • Power board (A1) defective • Speed sensor (speedometer) defective, or loose contact on plug.
Measurement	1. A1 / S502 pin 2 (GND) to pin 3 ($+U_B$) 2. Speed sensor plug S502 , pin 4 – pin 2 GND (pulses per revolution). See also section 10.3.2
Error code reset	Perform a MAINS RESET after standstill.

– rot... – New rotor identified

Each time a centrifuging run is started, the centrifuge recognises the rotor code of the installed rotor with the help of a sensor. This means that the nominal speed of the installed rotor cannot be exceeded.

After the identification of a newly installed rotor the drive will cut off and its rotor code "rot ..." will be displayed. Example: rot 3 = rotor code 3.

Press the START key.

If the speed rating of the newly installed rotor is lower than the last speed entered, the speed rating of the newly installed rotor will be displayed.

If the speed rating of the newly installed rotor is higher than the last speed entered, the last speed entered will be displayed.

Press the START key to start the centrifugation run.

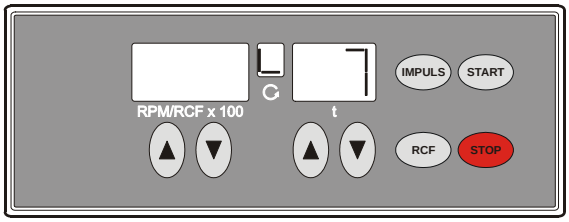
5.4 Defects without Error indications

No speed indication / Machine-Version-Error

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

Error cause:
- Wrong machine version adjusted

Example for indication:



Proceed as the following:

1. Adjust the machine version 7 (ROTOFIX 32 A) by using the ▲ and ▼ keys beneath the time indicator.
2. Press the key STOP in order to store the set machine version.
3. Perform a MAINS RESET.

The RCF key does not function

Error: The RCF key does not function.

Error cause:
- Wrong machine version adjusted.

The lid can not be opened

Error: The lid can not be opened.
The rotation display indicates "Lid opened", but the lid is closed.

Error cause:
- Micro switch at lid lock is defective
- Loosen contact on plug S404 / Pin 5 and 6
- Power board (A1) defective
- Jumper for lid lock control is set on power board (A1), see chapter 6.6

Measurement: Remove plug S404 and measure between Pin 5 and 6:
Switch closed: $\approx 0\ \Omega$
Switch opened: $\infty\ \Omega$
See also section 10.3.4.

Opening the lid: Open the lid by using the emergency release.

The lid can not be opened

Error	The lid can not be opened The rotation display indicates "Lid closed" and the lid is closed.
Error cause	• Lid lock is defective • Loosen contact on plug S404 / Pin 1 and 3 • Power board (A1) defective • Jumper for lid lock control is set on power board (A1), see chapter 6.6
Measurement	Measurements see section 10.3.4.
Opening the lid	Release the lid by using the emergency release.

No display

Error	No power supply on control board, no display
Error consequence	No operation possible
Error cause	• No mains supply • Fuses F1, F2 defective • Fuse F4 defective (only with type 1206-02) • Power board (A1) defective • Control panel (A3) defective • Flat ribbon cable to control panel (A3) defective • Overtemperature fuse F3 defective
Measurement	1. Mains supply power board A1 S402L to S402N 2. Power board A1 S501 Pin 4 (+5V) to Pin 1 (GND) 3. Control panel A3 S502 Pin 4 (+5V) to Pin 1 (GND) 4. Overtemperature fuse F3. Remove plug S405 and measure directly at both flat connections of the overtemperature fuse: Fuse OK : $\approx 0\ \Omega$ Fuse defective: $\infty\ \Omega$. See also section 10.3.3.

6 Settings and enquiries

6.1 Setting the machine version

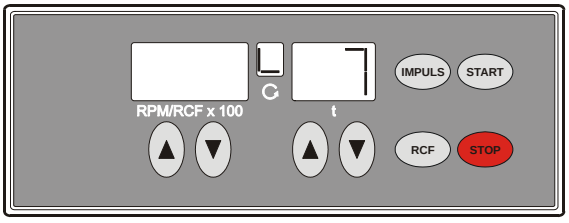
The machine version stored in the control panel must correspond to the centrifuge model. Control panels supplied as spare part are already set to machine version 7 (ROTOFIX 32 A).

> If the machine version 4 (ROTOFIX 32) is set in the control panel no error message will be displayed.
> Attention: In this case the RCF key does not function.

If another machine version than 7 or 4 is set in the control panel, the set machine version will appear in the display after switching on the centrifuge.

The machine version 7 (ROTOFIX 32 A) must be set as follows:

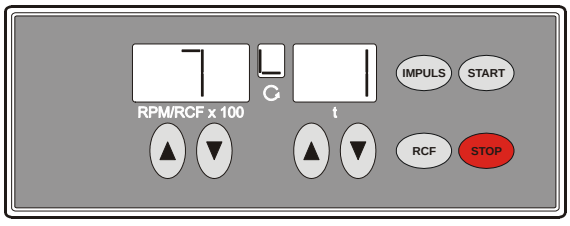
1. Set the machine version 7 by using the ▲ and ▼ keys beneath the time indicator.

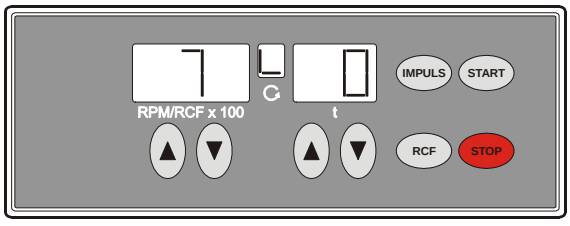


2. Press the key STOP in order to store the set machine version.

6.2 Enquiry the machine version

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key IMPULS 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.:

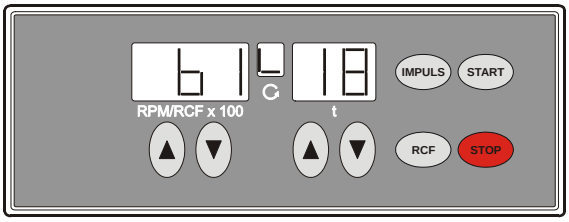




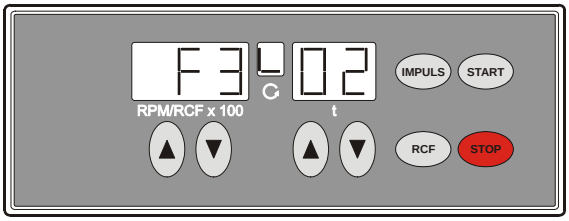
   If the machine version and brake step are not displayed, press the ▲ key under the speed indicator until they are displayed.
4. To exit the machine version display press the key STOP or perform a MAINS-RESET.

6.3 Enquiry the programme versions

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key IMPULS 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. b1.18) is displayed.



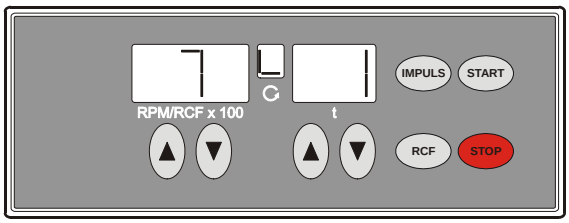
5. Press the key ▲ beneath the speed indicator again.
   The programme version of the power board (e.g. F3.02) is displayed.

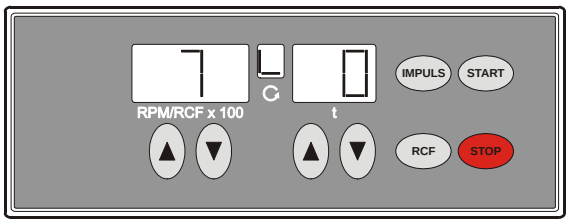


6. To exit the machine version display press the key STOP or perform a MAINS-RESET.

6.4 Setting the brake step

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key IMPULS 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.:



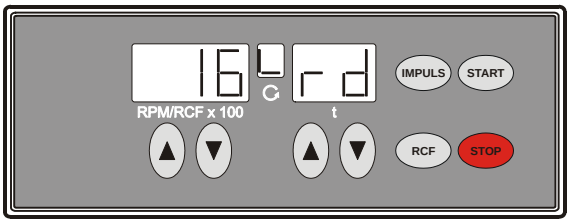


   If the machine version and brake step are not displayed, press the ▲ key under the speed indicator until they are displayed.
4. Set the desired brake step with the keys ▲ ▼ beneath the time indicator.
   Step 1 = short run-down time, Step 0 = long run-down time.
   For run-down times, see chapter "Anhang/Appendix, Rotoren und Zubehör/Rotors and accessories".
5. Press the key STOP to save the setting.

6.5 Setting the centrifuging radius

☞ The centrifuging radius must be entered in centimeters.

1. Switch off the mains switch.
2. Keep the key ▲ beneath the speed indicator and the key IMPULS pressed simultaneously.
3. Switch on the mains switch and release the keys again.
4. Press the key ▲ beneath the speed indicator until the following display appears:



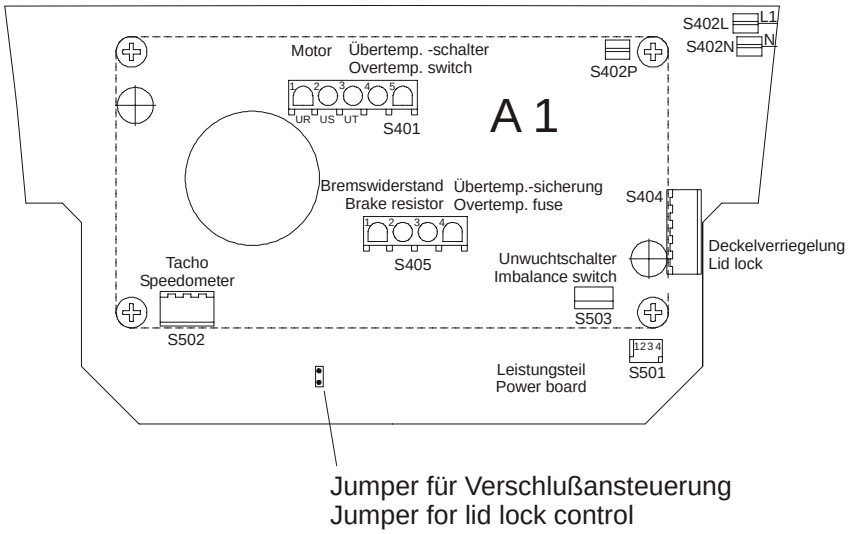
   The set centrifuging radius is displayed in the speed indicator.
5. Set the desired centrifuging radius with the keys ▲ ▼ beneath the time indicator.
   For centrifuging radius, see chapter "Anhang/Appendix, Rotoren und Zubehör/Rotors and accessories".
6. Press the key STOP to save the setting.

6.6 Lid lock control

With the centrifuge ROTOFIX 32 A the solenoid of the lid lock is energized automatically when the rotor is at standstill.

After the lid is opened the solenoid will drop out again.

With this kind of lid lock control, the jumper for the lid lock control on the power board (see below) may **not** be plugged.



6.7 Imbalance switch-off

The permissible imbalance is specified for rotor 1624 by the indication of the difference in weight of opposite rotor positions.

When having a difference in weight within the range of 10 g to 15 g during run-up, the drive has to switch off before reaching 1500 RPM.

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

With a test run with the indicated differences in weight the imbalance switch-off will be checked.

Adjusting the imbalance switch:

- Loosen both screws at the angle bracket of the imbalance switch on the housing floor until you can shift it.
- Set the permissible imbalance by shifting the angle bracket.
- Tighten both screws 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, the display and the LEDs.
- 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	MΩ
• Protective conductor resistance	< 0.2	Ω
• 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	Motor cover
2	Packing ring
3	Centrifuge chamber
4	Lid with window
5	Handle
6	Lid covering
7	Window with gluing ring
8	Hinge
9	Pneumatic spring
10	Appliance plug combination element (without fuse holder)
11	Fuse holder
12	Fuse
13	Left lid lock
14	Right lid lock (electrical)
15	Control panel
16	Speed sensor
17	Motor
18	Rubber-metal bearing
19	Upper anti-twist device
20	Lower anti-twist device
21	Imbalance switch
22	Brake resistor
23	Overtemperature fuse at brake resistor
24	Mains choke coil (only with type 1206)
25	Electronic power board
26	Covering foil
27	Rubber foot
28	Transformer (only with type 1206-02)
29	Fuse holder (only with type 1206-02)
30	Fuse (only with type 1206-02)

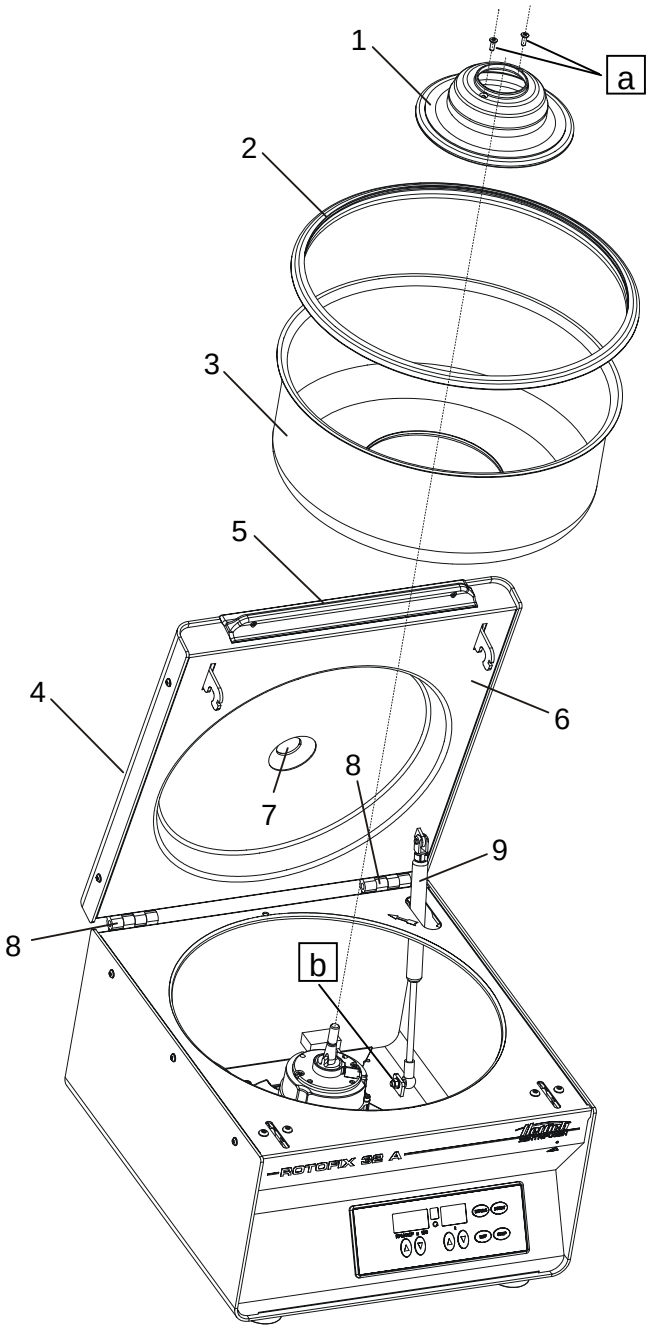
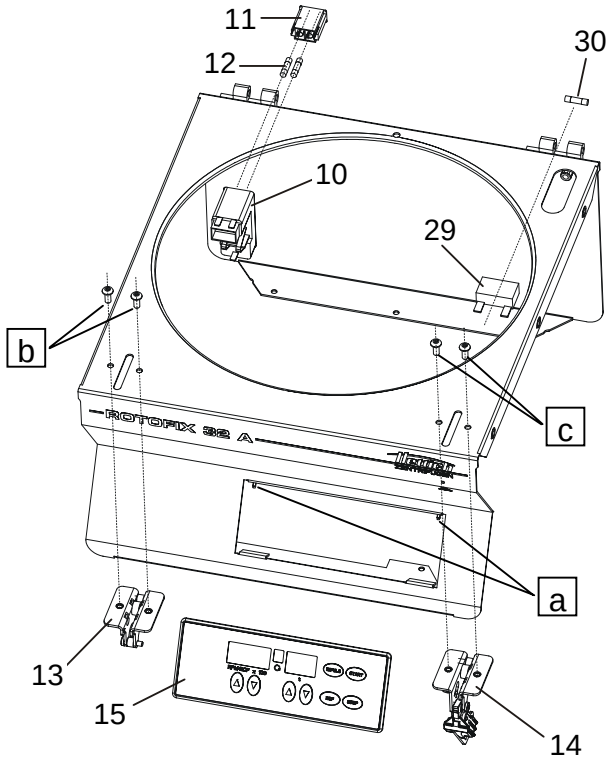


Fig. 1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b
c
ROTOFIX 32 A
a
13
15
14

Fig. 2

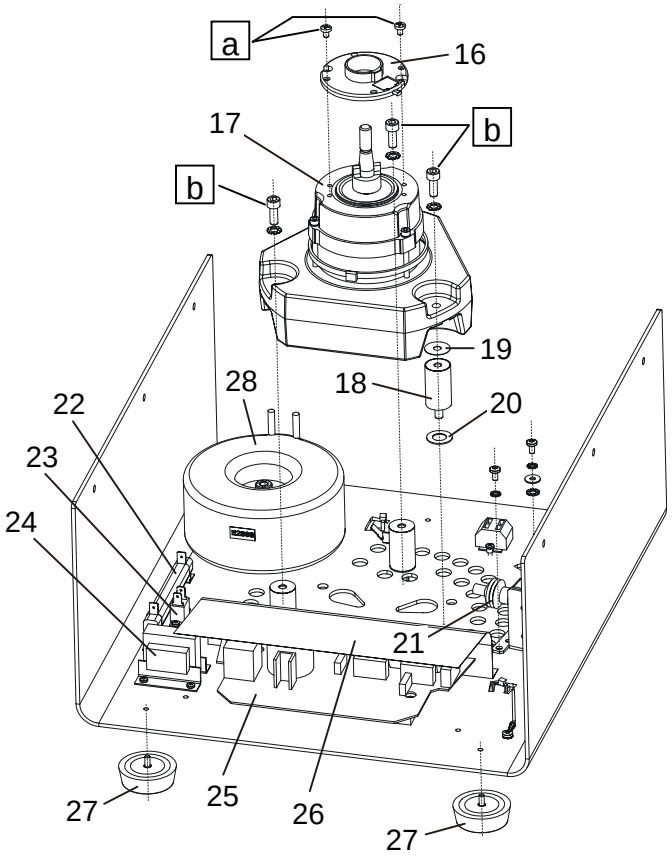

a
16
17
b
b
19
28
18
22
20
23
24
21
27
25
26
27

Fig. 3

9 Assembling and disassembling components

9.1 Removing the centrifuge chamber

- Open the lid.
- Switch off the mains switch and disconnect the centrifuge from the mains supply.
- Remove the rotor.
- Undo both screws (Fig. 1, a) on the motor cover and remove the motor cover (Fig. 1, item 1).
- Take out the centrifuge chamber (Fig. 1, item 3) and unplug the protective conductor from the centrifuge chamber.

9.2 Speed sensor B3

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Pull the plug S502 on the power board (Fig. 3, item 25), see chapter "Connecting diagrams".
- Remove the fixing of the speed sensor cable at the motor (Fig. 3, item17).
- Remove both fastening screws (Fig. 3, a) of the speed sensor (Fig. 3, item 16) and exchange the speed sensor.
- To mount the speed sensor, carry out these steps in opposite order.

9.3 Motor M1 / Rubber-metal bearings

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 "Removing the centrifuge chamber".
- Remove both fastening screws (Fig. 3, a) of the speed sensor (Fig. 3, item 16).
- Pull the plug S401 on the power board (Fig. 3, item 25), see chapter "Connecting diagrams".
- Use a socket spanner to loosen and remove the three fastening screws (Fig. 3, b) on the lower end plate of the motor.
- Lift the motor (Fig. 3, item 17) upwards out of the centrifuge and unplug the ground wire.
- Before the motor is installed, the three rubber-metal bearings (Fig. 3, item 18) must be checked for possible wear or cracks. These items must be replaced if necessary.
- Exchange the motor.
- To mount the rubber-metal bearings and the motor, carry out these steps in opposite order.
  Care must be taken of the anti-twist devices (Fig. 3, item 19 and 20) when the rubber-metal bearings or the motor are installed.

9.4 Power board 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 "Removing the centrifuge chamber".
- Pull all plugs on the power board (Fig. 3, item 25), see chapter "Connecting diagrams".
- Remove the two fastening screws of the power board.
- Exchange the power board.
- To mount the power board, carry out these steps in opposite order.
  Before the installation of the power board it must be noted that there is sufficient heat-conducting paste between the metal surface of the power board and the centrifuge housing floor.

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

9.5 Control panel A3

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Remove the two fastening screws (Fig. 2, a) of the control panel (Fig. 2, item 15) and lift up the control panel carefully.
- Unplug the flat ribbon cable from the power board (Fig. 3, item 25).
- Exchange the control panel.
- To mount the control panel, carry out these steps in opposite order.

9.6 Brake resistor R1

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Unplug the two cables from the brake resistor (Fig. 3, item 22).
- Remove the two fastening screws of the brake resistor.
- Exchange the brake resistor.
- To mount the brake resistor, carry out these steps in opposite order.

9.7 Overtemperature fuse F3

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Unplug the two cables from the overtemperature fuse (Fig. 3, item 23).
- Unscrew the two fastening screws of the overtemperature fuse.
- Exchange the overtemperature fuse.
- To mount the overtemperature fuse, carry out these steps in opposite order.

9.8 Flat ribbon cable

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Unplug the flat ribbon cable from the power board (Fig. 3, item 25).
- Remove the control board from the housing, see chapter "9.5 Control panel A3").
- Remove the three fastening screw on the back side of the control panel.
- Carefully take out the board of the housing.
- Unplug the flat ribbon cable from the control board.
- Exchange the flat ribbon cable.
- To mount the flat ribbon cable, carry out these steps in opposite order.

9.9 Appliance plug combination element

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Press the upper and the lower fastening clip of the appliance plug combination element (Fig. 2, item 10) and remove it out from the housing.
- Pull all cables from the appliance plug combination element.
- Remove the fuse holder from the appliance plug combination element.
- Exchange the appliance plug combination element.
- To mount the appliance plug combination element, carry out these steps in opposite order.

9.10 Imbalance switch S2

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Pull the plug S503 on the power board (Fig. 3, item 25), see chapter "Connecting diagrams".
- Loosen the two cables at the imbalance switch (Fig. 3, item 21).
- Unscrew the two fastening screws of the imbalance switch.
- Exchange the imbalance switch.
- To mount the imbalance switch, carry out these steps in opposite order.
  After mounting the imbalance switch, adjust it as described in chapter "Imbalance switch-off".

9.11 Lid lock Y1

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Remove the two fastening screws (Fig. 2, b or c) of the lid lock (Fig. 2, item 13 or 14).
- Unplug the cables from the micro switch and from the printed circuit board of the electrical lid lock (Fig. 2, item 14).
- Remove the protective conductor from the lid lock (Fig. 2, item 14).
- Exchange the lid lock.
- To mount the lid lock, carry out these steps in opposite order.

9.12 Pneumatic spring

> The pneumatic spring may be dismounted only if the lid is open, i.e. if the pneumatic spring is not under tension.
>
> During mounting and removing the pneumatic spring it is necessary to hold the lid, in order to avoid a damage of the hinges.

- Remove the centrifuge chamber as described in chapter "Removing the centrifuge chamber".
- Loosen the stop spring (Fig. 4, a) of the connecting pin at the lid.
- Press the opened lid slightly to the back in order to relieve the connecting pin. Take out the connecting pin.
- Unscrew the nut (Fig. 1, b) at the ball and socket joint of the pneumatic spring and remove the pneumatic spring.
- To mount the pneumatic spring, carry out these steps in opposite order.

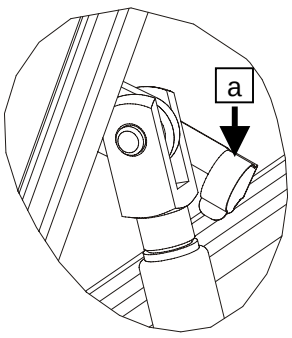
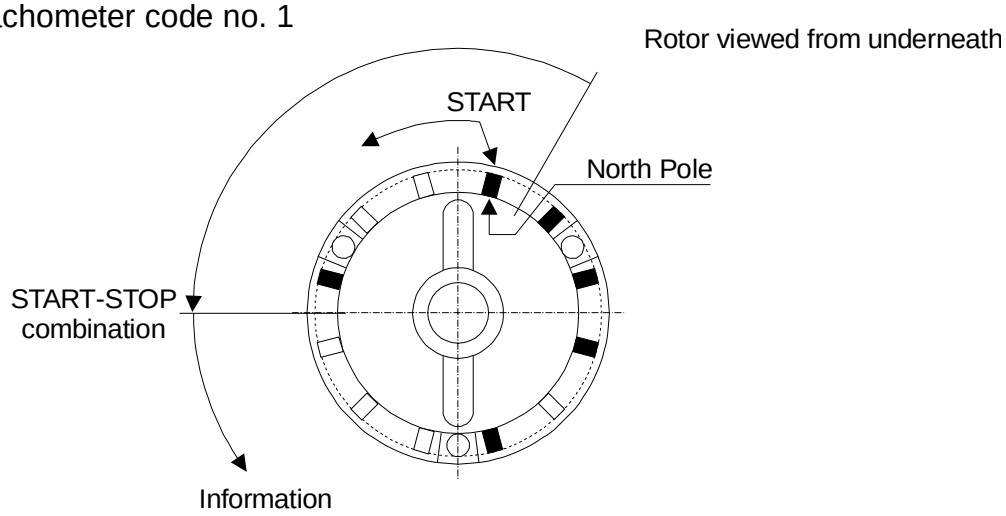


Fig. 4

10 Technical documents

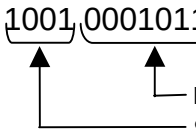
10.1 Tachometer code configuration of the rotors

Example: tachometer code no. 1



tachometer code determines:
1. maximum speed of rotor
2. run up and braking ramps
3. control response of electronics

e.g. Rotor 1624



rotor code

Start / Stop combination.
The begin of the Start / Stop combination is marked with a white dot.

0 = no magnet (empty place), 1 = magnet inserted

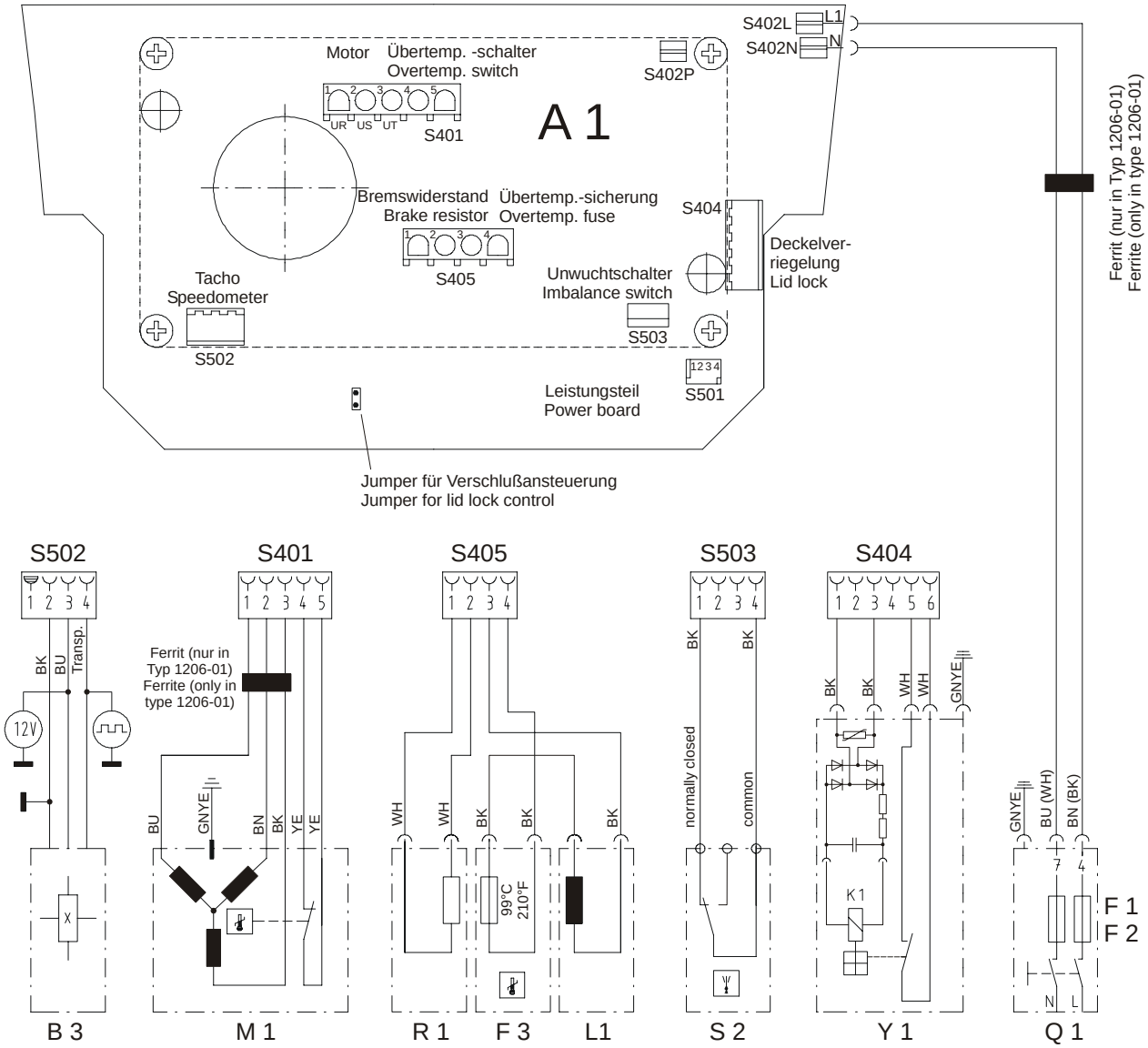
Tachometer code-no.	Configuration	RPM	Rotor
0	1001 00001111	---	---
1	1001 00010111	4.000	1624, 1619, 1611, 1626
2	1001 00011011	4.000	1628
3	1001 00011101	6.000	1613
4	1001 00011110	6.000	1618, 1620A
5	1001 01000111	6.000	---
6	1001 01010101	6.000	---
7	1001 01010110	6.000	---
8	1001 01011010	4.000	1648
9	1001 01100011	6.000	---
10	1001 01110001	6.000	E778-01
11	1001 10000111	4.000	---
12	1001 10001011	4.000	1617
13	1001 10001101	2.000	SK 26.02-3, SK 26.02-5
14	1001 10100011	4.000	1418, 1324
15	1001 11000011	6.000	---

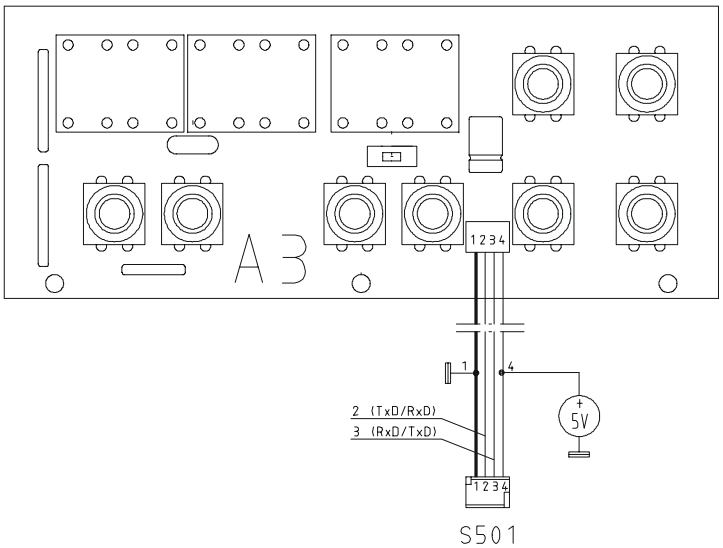
10.2 Connecting diagrams

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 ROTOFIX 32 A



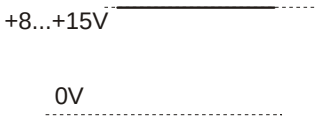


Typ / type	F1, F2	F4
1206	T 3.15 AH/250V	---
1206-01	T 5 AH/250V	---

10.3 Signals and measurements

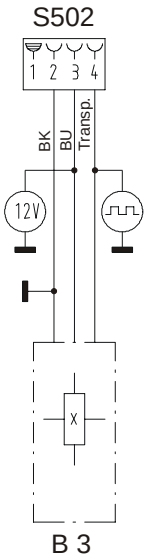
10.3.1 Speed sensor (Tacho) B3

Power supply:
Plug S502, measure between Pin 2 (GND)and 3:



Tacho signal:
Plug S502 measure between Pin 2 (GND) and 4:

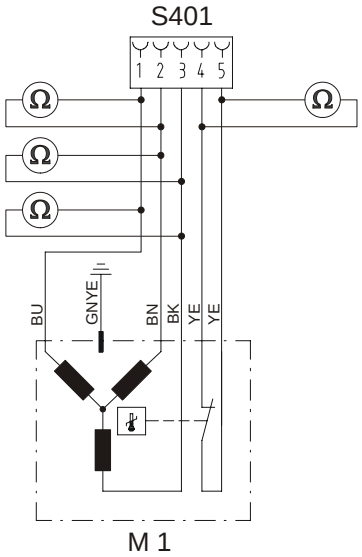
6 pulses per revolution



10.3.2 Motor

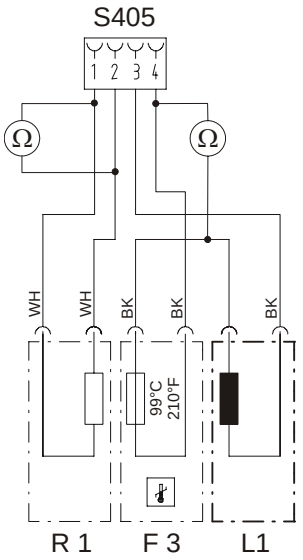
Motor coil
Remove plug S401 and measure between two lines:
230 V version: ≈ 24.7 Ω
120 V version: ≈ 3.6 Ω

Overtemperature switch
Remove plug S401 and measure between pin 4 and 5 :
Switch closed : ≈ 0 Ω
Switch opened: ∞ Ω



10.3.3 Brake resistor R1 and overtemperature fuse F3

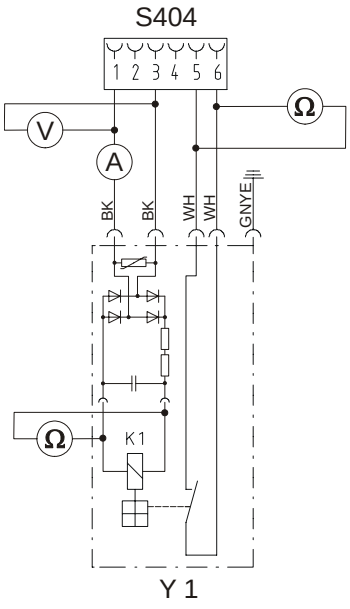
Brake resistor R1
Remove plug S405 and measure between pin 1 and 2 :
230 V Version: ≈ 330 Ω
120 V Version: ≈ 82 Ω



Overtemperature fuse F3
Remove plug S405 and measure directly at both flat connections of the overtemperature fuse:
Fuse OK: ≈ 0 Ω
Fuse defective: ∞ Ω

10.3.4 Lid lock Y1

Supply voltage:
When rotor is at standstill measure at plug S404 between pin 1 and 3:
Lid closed: 230 V respectively 115 V
Lid opened: 0 V



Current consumption:
When rotor is at standstill and lid is closed measure at plug S404, pin 1:
230 V Version: ≈ 22 mA
120 V Version: ≈ 50 mA

Lid switch:
Remove plug S404 and measure between pin 5 and 6 :
Switch closed: ≈ 0 Ω
Switch opened: ∞ Ω

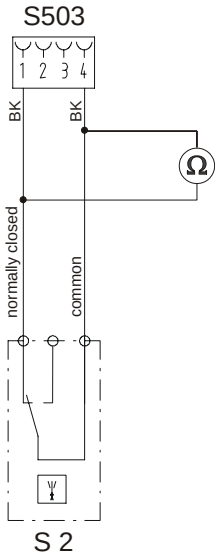
Lid lock solenoid K1
Remove plug S404. Measure at the connecting cables of the solenoid:
230 V Version: ≈ 5.7 KΩ
120 V Version: ≈ 1.0 KΩ

10.3.5 Imbalance switch

Remove plug S503 and measure between pin 1 and pin 4 :

Switch closed: ≈ 0 Ω

Switch opened: ∞ Ω

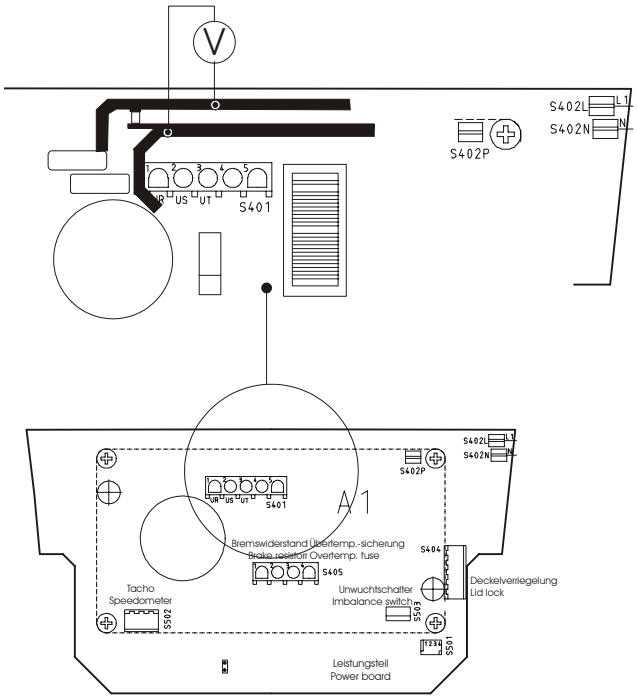


10.3.6 Intermediate voltage on power board A1

The intermediate voltage has to be measured during the run (run-up, run and run-down).

230 V version:
380 V DC

120 V version:
203 V DC



10.4 Technical specifications

Manufacturer	Andreas Hettich GmbH & Co. KG D-78532 Tuttlingen	
Model	ROTOFIX 32 A	
Type	1206	1206-01
Mains voltage (± 10%)	208 – 240 V 1~	100 – 127 V 1~
Mains frequency	50 – 60 Hz	50 – 60 Hz
Connected load	300 VA	300 VA
Current consumption	1.4 A	3.0 A
Max. capacity	4 x 100 ml / 32 x 15 ml	
Allowed density	1.2 kg/dm^3	
Speed (RPM)	6000	
Force (RCF)	4186	
Kinetic energy	3160 Nm	
Obligatory inspection (BGR 261)	no	
Ambient conditions (EN 61010-1)		
– Set-up site	Indoors only	
– Altitude	Up to 2000 m above sea level	
– Ambient temperature	2°C to 40°C	
– Humidity	Maximum relative humidity 80% for temperatures up to 31°C, linearly decreasing to 50% relative humidity at 40°C.	
– Excess-voltage category (IEC 60364-4-443)	II	
– Pollution degree	2	
Device protection class	I	
Not suitable for use in explosion-endangered areas.		
EMC		
– Emitted interference (suppression of radio interference)	EN 55011, Group 1, Class B EN 61000-3-2 EN 61000-3-3	FCC Class B
– Interference immunity	EN 61000-6-2	----
Noise level (dependent on rotor)	≤ 57 dB(A)	
Dimensions		
– Width	366 mm	
– Depth	430 mm	
– Height	257 mm	
Weight	23 kg	

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