

2.4 Test Points

Mains terminal Board resistance	120V 50Ω	All given values are related on 120 V (+/- 10%) mains voltage for board supply
Motor over-temp. terminal X20/B3,B4*	20V DC	Voltage drop by one disconnected lead (error case) and linked terminal XR
Fan rotor chamber, terminal V1,V2	145 Ω	Switch OFF unit, fan resistance temperature 20°C
Fan rotor chamber, terminal F1,F2	465 Ω	Switch OFF unit, fan resistance temperature 20°C
Speed detection plug XW (1 to 4) (3 to 4) speed	5V DC 4,4V 0V n=f*30	Board with active filter circuit Low voltage supply Light barrier is passed through (slot position) Light barrier is out (turn cone a little by hand) When centrifuge is running
Imbalance sensor plug XW (1→4) (2→4)	12V DC a(t)	Low voltage supply of sensor board Amplitude of lateral acceleration is rotor and speed dependent, analyzed for n > 250 rpm
Motor current I_M cable (U,V,W)	3 * 7A	Split core transformer with Flukemeter maximum during acceleration
	3 * 5,2A 3 * 3,0A	Rotor #4394, set speed = 3750min-1 , 560W
Motor winding resistance 20°C – insulation value	3x2,5Ω > 10MΩ	Switch OFF unit, pull off motor plugs, measure inter U -> V, V -> W, W -> U Resistance inter each phase and motor casing
Brake resistor terminal XD	60Ω	Switch OFF unit, 2 resistors parallel connected, resistance at 20°C
Rotor detection plug XR	5V DC 0V DC	Per rotor revolution 2 different long pulses are separated from 2 different pulse pause lengths, this pulse mode is generated by 4 alternately polarized magnets

Error Code

„E-34“ message	Over-voltage	Brake resistor, main board	Check brake resistors, replace main board
„E-35“ message	Over-current	Main board	Replace main board
„E-36“ message	NMI interruption	Over voltage or over- current	Replace main board
„E-37“ message	Over-current continuously	Main board	Replace main board
„E-38“ message	Current measurement disturbed	Analog signal > hardware over current	Replace main board
„E-39“ message	Speed control check >n max.	Speed > calculated speed	Check speed detection board, replace the main board
„E-40“ message	Acceleration of the unit is too slow	Big imbalance Motor or main board faulty	Check rotor loading, motor and main board
„E-41“ message	Offset voltage from the imbalance sensor is in a inadmissible area	Imbalance sensor faulty Wiring from the speed detection board to the main board is broken	Replace speed detection board Check / replace the wiring

Error Code

„E-18“ message	Bucket code not valid for this rotor	Not valid	
„E-19“ message	Rotor code not programmed	Wrong rotor installed	Check rotor
		Interference during recognition	Check rotor recognition board and wiring
„E-20“ message	rotor code not valid	See E-19	
„E-21“ message	Recognition disturbance	wiring	Check wiring
„E-22“ message	Speed signal disturbance	wiring	Check wiring
„E-23“ message	Speed control measuring disturbance	2 nd check was done by rotor recognition system	Check speed detection board
„E-24“ message	Latch not in top position	Micro switch failed, de-adjusted, latch	Check micro switch adjustment, if necessary replace it
„E-25“ message	Time out latch open	Hall sensor signal not applied	Check latch motor and PCB
„E-26“ message	Time out latch close	Hall sensor signal not applied	Check latch motor and PCB
„E-27“ message	Signal given by latch not valid	Wrong identified signal after power “on”	Check hall sensors
„E-28“ message	Wrong sense of rotation	After replacement of the motor- wires mixed	Check wiring at terminal
„E-29“ message	Motor doesn't turn	PCB faulty, see E-21, E-22	Change PCB, rotor recognition, speed detection, fasten motor wiring at terminal
„E-30“ message	Control-voltage interruption	PCB failed	Replace PCB
„E-31“ message	over- temperature motor >150°C	Hot motor, no air circulation	Check motor, check grill for dust
„E-32“ message	Over- temperature Electronic	Faulty main board	Replace main board
„E-33“ message	High-pressure Cooling system	Faulty high pressure switch, blocked system	Inspect cooling system

Error Code

„E-01“ message	System clock pulse not stable	Hardware fault on main board	Change main board
„E-02“ message	program sequence was disturbed	Internal Software problem	Change CPU, replace main board
„E-03“ message	Stack overflow	Internal Software problem	No action in the field possible
„E-04“ message	Stack underflow	Internal Software problem	No action in the field possible
“E-05” message	Reset by HW watchdog timer	Software problem	No action in the field possible
“E-06” message	Data lines to key board disturbed	Wiring display board	Check wiring and connectors
“E-07” message	Display board doesn't match to main board cooled/non-cooled	Check software	Replace NV RAM and CPU
“E-08” message	Check sum error E-PROM	E-PROM failed	Replace E-PROM
“E-09” message	Check sum error NV RAM	NV RAM failed	Replace NV RAM
“E-10” message	NV RAM not initialized	Initializing of NV-RAM is not valid	check NV-RAM and socket, insert the correct NV-RAM
“E-11” message	NV RAM doesn't match E-PROM	Check versions of NV RAM and E-PROM	Replace NV RAM and E-PROM
“E-12” message	Check sum error NV RAM	NV RAM failed	Replace NV RAM
“E-13” message	Check sum error NV RAM	NV RAM failed	Replace NV RAM
„E-14“ message	chamber over temperature: display >50°C	Compressor didn't work	Check leads, terminals, start relay, capacitor, compressor
		Faulty cooling cycle	Exp. valve, refrigerant loss
„E-15“ message	Open temp. sensor	Check sensor, control circuits	Replace sensor or main board
„E-16“ message	Short cut temp. sensor	Check sensor, control circuits	Replace sensor or main board
„E-17“ message	wrong or faulty rotor detection	a wrong rotor was installed	wait for standstill, open the lid and install a correct rotor
		Mains voltage failure	press stop key, wait for standstill and restart
		Faulty detection circuit	replace the main board

2.3 Error code

„rotor“ in speed display	Wrong selection of detected rotor	Inadmissible speed or rcf value was pre-selected	Press start again (within 15s), else wait for rotor standstill, lid OPEN/CLOSE, set value, start
“bAL” message appears in speed display	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	Change or reinforce the base (table, lorry with lockable wheels, etc.)
		Centrifuge drive is not correctly leveled	Level the drive correctly by means of unit's feet
		Rotor itself has imbalance	Rotor must no longer be used, send back to Kendro
		Drive shaft or rotor fixing is damaged	Replace collet chuck or motor
		Imbalance sensor	Replace sensor board
		Circuits of main board	Replace the main board
“Lid” appears in speed display	Lid was opened manually during run	Forbidden intervention emergency opening device must only be used at standstill	Close lid immediately, turn power OFF/ON, press lid down for locking, press start key, press stop to finish run
	Protection circuit (20V) interrupted during run	Defective micro switch or leads or connectors to micro switch are interrupted	Check leads and connectors to micro switch, in case of a faulty micro switch, replace them
„OPEn“ appears in speed display by supposedly closed lid	20V supply for protection circuit is interrupted at standstill	Loose plug connectors	Check plug X20
		Interrupted leads to micro switch	Check leads to micro switch for continuity
		Defective micro switch	Replace micro switch
“S-LID” appears in display	Sensor signal not clear	Latch not in valid position during power on	Switch unit “off” and “on” again
“P oFF” appears in display	CPU can not store data in NV-Ram	NV-Ram is faulty	Replace the key and indication board

2.2 Trouble Shooting

Displays remain dark	No mains voltage supply	Mains switch with integrated fuse or fuses on main board	Switch on again, disconnect electric. components success., search for other faults
		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
	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 of all boards
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)
	Electrical	Defective terminal connection, faulty lead or motor winding	Check voltage on motor terminal and winding resistances -see test points on main board
		Faulty power electr.	Replace main board
Lid cannot be opened by key at standstill	Locking drive is not supplied with voltage	24V supply faulty relay K2 faulty driving circuit	Check voltage for drive motor Check switch. after power ON Replace the main board No or defective NV-RAM
	Latch motor	Faulty motor winding	Replace complete motor
	Lid is not correctly locked	Lid bolt is jamming	Push lid centrally into lock and press the key again
		Lid is deformed	Re-adjust the lid centrally