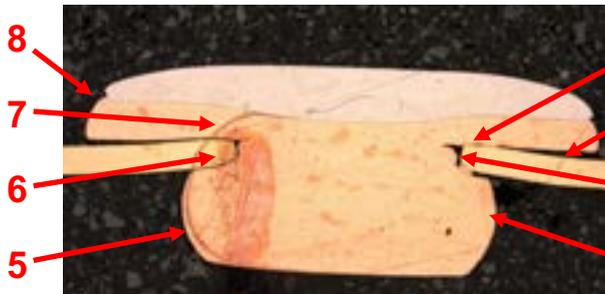


## Contacts, their construction and materials, A Simplified Overview

Relay contact rivets are generally with a composite construction comprising a layer of the contact material bonded to an underlying copper rivet. As in everything, there are exceptions and occasionally solid contact rivets are encountered. These cost more so are only used in special cases. The quality of the rivet and its performance is influenced by the quality of the join between the two materials as well as the quality of the contact surface material itself. This can be especially important with high currents and when operating at the extremes of temperature range.



(source of picture: Panasonic)

The photograph shows a poor quality rivet with many problems.

- 1) Punching burr
- 2) Air Gap
- 3) Crack
- 4) Twisted contact blade
- 5) Rivet badly formed
- 6) Surface pressure
- 7) Poor hardness control in rivet
- 8) Surface of rivet separating from copper body

The contact itself is usually made of a silver alloy, and this can be a melt alloy or a sintered alloy depending upon the materials used. Generally, melt alloys are used for low power and signal applications, and sintered alloys for higher power.

### Common contact materials in Durakool relays

Contact Material	Common Name	Features	Guide Range	Applications	Type
AgNi 0.15	Fine Silver or Fine grain silver	Silver with 0.15% Nickel. Universal but welds easily. Sensitive to atmospheric sulphur so is often available with Au flashing. (see below)	1V to 150V 50mA to 100A >1W	Resistive loads and loads switched not under power. General purpose use.	Melt
AgNi 90/10	Silver Nickel	Silver with 10% Nickel. Important general purpose material with reduced susceptibility to welding. Good general purpose replacement for AgCdO.	approx. 6V to 380V 10mA to 100A	Excellent for resistive loads with some inductive capability. A good "all rounder".	Sintered
AgCdO	Silver Cadmium Oxide	Now <u>banned under RoHS</u> . Excellent general purpose power switching material	12V to 380V > 0.5A > 10W	Motor loads, general purpose power switching	
AgSnO <sub>2</sub>	Silver Tin Oxide	Excellent resistance to welding. Very good AC & DC performance. Good replacement for AgCdO in power switching. More expensive than AgNi 90/10	>12V to >380V > 0.5A > 10W	Good for motor, lamp and capacitive loads. Good general purpose use.	
AgSnInO	Silver Tin Indium Oxide	More advanced version of AgSnO <sub>2</sub> . Excellent general purpose power switching. Highly resistant to welding. Good DC performance	> 12V to > 380V > 0.5A > 10W	Excellent for DC motor loads. Good for lamp and capacitive loads. Good general purpose material in automotive applications	
W or AgW	Tungsten (Wolfram)	High resistance. Very low susceptibility to welding. Not usually used on its own.	> 60V > 1A > 50W	Used as a pre leading contact in conjunction with another contact (usually AgSnO <sub>2</sub> ). Excellent for high inrush loads.	

Two common contact surface finishes are available from Durakool:

1) Au (gold) plating. Typically a gold layer > 2um, and may be as much as 10um (unusually) thick. The gold acts a switching surface and is very good at switching low level signals with repeatability. Will be damaged if exposed to arcs and is not recommended for switching non-resistive loads and not for high currents. Care is needed with the gold plating process to ensure an even and consistent plating.

2) Au (gold) Flash. Flash is defined as a very thin (<0.3um) layer of gold plating. The purpose of which is to protect the contact rivet from atmospheric contamination or tarnishing whilst in storage. It serves little real function in normal use being eroded away as soon as the contacts start switching. Even if there is no arc, the mechanical action of the contacts wiping over each other will remove it quickly. The underlying contact material takes over to switch the load. Can sometimes be used to solve problems with automated test equipment (ATE) that only inject very small currents when testing PCB's. After tests are complete the gold has been worn away but the gold helped the ATE to identify the contacts were closed.