

## 91-308 Electrode Tests

### Electrode Adhesion Tests & Soldering

#### Electrode Materials

Silver and Nickel (electroless and sputtered) are the most commonly used electrodes for piezoelectric materials and are both offered by SensorTech. Other less commonly used electrodes are chrome-gold and conductive epoxies. Table-1 provides the characteristics of the silver and nickel electrodes.

#### •Soldering Procedure

- Soldering iron 20W. Preheat the iron for 20 minutes.
- Clean the area of the ceramic to be soldered with a soft abrasive or pencil eraser.
- Pre-tin both the wire (#22 AWG solid copper) and the ceramic. Use flux if necessary. Avoid excess solder.
- Join the lead to the ceramic using the soldering iron. Soldering duration should be kept to a minimum (typically 3-5 second)

Material	Thickness	Solder	Flux	Cleaner
Silver	0.0005" - 0.0015" ( 12µm - 38µm )	SN62 62/36/2 ( Pb/Sn/Ag )	Kester 1544 or 1571 Superior #30 for Nickel Rosin Type Non-Corrosive	Ethanol Kester 5235
Nickel	0.0002" - 0.0010" ( 5µmm - 25µm )	SN60 60/40 ( Pb/Sn )		

#### Definition of Electrode Quality

The electrode quality is best defined by its conductance, adhesive characteristics and the surface finish.

#### Adhesion Tests

##### Tensile Tests

- Tensile tester (Chatillon or Wagner) (0-20 lb. or 0-10 kg range)
- A test wire (#22 AWG Solid copper wire) is soldered to the ceramic using the procedure outlined in Section-2.
- A tensile load is applied slowly to the ceramic. The loading is continued until the lead separates or the required load is registered on the dial.

##### Pressure-sensitive Tape Adhesion Tests

The pressure-sensitive tape method can be used when it is impractical to use a solder tensile test or when testing is impossible because of the size and shape of the ceramic element. The use of pressure-sensitive tape is also sometimes preferred as it is a non-destructive test method.

To avoid discrepancies in the results, careful choice of materials and procedures is required for each test.

- Clean the electrode surface with a solvent or a degreaser such as trichloroethane.
- Attach the strip of pressure-sensitive adhesive tape with an average adhesion to steel value necessary for your application (typically 25-50 oz/in). Press firmly.
- Lift one end of the tape normal to the electrode surface and pull until the tape is removed. The pull must be even and continuous until the tape is removed.

#### Relevant Standards

DOD-STD-1 376A (SHIPS)