Techniques for Avoiding Lifted Solder Tabs

Of all the Micro-Measurements Application Notes, more than half provide instructions for soldering leadwires to strain gages. Indeed, of the steps necessary for a successful gage installation, soldering usually requires the most practice to become proficiently skilled. And, of the faults in gage soldering, lifted or dislodged solder tabs are perhaps the most common. This unwelcome event is always frustrating because, when it occurs, the affected gage must be removed and replaced.

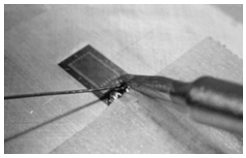
Why does this occur, and how can it be prevented? Here are the most usual causes of lifted soldering tabs, and the remedies for preventing them from occurring in your future installations.

- Soldering Heat
- Wire Size
- Strain Relief

SOLDERING HEAT

Most Micro-Measurements strain gages are limited to use at temperatures of +500°F (+260°C) or lower. Yet the temperature of the soldering iron tip typically must be in the range of +600°F (+315°C) to +700°F (+370°C) for the lowest temperature solder, 361 and 361A lead-tin eutectic solders, which melt at +361°F (+183°C). Tip temperatures must be even higher for other solders. That means the dwell time of soldering iron tip on solder tab must be limited to one or two seconds maximum in order to reduce gage heating. The following should help you to accomplish the soldering operation in this period of time:

- Pre-tin the gage tabs and terminals before attempting to attach leadwires. Make certain the gage tabs are not coated with tape mastic or bonding adhesive. If necessary, clean the tabs with a soft "pink" pencil eraser. (Be certain to avoid the coarse ink erasers which will damage the tabs.)
- Properly tin the soldering iron tip. A pool of molten solder on the tip is essential for rapid heat transfer.



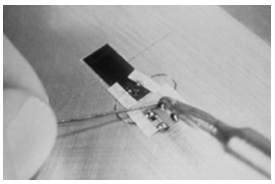
Soldering leadwire to CEA-Series gage.

- Ensure that adequate amounts of solder flux are present. Wetting of the solder tab requires flux. Use either solder with a flux core (361, 361A, and 570) or apply an external flux (AR or SS). (The SS flux is necessary only on the tabs of D- and K-alloy gages without copper dots or pads.)

WIRE SIZE

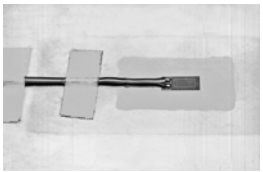
Wires that are too large place excessive stress on the solder tab/gage backing interface. General guidelines for cable selection include:

- When soldering to EA-, N2A-, EP -, ED-, or EK-Series strain gages with 3-mm or larger gage lengths, use 30- to 36-AWG single-conductor copper wire between the solder tab and the terminal strip. For shorter gage length (and smaller tab sizes) use 34- to 36-AWG wire.



Connecting jumper wire between solder tabs and terminal strip.

- When soldering the leadwires directly to CEA-Series gages, or those with Option W terminals, with 3-mm or larger gage lengths, use 26- to 30-gauge stranded wire. For shorter gage length (and smaller tab/terminal sizes) use 30-gauge stranded wire.



Finished CEA-Series gage installation.

APPLICATION NOTE

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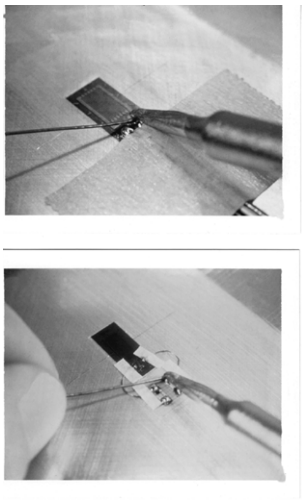
STRAIN RELIEF

Failures can occur at the solder tab from excessive movement of the wires after attachment. Securing the leadwire cable to test specimen and the incorporation of a strain-relief loop in the leadwires between the gage tabs and point of attachment will help ensure that the movement of the wires at the gage tabs or terminals is minimized.



Making a strain relief loop.

Detailed soldering techniques are described in the following Micro-Measurements Application Notes:

- TT-602, Silver Soldering Techniques for Attachment of Leads to Strain Gages
- TT-603, The Proper Use of Bondable Terminals in Strain Gage Applications
- TT-604, Leadwire Attachment Techniques for Obtaining Maximum Fatigue Life of Strain Gages
- TT-605, High-Elongation Strain Measurements
- TT-606, Soldering Techniques for Lead Attachment to Strain Gages with Solder Dots
- TT-608, Techniques for Attaching Leadwires to Unbonded Strain Gages
- TT-609, Strain Gage Soldering Techniques

These techniques are also included in all strain gage workshops at Micro-Measurements training programs. Additionally, EA-Series Practice Patterns are available upon request at no charge for bonding and soldering practice. And, of course, use of strain gages with Option P or Option P2 (preattached leadwires) can eliminate the need for soldering to the gage or terminal altogether in many applications. With the proper strain gage accessories and installation techniques, lifted soldering tabs can be virtually eliminated. Should you have any questions concerning your specific applications, our Applications Engineering Department is always available by telephone, facsimile or email to help ensure your success in stress/strain measurements.

APPLICATION NOTE