

Changing solder alloys in a solderpot

Introduction

If one has to change over to a new solder alloy composition, e.g. from a tin-lead alloy to a lead-free alloy, it is important that the solderpot is sufficiently cleaned. This cleaning is necessary to avoid contamination of the new solder alloy.

Practical case

In the case one has to change the solderpot content from a tin-lead alloy to a lead-free alloy one must keep in mind that the maximum lead content in a lead-free solder must be below 0.1%.

If we want to make sure that the remaining tin-lead solder residues after draining the solderpot will give a maximum added contamination of only on tenth of that 0.1% (= 0.01%) we can calculate how much of the tin-lead alloy might be left in the drained solderpot.

Calculations

If the solderpot has a volume of 90 dm³ we can calculate how much solder weight will be in the pot after filling it with lead-free solder with a density of 7.4 kg/dm³. This will give a total solder weight of 666 kg. The weight of the maximal added lead as a result of the exchanging of the tin-lead solder for the lead-free solder we just defined as 0.01%. This is equivalent to 66.6 grams of lead. Lead has a density of 11.36 kg/dm³ and tin has a density of 7.29 kg/dm³.

66.6 grams of lead in solder from the old composition 63/37 (weight ratio) is equivalent to $66.6 / 11.36 = 5.86$ cc lead. The 66.6 grams lead in solder with the 63/37 composition means that we also have a weight of $63/37 * 66.6 = 113.4$ grams of tin. This has a volume of $113.4 / 7.29 = 15.56$ cc tin. So if a total volume of $5.86 + 15.56 = 21.42$ cc of the old tin-lead solder is left, we have already 0.01% of lead contamination in the new solder bath.

To make it more visual, that 21.42 cc of 63/37 solder that gives already 0.01% lead contamination is equivalent to a 63/37 solder cube with a side length of only 27.8-mm.

Note: The maximum allowable 0.1% lead in the lead-free solder is equivalent to a 63/37 alloy solder cube of 60 mm.

Such a small amount could easily remain in so called "dead corners" on spots that are not so easy to inspect.

If that amount is present the new lead-free solder it is directly at its maximum contamination level.

It is for that reason that we always recommend using a new solderpot for the lead-free solder process.

Flushing the solderpot

An alternative to get rid of the old solder residues is to dilute them with a pure tin rinse of the solderpot once the 63/37 alloy is drained off.

After draining the old alloy the solderpot should be filled with pure tin. Once the tin is molten the solder pumps should run for a day. This will dissolve the remaining 63/37 alloy residues in the tin. After draining the tin (that is now "contaminated" with lead) from the solderpot, the pot can be filled with the new lead-free alloy.

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