



Electrolux

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Customer Care - EMEA  
Training and Operations Support  
Technical Support

# SERVICE MANUAL

## HOBS

Module: Induction - Power Board

### Tiger & King Tiger



## 1 PRECAUTION



### Information "Warnings"

All work with open appliances must be done with the mains supply disconnected.

Work on electrical equipment should only be carried out by qualified personnel.

Before working on a device, check the efficiency of the system casing using appropriate equipment. As an example, refer to the indications described / illustrated in the portal Electrolux Learning Gateway (<http://electrolux.edvantage.net>).

After the work, carry out electrical safety tests and ensure that the all safety devices are working properly.

In the case of manipulation / replacement of the PCB, use the ESD kit (Code 405 50 63-95/4) to prevent electrostatic discharge damage the circuit board see SB No. 599 72 08-09

#### Document Revisions

| Revision | Date    | Description       | Approved by   |
|----------|---------|-------------------|---------------|
| 0.0      | 05/2017 | Document creation | Ulrich Häutle |
|          |         |                   |               |

## 2 PURPOSE OF THIS MANUAL

The purpose of this Manual is to provide information of Induction Built-in Hobs based on the Induction Power board "Tiger & King Tiger".

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### 4 OVERVIEW OF TIGER POWER BOARDS

The Tiger Power board (POB) is an induction Power board to drive 2 coils per module. Each coil can drive booster power up to 3,7 kW. The power management shares the 3k7/phase on the two coils. Typically the Tiger POB is driving standard round coils. The lower part of the fan is integrated in the housing.

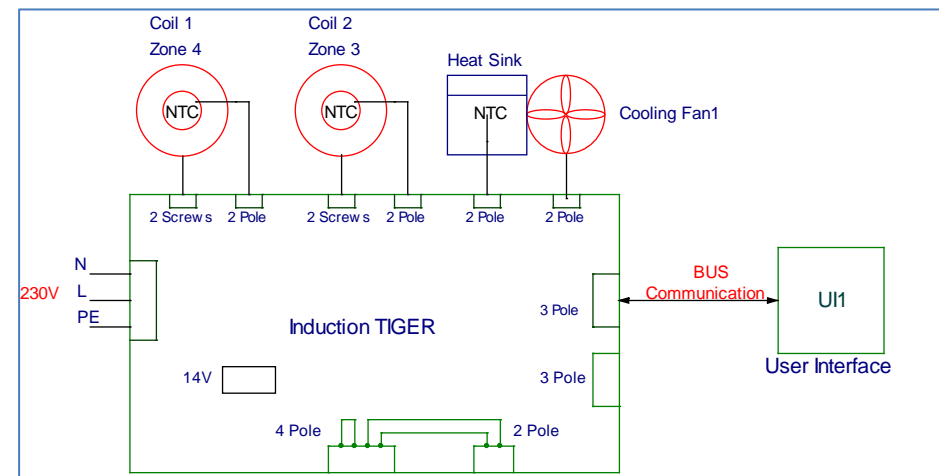
Typically the Tiger is used with a second Tiger (left and right side).

A special variant is available to drive 5k2W appliances as well.



#### 4.1 GENERAL DATA

- 2 zones (generators)
- single-phase: 200V - 230V, 240V 50Hz/60Hz, 16A total current limit (per module)
- up to 5k2 /23A with a special version
- 400V-tolerant in standby mode only;
- booster power function on each zone(time limited);
- MACS protocol, 2 parallel MACS connectors
- 2 micro controller: (Power and Control)
- Two different software loaded; from the factory only
- cooling fan with speed variation, for each module
- each coil with one NTC
- Jumper and Dummy NTC
- Error Codes (E0...E9)
- 5V power supply; **but not isolated!!**
- 6...14V power supply for Fan; PWM controlled
- 14 V connector (optional) for special user interface



#### 4.2 TIGER POB GENERATIONS

This type of Electronic is always placed in steel protection box.

Different variants were developed during the last years. The latest Hardware is compatible to all older Tiger versions. The downgrade is managed by dedicated Software.

These different programs are necessary due to the different safety - settings in collaboration with the user interface. Please don't mix the spare parts.

#### 4.2.1 TEIS 2006

Max Power per generator: ~2.8kW

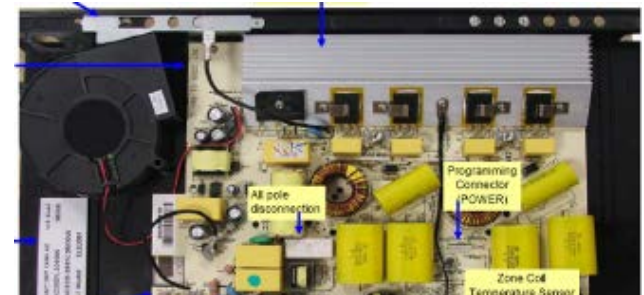
The both POB are connected **direct** to the user interface.  
The user interface (UI4) is glued to the glass.

The POB is with TACS communication protocol.

A special Version of Tiger is the spare part for this hardware.

Tiger is a spare part for Teis:

- both Tiger POBs need the jumper
- the Jumper&NTC is included to the spare part kit.



#### 4.2.2 MINI 2007

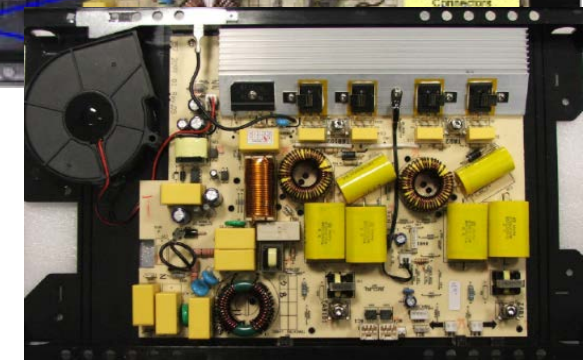
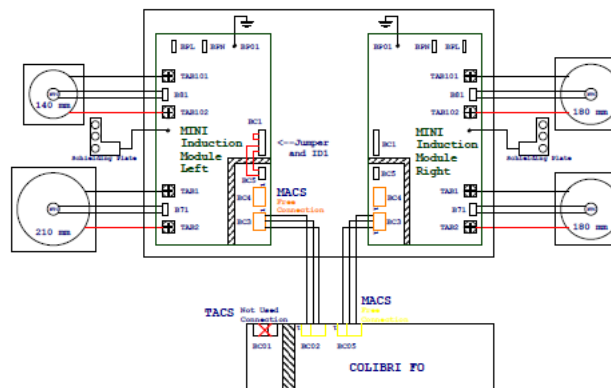
Max Power per generator: ~3.3 kW

The both POB are connected direct to the user interface.

The user interface (Colibri) is placed in a carrier.

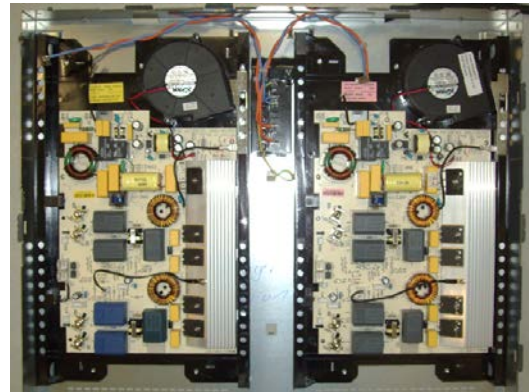
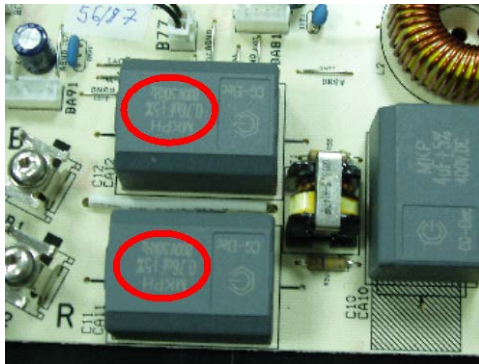
The POB is with MACS communication protocol.  
With MACS each POB needs an identification (jumper).

Tiger is a spare part for Mini:



- Only the left side needs the jumper
- One spare part can be used on both sides
- Use the jumper and the dummy NTC from the defective hob

#### 4.2.3 TIGER STANDARD AND HP VERSIONS BETWEEN 2008 AND 2011 (TIGER EOS)



This Generation needs two different versions.  
The printing on the both front capacitors tells you:

- 0,68 $\mu$ F = standard version  
for all coils with < 3,3kW (d140/d180/d210Max) and the 280D double coil
- 0,76 $\mu$ F = High Power version (HP)  
for all coils with > 3,3kW (d210HP, d290)

#### 4.2.4 TIGER SINCE 2012, REV I

Max Power per generator: ~3.7 kW

The Tiger "Rev. I" with 68 $\mu$ F can drive a coil up to 3k7W(5k2) in collaboration with the 210plus (280D) coil. The left POB (yellow label) and the right board POB (red label) are technical the same. The difference is only the applied jumper.

The Tiger "Rev. I" electronic replaces all Teis ; Miniboards and all old Tiger versions. The plastic housing is compatible to all protection boxes and to all coils.

Tiger 2012 is a spare part for Tiger 2008...2011

- One spare part can be used on both sides
- Use the jumper and the dummy NTC from the defective hob

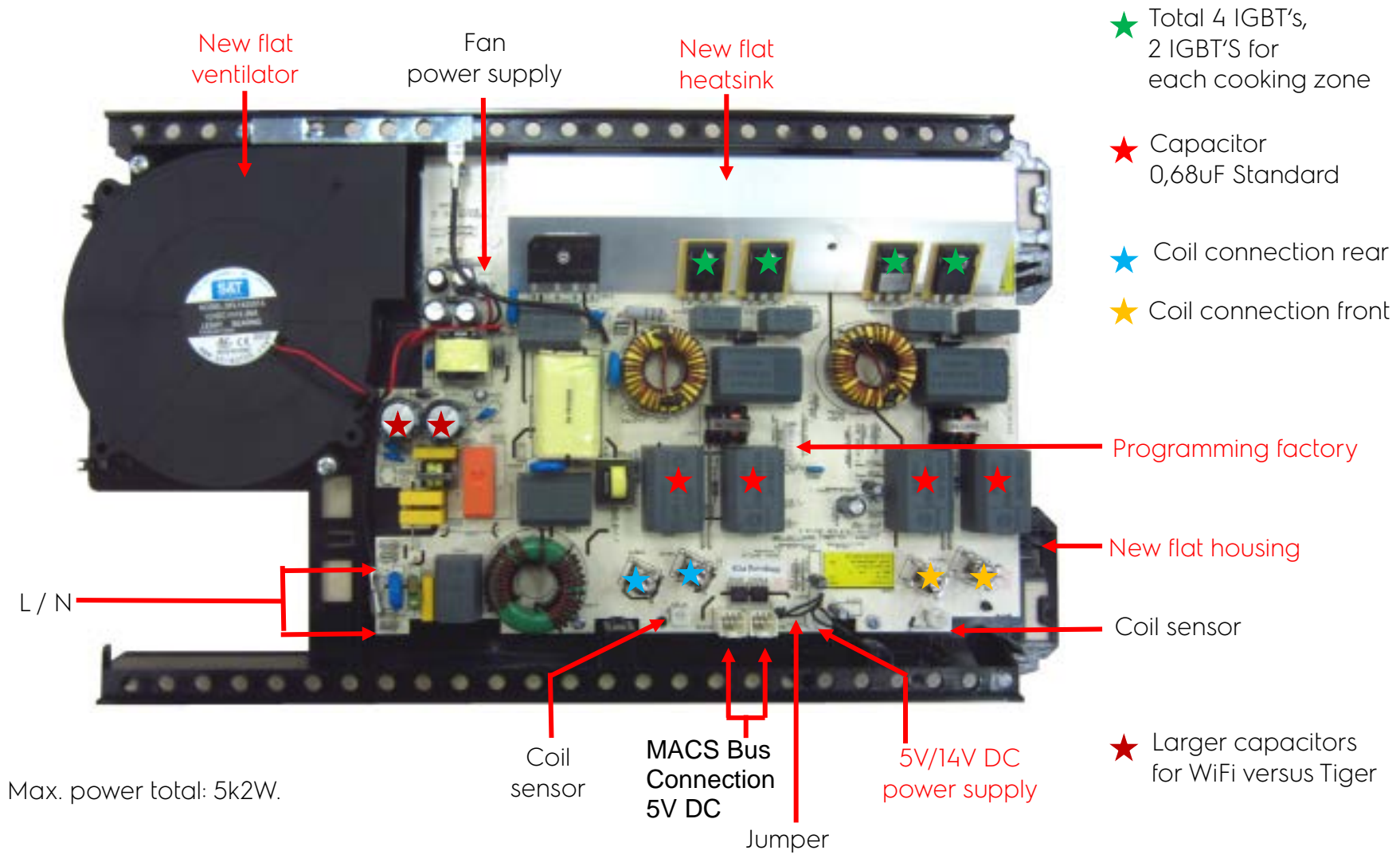


#### 4.2.5 KING TIGER 2017

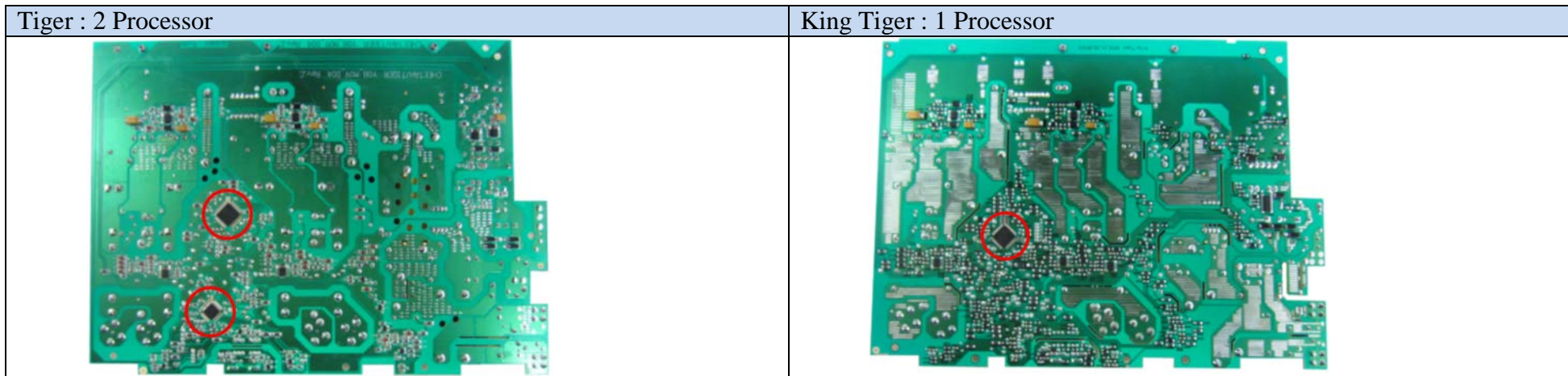
- Power board has two generators (two cooking zones).
- Single-phase: 230VAC +10 -15% / 50/60 Hz, max 5k2W, 23A total current limit (per POB) time limited, 200VAC 50/60 Hz max 3200W.
- 400V detection.
- Electronic operating temperature  $\rightarrow$  85°C
- Fan operating temperature  $\rightarrow$  80°C :  
A large fan is implemented with lower rpm, the fan can be repaired from top.
- Stand-by power consumption  $\rightarrow$  < 0,5W
- Boost power function on each generator:  
max. power reached by a single zone is 3600W at 230W (time limited).
- Click noise reduction in pulse mode.
- Power supply for NIUX connectivity.
- New housing for 25mm worktop.
- This board can be programmed by sidekick.ils about the Tiger/Kingtiger Powerboard



## 5 DETAILS ABOUT THE KINGTIGER POWERBOARD







## 5.1 OPERATING VOLTAGE & INSTALLATION

The induction board is specified 200V /240V but it is working until ~ 180V.

For the 200V Japan: a special Software is loaded on the Power board or on the user interface. For evaluation you can run the hob on 230V but you will get higher power.

Hint:

The net situation can have impact on the performance. Zones with **High Boost** power can have a significant power reduction (see table).

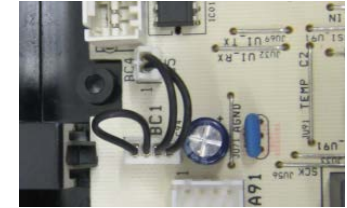
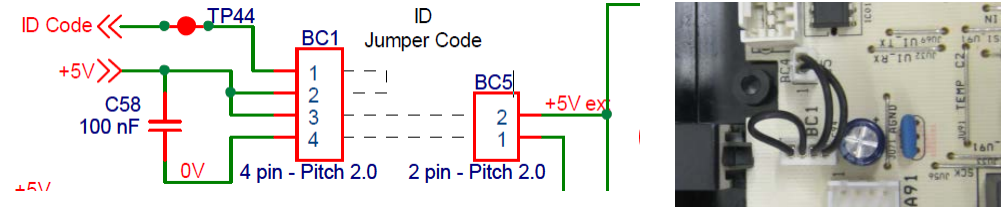
| Zone         | Pot                    | Power @230V | Power in W @210V |      | Power in W @240V |    |
|--------------|------------------------|-------------|------------------|------|------------------|----|
|              |                        |             | Power in W       | %    | Power in W       | %  |
| 210Plus, P   | 210mm, Stainless Steel | 3500        | 2850             | -19% | 3600             | 3% |
| 210Plus, P   | 210mm, Silargan        | 3300        | 2700             | -18% | 3450             | 5% |
| 210Plus, L14 | 210mm, Stainless Steel | 2300        | 2200             | -4%  | 2300             | 0% |
| 210Plus, L15 | 210mm, Silargan        | 2300        | 2200             | -4%  | 2300             | 0% |
| 180          | 180mm, Stainless Steel | 2800        | 2450             | -13% | 2850             | 2% |
| 140          | 145mm, Stainless Steel | 2400        | 2300             | -4%  | 2450             | 2% |

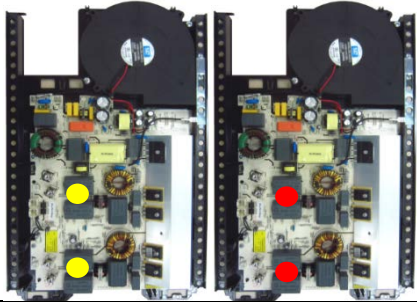
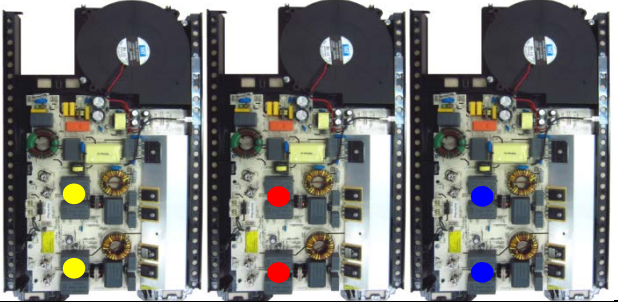
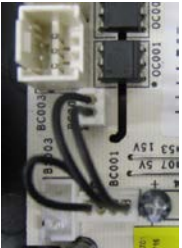




## 5.2 MASTER - SLAVE WITH JUMPER, VALID IN TIGER AND KING TIGER

The jumper can have several functions:

- The Macs-Bus communication requires a clear identification of all components (Board ID1, Board ID2...; User interface). The bridge PIN1-PIN2 tells the board = ID1
- The 5V power supply for the UI is not isolated. Only one board is allowed to generate the supply voltage for the interface. The bridge PIN 3+4 == PIN1+2 is supplying the 5V to the bus.

The Jumper is supplying the 5V to the bus and is creating the ID1 (see diagram).



| Tiger and King Tiger                                                                                                                                                    | King Tiger                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Combination with two power boards                                                                                                                                       | Combination with three power boards                                                                                                                                                                                                                               |
|                                                                                       |                                                                                                                                                                               |
| <span style="color: yellow;">●</span> ID1 = Rear , Front <span style="color: red;">●</span> ID2 = Rear , Front                                                          | <span style="color: yellow;">●</span> ID1 = Rear , Front <span style="color: red;">●</span> ID2 = Rear , Front <span style="color: blue;">●</span> ID3 = Rear , Front                                                                                             |
|   |    |
| With Jumper      Without Jumper                                                                                                                                         | With Jumper      Without Jumper      With Special Jumper                                                                                                                                                                                                          |

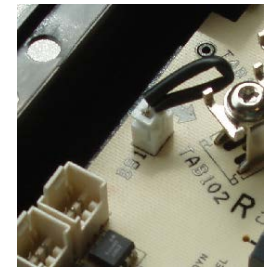
Hints:

- **jumpers on both power boards:** all boards and the user interface **will be destroyed** immediately after plug-in
- **no jumper:** no power on the user interface (**UI is dark**)
- the jumper is on the left side: if you move the jumper on the right side > the zone settings will be swapped (this is maybe helpful for repair: but use only one jumper in the hob)

### 5.3 DUMMY NTC (387540300); VALID IN TIGER AND KING TIGER

Due to the safety requirements all sensor ports on the POB must have a dedicated value. Unplugged sensor ports are not allowed.

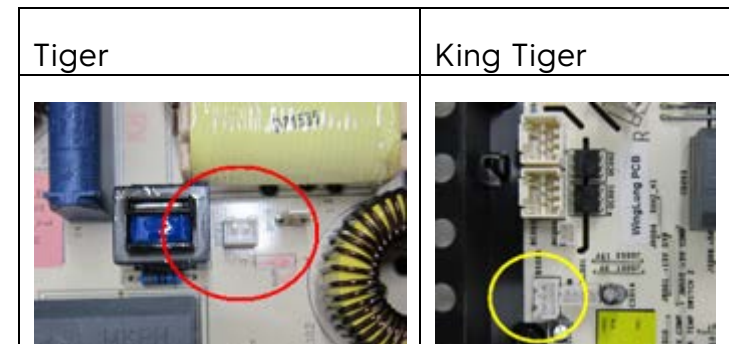
- In all 3zone versions:  
The not used connector has to be plugged with a dummy NTC.  
Inside of the tube is a 100kOhm Resistor.
- If the Dummy NTC is not plugged or damaged you will get **E4**



### 5.4 ADDITIONAL POWER SUPPLY 14V FOR THE USER INTERFACE

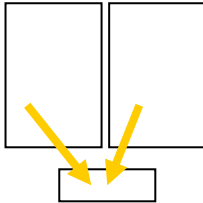
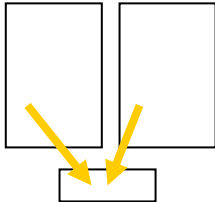
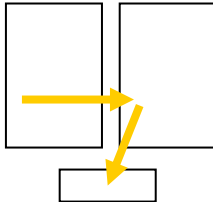
For user interfaces and optional boards with high power consumption the 5V on the standard MACS connector provides not enough power.

- \* **Tiger:** the internal 14V are available at the 2 pol connector (GND-14V)
- \*
- \* **King tiger** a 3 pol connector is introduced with integrated 5V/14V/GND.



## 5.5 MACS WIRING

There is an evolution how the hobs are internally wired. Do not mix the cables.

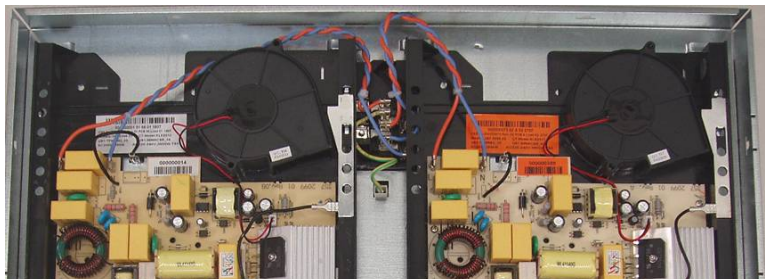
| 2007                                                                              | 2008                                                                                             | Since 2009                                                                          |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Yellow cables from left/right board to the UI<br>In Mini                          | cables form both boards to the UI or from the left to the right and from right to UI<br>In Tiger | from POB - POB ;<br>from the power board to UI<br><b>in Tiger and King tiger</b>    |
|  |                |  |

## 5.6 WIRING TO THE MAINS TERMINAL

The wires are twisted for EMC reason. If the wiring has to be replaced -> twist the wiring manually as possible.

The L/N connection on the board is different; follow the printing on the board

- \* **Tiger:** L/N
- \* **King tiger:** N/L



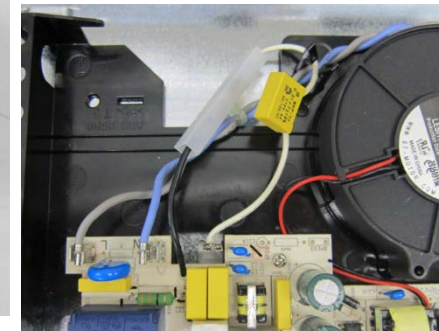
## 5.7 LEAKAGE CURRENT (KIT405 517 586/5)

A leakage current to earth of 1mA is normal and is similar to other appliances. A consumption current of 0.6 +- 0.1 Amp is normal in stand by. This is due to filter with capacitors. This is a reactive current and could not be measured with the electricity meter.

### Service Kit only for Tiger

It could happen that in one phase installation the leakage current is more than 30mA. In this case RCD can act.

- With this service kit you will get two additional capacitors and connection material for one hob.
  - This Service Kit will reduce the leakage current to a comfortable level.
  - This Kit can be used only in Tiger appliances.
  - Please add this capacitor on both Tiger modules.
- \* Service Kit in **King tiger** is not needed, the capacitors are "on board"



## 5.8 FAN & COOLING

The temperature of the heatsink is measured permanently from the power board controller. If the temperature is exceeding internal limits the power on the IGBT is reduced automatically to protect the electronic. Usually the booster power is reduced.

After switching on the hob the fan starts for a short time for a self-check.

During operation the fan speed is controlled by an algorithm taking in account the heatsink temperature and the power request:

- FAN off: cold heatsink & power request < 700W
- Fan on at lowest speed: cold heatsink & power request >700W
- Fan medium speed: due to heatsink and power request
- Fan on at highest speed: heatsink > 63°



Hint: The fan is controlled with PWM method but can be tested with DC supply (~6V ...12V).

- \* **Tiger:** max. rpm : 3000; 450 mA; 6...12V
- \* **King tiger:** max. rpm: 1800; 260mA; 6...12V

How to verify a bad fan:

- You should feel the 4 position of the magnetic bearing during rotation.
- Moving the impeller downwards - the impeller should jump back.
- The gap to the bottom - housing should be at least 1 mm; If there is a doubt compare left-right or with a new fan



Electrical connection

Thickness of the housing: The size of the ventilator is thinner than in the Induction modules of Tiger.



## 6 ERRORS: INDUCTION POWER BOARDS

The King xx boards will come with extended error codes. The timer display will flash between the two pairs. Here some examples. For detail see Troubleshooting.

- \* **Tiger:** E + Component code
- \* **King tiger:** E+ Component code : Failure detail + Position (1 = left; 2 = right)



| Trouble Shooting                     | Tiger | King xx |
|--------------------------------------|-------|---------|
| 400V                                 | E3    | E3 11   |
| Front left NTC not connected         | E4    | E4 11   |
| Rear right NTC shortcut              | E4    | E4 02   |
| Connection problem on the right side | E8    | E8 22   |

### 6.1 HOB IS DARK - CANNOT START

**The UI is dark: missing 5V for the Userinterface**

**please check all wires from the net to the powerboard with the jumper and to the UI**

- L and N available?
- Macs connected and wire not squeezed?
- Check PIN 1&3 of the Macs (PIN 1 = GND and Pin 3 = 5V)
- Defect UI?
- Defect POB where the ID Jumper is connected

## 6.2 WRONG CONNECTION -400V PROTECTION - BEEP

- In case of 400V connection (wrong connected Neutral) the interface will send a permanent beep
- press on/off key
- \* Tiger 400V: beep + E3
- \* King tiger 400V: beep + E311
- \* Tiger < 180V; E3
- \* King Tiger < 180V; E321

Remove immediately the hob from the net and change the connection

Hint: missing N cannot be detected, the User interface starts to flash and undefined relay's noise will appear



## 6.3 E4 - NTC NOT PLUGGED OR DAMAGED

E4 can appear when the customer is overheating the cookware. After cooling down the hob the E4 disappears.

- \* **Tiger:** E4
- \* **King tiger:** not plugged NTC E41x  
damaged NTC E40x

|     |           |
|-----|-----------|
| 18° | ~140 kOhm |
| 25° | ~100 kOhm |
| 30° | ~80 kOhm  |

The correct resistor value of the sensor can be measured. (see the table)

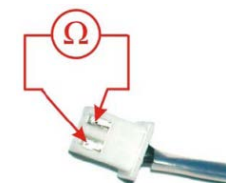
Hint:

The hob needs time to detect Errors: ~ 35 sec

After a repair on the coils please wait and let the hob run to be sure that everything is fine.

Hint:

Spare part is only the sensor, not the coil.





### 6.4.1 HARDWARE ERROR ON THE INDUCTION POWER BOARD

Internal failures of the power board are shown with the Code E6. Boards with E6 cannot be repaired in the field and must be exchanged.

The detailed code is stored in the internal memory and be read out from quality organisation.

The power board detects with E6

- Broken IGBT or blown fuses
- Problems on the internal bus between the both micro;
- If the main relays is glued
- Some problems on the 14V; which supports UI and Fan

The power board cannot detect:

- Damage on the power supply; if 5V is not available, the microprocessor cannot start the self-check. The UI cannot show the error
- Damage on the pot detection; the hardware cannot detect the difference if the pot is missing or a broken component in the circuit

### 6.4.2 REASONS FOR BROKEN POWER BOARDS

Copper fuse blown (picture left):

In some conditions the software and the circuits on the board cannot limit the IGBT current fast enough. If this happens the fuses of the board are burned and the IGBT is destroyed. Exchange the damaged board.

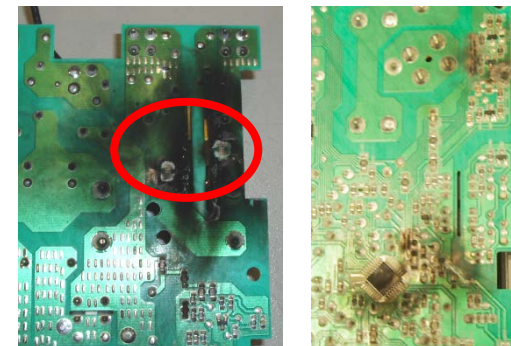
5V area lines blown (picture right)

The internal 5V bus (Macs-Bus) is not isolated to ground.

If the Bus-cables have contact to ground its like a shortcut; (damaged isolation, sharp edges) all 5V connections can be destroyed.

There is a high possibility that **both** power boards **and** the user interface are destroyed.

→ Exchange electronic and the bus-cables.



## IGBT Destroyed

The IGBT is protected by software and hardware circuit to avoid too high current and too high temperature.

High current can be created with strange pot materials (too less effective current in the coil).

Too high temperature is possible if the cooling is not sufficient enough (fresh air...).

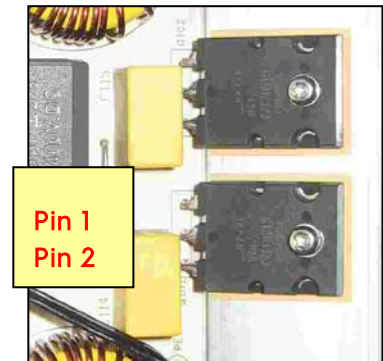
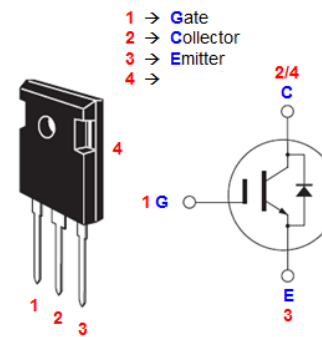
IGBT cannot be repaired; If you like you can verify the resistance of the IGBT's between:

how check IGBT:

measure between Pin1-Pin2 **or** Pin2-Pin3:

High impedance (kOhm...MOhm) → Okay

Low impedance (<50 Ohm) → defect



## 6.5 E7- DEFECT FAN

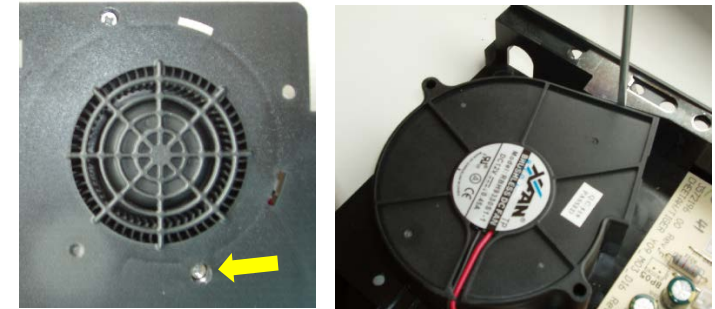
The software is detecting the start of the cooling fan. The Error E7 indicates two main reasons:

- the fan cannot start - needs more power to start than expected;  
dusty environment and loss of oil out of the sintered bearing can be the reason  
Sometimes the fan grid can be damaged during installation/transport and the grid is in contact with the fan wheel - to guarantee full life time the fan should be changed  
the fan rotor can be bended and is touching the housing
  - Not connected fan  
or other mechanical problems inside of the fan
- \* Tiger: E4
- \* King tiger: not plugged Fan E71x  
blocked Fan E70x

## 6.5.1 EXCHANGE THE TIGER FAN:

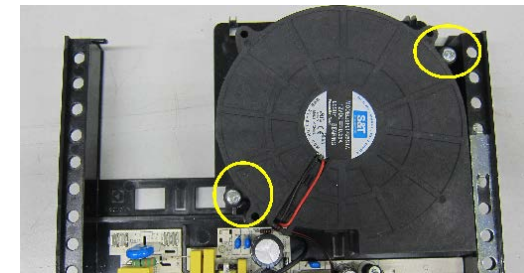
The Cheetah fan (Kit: 405506404) can be used as a spare part in Tiger:

- remove the screw from the rear (2x) and open the fan housing with a screwdriver; starting on the right side (see picture)
- Snap in all three hooks.  
Double-check the gap between upper and lower case  
If one of the hooks is broken remove the plastic parts carefully - don't worry the screws are good enough;
- screw both screws
- after repair: don't forget to plug the connector



## 6.5.2 EXCHANGE THE KING TIGER FAN:

- Open the hob as usual; lift the rear coils
- the fan can be disassembled from the top
- after repair: run a corresponding zone on Level P ~ 5min to be sure that the fan is working



## 6.6 E8- COMMUNICATION ERROR BETWEEN UI AND POB

The UI cannot speak with the other User interfaces or with other powerboards

- All POB are connected to the net in the right way
- MACs correct plugged?
- Check PIN2 of the Macs (serial data), maybe damaged
- Swap the jumper to see if right POB can start the UI
- Correct software loaded
- >> E8 is mainly an error on the right side



- \* Tiger: E8 and EE on corresponding zones
- \* King tiger: E82x and other E8xx, see sample

|                                |      |                                                                                                                      |
|--------------------------------|------|----------------------------------------------------------------------------------------------------------------------|
| Right side not connected to L2 | E822 | E on all right Zones                                                                                                 |
| Macs bus cable ; Wire 2 Cutted | E821 | Voltage available, UI can Start;<br>But Missing Status ;<br><br>Operating on the right side for a second is possible |