

GARLAND™

WORKING DRAFT INDUCTION COOKERS SERVICE MANUAL

GIU 2.5 KW

GIU 3.5 KW

GIU 5.0 KW

GIWOK 3.5 KW

GIWOK 5.0 KW

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1 Safety

1.1 Description of danger signs



The safety information which may cause personal injury at non-observance is specially marked with this general danger symbol



The electrical connection must be made by an expert.

CAUTION

Is used if there is a hazard or unsafe practice which could result in minor personal injury or property damage

1.2 Qualification and training of personnel

The staff for assembly, installation, servicing, operation and maintenance must have the appropriate qualifications. The field of responsibility, competence and supervision of the staff must be defined and controlled.

1.3 Safety prescriptions for installation and service

The operating personnel has to make sure that the installation and service as well as all inspection is done by authorized and qualified personnel. This personnel must have read very carefully the "Instructions for use" in order to meet the requirements. For installation, service, maintenance, repair and overhaul of the induction cookers, the personnel has to be specially qualified and must be authorized by the manufacturer. In principle, such work on induction appliances must only be carried out when it has no connection. The cookers must be switched off and disconnected from the electric supply.

1.4 Unauthorized reconstruction and use of spare parts

Reconstruction of the cooker or changes to the cooker are not allowed. Contact the manufacturer if you intend to make any changes on the cooker. To guarantee safety, use genuine OEM spare parts and accessories authorized by the manufacturer. The use of other components cancels any liability for the resultant consequences.

1.5 Improper operating methods

The operating reliability of the cookers can only be guaranteed with appropriate application of the cooker. The limit values may be exceeded on no account.

2 Technical Information

Base-Line

Type 3500 SH/BA, SH/IN	208 V / 1 ph	230 V / 1 ph	240 V / 1 ph
Wattage kW	3.5	3.5	3.5
Current A	17	16	16
Power factor Cos	> 0.95	> 0.95	> 0.95
Discharge rate mA	4	4	4
∅ coil mm	195	210	210

Type 5000 SH/BA, SH/IN	208V / 3 ph	400 V / 3 ph	440 V / 3 ph
Wattage kW	5.0	5.0	5.0
Current A	10	14	8
Power factor Cos	> 0.95	> 0.90	> 0.90
Discharge rate mA	4	4	4
∅ coil mm	210	210	220

Wok-Line

Type 3500 SH/WO, SH/WO/IN	208 V / 1 ph	230 V / 1 ph	240 V / 1 ph
Wattage kW	3.5	3.5	3.5
Current A	17	16	16
Power factor Cos	> 0.95	> 0.95	> 0.95
Discharge rate mA	4	4	4
∅ Ceramic bowl mm	260	260	260
∅ coil mm	240	240	240

Type 5000 SH/WO, SH/WO/IN	208 V / 3 ph	400 V / 3 ph	440 V / 3 ph
Wattage kW	5.0	5.0	5.0
Current A	10	14	8
Power factor Cos	> 0.95	> 0.90	> 0.90
Discharge rate mA	4	4	4
∅ Ceramic bowl mm	260	260	260
∅ coil mm	240	240	270

Max. tolerance of power supply	Nominal voltage +6 / -10%
Frequency	50/60 Hz
Protection class	IP 43
Min. diameter of pans	Ca. 12 cm
Max. ambient temperature: stockage	-20 to 70°C / 0 to + 160° F
Max. ambient temperature: function	-5 to 40°C / -40 to 110° F
Max. relative humidity of air: stockage	10 to 90%
Max. relative humidity of air: function	30 to 90%

On the power board, a main filter for the interference suppression is integrated

Certification

Satisfies the latest specifications: VDE EN 60335-1/-2/36, UL 197; CAN/CSA/C 22.2 No. 109, SSF 4-1996, CE-compliant.

Construction

The cookers are made of stainless steel (CNS 1.4301). The case is sealed. The mounting of the vitrocerame as well as the ceramic bowl is done with screws.

3 Functioning

3.1 Adjusting the performance rate

The performance rate is adjusted by the potentiometer (control knob). The inductive performance depends on the position of the potentiometer: Position 1 = minimum power, Position 10 = maximum power.

3.2 Checking the temperature

Induction coil

The temperature of the induction coil is checked by a temperature sensor. If the coil is heated over the maximum power, the heating process is stopped. As soon as the coil has cooled down, the Induction unit may be re-started. Turn the position of the control knob to "0" and then on the desired power.

Power board

The temperature of the power board is checked by a temperature sensor. As soon as the heat sink has heated above 55°C/130°F, the cooling fan will start. Temperatures of the heat sink of more than 70°C/ 160°F will reduce power automatically. In order to keep the induction cooker working under normal conditions until cooled.

Logic Board

The temperature of the logic board determines the ambient temperature of the appliance. As soon as the temperature is higher than the programmed value, the heating process is stopped. It can be re-started as soon as normal conditions are reached.

3.3 Protection overload current

Detecting inappropriate pan material or magnetic objects on the heating area, will cause the current in the induction coil to be raised. In order to protect the power board, the current in the coil is checked. As soon as the current in the coil exceeds the tolerance, the generator is blocked and there is no further active exchange of energy. The unit can be re-started as soon as normal working conditions are reached.

4 Surroundings of installation



The electrical connection must be made by an expert.

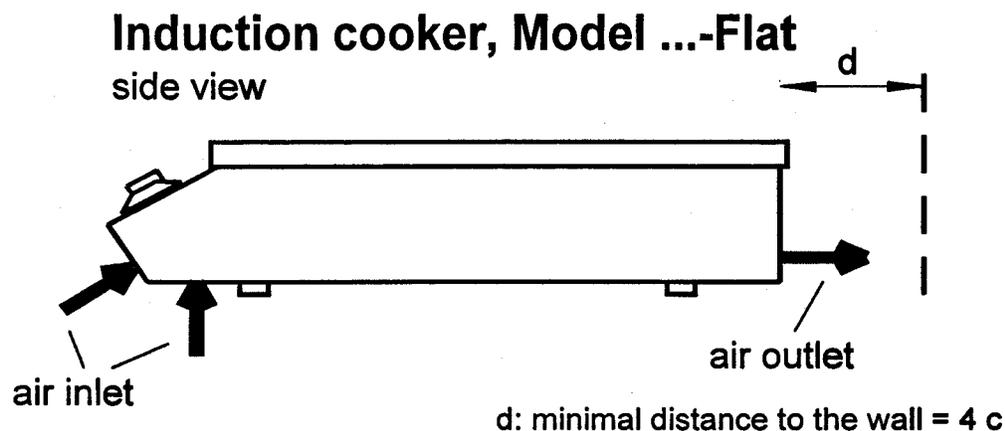
Please obey the following rules:

- Verify and make sure that the voltage of the main conductor corresponds with the specification plate.
- The electrical connections must satisfy local house installation regulations. The national and local regulations must be observed.
- The induction cooker is equipped with a flexible cable which must be connected to a proper receptacle.
- When circuit breakers are used, they must be rated according to local regulations.

The cooker has to be set up on a level surface like a table and requires an area of at least 400 x 480 mm. The air inlet and air outlet must not be obstructed, the surface must be able to withstand a load of 40 kg. The cooker doesn't have to be fixed on the table. The control knob to operate the cooker must be easily accessible.

To guarantee proper operation of the cooker, the ambient temperature must be within the range of -5° to 40°C / -40° to 110°F and humidity of air between 30% to 90 %

The cooker may not be exposed to jets of water.



4.1 Pan material for induction cookers

Cooking with induction → it is very important to use appropriate pan material. The bottom of the pan is the element that closes the magnetic field generated by the induction spool. Use only appropriate pan material.

In order to check whether your pan is appropriate, use a magnet. This has to stick to the bottom of the pan. If not, your pan is not suitable for induction cookers. Choose a pan suitable for induction.

5 Tests

5.1 Pan detection (Install Line only)

ATTENTION

The heating area is warmed by the hot pan. In order to avoid injuries (burns), do not touch the heating area.

This test shows whether the induction cooker is working well when pans with too small diameter are used and if little metallic objects are heated on the heating area. To do this test, you need the following material:

- An appropriate pan with a bottom diameter of 4-5 inches
- metallic plate 1 diameter $d = 4-5$ inches

Test with pans

Step	Action	Level	Result
1	Put the pan in the middle of the heating area	112	Heat, the indicator lights
2	Push the pan until the edge of the pan is in the middle of the heating area	112	No heating, the indicator doesn't light

5.2 Power rating

ATTENTION

The heating area is warmed by the hot pan. In order to avoid injuries (burns), do not touch the heating area.

This test shows whether the rating may be set by the potentiometer. You need an appropriate pan (or a Wok-pan for Wok types) with a bottom diameter of $>4-5$ inches.

1	Put the pan on the heating area until water is boiling	12	Heat, water is boiling
2	Reduce the power by turning slowly the control knob	121	Heat rating reduces (water does not boil anymore), phase current reduces continuously

5.3 Maximum rating

ATTENTION The heating area is warmed by the hot pan. In order to avoid injuries (burns), do not touch the heating area.

For this test you need a pan with a bottom diameter of 28 cm or more, resp. a Wok pan for the Wok types.

Test cooking time

Step	Action	Level	Result
1	Put a pan on the heating area and fill it up with one litre of water (~ 20°C/70°F)	12	heat
2	Measure the time until water is boiling (Type Base-Line)	12	The measured time should be: 120 Sec./litre (3.5kW) 50 Sec./litre (5.0kW)
	Measure the time until water is cooking (Type Wok-Line)		90 Sec /litre (3.5kW) 60 Sec./litre (5.0kW)

5.4 Current

Step	Action	Level	Result
1	Put a pan on the heating area and fill it up with one litre of water (~ 20°C/70°F)	12	heat
2	Measure phase current	12	Standard value: 1 x 208 VAC - 3.5 kW 17A 1 x 220/230 VAC - 3.5 kW 16 A 3 x 208 VAC -3.5 kW 10 A -5.0 kW 14 A 3 x 380/400 VAC - 5 kW 8 A

ATTENTION

The heating area is warmed by the hot pan. In order to avoid injuries (burns), do not touch the heating area.

With this test, the fan and the degree of boiling are verified. At the beginning of the test, the induction cooker should be cold. You need a pan with a bottom diameter of >11-12 inches or a Wok pan.

Step	Action	Level	Result
1	Put a pan on the heating area and fill it up with one litre of water	12	heat
2	Measure the time until the fan starts working	12	The fan should start working after 6-8 minutes
3	Continue cooking for about 30 minutes	12	The heating process may not be interrupted (indicator lamp) The fan may repeatedly start and stop.
4	Stop the induction cooker	0	The fan stops immediately

5.6 Test components

CAUTION

The supply cable must be unplugged.

5.6.1 Power board

The function of the transistor modul and of the rectifier are verified.

Rectifier (picture 1)

Conducting-static voltage Diode $U_{\square} = 0.5V$: if all conducting-state voltages show approx. 0.5 V, the rectifier is working.

A short circuit between ,+' and ,-', means that the transistor module is defective.

Transistor module (picture 2)

Conducting-state voltage Diode $U_{\square} = 0.4 V$: if all conducting-state voltages show approx.0.4 V, the transistor module is working. A short circuit between C2-E2, C1-E1 and C1-2 means that the transistor module is defective.

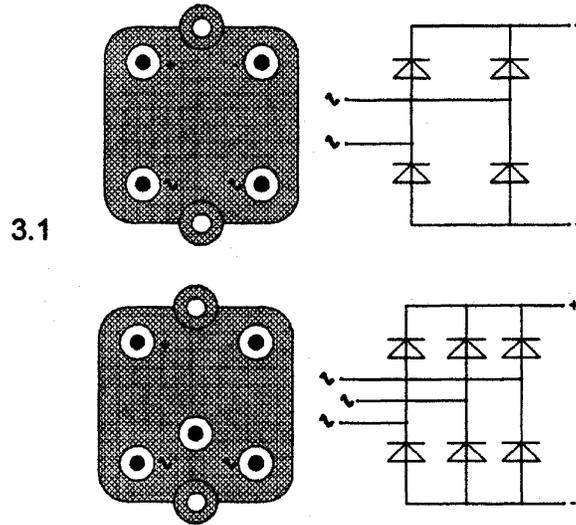
If the rectifier and/or the transistor module seem to be defective, separate the power board K016/K031 from cooling plate and verify the rectifier and the transistor module without power.

5.6.2. Rectifier

The rectifier is separated from the power board but still fixed on the cooling plate. Dismount according to "Replacement of power board".

- Conducting-state voltage Diode U_{\square} = approx. 0.5 V: if all conducting-state voltages show approx. 0.5 V, the rectifier works.
- Short circuit at the different diodes: rectifier is defective.

Picture 1



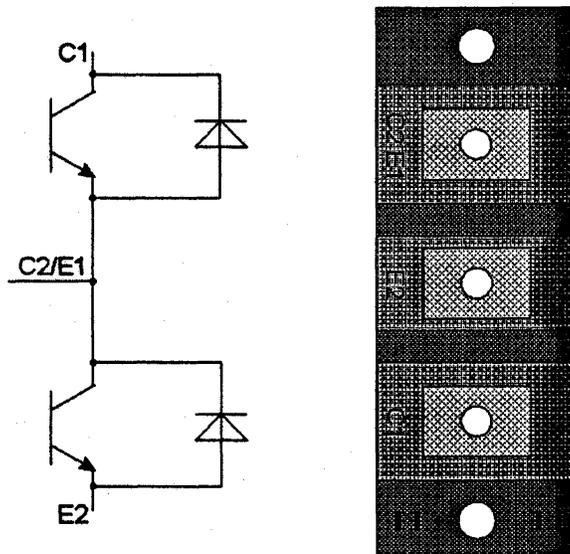
5.6.3 Transistor module

The transistor module is separated from the power board but still fixed on the cooling plate. Dismount according to "Replacement of power board".

Conducting-state voltage Diode U_{\square} = approx. 0.4 V: if all conducting-state voltages show approx. 0.4V, the transistor module is working.

A short circuit between AC2-E2, C1-E1 and C1-E2 means that the transistor module is defective. If the module is defective, verify diodes D7, D8, D9 and D10 on short circuit (see 9.2/9.3). Replace the power board when you discover a short circuit.

Picture 2



6 Maintenance / Service

Maintenance work may only be completed by authorized personnel. Before starting any maintenance, the power supply must be disconnected and the appliance must have cooled down. The following maintenance must be completed periodically. The longer and the more frequently the cooker is used, the more often the maintenance will have to be completed. Every cooker must be checked at least once a year.

Fan

The good function of the cooker can only be guaranteed if the electronics kept within normal working temperatures.

- The air inlet and air outlet slots must not be hindered
- The airducts must be free of dirt
- The air must circulate unhindered through the cooling plate (no hindrance)
- The fan is secure
- The cooling plates are secure

Induction coil

Check:

- Coil is securely mounted (screws tightened)?
- Coil adhesive (secured o.k.)?
- Ferrite (secured o.k.)?

Generally

Check

- Ground connection to earth?
- Screw connections
- Any kind of liquids that have entered the cooker
- Dirt in the cooker

7 Trouble Shooting

7.1 Generally

ATTENTION

Do not open the cooker when it is connected to the power supply.
Dangerous voltage inside!

The induction cooker may only be opened by authorized personnel. Stop any work if the heating area (vitrocerame) is broken. The induction cooker must be switched off and the power cable must be disconnected. Do not touch any parts inside the cooker.

Before replacing a part check the wiring. Pay special attention to the following faults:

- Broken cables
- Pinched cables
- Loose or broken solder joints

You must not attempt any repair on the printed boards.

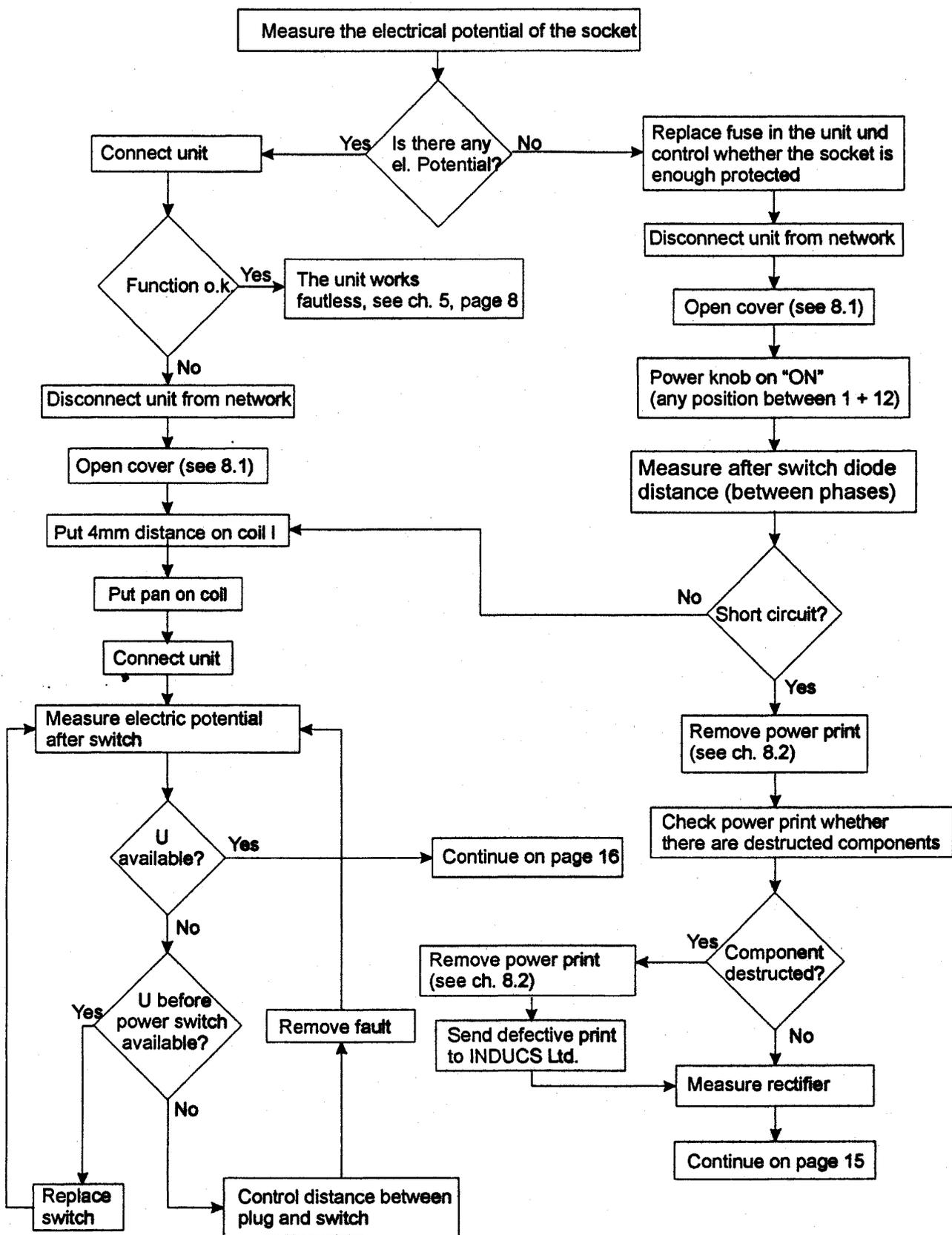
7.2 Error messages

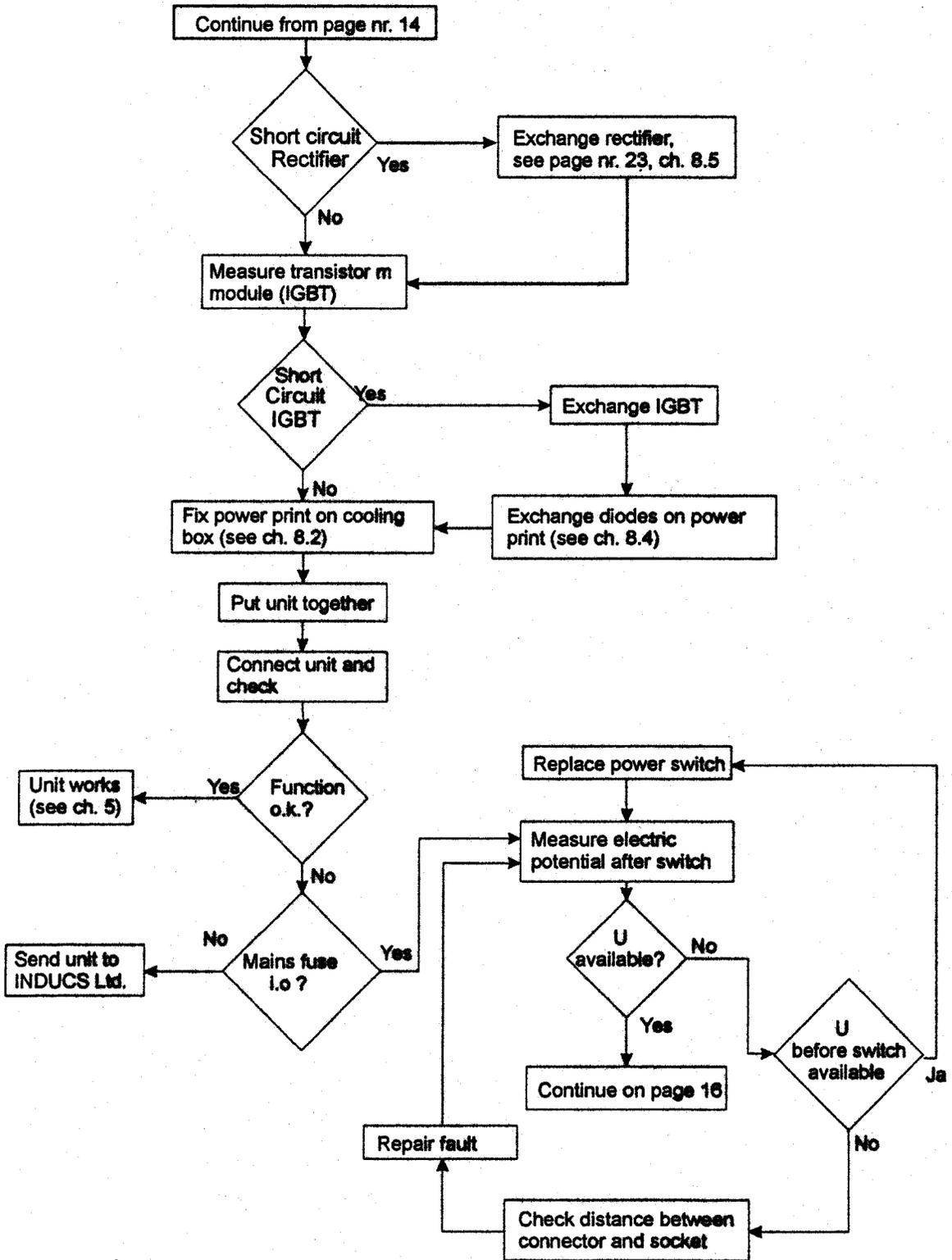
LED8	LED7	LED6	LED5	Code	Signification	
--	--	--	--	--	Normal function	
--	--	--	on	1	No coil current, Hardware overcurrent	
--	--	on	--	2	High coil current, Software overcurrent	
--	--	on	on	3	Temperature cooling plate	
--	on	--	--	4	Temperature heating area	1)
--	on	--	on	5	Potentiometer line break	
--	on	on	--	6	Temperature inside	
--	on	on	on	7	Heating area detecting element	2)
on	on	--	--	12	Power reduction cooling plate temperature	3)
on	on	--	on	13	Power reduction heating area temperature	3)

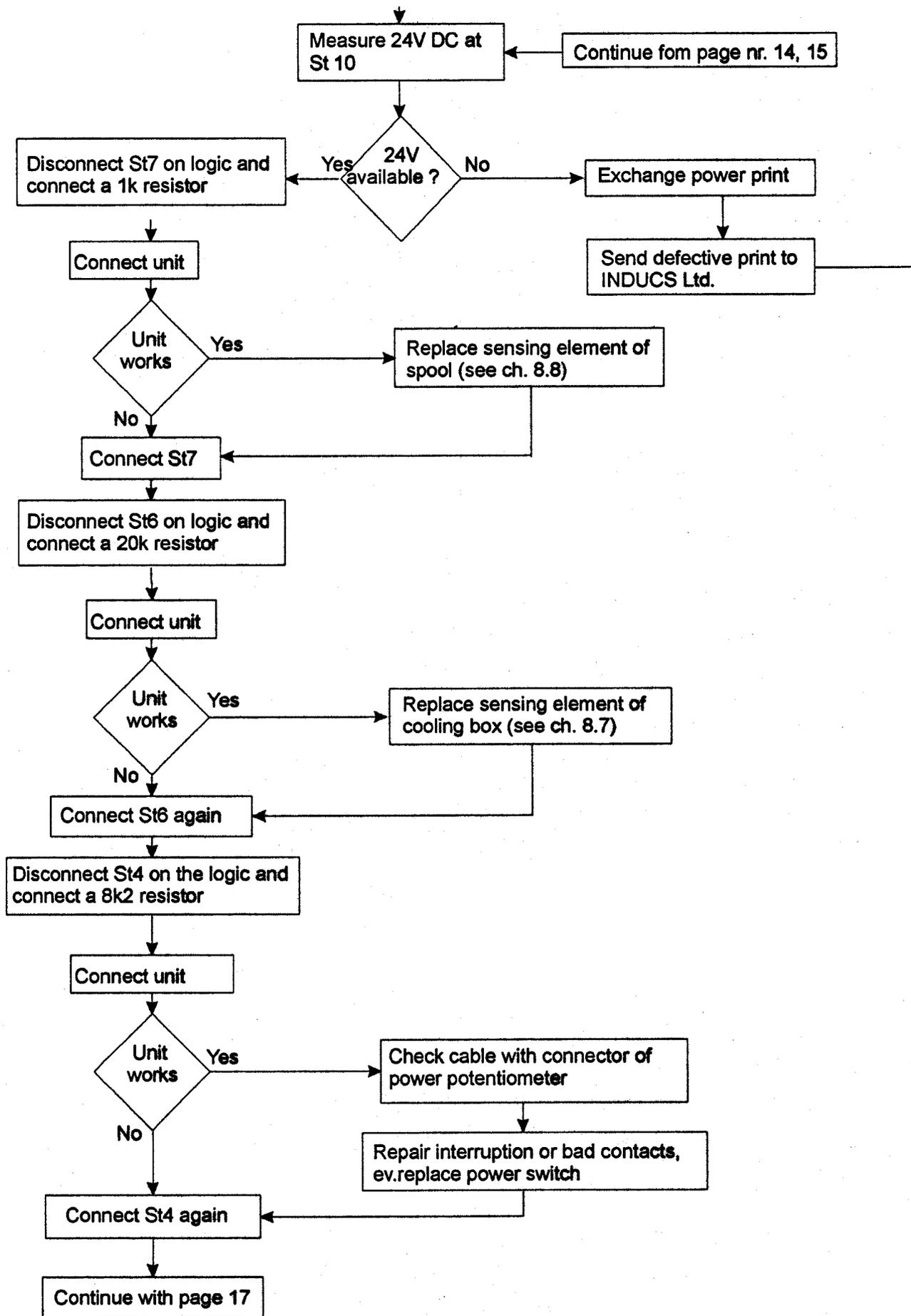
- 1) The induction unit can only be started again by turning the knob to "off" to reset.
- 2) The induction unit will continue to work but the temperature of the cooking platform will not be controlled anymore.
- 3) The induction unit continues working at reduced power levels.

"Code" means the number of flashes of the indicator lamp.

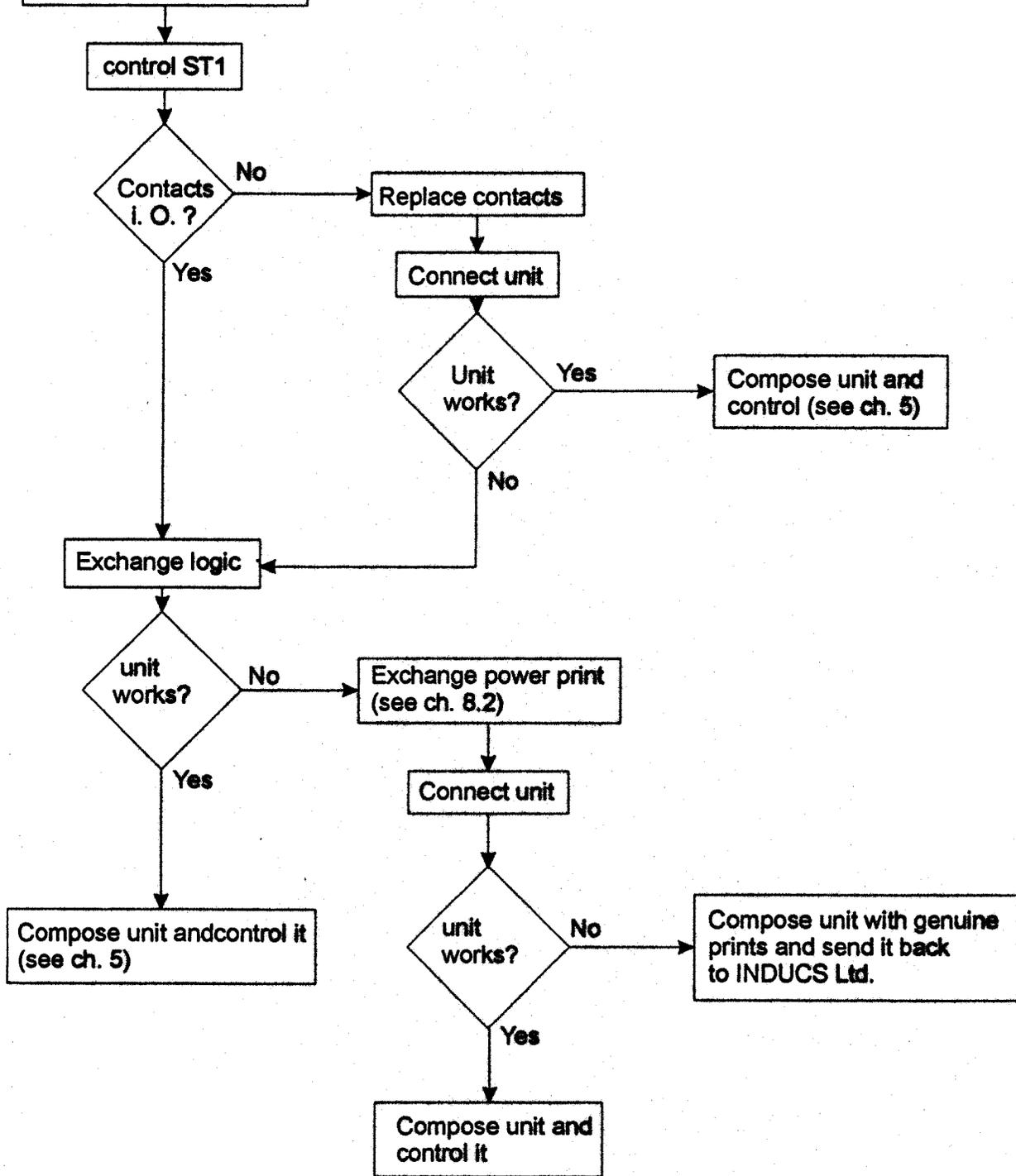
Order of error message: The indicator lamp flashes at an interval of 0,6 sec. The number of the following short flashes has to be counted and informs you about the kind of error corresponding to the above mentioned code system.







Continued from page 16



Fault	Possible cause	Action to take through authorized personnel	IN
Fuse burns out at starting	Cooker is incorrectly connected	Check the connections	
	Short circuit at power board	Check the power board	AP1
	Short circuit in wiring	Check the wiring	
No heating (indicator lamp does not flash)	Potentiometer on "OFF" position	Turn the potentiometer on "ON"	
	Main switch defective	Check power on binder 5 and 6 (one phase) or 4,5, and 6 (three phase) on power board	
	No current supply	Check the fuses, Check connection	
	Power supply not satisfactory	Check power supply	
	Fuses „Logic supply“ on power print defective	Check and replace fuses S1 and S2 (Typ 1AT)	
	No heating	Pan too small (Diameter of pan bottom less than 12 cm)	Use appropriate pan
Pan is not placed in the middle of the heating area (pan can not be detected)		Push the pan in the middle of the heating area	
Inappropriate pan		Choose a pan appropriate for induction 1)	
Power board defective		Check power board	AP2
Logic board defective		Check logic board	AL1
Potentiometer defective		Check potentiometer	AO1
Temperature sensing element Coil defective		Check temperature coil sensing element	AT1

Fault	Possible cause	Action to take through authorized personnel	IN
No heating with small pans	Pan detection incorrectly tuned	Check logic board	AL2
Poor heating, indicator lamp is ON (flashes)	Pan is not ideal	Chose a pan that is recommended for induction cooking. Compare results with your pan.	
	Potentiometer defective	Check potentiometer	AO2
	Air cooling system is obstructed	Make sure that the air supply and air exit are not obstructed	
Poor heating	Ambient temperature is too high (the air cooling system cannot hold the cooker in the normal operating temperature 2)	Make sure that no hot ambient air is sucked in by the fan. Reduce the temperature of the ambient air. The temperature of the air supply may not exceed 40°C/ 110° F.	
	One phase is missing (only with three phase supply)	Check the fuses	
	Power board defective	Check power board	AP3
	Logic board defective	Verify logic board operation	AL3
No reaction on turning the control knob	Potentiometer is defective	Check potentiometer	AO3
Heat rating switches off and on within minutes, fan is working	Air cooling system is hindered	Make sure that air supply and air exit are not hindered, clean air slots	
	Fan is dirty	Clean fan	AF1
Heat rating switches on and off within minutes, fan does not work	Fan defective Fan checking defective	Check fan	AF2
Heat rating switches on and off within minutes (after a long and constant use)	Coil is overheated, heating area is too hot Empty pan Overheated oil in the pan	Switch off cooker, put pan away and wait until the heating area has cooled down.	

Fault	Possible cause	Action to take through authorized personnel	(IN)
Small metallic objects (for ex. spoons) are heated on the heating area	Pan detection is wrong	Check logic board	AL4

- 1) In order to verify whether the pan is appropriate use a magnet which should stick to the bottom of the pan. If it does not, your pan is inappropriate for induction cookers. Choose pan material that is recommended for induction appliances.
- 2) The cooling system starts to work when the temperature of the cooling plate is higher than 55°C/160°F, it reduces the checking of the power in order to hold the power board in normal working conditions.

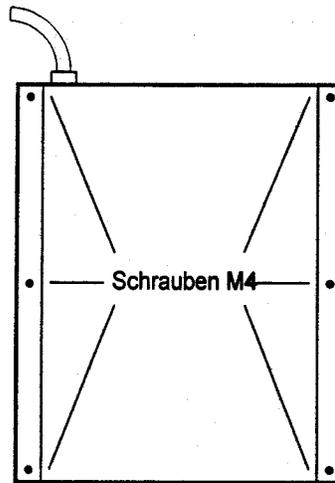
7.5 Fault repair

Detailed instruction of the steps in order to repair faults (see list "Faultfinding")

Nr	Action
AP1	Disconnect the power supply of the cooker. Check with an ohmmeter whether a short circuit has occurred. Make this test in "ON" and "OFF"-positions. Locate the short circuit. If it is the power board, replace it. Verify the operation.
AP2	Check load +24 VDC ST 1/1: „24 VDC, ST 1/4 ND (on power prints K016, K031 and on logic prints K018) If wrong, replace logic board.
	Sign „enable“ (ST 1/2) and „low“ (ST 1/3) ^a . If wrong, replace logic board K018, Check components (see "Test components")
AP3	Sign "low" (ST 1/3) and high0" (ST 1/5) ^a If wrong, replace logic board K018, otherwise check components on the power board (see "Test components").
AL1	Verify signs "enable" (ST 1/2) and "low" (ST 1/3) ^a . If wrong, replace logic board K018.
AL2	Replace logic print
AL3	Check signs "low" (ST 1/3) and "high0" (ST 1/5) ^a . If wrong, replace board print K018 otherwise replace power unit (s. AP3)
AL4	See AL2

(1-Phase, 3-Phases)

- Turn the induction unit over
- Remove screws
- Turn induction unit back in normal position
- Lift cover, turn away at the right side, put it to the right side
- Remove spool carrier: remove 2 stop nuts at the left
- Remove M4 screws
- Remove screws A1 and A2
- Turn away spool carrier at the left



(Vorderseite)
Sicht von unten

8.2 Power board K016, K031 (1 Phase, 3 Phases)

Removing the power board:

- Disconnect all connectors on the power board: ST1
- Disconnect all clamped joints on the power board:
1 Phase: L1, N, PE, 1,2,3,4,7,8,
3 Phases: L1, L2, L3, PE, 1,2,3,4,5,6,7,8.
- Disconnect ST5 on logic board K018
- Remove all soldered joints
- Remove pin M4 and screw M4 in the corner of the print
- Remove the connection to the transistor module, 3 screws M5x12
- Remove the rectifier, 5 screws M4x16 (3 Phases) or 4 screws M4x16 (1 Phase)
Pay attention to the distance bolts and the plain washers: bolt head/spring washer/spring washer/ plain washer/ distance bolt (range the two spring washers together)
- Remove power board

Assembly of the power board

- Put the power print on the bolts. Pay attention to the connectors J16, J17, J18, J19: The four wires of the transistor module must be connected through the wholes of the power board.

Phase) Pay attention to the distance bolts and the plain washers: bolt head/spring washer/spring washer/ plain washer/distance bolts (range the two spring washers together)

- Put the screws to attach the transistor module. Do not yet tighten the screws.
- Install the screws of the rectifier
- Install the screws on the transistor module. Don't tighten too much.
- Install the bolt M4 and the screws M4 in the corners of the print plate
- Solder the connectors J16, J17, J18, J19 with solder gun
- Connect the clamping joints on the power board:
1 Phase: L1, N, PE, 1,2,4,5,7,8
3 Phases: L1, L2, L3, PE, 1,2,3,4,5,6,7,8
- Connect all plug-type connectors on the power print: ST1
- Connect ST5 on the power print K018
- Connect the coil with A1 and A2 (screws)

8.3 Logic board K018

Removal of logic print

- Disconnect all plug-type connectors: ST1, ST4, ST5, ST6, ST7, ST8
- Remove nut M3 and the 3 plastic bolts
- Remove the logic board

Assembly of the logic board

- Install the new logic board
- Install the board with nut M3 and the 3 plastic bolts
- Connect all plug-type connectors on the logic print: ST1, ST4, ST5, ST6, ST7, ST8

8.4 Transistor module

First disconnect power board K016, K031 (see 8.2)

- Remove the two hexagon socket screws
- Remove the module of the cooling plate
- Clean the surface of the cooling plate: remove the heat conducting paste (i.e methyl spirit)
- Put on a new small amount of heat conducting paste on the new transistor module. Make sure that the whole side below is well covered with paste.
- Attach the module with the hexagon socket screws at the cooling plate
Attention: Measure (and replace if necessary) Z-diodes D7, D8, D9, D10 on the power board , eventually replace D7, D9 =12V, D8, D10 = 6.8V (see page 26/27)
- Attach the power board K016, K031 (see 8.2)

8.5 Rectifier

First disconnect the power print K016, K031 (see 8.2)

- Remove the screws
- Remove the rectifier from the cooling plate
- Clean the surface of the cooling plate: remove the heat conducting paste (for example with methyl spirit)
- Put on a small amount of heat conducting paste on the new transistor module. Make sure that the whole side below is well covered with paste.

Attention: Measure (and replace if necessary) Z-diodes D7, D8, D9, D10 on the power print, eventually replace D7, D9 =12V, D8, D10 = 6.8V (see page 26/27)

- Attach the power board K016, K031

8.6 Fan

- Remove cable from binding posts K7/K8
- Remove the fan with 4 screws on the bottom of the unit
- Remove the fan
- Put in the new fan with 2mm-distance bolts
- Fix the fan with 4 screws

8.7 Temperature sensing element cooling plate

The sensing element is installed in the cable lug that is fixed at the transistor module. Replace the whole part (cable lug with sensing element, cable and connector)

- Remove first the power board K016, K031 (see 8.2)
- Remove the hexagon socket screws at the transistor module
- Remove that whole part (cable lug with sensing element, cable and connector)
- Attach the cable lug with the hexagon socket screws on the transistor module

Attach the power board K016, K031 (see 8.2)

8.8 Temperature sensing element coil

- Place ST7 on logic print
- Remove coil from spool carrier plate
- Replace sensing element. Attention: the sensing element must, when the unit is connected, be placed on the vitrocrame.
- Attach coil on the spool carrier plate. Distance lower border of coil to carrier plate must be 23mm.
- Place ST7 on logic

Appendix C018 Logic print

St7 Temperature sensing element, coil

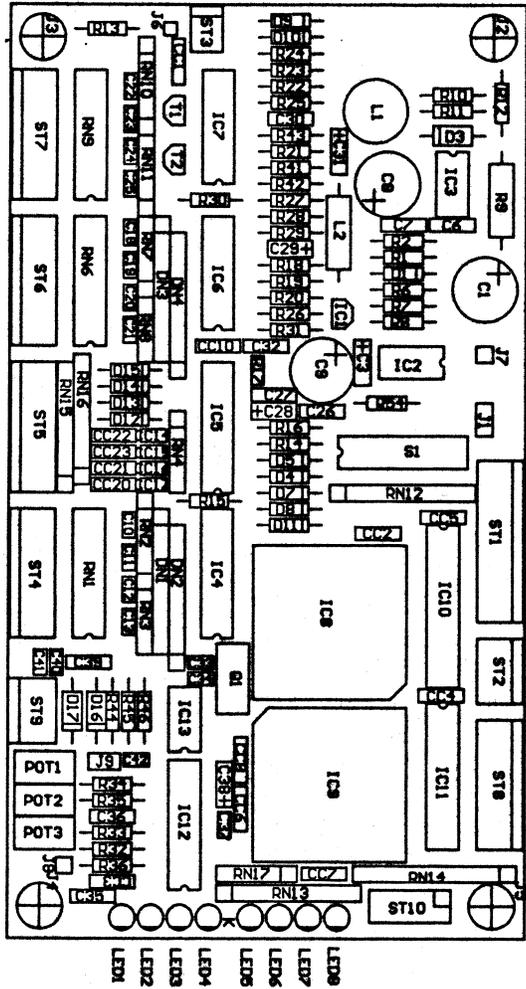
St6 Temperature sensing element cooling block

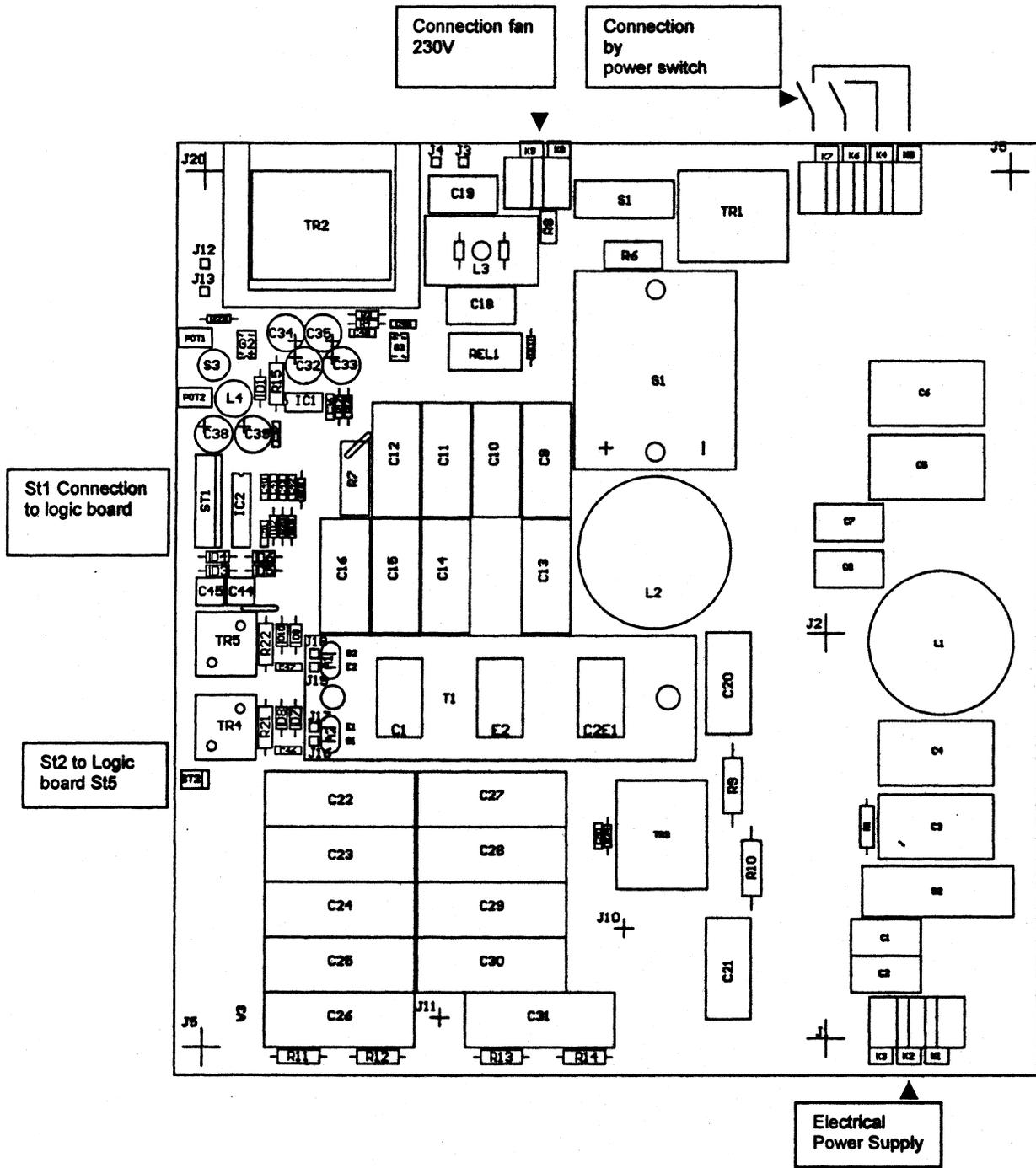
St5 overcurrent to power print

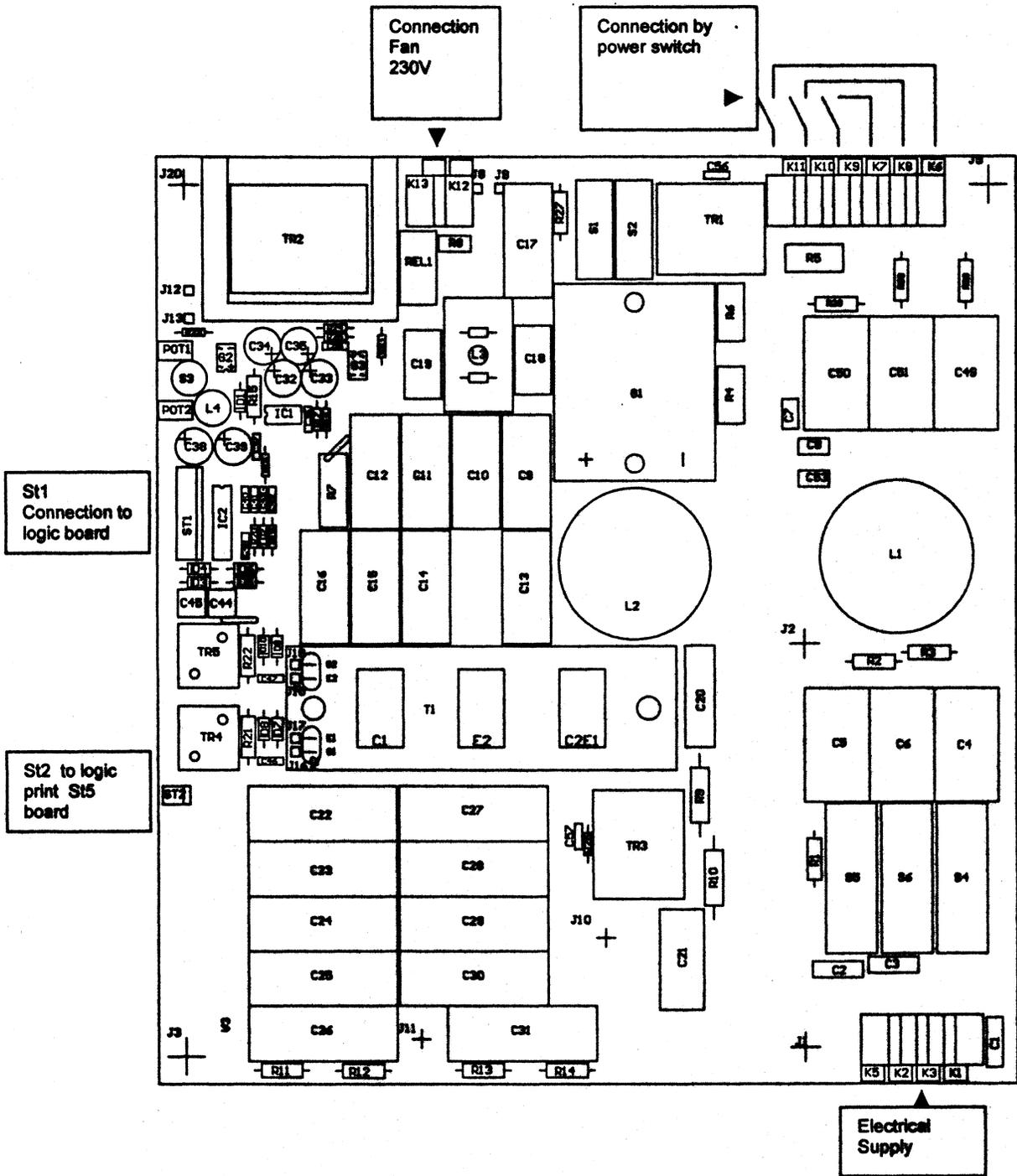
St4 Power rating

St1 Connection to power board

St8 External indicator







9.5 Signal connector ST1

ST1 on power board K016 and ST1 and Logic print K018 are directly connected (connector 1 at connector 1, connector 2 at connector 2). Therefore the signs are identical.

Connection	Sign	Short description
1	+24 VDC	Supply +24V for Logic print
2	enable	Verify transistor module..... 
3	low	Verify transistor module: Logic sign (High speed CMOS), frequency env. 20 kHz
4	GND	GND Logic
5	High0	Verify transistor module O:: Logic sign (High speed CMOS), frequency env. 20kHz
6	High1	Not occupied
7	High2	Not occupied
8	High3	Not occupied
9	iph	Sign, proportional to phase current, range -5V to +5V

Error codes list

Order of error message :

The indicator lamp flashes for an interval of 0,6 sec. The number of the following short flashes has to be counted and informs about the kind of error corresponding to the following list :

Number of flashing signals – Code	Signification	Help
--	No fault, normal operation	
01	No coil current, Hardware overcurrent	1)
02	High coil current, Software overcurrent	
03	Temperature of heat sink too high	3)
04	Temperature of the cooking field (coil) too high	2)
05	Potentiometer disconnected or defect	
06	Raised temperature inside of unit	
07	Short circuit of coil sensor	2c
08	External temperature sensor disconnected or defective	
09	Fault on operation with external temperature sensor	
10	System fault, data link system generator	
11	System fault, data link system keyboard	
12	Power reduction caused with raised temperature	
13	Power reduction caused with raised coil temperature	
14	Power reduction caused by bad pan material	

- 1)
 - a. Faulty pan material – compare results with another pans recommended by Inducis Ltd.
 - b. Check coil contacts
 - c. Check IGBT- modul and power print

- 2)
 - a. Cooking with empty pan !!!
 - b. Check the coil temperature
 - c. Check coil temperature sensor (resistance measurement - 1k Ω)

- 3)
 - a. Check out if cooling air inlet is blocked
 - b. Check out fan functionality
 - c. Check the NTC temperature sensor (20K Ω resistance)

1 Description of the system

1.1 Block scheme

