# Soldering correctly

In model railroading a soldering iron is an indispensable tool. It is needed for many tasks, like:

- Wiring
- Installing decoders in locomotives
- Building electronic kits
- Building of overhead lines
- Manufacturing of metal models, and many more.

Reason enough to give a couple of tips for correct soldering

## Selecting a good soldering iron

A good soldering iron does not have to be expensive. It should be selected however suitably for the task. In model railroading mainly smaller parts as well as electronics parts need to be soldered. For these purposes a soldering iron with maximally 30 Watts, for SMD parts a 15 Watt unit are suitable. The tip is just as important. This should straight - not bent - and in front be course-sharpened. At the foremost point it should possess a diameter of maximally 1mm. Continuous soldering points are to be preferred, pure copper soldering points, like they were frequently used in former times, must be filed and again tinned again and again.

The substantially more expensive soldering stations are particularly pleasant. With these the soldering temperature can be set. This temperature is constantly measured and kept constant.

| | |
|---|---|
|  | *A cheap soldering iron. This model uses a copper tip which needs to be reshaped every now and again. Professionals have their special form for the point. The filed tip must be tinned immediately.* |
|  | *The soldering stations are more comfortable.* |

| | |
|---|---|
|  <br>  | *Here is an other cheap soldering iron. Unfortunately this has a completely useless soldering tip for electronics and model construction work. As you may see in the detailed picture, the tip is not pointed, but simply flattened.* |

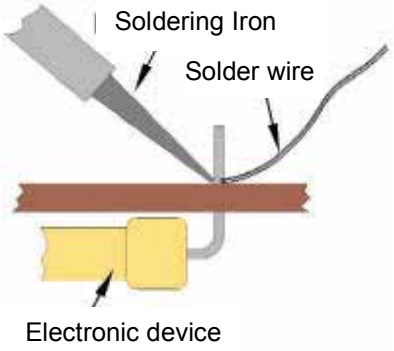
A sturdy soldering iron stand, as shown in the picture above, is essential. The sponge must be kept damp at all times. The soldering point is cleaned again and again here. Only with a clean soldering point a good soldered connection is achieved.

Always use an electronics wire solder with rosin fluxing agent core. This is available on roles. For our purposes a diameters of approximately 0,7 to 1,2 mm is suitable, depending upon application. Other fluxing agents, like soldering fat or solder fluid is not necessarily and should in no case be used.

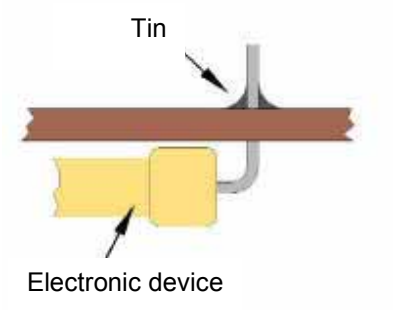
| | |
|---|---|
|  | *Use an electronic wire solder whit a rosin flux core.* |

## Soldering approach

Using a printed circuit board as an example I would like to demonstrate how to work with the soldering iron:

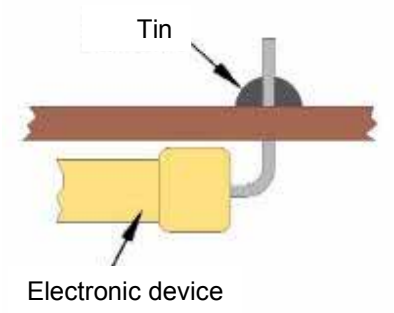



*Hold the soldering iron with light pressure to the connecting lead and the copper surface, and do not move. Immediately apply the solder wire. The tin solder must begin to flow immediately. Owing to the rosin vein the liquid tin flows fast over the copper surface of the printed circuit board and encloses the wire of the electronic component. For this to happen, this wire should be clean. If not then use a sharp knife and scrape the wire clean. You will need to do this for lacquered copper wires.*

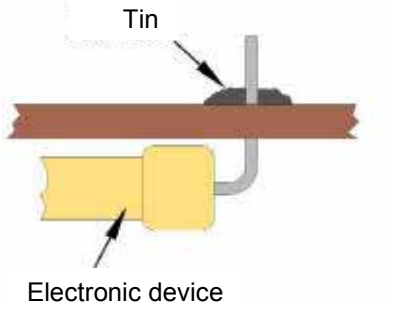



*The soldering procedure should not last longer than 4-5 seconds, better less. A longer soldering time can lead to the destruction of the device. A perfect soldered connection looks as in accompanying picture. The tin solder is shining, not matte. (Note: except if you use lead-free solder)*

**Below two examples of bad soldered connections**




*Thick bulge, possibly matte surface.*
*Error:*
*Too much tin applied, wrong temperature, unclean device leads.*




*Unclean, matte surface. Possibly a "cold soldered connection". Sometimes the device can even be pulled out again.*
*Error:*
*Device or soldering iron was moved during the process, wrong soldering point or temperature. Dirty soldering iron tip or connecting lead.*

# Resistances: Colour code

*This picture shows a carbon film resistor with 0.3W.*
*This possesses only 4 rings, the first two rings are for the first two digits, the third ring for the number of zeros. The last ring - set off from the other three - indicates the tolerance value (± 5%).*

## International colour code

| Ring: | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Colour | 1. Digit | 2. Digit | 3. Digit | Zeros | Tolerance |
| black | - | 0 | 0 | - | - |
| brown | 1 | 1 | 1 | 0 | + 1 % |
| red | 2 | 2 | 2 | 00 | + 2 % |
| orange | 3 | 3 | 3 | 000 | - |
| yellow | 4 | 4 | 4 | 0000 | - |
| green | 5 | 5 | 5 | 00000 | + 0,5 % |
| blue | 6 | 6 | 6 | 000000 | - |
| violet | 7 | 7 | 7 | - | - |
| grey | 8 | 8 | 8 | - | - |
| white | 9 | 9 | 9 | - | - |
| gold | - | - | - | x 0,1 | + 5 % |
| silver | - | - | - | x 0,01 | + 10 % |
| (none) | - | - | - | - | + 20 % |

**Note:** With four rings the third number is void. If the resistance possesses 6 rings, then the sixth ring indicates to the temperature coefficients. Resistances with only three rings are not seen often. These do not have a tolerance ring, the tolerance thus amounts to ± 20%.

**How do I recognize the "read direction" of the colour rings?**

The last ring is usually somewhat broader and besides slightly set off from the other rings.

**Example:**

| | | |
|---|---|---|
| 1. Ring: | yellow | 4 |
| 2. Ring: | violet | 7 |
| 3. Ring | black | 0 |
| 4. Ring: | red | 00 |
| 5. Ring: | brown | 1% |

The nominal resistance value therefore amounts to 47000 Ω resp. 47 kΩ, the tolerance is ± 1%. The effective resistance value can thus be between 46530 and 47470 Ω.