2.2 Trouble Shooting

Error Indication	Error Cause	Possible Error Source	Corrective Procedure
Displays **remain dark**	No mains voltage supply	Mains fuse or circuit breaker failed	Check fuse or circuit breaker and replace or switch on again
		Faulty mains cord or instrument socket	Check instrument cord and socket, replace defective parts
		Unit fuse or fuses on main board defective	Replace it, if fuse blows again, search for other faults
	No low voltage supply for indication board	Faulty connection from CPU to indication board	Check connections on CPU, indication board and connecting leads, replace defective parts
		Faulty indication or CPU board	Replace main board completely
	Interrupted program	NV-RAM out of socket or not correctly placed	Insert the valid NV-RAM and push it correctly into socket
All display **elements** are shortly **illuminated**	CPU program reset may be caused by EMI	Reduced voltage supply (>10%)	Remedy the failure if the voltage drops often, use a voltage stabilizer
		Bad or missing ground connection	Check all ground connections and the ground connection
Constant	Interruption	Parameter NV-RAM	No or defective NV-RAM
Drive makes **noises** -no good separation result	Mechanics	Wear out of motor rubber mount	Replace motor rubber mounts (at least every three years)
		Motor bearings	Replace motor completely
	Electrical	Defective terminal connection, faulty lead or motor winding	Check voltage on motor terminal and winding resistances -see test points on boards
		Faulty power electr.	Replace main board
Lid cannot be opened by key at standstill **->"E-17"**	Lid solenoid is not sufficiently supplied with voltage	Missing mains voltage	Remedy see above, manual opening cord in bottom plate
		PTC resistor has released	After a waiting time of 2 minutes press key again
		Faulty driving or triac circuit	Replace the complete main board
	Faulty lid coil	Faulty winding of coil	Replace complete lid lock device
	Lid is not correctly locked	Lid bolt is jamming	Push lid centrally into lock and press the key again
		Lid is de-adjusted	Re-adjust the lid centrally
"Lid" message alternates with speed values	Lid opened mechanically during run **FORBIDDEN!**	Mechanical emergency lid opening must only be used at standstill	close lid immediately, pull and plug in power cord again, press start to continue run, press stop to finish run
	circuit for lid switches and motor over-temperature switch is interrupted **during run**	lid switches or leads are interrupted	check leads to the lid switches, if a micro switch is faulty, change lid lock assembly
		motor over temperature switch has tripped, blocked air flow to the motor only two phases are controlled to the motor	after cooling down check temperature switch with ohmmeter
			check terminal connection XM and motor windings - approx. 11,5 Ohm between conductors - replace defective parts
"OPEN" message by supposedly closed lid	15 V - circuit for lid switches and motor over - temperature switch is interrupted **at standstill, check FET – temperature switch for close**	leads to lid switches interrupted or a defective lid switch	check leads to the lid switches, if a micro switch is faulty - replace lid lock assembly
		leads to motor over-temperature switch are interrupted	check motor over-temperature switch and leads for continuity, replace faulty parts (motor)

Troubleshooting (cont.)

Error Indication	Error Cause	Possible Error Source	Corrective Procedure
"bAL" message alternates with speed values	Imbalance run	Rotor not symmetrically loaded	Open lid, check rotor loading, close lid again and restart
		Base is not sturdy enough and comes into vibrations Trunnions are not greased	Change or reinforce the base (table, lorry with lockable wheels, etc.) grease trunnions
		Rotor itself has imbalance	Rotor must no longer be used, send back to Kendro
		Rotor fixing or drive shaft is damaged	Centrifuge must no longer be used, replace nut or drive
	Signal fault	Leads to imbalance switch are interrupted	Check leads with ohmmeter and replace if faulty
		Faulty imbalance switch	Replace defective parts
		Faulty imbalance circuit component	Replace main board

2.3 Error codes

E-00 Flashes	faulty speed measuring **easy check:** power ON, open lid, turn rotor by hand and close lid - speed values should now be indicated	faulty plug or lead connections or faulty speed detection board	check plug contacts and leads - measure speed detection signal on XW1, XW3 - replace faulty parts
		faulty processing circuit on main board	replace main board
	motor didn't start	Connection: drive – main board	Check terminal and lead connection
		Defective drive	Check resistance of motor windings, replace faulty parts
		Faulty main board	Replace main board
E-02	Program sequence disturbed	bad ground connection	check all ground connections, tighten loose screws
E-03	speed measuring disturbed during run > 200 rpm	See E-00	wait until rotor has come to standstill, check rotor for correct fastening see E00 as well
E-06	data lines to keyboard disturbed during operation	faulty crimp terminals or connecting leads	replace crimp terminals or install new wiring
		faulty tracks or components	Replace key and indication board or main board
E-08	Over-voltage of intermediate circuit	Defective leads or brake resistor	Check leads and brake resistor, replace defective parts
		Driving and/or braking circuits	Replace the main board
E-11	program sequence disturbed	NV-RAM not installed or faulty	insert the correct NV-RAM
E-15	program sequence disturbed	reading error of NV-RAM (checksum)	if error indication occurs repeatedly change NV-RAM
E-17	micro switches didn't open after pressing lid key	faulty leads or micro switches defective lid lock	replace defective parts change lid lock
E-19	checksum error of NV-RAM (incorrect data)	false key board cooled – non cooled version	connect the right key board
		false NV-RAM	place the right NV-RAM, watch the identification No.
E-20	NV RAM doesn't match to CPU	Wrong NV RAM or CPU	Replace NV RAM
			Replace CPU
E-21	Acceleration too low	Faulty motor or main board	Replace motor
			Replace main board
E-22	NV-RAM and CPU didn't match	Wrong NV-RAM	Install the correct NV-RAM
		Wrong CPU	Install the correct CPU

2.4 Testpoints

Test Points	Unit Value	Condition
mains terminal XN on power board	Line voltage (+/-10%)	all given values refer to line voltage
terminal **XM** **motor voltage** measured inter 2 motor leads	 3 * 65 V AC – 3 * 0,5 A 3 * 170 V AC – 3 * 1,3 A 3 * 245 V AC – 3 * 1,6 A	**rotor 75003454** 1,000 rpm 3,000 rpm 6,000 rpm
motor current I_m after reach of set speed (all values measured after 5 min)	3 * 73 V AC – 3 * 0,7 A 3 * 232 V AC – 3 * 2,3 A	**Rotor 75003450 with 75003451** 1000 min-1 4000 min-1
Motor **winding resistance** Insulation resistance	 3 * 4,7 Ω 8	 Ambient 20°C -to ground
intermediate circuit voltage U_D inter **PWM+** (cathode of anti-kick-back diode V7) and **PWM-** (current measurement resistor R18)	 340V 290V 365V	 at standstill during acceleration during deceleration
Current I_D in intermediate circuit (voltage drop cross R 18) $U = I_D \times R_M$	 165 mV DC 290 mV DC -65 mV DC	 Set speed Shortly at max acceleration Shortly at max deceleration
Terminal **XE** Voltage drop imbalance switch	 0,2 V DC 11,4 V DC	 Sensor plugged in Sensor unplugged
Terminal **XW** Voltage drop pin 3 to 1 Voltage drop pin 3 to 2	 12,2 V DC 1,3 V DC 0,5 V DC 10,5 V DC	 XW disconnected Cross diode Transistor active Transistor inactive
Terminal **XC** Resistance latch solenoid	 35 Ω	 Disconnected from line
Terminal **XA** Lid switch **XA1** inter **PWM-** (Anode of 15 V Zenerdiode V8) **XA2** inter **PWM-**	 14,5 V DC 14,2 V DC 0 V	 Door open Door closed - Over-current LED shortly active Open XB (motor over-temperature)
Terminal **XD** Brake resistor	 150 Ω	 Ambient 20°C
Terminal **XB** Motor over temperature	 15 VDC	 Door open, XB one side disconnected
Terminal **XK** Fan motor Resistance of coil	 385 Ω	 Disconnected from line

2.5 Imbalance Behaviour

- **Install** in table available **rotor**(s) in unloaded condition

But Rotor 75003454 must be used with Centrilab-system in any case

Rotor / Bucket	Run through weight	Cut off weight
75003454	approx. 20g	approx. 100g
75003450 mit 75003451	approx. 10g	approx. 15g

Insert rotor dependent cut-off weights and position them at angles of 90° to each other, the centrifuge must stop 4 times indicating "bAL" message in case of false correct the adjustment of the imbalance switch

Insert the admissible imbalance weights in the same manner, the centrifuge must run through 4 times to maximum rotor speed - in case of false correct the adjustment of the imbalance switch

2.6 Cleaning of Instrument Parts

ATTENTION - WARNING!

The electrical and electronic components must not be cleaned with moist detergents!

For Cleaning the centrifuge housing or its accessories see Operating Instructions section 1 (maintenance and care)

- **Electronic components**

  Clean dusty components carefully with a dry and soft brush and remove loose dust with a vacuum cleaner

- **Fans**

  Scratch off carefully with a knife or similar tool the crusted dirt from the fans' blades. Resulting grooves or marks must be removed subsequently with a fine abrasive cloth. Loose dirt is to remove with an absorbent cloth or vacuum cleaner