

# Recommendations for soldering a cable on a motor

## Introduction

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To solder a cable on a motor is not straightforward and one must pay attention to set properly the following parameters to be successful:

1. Temperature
2. Soldering time
3. Solder material

Points 1 and 2 will be discussed in section 2. Concerning the material, it is highly recommended to use an unleaded solder in accordance with the ROHS instructions (FAULHABER usually uses a lead-free wire made of Sn99Cu1 or Sn95Ag4Cu1 with a diameter between 0.5 and 0.8mm).

## Temperature and soldering time

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In the production facility, the temperature used to solder the cable on the pcb is 360°C (corresponding to the maximum temperature) because it enables a fast and easy soldering. Consequently, you must pay attention that the soldering is done in a few seconds only, meaning the time of contact between the pcb and the hot tip is typically less than 2 sec, to avoid burning the pcb and the cable protection.

If you choose to use a lower temperature of soldering, then it is more delicate to connect the cable on the pcb because the unleaded wire will need a longer time of heat and could result to spherical particles that are difficult to handle, thus reducing the quality of the soldering.

In conclusion there is a tradeoff between time of soldering and temperature of tip that must be determined depending on your preferences.

## Cable properties (lead wires tinning)

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It is also important that the cable you want to solder on the pcb is tinned before being soldered (some are tinned during their industrial fabrication others not). To tin a cable, use the same temperature and time that you would use for the soldering.

If you buy a cable that is already tinned, ensure that the material used is the same than yours or at least compatible. Most lead wires tinned on the market use Sn99Cu1 or Sn95Ag4Cu1.

## Soldering steps

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It is important to respect the following steps for a proper soldering:

- Apply the hot tip on the pcb.
- Keep the tip on the pcb (see Figure 1a) and apply the unleaded wire on the pcb (not on the tip, see Figure 1b) to melt it.
- Remove the tip to avoid burning the pcb (remember to respect max time of contact).
- Tin your cable if not already done.
- Apply successively the hot tip and the cable on the pcb. If necessary add some solder (see Figure 1b).

The result can be visually checked as a shiny, smooth and round soldering should be observed (for example, a dull color means that the soldering time was too long, see Figure 4).

Also the soldering must have the proper aspect as shown in Figure 2 (bad example are illustrated in Figure 2b-c, Figure 3 and Figure 4)

For more information, please consider the IPC regulations at [www.ipc.org](http://www.ipc.org).

## Illustrations

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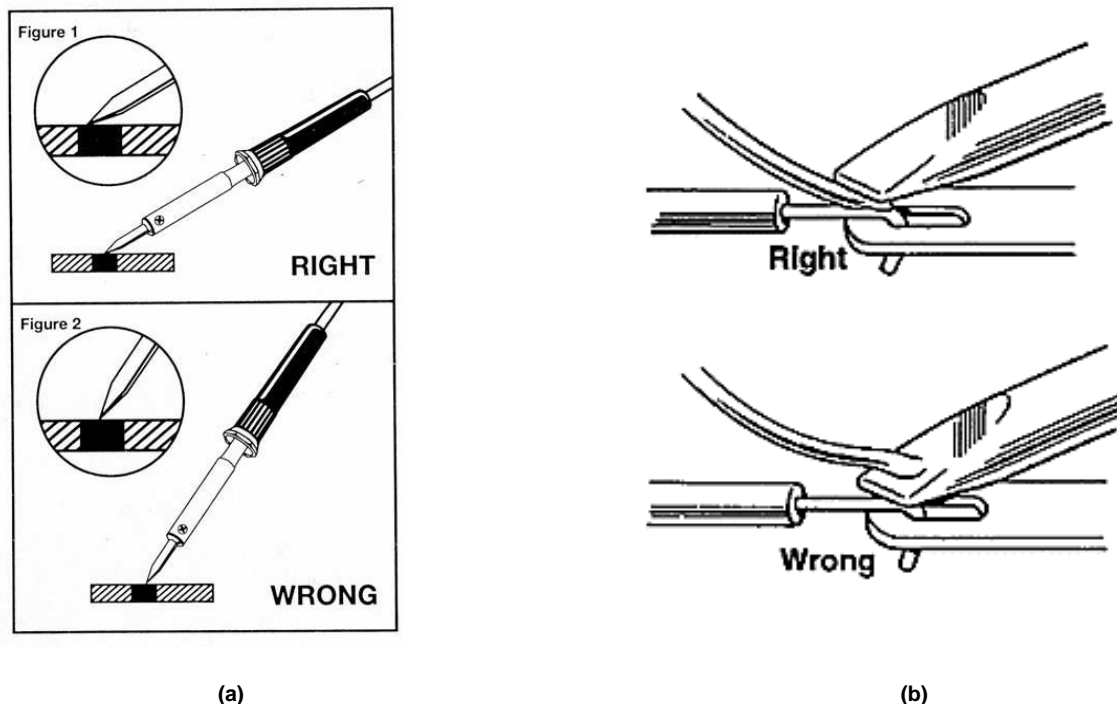
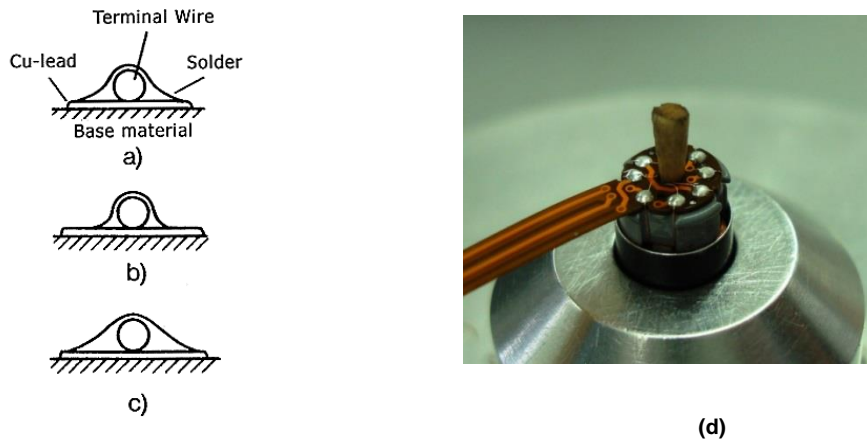
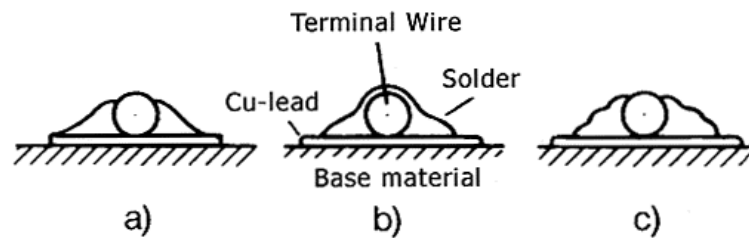


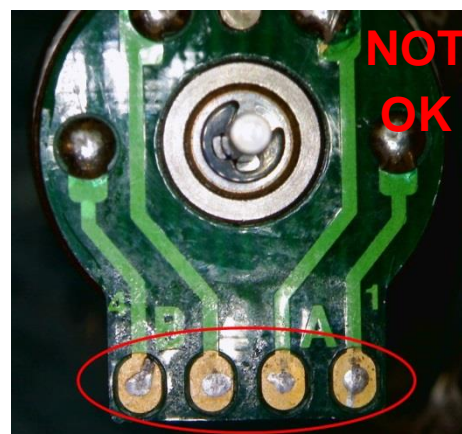
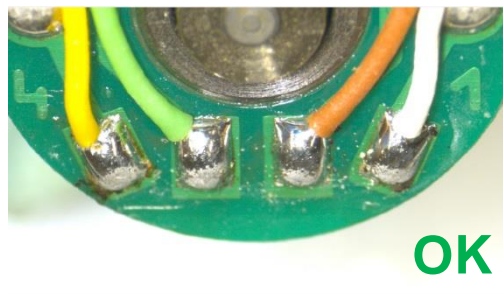
Figure 1 : (a) Right and wrong way to apply the tip on the PCB. (b) Right and wrong way to add some solder [3].



**Figure 2 :** Schematic representing the amount of solder. (a) optimal. (b) minimum. (c) excessive. (d) Picture of good solder realized on an ADM1220 stepper motor from FAULHABER.



**Figure 3 :** Schematic representing the quality of the soldering. (a) terminal wire badly soldered. (b) PCB badly soldered. (c) terminal wire and PCB badly soldered.



**Figure 4 :** Good and bad examples of a solder on various stepper motors.

## References

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