

# HIGH-END MONO MOSFET POWER AMPLIFIER

Total solder points: 299

Difficulty level: *beginner* 1  2  3  4  5  *advanced*



# K8040



**Features :**

- no compromise high-end design
- ideal to place next to the speaker (short wires to the speaker)
- auto-power on possibility when input signal is sensed
- auto-standby function when no input signal is sensed
- exclusive, high finish, solid aluminium enclosure
- high quality D-MOS IC output stage
- total of 40.000µF power supply capacitors
- relay-less speaker DC protection
- Real Clipping distortion indication
- power output level indication with backlight
- bypass output to drive bi-wired speakers using separate amplifiers
- double overheating protection with LED indication
- high grade speaker and input connections
- overload protection

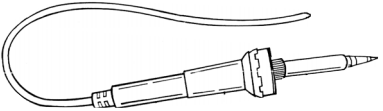
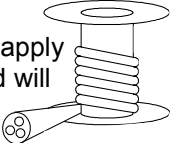
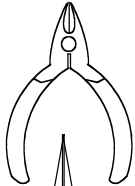
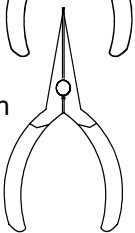
**Specifications**


- input:
  - input sensitivity for maximum output:..... 0dBm (= 0.775Vrms)
  - input impedance:..... 15Kohm
  - minimum auto switch on voltage:..... 5mVrms
- output:
  - maximum RMS output power 4ohm:..... 90W
  - maximum RMS output power 8ohm:..... 70W
  - dynamic RMS output power in 4ohm:..... 125W
  - minimum load impedance: ..... 4 ohm
  - damping factor (ref. 8ohm 100Hz): ..... > 1000
- audio:
  - signal-to-noise ratio (A-weighted ref. max. out): ..... >105dB
  - total harmonic distortion: ..... 0.003% @ 1kHz ref 1W
  - frequency response:..... 9Hz to 120kHz (-3dB) in 50W
- power requirements:
  - AC power: ..... 115Vac (110V to 120V) or 230Vac (220V to 240V)
  - consumption:..... 100W max.
- dimensions: .....290 x 165 x 68mm (11.4" x 6.5" x 2.7")
- weight (net):..... 3.4kg (7.5Lbs)

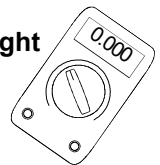
## 1. Assembly (Skipping this can lead to troubles !)

Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

### 1.1 Make sure you have the right tools:

- A good quality soldering iron (25-40W) with a small tip. 
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning. 
- Thin raisin-core solder. Do not use any flux or grease.
- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes. 
- Needle nose pliers, for bending leads, or to hold components in place. 
- Small blade and Phillips screwdrivers. A basic range is fine.

 For some projects, a basic multi-meter is required, or might be handy



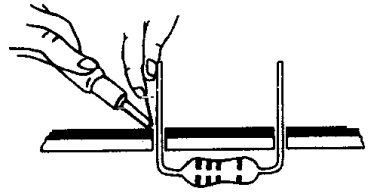
### 1.2 Assembly Hints :

- ⇒ Make sure the skill level matches your experience, to avoid disappointments.
- ⇒ Follow the instructions carefully. Read and understand the entire step before you perform each operation.
- ⇒ Perform the assembly in the correct order as stated in this manual
- ⇒ Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
- ⇒ Values on the circuit diagram are subject to changes.
- ⇒ Values in this assembly guide are correct\*
- ⇒ Use the check-boxes to mark your progress.
- ⇒ Please read the included information on safety and customer service

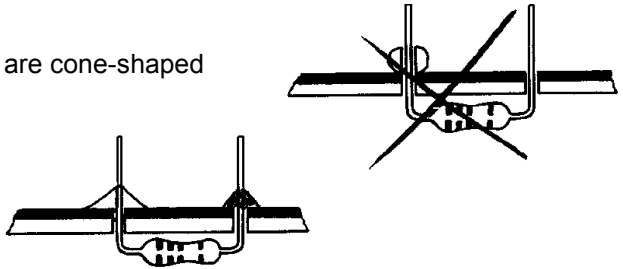
\* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

**1.3 Soldering Hints :**

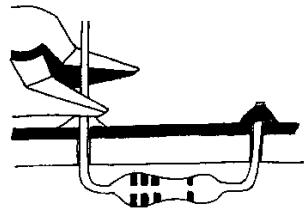
**1-** Mount the component against the PCB surface and carefully solder the leads



**2-** Make sure the solder joints are cone-shaped and shiny

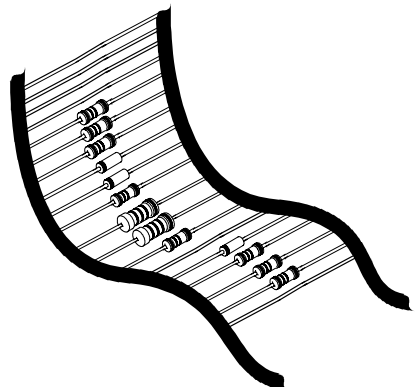


**3-** Trim excess leads as close as possible to the solder joint




**AXIAL COMPONENTS ARE TAPED IN THE CORRECT MOUNTING SEQUENCE !**

REMOVE THEM FROM THE TAPE ONE AT A TIME !



**CONSTRUCTION**

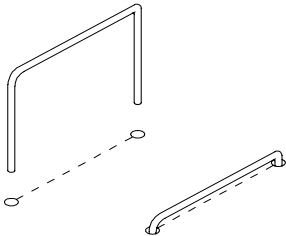
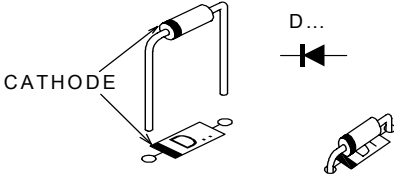
The unit consists of one main PCB with all the components including transformer and power supply.

 **Tip:** The pictures on the packaging can be used as a guideline.  
However, due to possible modifications they are not 100% reliable.

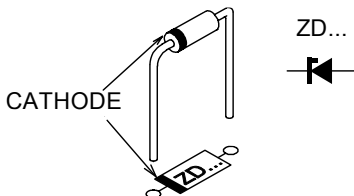
Mount the components in the order described:

**1. Jump wire**

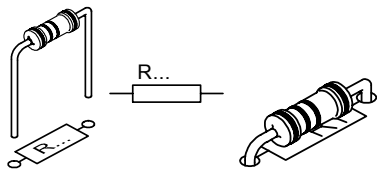
- J1
- J2
- J3
- J4
- J5
- J6
- J7
- J8

**2. Diodes (check the polarity)**

- D1: 1N4148
- D2: 1N4148
- D3: 1N4148
- D4: 1N4148
- D5: 1N4148
- D6: 1N4148
- D7: 1N4148
- D8: 1N4148

**3. Zener diode (check the polarity)**

- ZD1: 20V / 1.3W  
(Mount 5mm above the PCB)

**4. Resistors (check the color code)**

- R1 : 1K (1 - 0 - 2)
- R2 : 1K (1 - 0 - 2)
- R3 : 15K (1 - 5 - 3)
- R4 : 1K (1 - 0 - 2)
- R5 : 470R (4 - 7 - 1)
- R6 : 100R (1 - 0 - 1)
- R7 : 15K (1 - 5 - 3)
- R8 : 15K (1 - 5 - 3)
- R9 : 15K (1 - 5 - 3)
- R10 : 15K (1 - 5 - 3)
- R11 : 470R (4 - 7 - 1)
- R12 : 15K (1 - 5 - 3)
- R13 : 15K (1 - 5 - 3)
- R14 : 100R (1 - 0 - 1)
- R15 : 15K (1 - 5 - 3)
- R16 : 2K2 0.6W (2 - 2 - 2 - 9)
- R17 : 100R (1 - 0 - 1)
- R18 : 1K (1 - 0 - 2)
- R19 : 470R (4 - 7 - 1)
- R20 : 2K2 0.6W (2 - 2 - 2 - 9)
- R21 : 1M (1 - 0 - 5)
- R22 : 470R (4 - 7 - 1)
- R23 : 1K (1 - 0 - 2)
- R24 : 470K (4 - 7 - 4)
- R25 : 470K (4 - 7 - 4)
- R26 : 470K (4 - 7 - 4)
- R27 : 100K (1 - 0 - 4)

- R28 : 2K2 0.6W (2 - 2 - 2 - 9)
- R29 : 2K2 0.6W (2 - 2 - 2 - 9)
- R30 : 0R
- R31 : 15K (1 - 5 - 3)
- R32 : 100K (1 - 0 - 4)
- R33 : 100R (1 - 0 - 1)
- R34 : 0R
- R35 : 680R (6 - 8 - 1)
- R36 : 15K (1 - 5 - 3)
- R37 : 100K (1 - 0 - 4)
- R38 : 470R (4 - 7 - 1)
- R39 : 10R / 1W (1 - 0 - 0)
- JGND: 0R

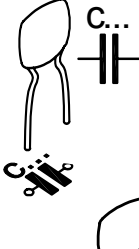
If long input signal wires are used a low input impedance can be useful.  
In this case mount for RX a 680R (6-8-1) resistor.

Check if your pre-amplifier can drive low impedance!

- ☞ Our K8021 is OK for low impedance.
- ☞ Our K8020 is not suited for low impedance driving.

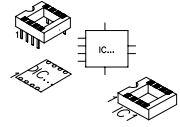
Rx is normally left open.

### 5. Capacitors

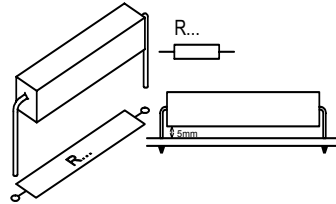
- C1 : 100nF (104)
  - C2 : 100nF (104)
  - C3 : 100nF (104)
  - C4 : 100nF (104)
  - C5 : 100nF (104)
  - C6 : 100nF (104)
  - C7 : 100nF (104)
  - C8 : 100nF (104)
- 

### 6. IC sockets. Watch the position of the notch!

- IC1 : 8p
- IC2 : 8p
- IC3 : 6p



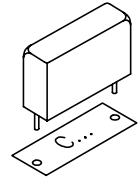
### 7. 10W resistor



- R40 : 4R7 (4.7, 4R7)

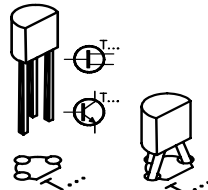
### 8. Capacitors

- C9 : 2n2 (222)
- C10 : 220n (224)
- C11 : 1uF
- C12 : 1uF
- C13 : 2.2uF
- C14 : 2.2uF
- C15 : 100n / 250V (104)
- C16 : 100n / 250V (104)

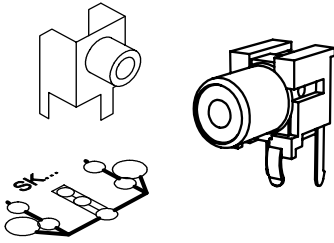


### 9. Transistors

- T1: BC547
- T2: BC547



## 10. RCA connectors. Mount them straight and against the PCB

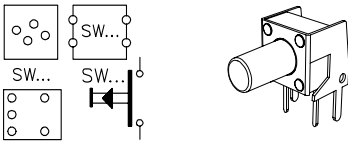


- SK1: MJ-523AG/R
- SK2: MJ-523AG/B

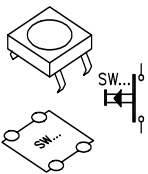
### Tip:

A red and a black type are delivered with the kit, if you bought 2 amplifiers for stereo then one amplifier can be built with red connectors (right amp.) and one with the black connectors.

## 11. Push button. Mount them straight against the PCB surface !

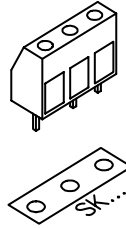


- SW1: TS-04PV

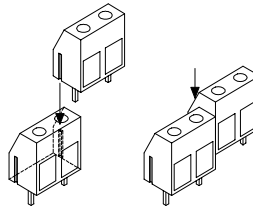


- SW2: KRS1243

## 12. Terminal blocks



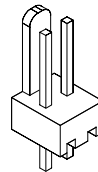
- SK3: 3p "Mains in"
- SK4: 3p "Mains transformer"



- SK5+SK6: 2x 2 pole Transformer output

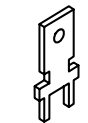
☞ **First slide these two connectors in each other.**

## 13. Terminal connectors



Check that the position corresponds with the PCB silk printing.

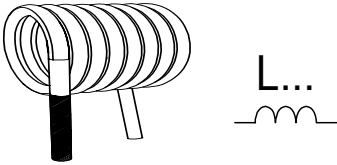
- SK7: 2 pole Temp sensor
- SK8: 2 pole Power meter



- SK9: LS+
- SK10: LS-



**14. Coil**



This coil will have to be made by yourself. Use the supplied copper wire (1.5mm) with the kit.

Wind this wire round a 8mm drill or other round object and make 8 turns.

You can snip off the remaining copper

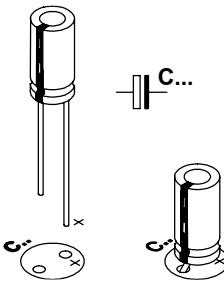
Then remove (scratch) the isolation from the connections using a knife.

Mount the coil and make sure to have a perfect soldering.

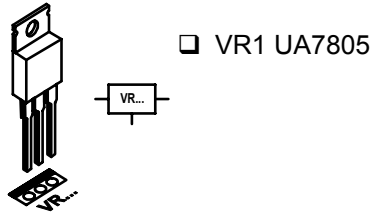
- L1: 8 Turns dia 8mm

**15. Electrolytic capacitors.  
Check the polarity !**

- C17: 10µF
- C18: 10µF
- C19: 10µF
- C20: 10µF
- C21: 10µF
- C23: 1µF
- C24: 10µF
- C25: 47µF/63V
- C26: 47µF/63V
- C27: 47µF/63V
- C28: 47µF/63V
- C29: 220µF/63V
- C30: 220µF/63V

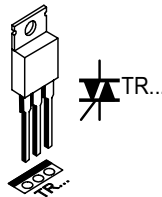


**16. Voltage regulator. The back side corresponds to the thick line.**



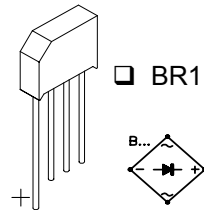
- VR1 UA7805

**17. Triac. The back side corresponds to the thick line.**



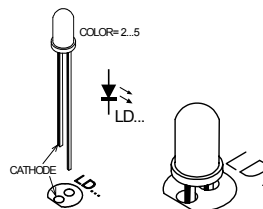
- TR1: TIC246 or eq.

**18. Bridge rectifier.  
Check the polarity !!**



- BR1: RS603

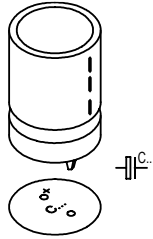
**19. LEDs**



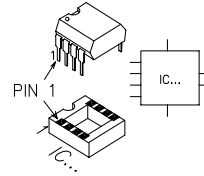
- LD1: LED3RL (3mm LED)
- LD2: LED3RL (3mm LED)
- LD3: LED3RL (3mm LED)

**20. Power electrolytic capacitors. Check the polarity !**

- C31: 10.000µF
- C32: 10.000µF
- C33: 10.000µF
- C34: 10.000µF

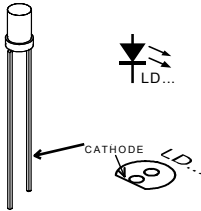


**21. IC's. Watch the position of the notch !**

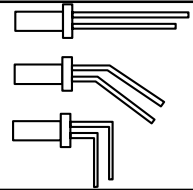


- IC1: VK8040 (PIC12C508)
- IC2: CA258 or eq.
- IC3: MOC3041 / KP3020

**22. Mounting front LED's. Check the polarity ! Short lead = Cathode or - !**



**CAUTION:**  
After bending the leads the long appearing lead will be the cathode!

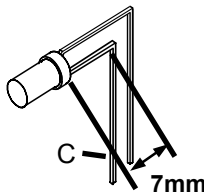


**First:** Bend the leads exactly like the drawing.

**Next:** Solder **one** lead, and check the position, if necessary correct by heating the soldering.

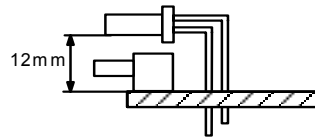
**Last:** Solder the second connection.

- LD4: L-424YDT
- LD5: L-424YDT
- LD6: L-424YDT
- LD7: L-424YDT



**IMPORTANT**

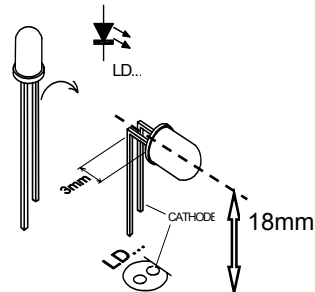
Mount these LED's exactly like in the drawing, otherwise some LED's will not fit correctly in the front panel. Please also use the front panel as a positioning reference.



**Meter backlight:**

LD8 is a white LED serving as backlight for the power meter.

- LD8: L5WD (5mm white)

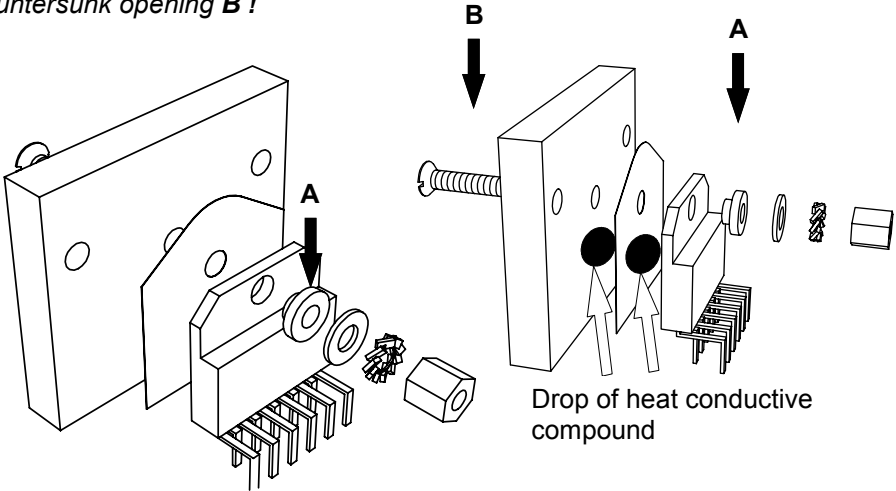


**23. Mounting the Power IC**

□ IC4: TDA7293

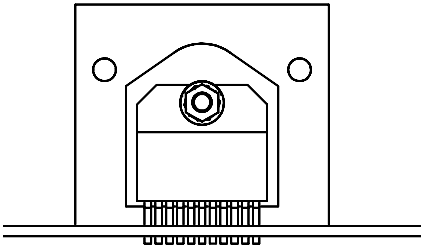
Mount the support plate onto the IC as shown in the drawing.  
 Put a drop of silicone compound on both sides of the mica isolator.  
 Also check the position of the plastic isolator **A**.

**ATTENTION :** *The bolt should be inserted on the side of the IC holder with the countersunk opening **B** !*



**DO NOT TIGHTEN THE NUT YET**

1. Position the IC onto the PCB.
2. Make sure that the support plate is touching the PCB surface.
3. Tighten the support nut.
4. Check again that the plate is touching the PCB surface.
5. Solder the IC connections.



## 24. Mounting the power transformer and mains voltage selection

Mount the transformer as in the drawing (see also the picture on the packaging)  
Use the supplied straps (4 pcs) to fix the transformer.

### Primary windings (MAINS) connection:

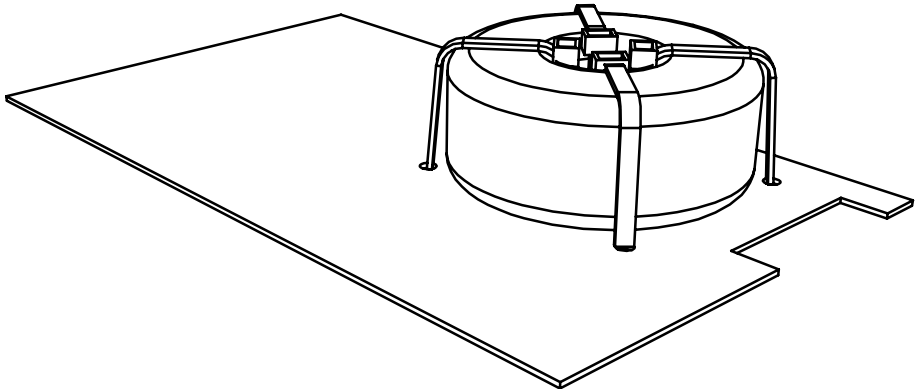
**Check the table on the PCB for the correct voltage selection and connect the wires :**

For 230V (220V to 240V), edge orange, then brown and black.

For 115V (110V to 120V), edge brown, then orange and black.

**Using a black marker, erase the not used voltage on the rear panel of the unit!**

230V	120V	
ORANGE	BROWN	○
BROWN	ORANGE	○
BLACK	BLACK	○



### Secondary windings connection:

Connect the Red, Yellow, Blue and Grey wire to the SK5/SK6 connector, check the colors on the PCB.

## 25. Enclosure preparation

- ❑ Cut the thread in the holes for the enclosure feet in one of the aluminum profiles, using the supplied special M4 screw as a tap.

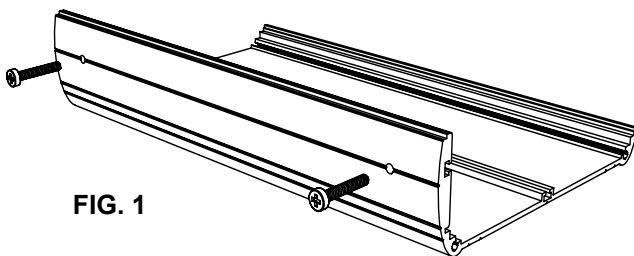


FIG. 1

- ❑ Mount the feet on the aluminum profile, using two M4 hexagonal Allen screws. Use the supplied Allen wrench. It is advisable to stick the protection adhesive onto the feet.

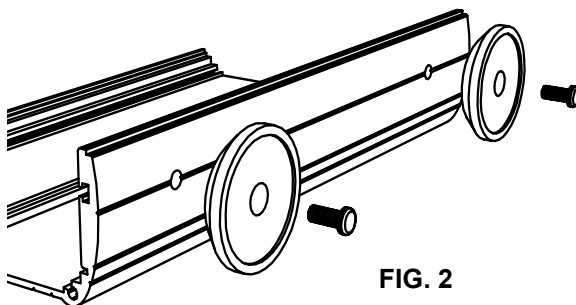


FIG. 2

- ❑ Cut the thread in the front and back of the aluminum profiles, using the supplied special M4 screw (4 holes per piece)

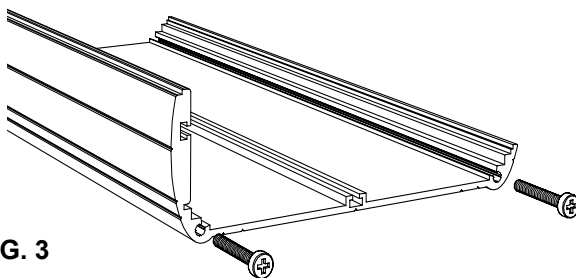


FIG. 3

- ❑ Position the main PCB in the aluminum profile that is prepared with the feet.
- ❑ Mark the center position of the three fixation holes on the aluminum. A reference indication is also on the PCB edge.

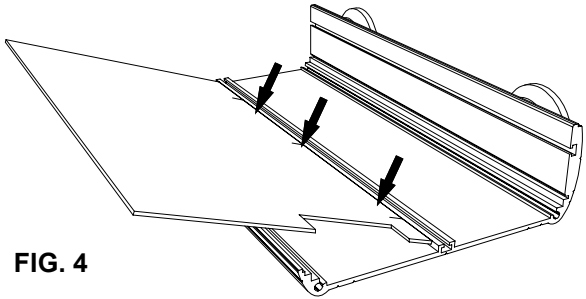


FIG. 4

- ❑ Remove the pcb and use a knife or a screwdriver to scratch the paint from the aluminum fixation, from the hole closest to the back end. This fixation will be used later to connect the ground and earth.

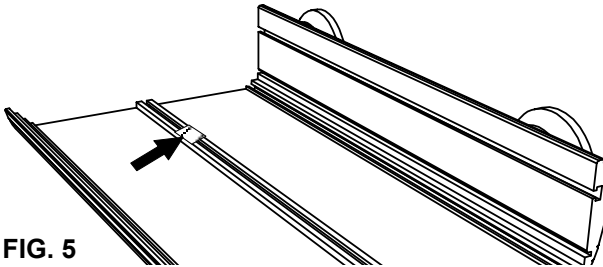


FIG. 5

- ❑ Mount the three 5mm (0.14") spacers as shown in the drawing. Use three hexagonal screws and 3 washer. **Do not tighten the spacers yet.**

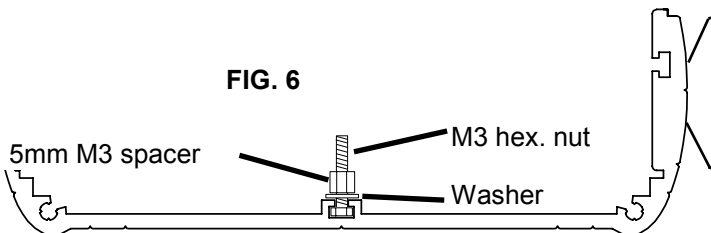
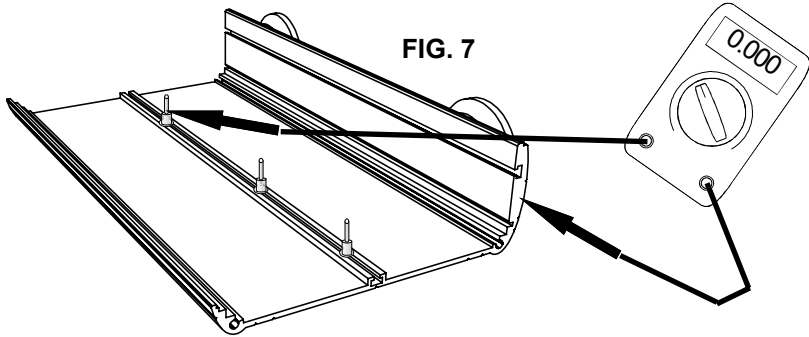


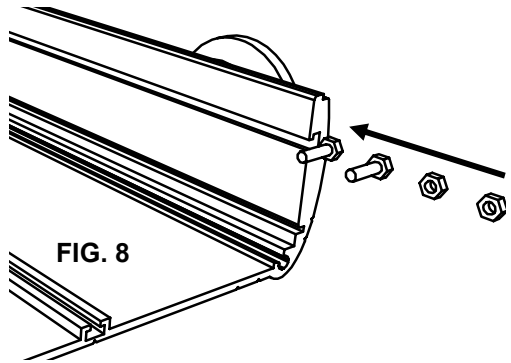
FIG. 6

- ❑ Position the PCB in the enclosure and check if the position of the spacers is correct, if so, remove the PCB and tighten the spacers.

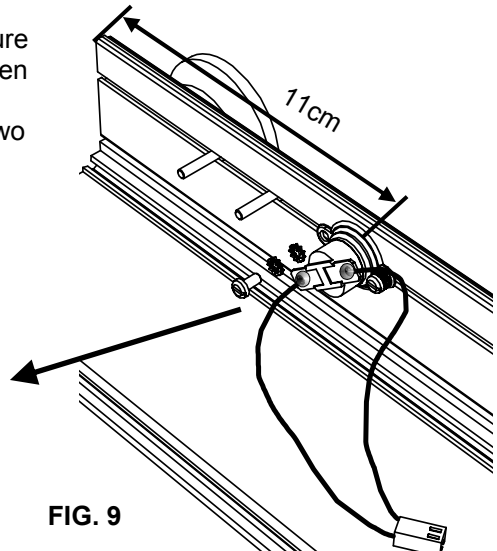
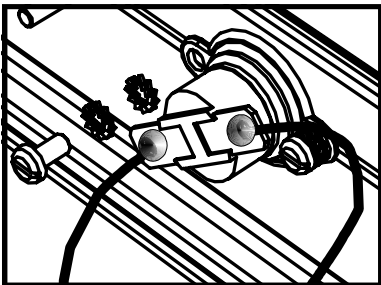
- ❑ Using an ohmmeter, measure between the edge of the aluminum profile and the back spacer, if there is a good electric contact (less then 10 ohm). If not, repeat the above step to remove the paint under the spacer.



- ❑ Slide two M3 nuts and two hexagonal bolts into the profile, the nuts will be used for the temperature sensor, the bolts will be used for the IC support plate:



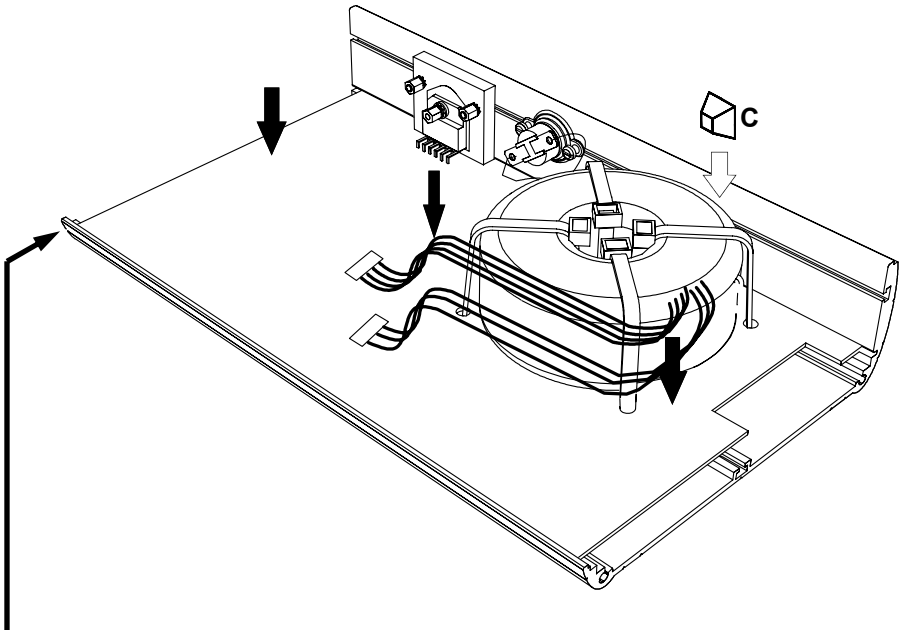
- ❑ Mount the temperature sensor, check the exact position. Make sure there is silicone compound between the sensor and the enclosure!
- ❑ Solder the wires of the supplied two pole connector onto the sensor. There is no polarity.



## 26. final PCB mount


### RE-CHECK CAREFULLY THE PCB FOR MOUNTING AND SOLDERING ERRORS!

- Mount the pcb into the enclosure, check the position of the power IC. The IC support must fit onto the previously inserted hexagonal bolts. **Make sure there is silicone compound between the IC support and the enclosure!**
- Glue the included insert **C** between the transformer and housing.



- Make sure the PCB is aligned with the back of the enclosure
- IMPORTANT: FIRST** fix the IC support
- THEN fix the pcb using three 5mm spacers + washer.

**DO NOT TIGHTEN THESE FIXATIONS YET.**

 Note: Not all components are visible on the drawing.

## 27. Speaker and mains connector assembly

Prepare the wiring of the mains connector like in the drawing.

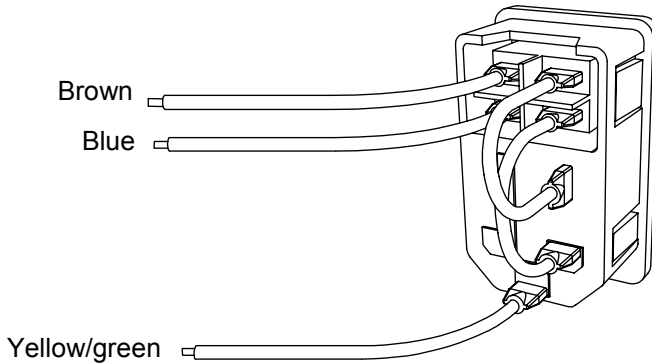
First mount the switch into the mains connector assembly.

Do not forget to isolate the soldering connections using a piece of shrink tube.

Use the supplied 0.5mm wire:

- Blue for Neutral
- Brown for Live
- Yellow/green for earth

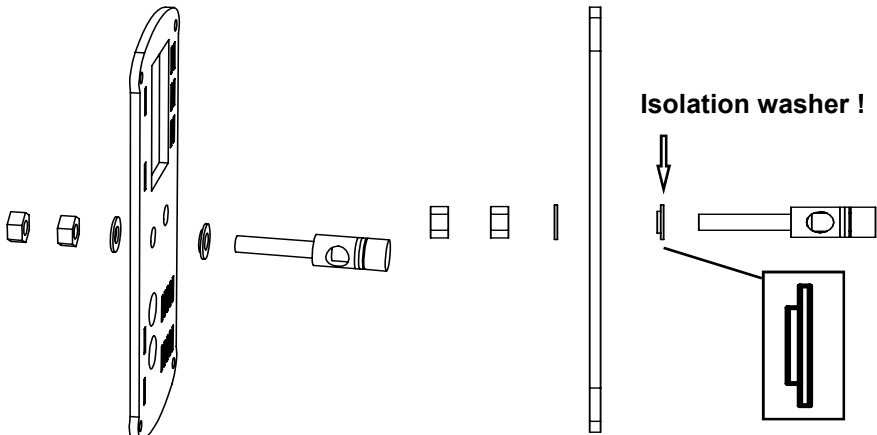
Use 3 pieces of about 10cm for later connection to the PCB mains connector.



- ❑ Mount the speaker connectors onto the rear panel. (black = negative)

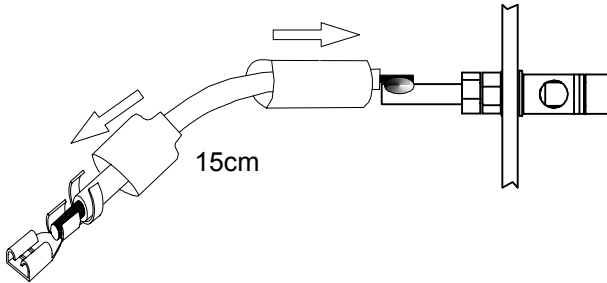
☞ Take care of the **isolation washers**, there are two different types!  
See picture.

☞ Make sure the connectors are very tight fit, and do not make electrical contact with the panel (check using ohm meter!).

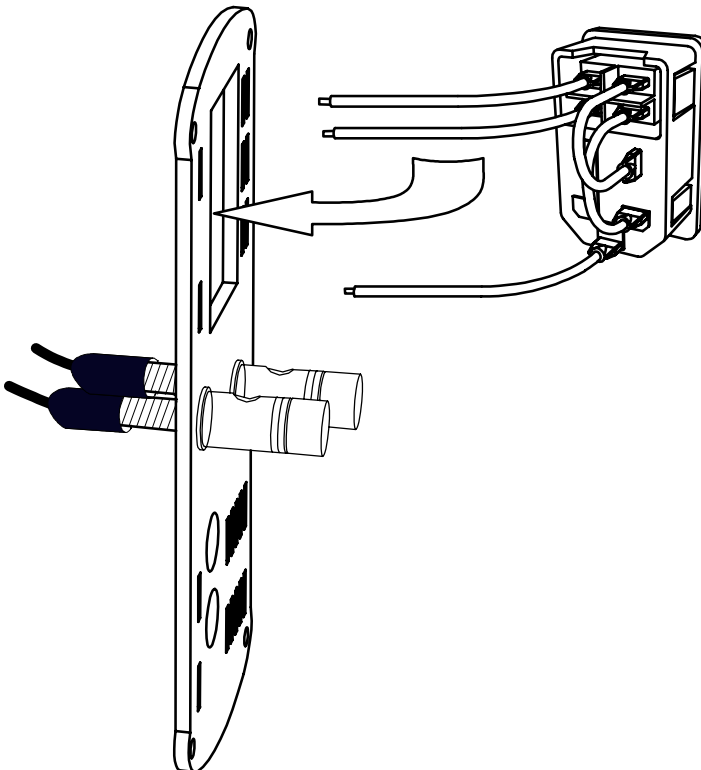


## 28. Final assembly and connection

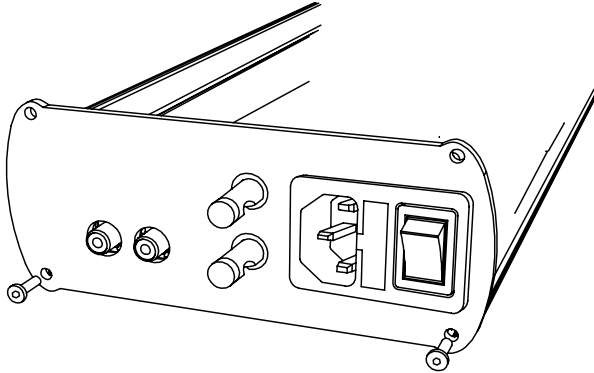
- ❑ Solder a 15cm (2.5mm) wire to the LS connectors. Black = negative, Red= positive, use a shrink tube to isolate the connection.
- ❑ Solder a spade terminal to the other end, do not forget the terminal isolation.



- ❑ Mount (insert) the mains connector onto the rear panel. Insert a 2A fuse into the connector (there is also room for a spare fuse).



- Mount the rear panel onto the enclosure, using two M4 Allen screws.



- Connect the speaker wires to the speaker output tabs. Check the polarity! Black= LS-, Red= LS+.



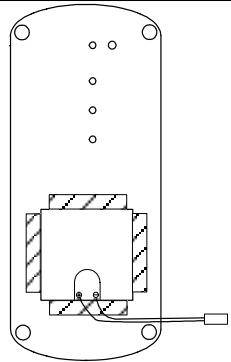
**DO NOT CONNECT THE MAINS WIRING WITH THE PCB YET!**


## 29. Preparing the front panel

- Connect the two wired connector to the meter, RED = +, BROWN = - to the meter.
- Mount the power meter onto the front panel.
- Fix the meter using a piece of transparent adhesive tape (four sides).

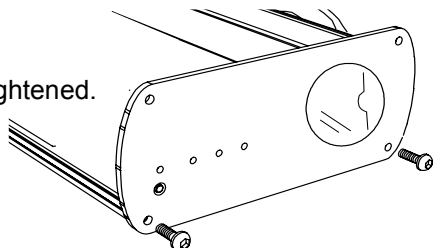
 Make sure the meter is positioned straight.

- Connect the meter to the PCB (SK8)
- Mount the front panel onto the front, using two M4 Allen screws.



 Check the position of the LED's and check if the button is working correctly. It could be that paint covering the holes, is preventing the buttons from smooth operation.

- Now the three PCB fixations can be tightened. Check the push button.

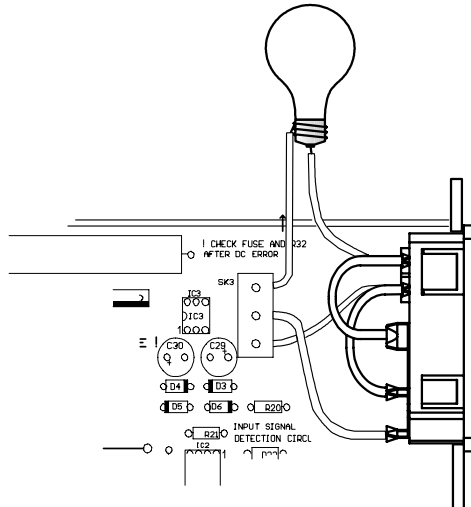


## 30. Test



## Check again all connections of transformer and mains

- ❑ Connect the mains wires to the mains connector SK3, Blue= Neutral, green/yellow= Earth.
- ❑ Connect a 60W light bulb in series with the Live (Brown wire) and the Live connection on the PCB.
- ❑ Mount both the fuse and the spare fuse in the fuse holder.



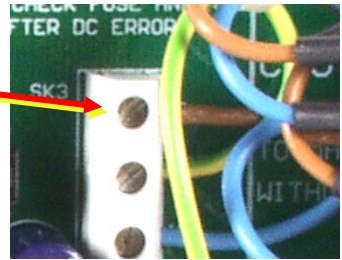
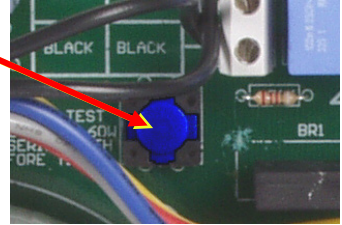
**CAUTION:** Some points on the PCB are connected to the dangerous mains voltage.

Connect the mains AC voltage to the mains. **See also the user manual about the power cord.**

- ☞ Normally after switching ON the amplifier, the light bulb should briefly light up.
- ☞ **If the bulb glows constantly, disconnect the power immediately and recheck all connections.**
- Normally the standby LED on the front panel should light as should both 35V power indication LED's LD2 and LD3.

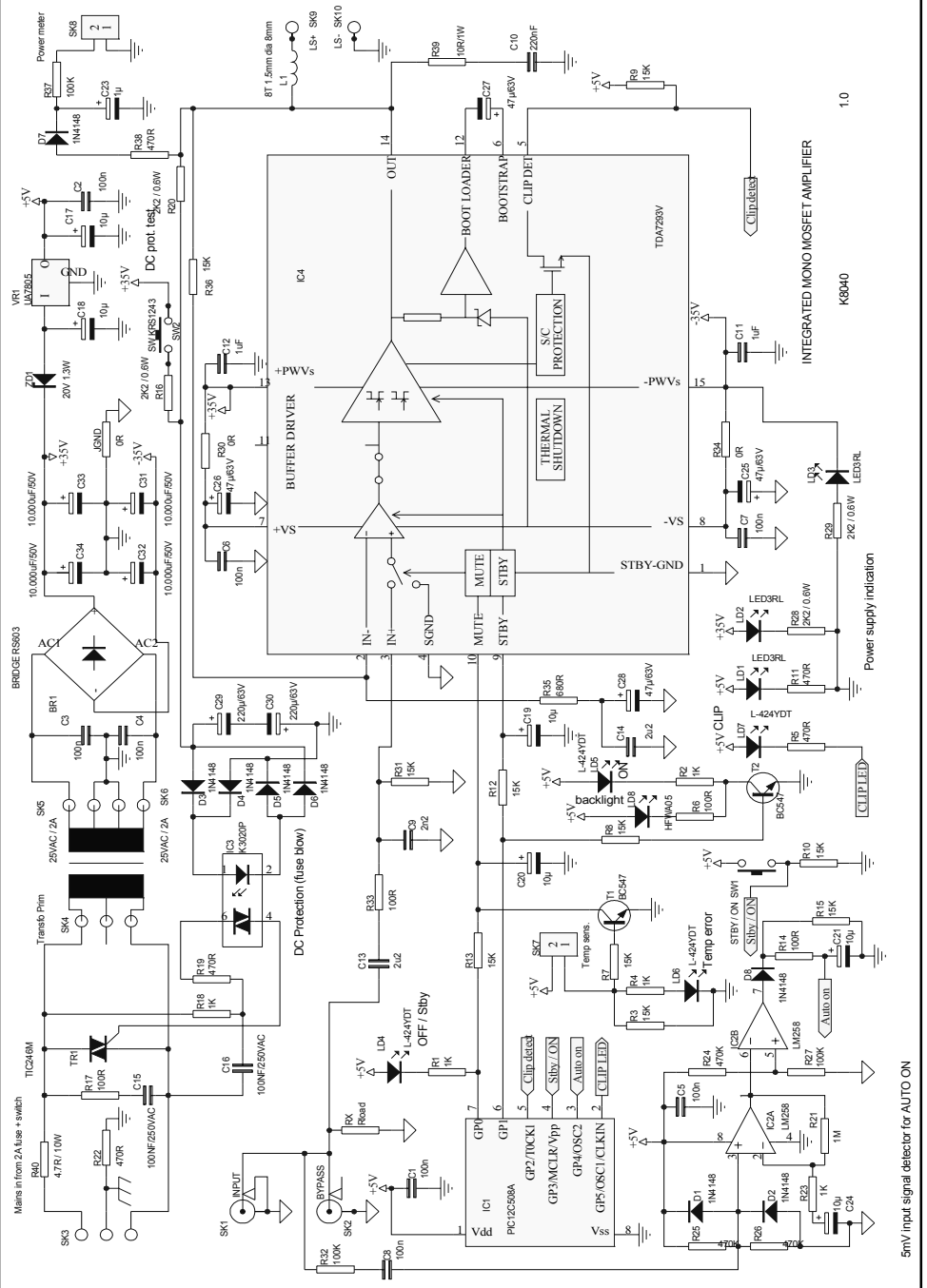
Test continued:

- Now push the DC protection test button SW2, the bulb should light if the button is pressed. Be careful not to touch any exposed live parts.
  - Disconnect the mains plug.
  - Now the brown Live wire can be connected directly to the connector SK3.
- ☞ Check the user manual to test all functions and operation of the unit. Finally the cover can be mounted.



Please note that the user manual is also used for the assembled version, some remarks may not apply to the kit version.

### 31. Schematic diagram







Velleman Home Automation System



**All appliances get intelligent, how about your home?  
see our website : [www.velbus.be](http://www.velbus.be)**

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