



Ultrasonic Soldering, Resistance Soldering and Brazing

Resistance Soldering, Heating and Brazing

Technical Information

www.solbraze.com

Contents

<u>Resistance Heating</u>	2
<u>Direct Resistance Heating</u>	2
<u>Electrode Resistance Heating</u>	3
<u>Thermopaks</u>	4
<u>Thermotools</u>	4
<u>Resistance Heads</u>	5
<u>Electrodes</u>	5

Resistance Heating

Technical

Resistance heating is the process of generating heat through the passage of electric current. The theory of resistance heating is simple, that heat will be produced as current moves through a material. In practice however some features need to be considered.

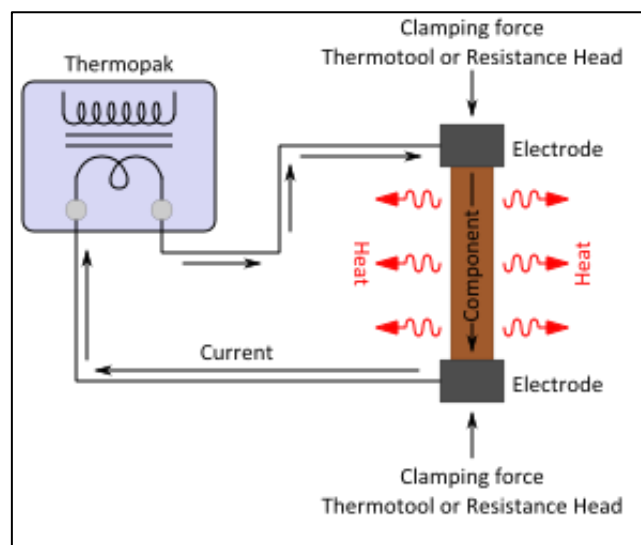


Figure 1. Typical Resistance Heating setup

There are three main types of resistance heating; direct, electrode and interface.

Direct Resistance Heating

Direct resistance heating is used on relatively long sections of uniform cross section. This method is not usually used for soldering but can be used for annealing and stress relieving.

Aspects of the process need to be considered in this process such as; the length of the component, electrode placement, clamping method and component imperfections i.e. sections in tension or compression.

The length of the component can affect the heating pattern so the placement of the electrodes should be considered to get uniform heating. The clamping method should be designed around the electrode placement and the clamping force can also impact the conductive properties at the interface. Whether a component is in tension or compression can also affect the conductance.

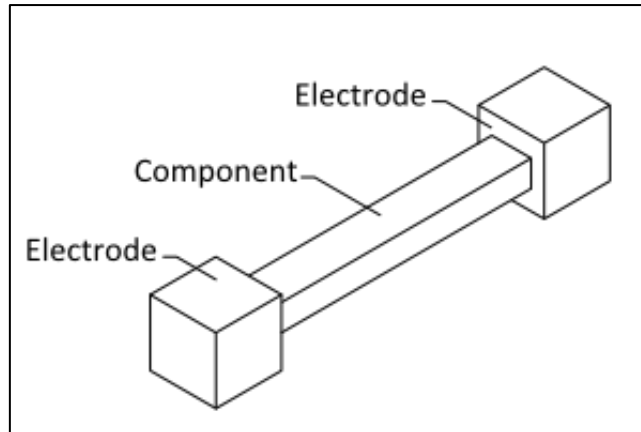


Figure 2. Direct Resistance Heating

Electrode Resistance Heating

Electrode resistance heating is suitable for soldering components of good electrical and thermal conduction properties such as copper. The advantages of electrode resistance heating are that the area can be heated quickly and locally so distortion and oxidation are kept to a minimum.

The resistance needs to be considered for each component and interface in the assembly. Different levels of resistance in different components can influence the electrode material. For example, in the soldering of two copper components electrodes of the same material would be used at both ends. If joining copper to steel however, then a higher resistance electrode would be placed next to the copper and a lower resistance electrode to the steel.

In practice almost all electrodes are made of either hard or soft electro-graphite. The softer grade allows a better surface contact but will deteriorate quicker than a hard grade.

The electrodes are used to clamp the component assembly. The clamping method can be by hand or automated depending on the job. As with direct resistance heating the clamping pressure and method need to be optimised for the component assembly. Each component the interfaces between them must have a good contact and as much of the area as possible should be in contact with the electrode.

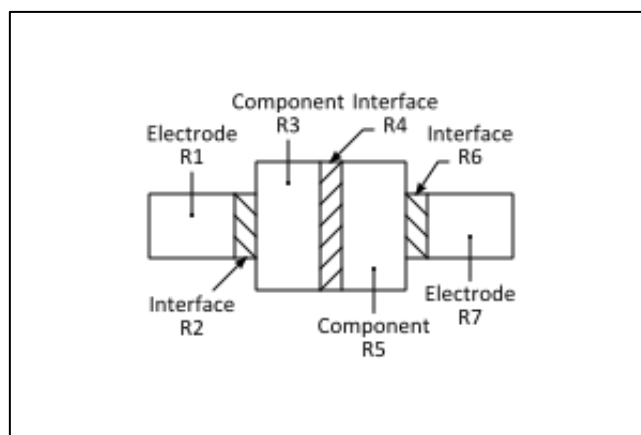


Figure 3. Electrode Resistance Heating

Thermopaks

Thermopaks are a power supply unit to be used with either Thermotools or Resistance Heads. The main component is a heavy duty step down transformer.

The transformer takes mains supply and steps it down to a low voltage needed for resistance heating. The transformer is specially designed so that the secondary is still capable of carrying a high current without generating excessive internal heat. There is also an earthed screen between the primary and secondary windings of the transformer to ensure that mains voltage does not appear on the output. The control circuit is run from a low voltage circuit.

The operator controls the output level by a terminal link or rotary switch depending on the Thermopak model. The output is then applied by using a footswitch. There is also a timer option on some models.

Thermopak	Rating (VA)	Voltage range	Input voltage
TP2	1000	4 / 5.5 / 6.7	220 / 240
TP25	1,500	3.4 / 4 / 4.6 / 5.3 / 6	220 / 240
TP3	3,000	2.5 / 3 / 3.5 / 4.5 / 5	220 / 240

Thermotools

Thermotools are handheld resistance heating tools. When used with a Thermopak they form an excellent solution to soldering and brazing processes. They work by transmitting current through electrodes into the parts being joined generating heat which activates and reflows the solder.

The advantages of using Thermotools are that they give fast localised heating. This makes them ideal for joining parts that are hard to reach or part of a fixed installation such as on electric motors, transformers and Bus Bar connections.

There are four types of Thermotool available; pencils, forks, tongs and water cooled tongs.

Pencils work with a single electrode on the tool and a clamp or earth plate connected to the component. These are best suited to hard to reach jobs and static assemblies.

Fork tools contain two electrodes that are side by side. They are used pressed against the component and the component closes the circuit. These are suited to jobs where the access is limited.

Tongs contain two electrodes that are manually clamped around the component. A more positive clamping force can be achieved using tongs. Shaping the electrodes to suit the component can also help make a good contact. Tongs are good for jobs that require the clamping of components although the process as a whole must be considered to make an effective joint.

Water cooled tongs are adaptations of tongs with a water recirculating function designed to aid cooling. These are used in jobs with high duty cycle of the Thermotool. A separate water cooling unit is required with these tools.

Thermotool	Model No.	Electrode	Thermopak
TT4	R 6676	E12	TP2/HE
TT4	R 7107	R7107/2	TP25
TT4	R 7615	R7107/2	TP2
TT5	R 4307	TC17	TP2, TP2
TT7	R 4489	TC3	TP25, TP2
TT8	R 3968	TC16	TP25, TP2
HD3W	R 3721	TC3(9)	TP3

Table 1. Thermotool range

If you can't see your Thermotool listed please contact Solbraze on 020 8891 1127.

Resistance Heads

Resistance heads are bench mounted units which can have static, manual or pneumatically operated electrodes. They are suited to component assemblies that can be fitted in a simple jig and also for repetitive production runs. The heating time can be controlled manually or automatically.

Please call for more information on Resistance heads.

Electrodes

There are a range of electrodes suitable for use with Thermotools and Resistance Heads. Please refer to the table on the next page for electrodes and sizes. There is more information on suitable electrodes for each piece of equipment under the Thermotool section. If you can't see the electrode you have please contact Solbraze.

Part no.	Stock no.	Dimensions	Notes
TC3 / TC3(9)	14007	2" x 1.25" x 0.375"	without holes
TC8	14015	1" x 0.375" x 3"	soft carbon (grade 4)
TC8(9)	14015	1" x 0.375" x 3"	hard carbon (grade 9)
TC3	14020	2" x 1.25" x 0.375"	with holes
TC17	14033	1" x 0.875" x 0.375"	without holes
E12	14035	6.5mm dia. x 66mm long	copper coated
TC3(9)	14039	2" x 1.25" x 0.375"	with holes
TC17	14040	1" x 0.875" x 0.375"	with holes

Table 2. Electrode range

Contact Solbraze on:

Internet: www.solbraze.com

E-mail: info@solbraze.com

Telephone: 01535 687790

Fax: 01535 687798

