Recommendations for soldering a cable on a motor

Introduction

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

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)

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

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*.

Illustrations

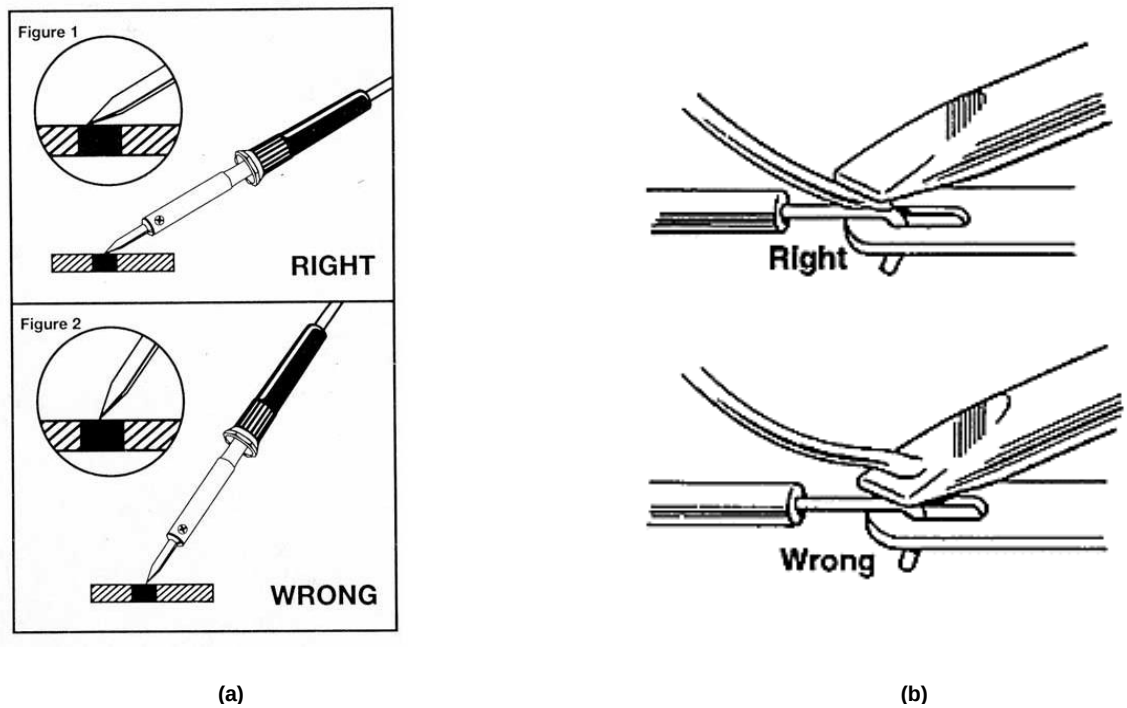
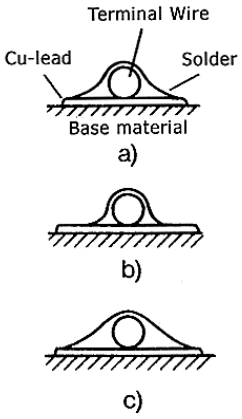


Figure 1 : (a) Right and wrong way to apply the tip on the PCB. (b) Right and wrong way to add some solder [3].



(d)

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.

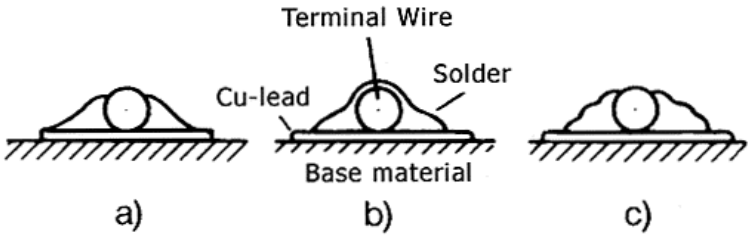
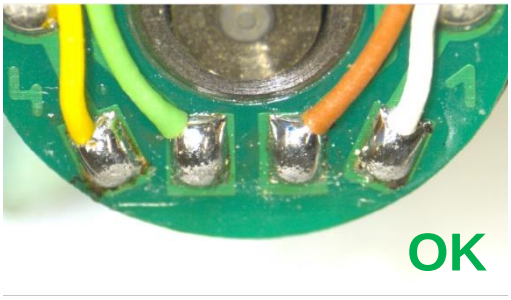


Figure 3 : Schematic representing the quality of the soldering. (a) terminal wire badly soldered. (b) PCB badly soldered. (c) terminal wire and PCB badly soldered.



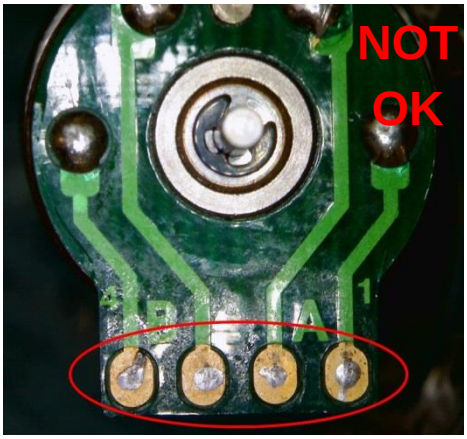


Figure 4 : Good and bad examples of a solder on various stepper motors.

References

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