

AgSnO₂

Silver Tin-Oxide

Powder Metallurgical

SCOPE: This information refers to silver tin oxide wires, profiles and contact tips manufactured by blending of silver and metal oxide powder without (SP) or with additives (SPW/PMT), compacting, sintering, extruding and drawing or rolling to final dimension. Profiles and tips are available with a backing layer of silver and optionally with an additional layer of a brazing alloy.

Designation of standard compositions

The silver content is designated by the first number: e. g. Ag/SnO₂ 88/12 with 88 wt.-% silver, balance metal oxides. The typical gradation of the latter are 8, 10, 12 and 14. Additives improve the switching behaviour of the different materials.

Applications

- » contactors
- » automotive relays
- » power line relays
- » earth leakage breakers, miniature circuit breakers
- » switches for domestic applications, main switches
- » circuit breakers up to switching currents of 5000 A

Physical Properties

The physical properties depend mainly on the composition. The effect of the SnO₂ content is shown in the following for one type of material.

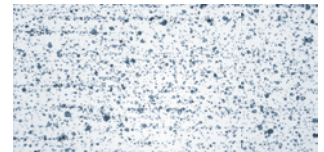
| Ag/SnO ₂ | DENSITY [g/cm ³] | ELECTRICAL CONDUCTIVITY [m/(Ω·mm ²)] | HARDNESS SOFT [HV1] | TENSILE STRENGTH SOFT [MPa] | ELONGATION [%] |
|---------------------|---------------------------------|--|------------------------|-----------------------------------|-------------------|
| 92/8 SPW | 10.1 | 48 | 57 | 200–260 | > 28 |
| 90/10 SPW | 10.0 | 47 | 62 | 210–270 | > 26 |
| 88/12 SPW | 9.9 | 45 | 67 | 220–280 | > 24 |

Characteristics

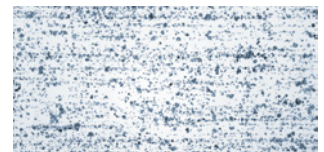
- » best anti-welding properties on make of all silver metal oxide variants up to currents of 5000 A (increasing with higher oxide content)
- » lowest erosion rate of all silver metal oxide materials for currents exceeding 100 A
- » significantly less material migration compared to Ag/CdO and Ag/ZnO
- » low contact resistance comparable to other silver metal oxides
- » special additives keep the contact resistance stable throughout the service life
- » excellent arc extinguishing properties
- » RoHS + ELV conform

Microstructure

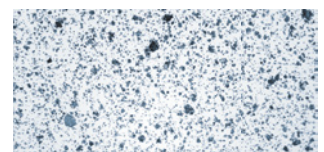
The micron sized SnO₂ particles are oriented slightly along the direction of extrusion.



Ag/SnO₂ 92/8 SPW
longitudinal section

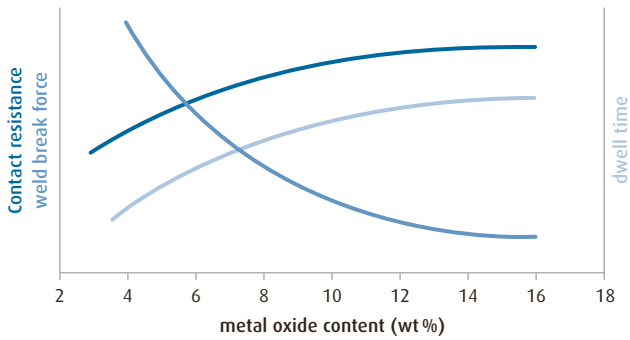


Ag/SnO₂ 88/12 SPW
longitudinal section

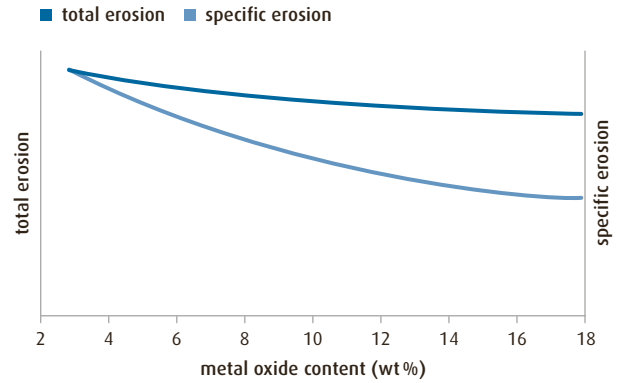


Ag/SnO₂ 88/12 SPW
cross section

Impact of Metal Oxide on Content on switching properties



Erosion Rates against Metal Oxide content



Key features of standard compositions

| Ag/SnO ₂ | DESIGNATION | CONTENT OF OXIDES [Wt-%] | ADDITIVE | SnO ₂ PARTICLES SIZE | APPLICATION | WIRES | PROFILES CONTACT TIPS | REMARK |
|---------------------|-----------------------------|--------------------------|---|---------------------------------|---|-------|-----------------------|--|
| SP | Wire Quality | 8, 10, 12, 14 | none | medium | for low loads in the current range < 25 A | X | | good workability, especially for demanding riveting |
| SPW | Standard Wire Quality | 2, 8, 10, 12 | WO ₃ | medium | for high loads in the current range < 25 A | X | | lower contact resistance, improved welding resistance |
| SPW4 | Standard Profil Quality | 8,10, 12 | WO ₃ | medium | automotive relays; contactor esp. for devices with large tips or more complex tip design, AC and DC application | | X | best workability of all profil qualities |
| SPW6 | Universal Contactor Quality | 12 | MoO ₃ | fine | AC contactors for the current range for Contactor from 20A up to 400 A | | X | material especially for contactors |
| SPW7 | Superior Profil Quality | 12 | WO ₃ Bi ₂ O ₃ | medium | contactors with high make capacities and long life time with AC3 load, automotive relays for high lamp loads | | X | best resistance against welding of all silvermetall-oxide materials |
| PMT1 | Special Wire Quality | 8, 10, 12 | Bi ₂ O ₃ | coarse | automotive relays (lamp, resistance and motor loads) | X | | high resistance against welding on make, low erosion rate with inductive loads |
| PMT3 | Superior Profil Quality | 14 | Bi ₂ O ₃ | medium | AC contactors for current range > 50 A | | X | lowest erosion rate with inductive loads, high resistance against welding |

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