



Ultrasonic Soldering, Resistance Soldering and Brazing

# Ultrasonic Soldering

Technical Information

[www.solbraze.com](http://www.solbraze.com)

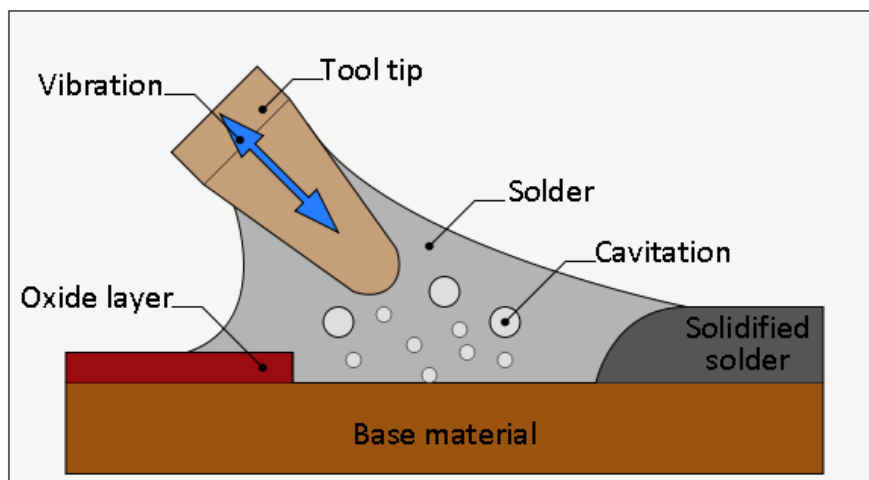
## Ultrasonic Technical Information

### Ultrasonic Soldering

#### Background

Ultrasonic soldering is used to join materials with either a metallurgical or mechanical bond.

A metallurgical bond is formed when the oxide from the base metal is removed through ultrasonic cavitation and implosion in the solder. The solder then comes in to contact with the base metal and the ionic attraction between the two forms a bond. A tin or lead solder bonded to copper is an example of this.



*Figure 1. Metallurgical bond formed by ultrasonic soldering*

A mechanical bond usually involves no oxide on the base material. The cavitation and implosion in the solder create forces that agitate the materials and form an interlocking mechanical bond. Coating a ceramic with solder is an example of this process.

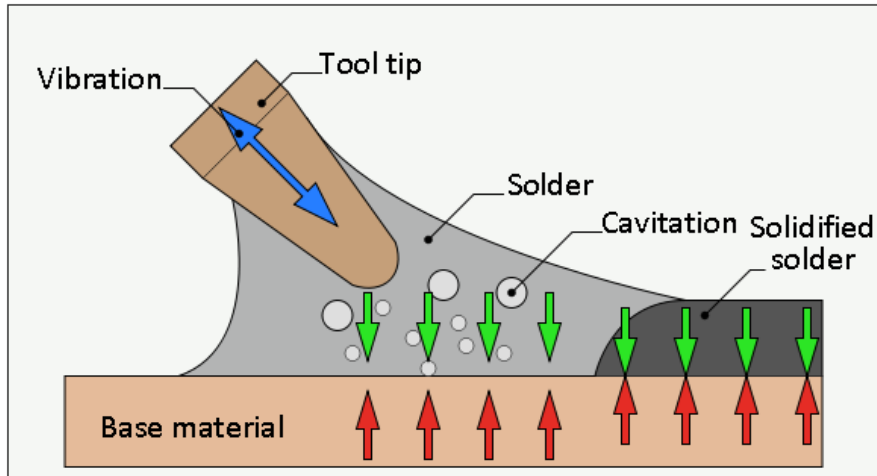


Figure 2. Mechanical bond formed by ultrasonic soldering

### When to use Ultrasonic Soldering

There are two main reasons for using Ultrasonic Soldering:

1. To eliminate the need for flux in the soldering process
2. To apply solder to ceramics and similar materials

The advantages of removing flux from the process are that there is no need for post-process cleaning and wicking caused by surface tension from the flux is removed. Eliminating post-process cleaning has the obvious benefit of cost saving for both the process and the flux itself. The benefit of eliminating wicking is that the solder coating on the base material can be better controlled.

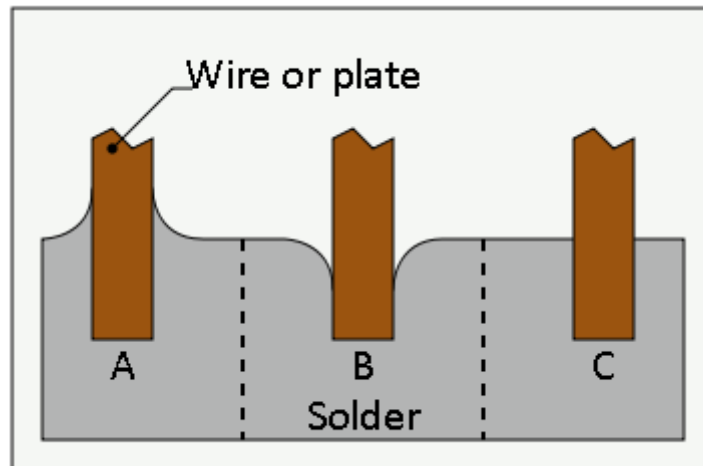


Figure 3. Wicking effect of solder in dip tinning, A - Flux only, B - No flux or ultrasonic, C - Ultrasonic only

### How to use Ultrasonic Soldering

There are two solutions that **Solbraze** offer:

1. Solsonic Ultrasonic Soldering Iron
2. UM250 Ultrasonic Soldering Bath

The Solsonic Soldering Iron is, in simple terms, a soldering iron with an ultrasonic generator and transducer. The iron is best suited for applications where a normal soldering iron would be used but the user requires the added benefits of ultrasonic soldering.

The UM250 Ultrasonic Soldering Bath is designed for dip tinning and soldering. The work piece is dipped into a bath of molten solder that has an ultrasonic transducer partially submerged in it. The work piece is then withdrawn after a set time with either a bonded solder layer now present or a bonded assembly. Depending on the application re-flow of the solder may be necessary.

### **Solsonic Ultrasonic Soldering Iron**

The Solsonic Ultrasonic Soldering Iron is a handheld tool best suited to jobs that require a standard soldering iron but with the benefits of ultrasonic soldering. The unit consist of the soldering iron itself and a control unit. The iron has the ultrasonic transducer built in and is cooled by air regulated by the control unit. The copper tip at the end of the iron is interchangeable.

The ultrasonic generator in the control unit has five power levels and an OFF setting so that it can be used as a conventional iron. The ultrasonic power is applied through a footswitch.

<b>Supply (electrical)</b>	240V 50Hz single phase
<b>Supply (air)</b>	Clean and dry air <1 bar
<b>Power rating</b>	80W
<b>Operating frequency</b>	40kHz
<b>Frequency power levels</b>	1 to 5 and OFF
<b>Control unit dimensions</b>	125 x 135 x 216mm

*Table 1. Solsonic Ultrasonic Soldering Iron Specification*

### UM250 Ultrasonic Soldering Bath

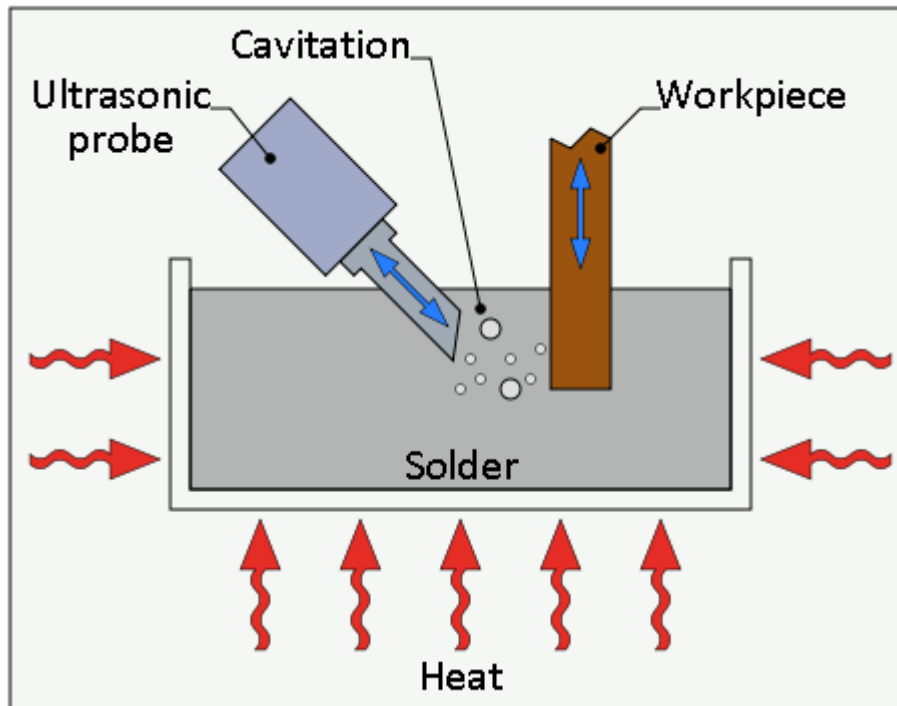


Figure 4. Ultrasonic solder bath

The UM250 consists of a solder bath, solder temperature controller, ultrasonic generator and ultrasonic probe. There is also the option of an automatic dross removal system. The probe is partially submerged in the solder providing the ultrasonic frequency to the work piece dipped in the solder. The solder temperature controller has a thermocouple to the solder bath to monitor temperature and adjust the heaters accordingly. The UM250 is best suited to dip tinning and soldering applications.

Supply (electrical)	240V 50Hz single phase
Supply (air)	Clean and dry air <1 bar
Power rating	250W
Operating frequency	20kHz
Solder bath element rating	700W
Solder bath dimensions (internal)	127 x 89 x 89mm

Table 2 . UM250 Ultrasonic Soldering Bath Specification

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