Soldering Techniques for Lead Attachment to Strain Gages with Solder Dots

Introduction

Many gages are now purchased with integral solder dots. These offer advantages of accurately controlled solder joint size, convenience when working in confined areas, and of having pretinned "hard-to-solder" alloys such as isoelastic and Karma. Controlled joint size, in turn, helps to increase gage fatigue life, and minimizes thermocouple effects.

If proper installation techniques are used, there should be no difficulty experienced in obtaining well-soldered connections; but care must be exercised. Open-faced gages with Option S (solder dots only) should be coated with adhesive at the time of installation. Such encapsulation effectively prevents dot enlargement and undesirable spreading during subsequent soldering steps. To expose the dots, lightly abrade with 400-grit silicon-carbide paper or simply solder through this overcoat. Encapsulated gages do not require additional coating with adhesive.

The following are important guidelines:

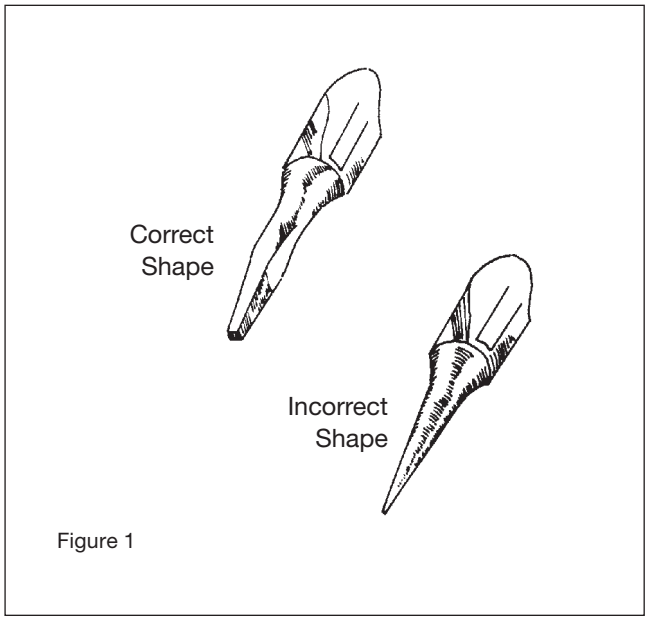

Figure 1

Soldering Temperature

"T" backed gages with Option S, and "S" Series gages, have dots composed of +570°F (*+300°C*) lead-tin-silver solder. Vishay Micro-Measurements wire solders have melting points ranging from +361° to +570°F (*+183° to +300°C*); the most common are the +361° and +570°F (*+183° and +300°C*) solder wire with rosin-core flux. Solid wires are also available, including a popular +430°F (*+220°C*) type.

A temperature-controlled soldering station, such as the Mark V or Mark VIII Soldering Units, is recommended. Tip temperature should be high enough to assure good wetting of the solder but not so high as to remove the dots, vaporize flux, or hinder keeping the iron properly tinned and clean. Unfortunately, most uncontrolled irons are quite capable of tip temperatures in excess of +900°F (*+480°C*), which is much too high for general strain gage soldering.

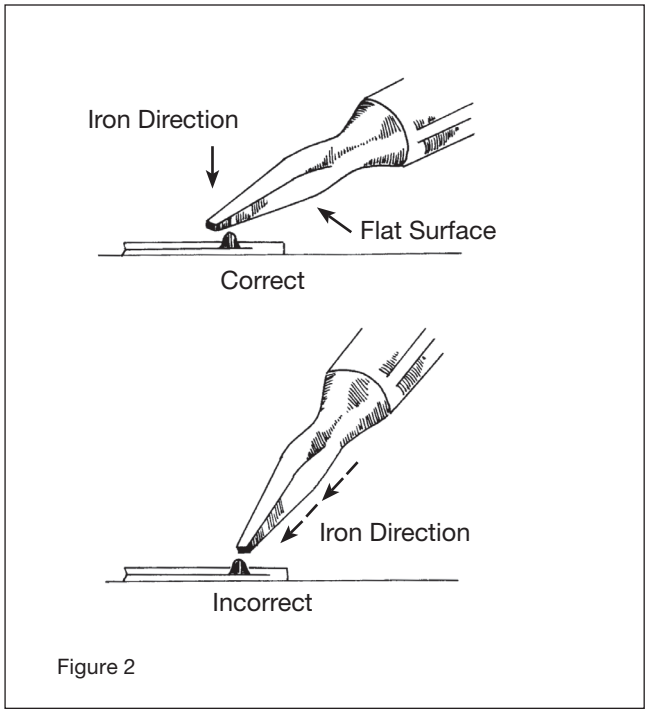

Figure 2

Soldering Tip Design

Never solder with a sharply pointed tip (Figure 1). A hot point applied to a solder dot usually draws out the solder. Use a clean, flat 1/16-in (*1.5-mm*) wide chisel or screwdriver type tip held flat against the work, as in Figure 2.

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Fluxing

Proper fluxing is essential. Enough M-Flux AR, either from melting of flux-core solder or adding M-Flux AR separately, must be introduced to assure complete wetting action. This is particularly important with +570°F (*+300°C*) solder as there is an increased tendency for the flux to be boiled away at higher temperatures.

If "spikes" are produced instead of smooth beads, it is a sign of inadequate fluxing, dwelling too long with the iron, and/or an improper iron temperature.

Rosin flux should always be used in making connections to Option S gages. All flux residue should be thoroughly removed with RSK Rosin Solvent.

Bead Formation

It is important to first build up a well-formed bead on each dot as in Figure 3. This is done by laying rosin-core solder wire across each dot, firmly applying the iron for *one second*, then simultaneously lifting both wire and iron. See Figure 4. If the first attempt fails, simply repeat this procedure, making certain to use enough flux. Feeding a cored solder into the joint area during heat application will increase the available flux.

Hold-down

Each connecting wire must be carefully and firmly anchored in place with spring loading against the dot bead, as illustrated in Figure 5, before soldering the connection. When this is properly done, a one-second touch of a hot iron and fresh solder with flux should complete the process.

Solder Compatibilities

All Vishay Micro-Measurements solders are compatible with each other. Of course, if one type is incorporated in the dot and another added from wire, a mixture is produced. This new alloy cannot be expected to have melting and strength properties any better than those of the lower temperature component. In special cases of mixing +430° and +570°F (*+220° and +300°C*) solders, a final alloy similar to +361°F (*+183°C*) solder can be encountered.

Figure 6 illustrates a typical installation. Note that solder dot (Option S or SE) gages are always connected to bonded terminals for strength. Refer to Application Note TT-603, *The Proper Use of Bondable Terminals in Strain Gage Applications*, for other arrangements.

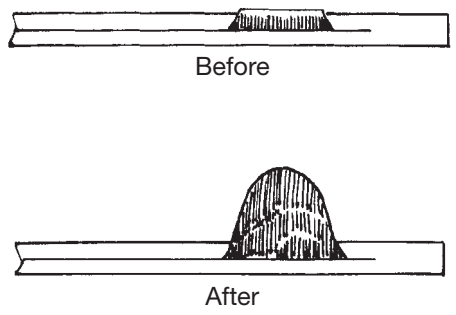

Figure 3

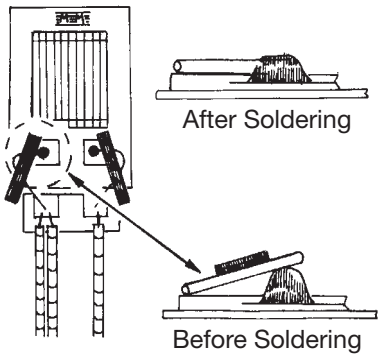

Figure 5

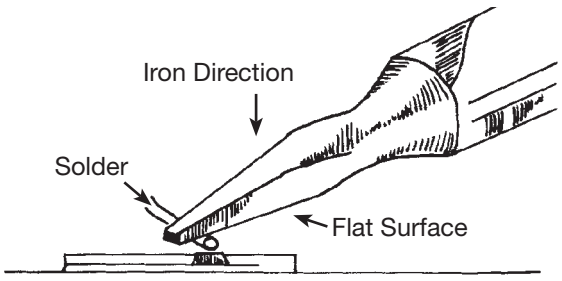

Figure 4

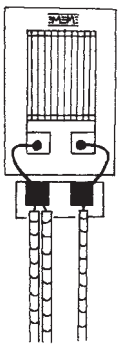

Figure 6

APPLICATION NOTE

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The various installation accessories referred to throughout this Application Note are Vishay Micro-Measurements Accessories, listed in our Strain Gage Accessories Data Book and available directly from Vishay Micro-Measurements.

Application Note TT-609, *Strain Gage Soldering Techniques*, provides a detailed discussion on general strain gage soldering techniques.