

AgSnO<sub>2</sub>

# 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/SnO<sub>2</sub> 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 SnO<sub>2</sub> content is shown in the following for one type of material.

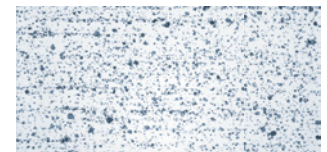
Ag/SnO <sub>2</sub>	DENSITY [g/cm <sup>3</sup> ]	ELECTRICAL CONDUCTIVITY [m/(Ω·mm <sup>2</sup> )]	HARDNESS SOFT [HV1]	TENSILE STRENGTH SOFT [MPa]	ELONGATION [%]
92/8 SPW	10.1	48	57	200–260	> 28
90/10 SPW	10.0	47	62	210–270	> 26
88/12 SPW	9.9	45	67	220–280	> 24

### Characteristics

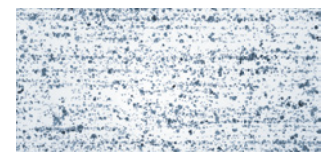
- » best anti-welding properties on make of all silver metal oxide variants up to currents of 5000 A (increasing with higher oxide content)
- » lowest erosion rate of all silver metal oxide materials for currents exceeding 100 A
- » significantly less material migration compared to Ag/CdO and Ag/ZnO
- » 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

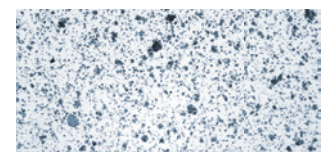
The micron sized SnO<sub>2</sub> particles are oriented slightly along the direction of extrusion.



Ag/SnO<sub>2</sub> 92/8 SPW  
longitudinal section

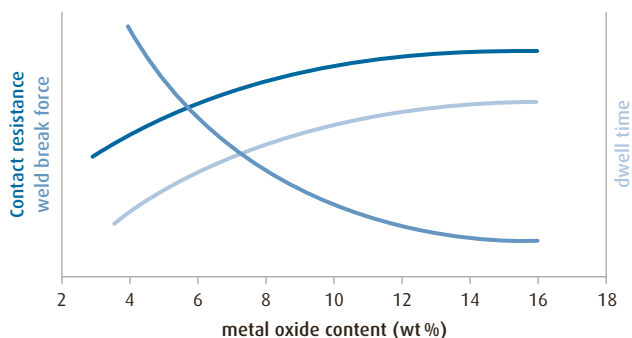


Ag/SnO<sub>2</sub> 88/12 SPW  
longitudinal section

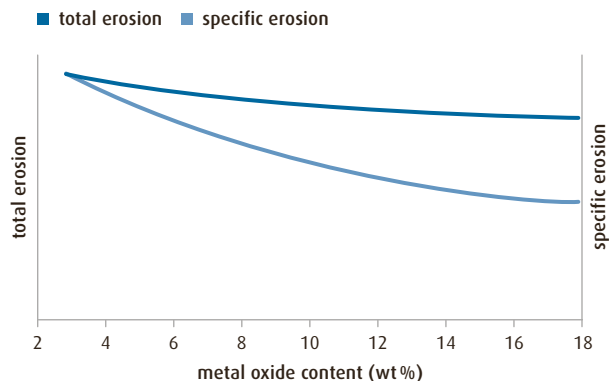


Ag/SnO<sub>2</sub> 88/12 SPW  
cross section

## Impact of Metal Oxide on Content on switching properties



## Erosion Rates against Metal Oxide content



### Key features of standard compositions

Ag/SnO <sub>2</sub>	DESIGNATION	CONTENT OF OXIDES [Wt-%]	ADDITIVE	SnO <sub>2</sub> 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 <sub>3</sub>	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 <sub>3</sub>	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 <sub>3</sub>	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 <sub>3</sub> Bi <sub>2</sub> O <sub>3</sub>	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 <sub>2</sub> O <sub>3</sub>	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 <sub>2</sub> O <sub>3</sub>	medium	AC contactors for current range > 50 A		X	lowest erosion rate with inductive loads, high resistance against welding

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