■ Electrical Contact Tips (Electrical Contact Plates)

The various internal oxidation electric contacts are manufactured by a proven internal oxidation technologies accumulated for over 20 years. We equipped the most advanced U.S. equipment for producing the contacts of AgCdO(Silver Cadmium Oxide), AgSnO2(Silver Tin Oxide), Silver Tungsten , Silver olybdenum,AgWC(Silver Tungsten Carbide), AgC(Silver Graphite) for switches, relays, breakers and magnetic contactor, etc.

●Properties of Electric Contact Tip Material

◎Environmental Electric Contact Materials

Contact Material Series	No.	Composition (%)	Hardness (Hv/HRB)		Electrical Conductivity (%IACS)	Density (g/cm^3)
$AgSnO_2$	T12	Ag 88, SnO_2 12	Hv	90~135	62	10.0
	★T13	Ag 87, SnO_2 13	Hv	110~160	54	9.9
$AgSnO_2In_2O_3$	★F11	Ag 89, $SnO_2In_2O_3$ 11	Hv	110~150	60	10.0
	F13	Ag 87, $SnO_2In_2O_3$ 13	Hv	110~155	58	9.9
AgNi	N30	Ag 70, Ni 30	Hv	85~140	70	9.5
	★N50	Ag 50, Ni 50	Hv	90~145	55	8.9
AgW	W50	Ag 50, W 50	HRB	40~70	50	13.4
	W65	Ag 35, W 65	HRB	65~95	45	14.8
	★WK50	Ag 50, W+WC 50	HRB	45~75	50	13.2
AgWC	K40	Ag 60, WC 40	HRB	55~85	58	12.0
	★K45	Ag 55, WC 45	HRB	55~85	48	12.1
	K50	Ag 50, WC 50	HRB	70~100	45	12.1
	K60	Ag 40, WC 60	HRB	70~100	40	12.4
AgWCC	★KC15	Ag 85, WC 12, C 3	Hv	50~80	60	9.5
	KC21	Ag 79, WC 18, C 3	Hv	50~95	53	9.7
	KC22	Ag 78, WC 19, C 3	Hv	50~95	50	9.7
	KC25	Ag 75, WC 22, C 3	Hv	55~95	46	9.7
	KC28	Ag 72, WC 24, C 4	Hv	60~95	45	9.7
AgC	C3	Ag 97, C 3	Hv	50~75	72	9.2

	C5	Ag 95, C 5	Hv	40~70	55	8.6
CuW	UW50	Cu 50, W 50	HRB	60~85	50	12.0
	UW60	Cu 40, W 60	HRB	60~95	48	13.1
	UW65	Cu 35, W 65	HRB	65~95	45	13.5
	★UW70	Cu 30, W 70	HRB	70~100	40	14.2
AgMo	M50	Ag 50, Mo 50	HRB	65	40	10.1
	M65	Ag 35, Mo 65	HRB	75	30	10

★ We have inventory of above standard materials for a quick delivery

◎Traditional Electric Contact Materials

Contact Material Series	No.	Composition (%)	Hardness (Hv/HRB)		Electrical Conductivity (%IACS)	Density (g/cm^3)
AgCdO	★D10	Ag 90, CdO 10	Hv	70~130	65	10.2
	D12	Ag 88, CdO 12	Hv	75~135	60	10.2
	D15	Ag 85, CdO 15	Hv	80~140	55	10.1
	★X2	Ag 86, CdO+α 14	Hv	120~180	42	10.1
	★X2G	Ag 82, CdO+α 18	Hv	100~160	54	10.0
	★X3	Ag 83, CdO+α 17	Hv	100~150	40	10.0
	NP6	Ag 82, CdO+α 18	Hv	105~155	42	10.0
	DF15	Ag 85, CdO+α 15	Hv	105~135	42	10.0

★ We have inventory of above standard materials for a quick delivery

■Common types of Electric Contact Tips

What is the most suitable dimensions and materials for different switches used under diverse electric current? It's hard to fix a formula since the structure design for numerous switching appliances all differs and the contact materials are increasingly developed. We could only make the choice according to experience from the test result. The main factors might effect the electric performance as stated below:

(1)Switch Type: For magnetic contactors, relay or circuit breaker which are tested under different test condition, the adopted contact material and size are different.

(2)Switch Structure: Such as spring press, arc-suppression design, heat-dissipation condition and breaking time should be considered while choosing material and design the contact dimensions.

(3) AC or DC: DC switches are liable to material transfer and large welding. The contact area for DC switch is required by 10%~30% larger than that used in AC ones.

(4) ElectricProperties: The main factors also include normal electric current, at-make current, voltage, electrical life, heat rising limit, etc.

■ Design Reference of Internal Oxidation Electric Contact Tips

1. Properties of Internal Oxidation Electric Contact Tips

Contact Materials	No .	Properties (Scores 1-9 from excellent to poor)		
		Anti-Erosion	Anti-Welding	Electrical Conductivity
AgCdO	D10	5	5	3
	D12	4-5	4-5	3-4
	D15	4	4	4
	X2	1-2	1-2	7-8
	X2G	1-2	1-2	7
	X3	1-2	1-2	7
	NP6	1-2	1-2	7
$AgCdOSnO_2In_2O_3$	DF15	1-2	1-2	7
$AgSnO_2In_2O_3$	F11	2-3	4	6
	F13	2	3	6-7

Remark

. 1.The comparison is made for above materials only.

2. Above table is for reference only as switch structures differ from each other. The design should be made according to test result.

2. Normal Dimension Tolerance:

(1).The oxidation process will cause the dimension-change after the contact is formed.Thus, except Ag layer tolerance is ±0.1mm., other tolerances for contact dims. below 10mm is ±0.1mm and for contact dims. over 10mm is ±0.2mm.

(2).The maximum width, length and diameter of contact is within 50mm. The limit of thickness is between 0.7mm~3.0mm.(The thickness and square measure need to be in direct ratio.)

For special type contact or contact with over 3.0mm thickness, we suggest to

produce the product by powder metallurgy method. Contact with thickness over 3mm is hard to be oxidized.

(3) For AgSnO2In2O3 contacts, the dimension suggested as below as the material is liable to be deforming after oxidation process.

F Type： Length, Width or Dia. below 5.0mm: "t" is better between 0.9mm~1.2mm;
Length, Width or Dia. over 5.0mm: "t" is better between 1.2mm~3.0mm

R Type： Length, Width or Dia. below 10.0mm: "t" is better between 1.0mm~2.0mm:
Length, Width or Dia. over 10.0mm: "t" is better between 1.5mm~2.5mm

Remark: The more contact area is, the thicker the contact thickness should be to avoid the deforming due to thickness deficient.

3. Cambered Surface (R):

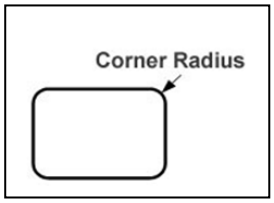
(1)Cambered surface includes：

Long-side camber, short-side camber and sphere camber. Don't use sphere camber to the utmost. Sphere camber is hard to produced because of its high hardness.

(2)The curvature of cambered surface is easily changed after being heated and oxidized,Thus, it requires bigger tolerance. The general tolerance is ±10R.

4. Corner Radius (r):

The natural formed corner radius after grinding process of oxidized contact tip is the first option, or else the normal permissible corner radius 0.3r could be adopted.

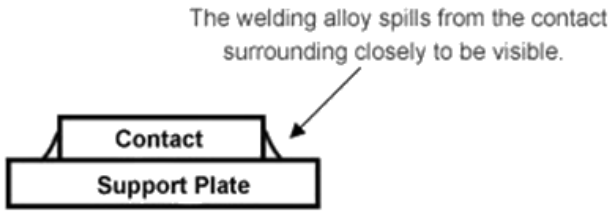


5. Brazing Alloy (Solder Backing):

(1) Cadmium-free brazing alloy such as BAg-5 & BAg-6 are recommended. But the contacts for MCCB could be brazed with BCuP-5 as MCCB requires less life cycle than other types of switches.

(2)The utility extent of brazing alloy depends on the contact area accordingly. (The bigger area is, the larger utility extent shall be.) The brazed area should be over 50% of the contact area. After being brazed, the bonding area should be more

70% of the contact area. The thickness of brazing alloy depends on the material properties. After the welding process,the welding alloy should spills from the contact surrounding closely to be visible (the thickness is between1/2 and 1/3 of the contact thickness).



■ Design Reference of Powder Metallurgy Electric Contact Tips

1. Properties of P.M. Electric Contact Tip Material:

Material Series	No.	Properties (Scores 1-9 from excellent to poor)		
		Anti-Erosion	Anti-Welding	Electrical Conductivity
AgNi	N30	5	5	3
AgW	W50	3	3	5
	W65	2	2	7
AgW+WC	WK50	3	3	5
AgW	K50	3	3	6-7
	K60	2	2	7
AgWC+C	KC15	7	3	6
	KC23	7	2	7
AgC	C5	8	2	5
CuW	UW60	4	4	7
	UW65	3-4	3-4	7
	UW70	3	3	7-8

Remark:

1. The comparison is made for above materials in table only.
2. Above table is for reference only as switch structures differ. The design should be finalized in conformity with the test result.

2. Normal Dimension Tolerance:

(1). The dimension range of length, width or diameter of powder metallurgy contact is normally between 3.5mm ~ 85mm.

(2). Contact of AgNi, AgWC+C or AgC requires re-pressing process, thus, F type is a better choice.

3. Ag Thickness (t)：

The Ag thickness of powder metallurgy contact should be over 1.0mm minimum.(The Ag layer should be increased accordingly when contact area is enlarged.) While Ag layer is below 1.0mm, we suggest to use internal oxidation contact instead. While Ag layer is over 3.0mm to maximum 15mm, we suggest to use single-press mold. (Ag layer is adjusted in accordance with the contact dimension. Ag layer thickness should be finalized only after sample-producing.)

4. Cambered Surface (R)：

(1) Cambered surface: long-side camber, short-side camber and sphere camber.

(2) The curvature of cambered surface will change after oxidation process. The general tolerance is ± 10R as it requires larger tolerance.

5. Corner Radius (r)：

Corner Radius requires at least over 0.5r. Powder metallurgy contact is crumbly. The lack of contact corner radius might cause corner collapse for square, rectangle or trapezoid shape.

6. Brazing Alloy (Solder Backing)：

(1). Cadmium-free brazing alloy - BAg-5 & BAg-6 are suggested. But the contacts for MCCB could be brazed with BCuP-5 MCCB requires less life cycle than other types of switches.

(2). The utility extent of brazing alloy depends on the contact area accordingly. (The bigger area is, the larger utility extent shall be.) The brazed area should be over 50% of the contact area. After being brazed, the bonding area should be more 70% of the contact area. The thickness of brazing alloy depends on the material properties. After the welding process, the welding alloy should spills from the contact surrounding closely to be visible (the hickness is between1/2 and 1/3 of the contact thickness).

7. Reference design of powder metallurgy contact：

(1)Tolerance of contact thickness (T):

(Contact is liable to shrink and change shape in sintering.)

Thickness(mm)	Contact Area(mm^2)	Thickness Tolerance(mm)
1.00～1.50	25～150	±0.10
1.51～2.00	25～150	±0.15
2.01～3.00	25～150	±0.20
1.00～1.50	151～200	±0.15
1.51～2.00	151～200	±0.20
2.01～3.00	151～200	±0.25
1.51～2.00	201～320	±0.20
2.01～3.00	201～320	±0.30
3.01～4.00	321～400	±0.50

(2) The tolerance for length, width or diameter is ±0.20mm.

(3) The tolerance for surface camber (R) is ±10R.

(4) Tolerances for special dimensions or dimensions out of above range is other specified.