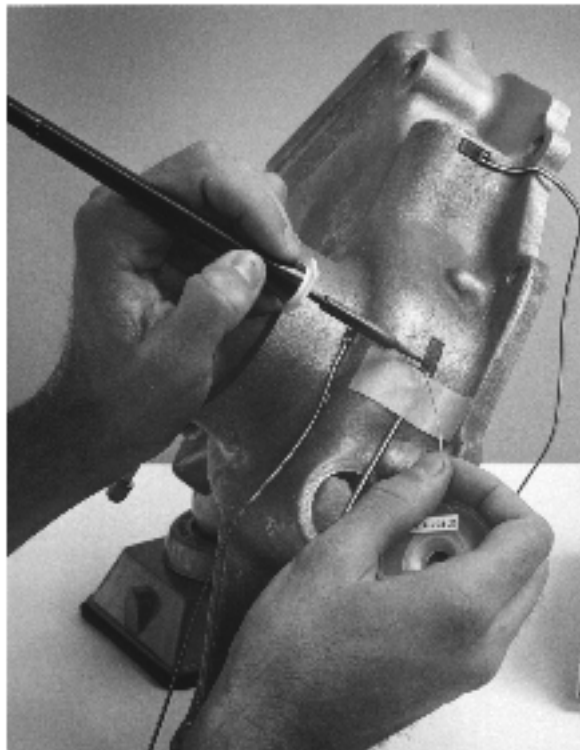

TECHNIQUE

Techniques for Avoiding Lifted Solder Tabs

Of all the Measurements Group Tech Tips, 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 unwelcomed 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](#)

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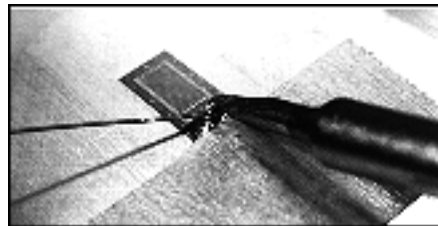
TECHNIQUE

Techniques for Avoiding Lifted Solder Tabs

Soldering Heat

Most Micro-Measurements strain gages are limited to use at temperatures of +500 deg F (+260 deg C) or lower. Yet the temperature of the soldering iron tip typically must be in the range of +600 deg F (+315 deg C) to +700 deg F (+370 deg C) for the lowest temperature solder, [M-LINE 361](#) and [361A](#) lead-tin eutectic solders, which melt at +361 deg F (+183 deg 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 ([M-LINE 361](#), [361A](#), and [570](#)) or apply an external flux ([M-LINE AR](#) or [SS](#)). (The SS flux

is necessary only on the tabs of [D-](#) and [K-alloy](#) gages without copper dots or pads.)



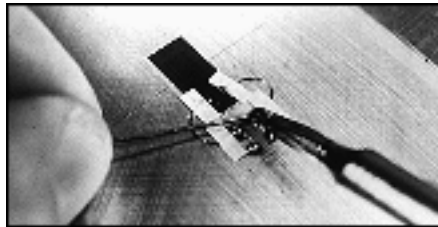
TECHNIQUE

Techniques for Avoiding Lifted Solder Tabs

Wire Size

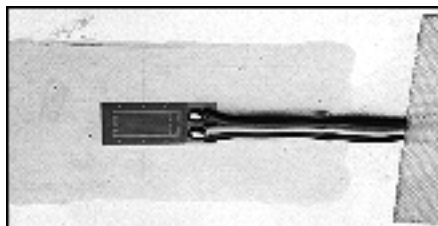
Wires that are too large place excessive stress on the solder tab/gage backing interface. General guidelines for cable selection include:

- 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.

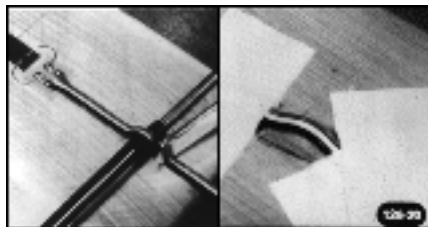


TECHNIQUE

Techniques for Avoiding Lifted Solder Tabs

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 Measurements Group Tech Tips:

- 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 volumes of the [VideoTech Library](#), as well as in all strain gage workshops at Measurements Group 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 or facsimile to help ensure your success in stress/strain measurements.



Strain Gage Selection

Karma Alloy

Modified Karma, or K alloy, with its wide areas of application, represents an important member in the family of strain gage alloys. This alloy is characterized by good fatigue life and excellent stability; and is the preferred choice for accurate static strain measurements over long periods of time (months or years) at room temperature, or lesser periods at elevated temperature. It is recommended for extended static strain measurements over the temperature range from -452 deg to +500 deg F (-269 deg to +260 deg C). For short periods, encapsulated K-alloy strain gages can be exposed to temperatures as high as +750 deg F (+400 deg C). An inert atmosphere will improve stability and extend the useful gage life at high temperatures.

Among its other advantages, K alloy offers a much flatter thermal output curve than A alloy, and thus permits more accurate correction for thermal output errors at temperature extremes. Like constantan, K alloy can be self-temperature-compensated for use on materials with different thermal expansion coefficients. The available S-T-C numbers in K alloy are limited, however, to the following: 00, 03, 05, 06, 09, 13, and 15. K alloy is the normal selection when a temperature-compensated gage is required that has environmental capabilities and performance characteristics not attainable in A-alloy gages.

Duplex Copper Feature

Due to the difficulty of soldering directly to K alloy, the duplex copper feature, which was formerly offered as an option, is now standard on all Micro-Measurements open-faced strain gages produced with K alloy. The duplex copper feature is a precisely formed copper soldering pad (DP) or dot (DD), depending on the available tab area. All K-alloy gages which do not have leads or solder dots are specified with DP or DD as part of the designation (in place of, or in addition to, the option specifier). The specific style of copper treatment will be advised when the [Customer Service Department](#) is contacted. Open-faced K-alloy gages may also be ordered with solder dots.

