

A vibrant, abstract background featuring swirling patterns of yellow, orange, red, green, and blue, resembling marbled paper or liquid paint.

**StanoStat products
for
Antistatic Coatings**



Keeling & Walker Ltd.:

- Based in the United Kingdom
- A part of the Amalgamated Metal Corporation
- over 100 years of manufacturing experience
- Leading manufacturer of Tin Oxides and Advanced Pigments
- ISO 9001, 14001 and 50001 certified



K&W Products:

Tin Oxide	Doped Tin Oxides	Advanced Pigments
Particle Size Range 3 nm – 500 μ m	Antimony Doped Tin Oxides	Yellow and Blue Indium Tin Oxide
High Purity 99.9 % - 99.999%	Fluorine doped Tin Oxides	Doped Tungsten Oxide
AlphaStannic Acid	Zinc Tin Oxide	Aqueous / Solvent Nano dispersions
Metastannic Acid	Calcium Tin Oxide	
Aqueous Nano dispersions	Aqueous Nano dispersions	



Antistatic / Conductive Coatings with StanoStat

Substrates:

- Glass
- Polymers
- Films
- Ink & Coatings
- Electrodes

Advantages:

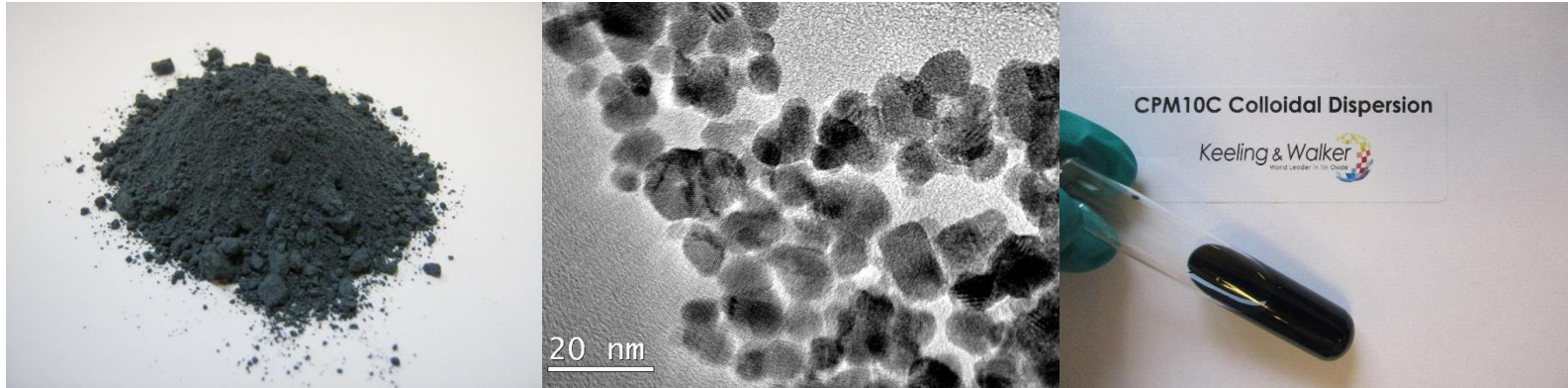
- low colour / not black
- Permanent Effect
- independent of environmental conditions
- non toxic
- easy to disperse
- thermally stable
- transparent applications possible

Disadvantages:

- high loadings ev. necessary



Antimony Tin Oxide (StanoStat CPM range):



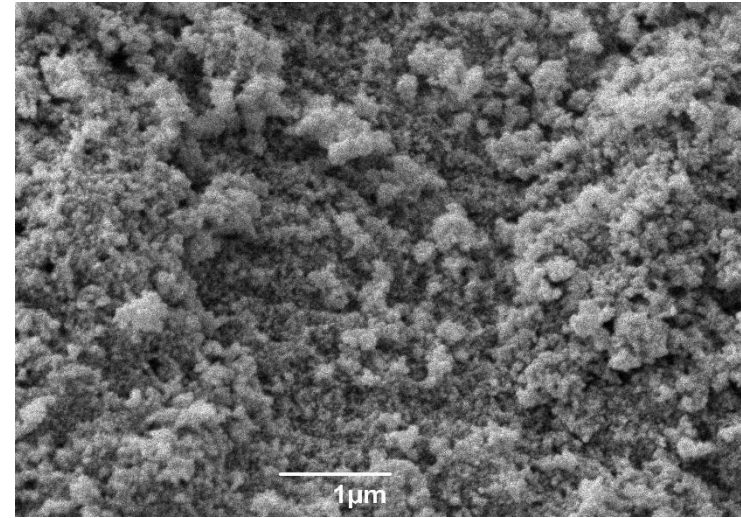
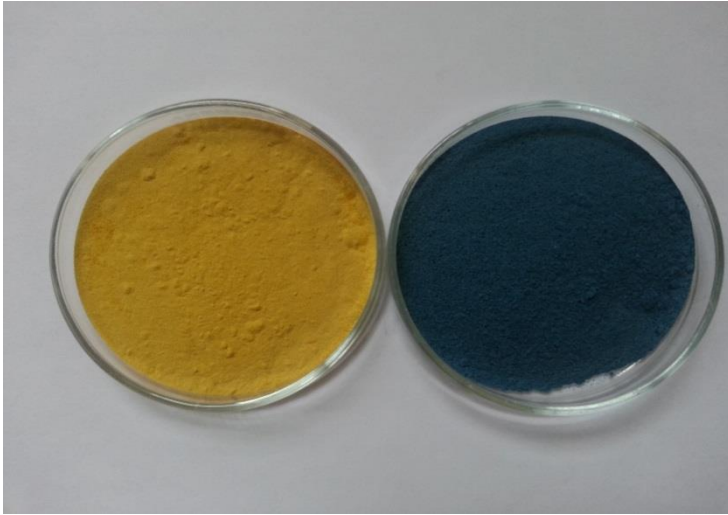
- SnO_2 / Sb_2O_5 mixed metal oxide with nano-sized primary particles
- Comprises aggregates of spherical primary particles
- Primary particle size (by TEM) 10 – 20 nm
- Easily milled in a variety of aqueous and organic media for production of nano-particulate dispersions and pastes

Applications:

- Antistatic and Infrared Light Absorbing Polymers, Films, Coatings and Inks



Indium Tin Oxide (ITO)



Yellow ITO

Composition 90% In_2O_3 / 10% SnO_2

- Surface area > 50 m^2/g (by BET method)
- Resistivity < 10 $\text{ohm}\cdot\text{cm}$

Blue ITO

Partially reduced ITO

Surface area > 35 m^2/g
Resistivity < 0.2 $\text{ohm}\cdot\text{cm}$



Fluoride Tin Oxide (FTO)



Colour Data:

Grade	L	a	b
FTO	91.4	-1.37	2.32

FTO powder:

- Light coloured
- good dispersability in coatings
- nano sized dispersions possible



Doped Tin Oxides: Chemical & Physical Properties

Type	ATO (CPM)	ATO (CP)	FTO	ITO Blue	ITO Yellow
Dopand	Sb	Sb	F	In	In
Dopand Level	0.5 – 15.0%	0.3 – 20 %	< 2 %	90 %	90%
Colour	Grey – blue	Light grey	Pale Grey-green	Dark-blue	Yellow
Thermal Stability	> 1000°C	> 1000°C	< 500°C	800°C	800°C
Conductivity	0.2 – 100 ohm.cm	< 20 ohm.cm	< 5 ohm.cm	< 0.2 ohm.cm	< 10 ohm.cm
Transparent dispersion	yes	no	no	yes	yes

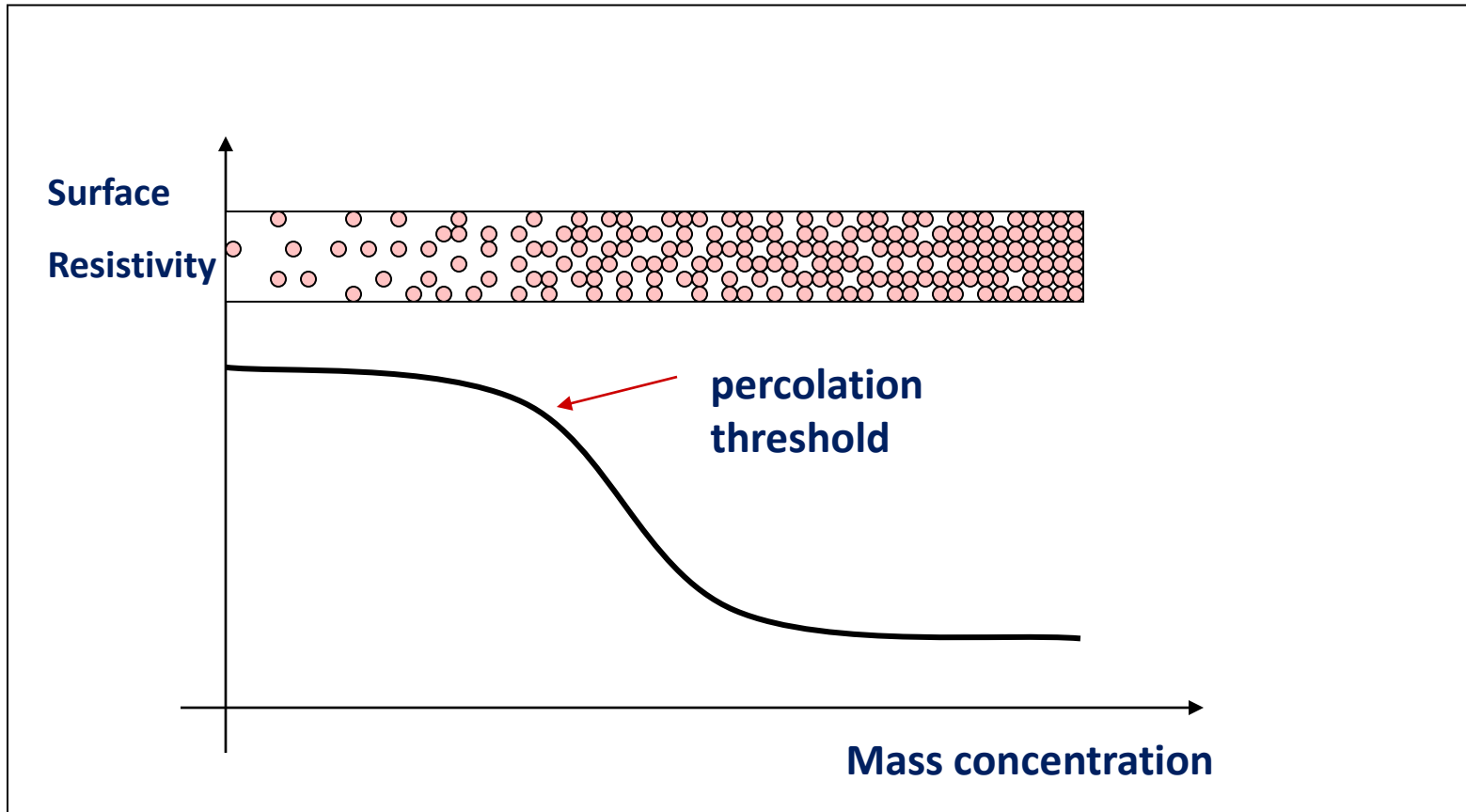


StanoStat CPM Dispersions for Antistatic Coatings:

	ATO CPM10C	ATO CPM10C	Yellow ITO	Blue ITO	CPM10M
Solvent	water	Exxsol D140	Water	Plasticizer	no
Additive	None or Aminoalcohol	Dispersant	Dispersant	Dispersant	Surface treated
pH	7-9	n.a.	n.a.	n.a.	n.a.
Primary Crystallite size	5 - 10	5 - 10	10	10 - 50	5 - 10
Solids Concentration	20 – 25%	20 -25%	20 – 25 %	20 %	100 %
					Redispersible powder

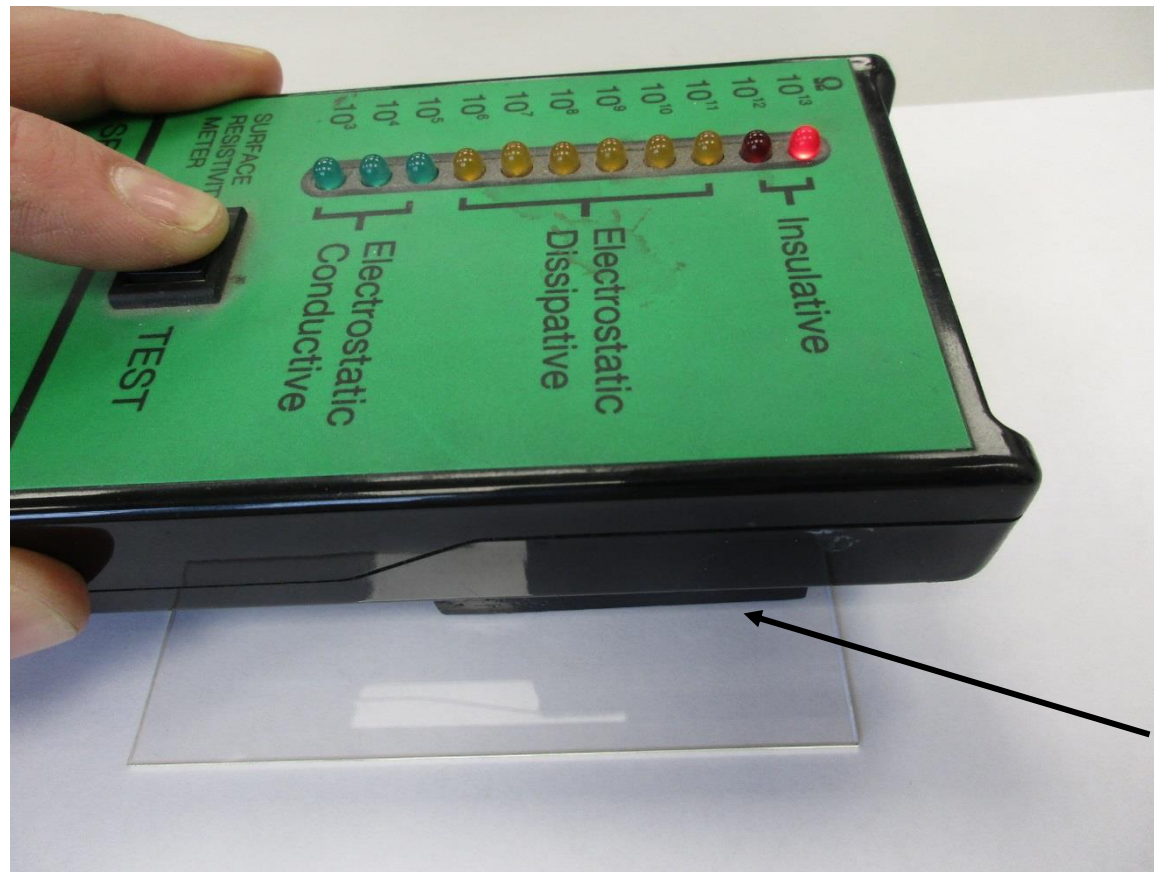


Percolation Effect





Measuring Antistatic properties with Surface Resistivity Meter



Electrodes



CPM10C Dispersion coating on Glass





Properties of binderfree annealed CPM10 films on Glass

Substrate type	Coating type	Coating method	Coating thickness nm	Annealing Type	Annealing Temperature	Sheet resistance Ohm/sq	Transmittance % at 550 nm
LCD Glass	ATO - CPM10	Dip	400	Thermal	100 C	240k	92
LCD Glass	ATO - CPM10	Dip	400	Thermal	200 C	90k	92
LCD Glass	ATO - CPM10	Dip	400	Thermal	300 C	9k	92
LCD Glass	ATO - CPM10	Dip	400	Thermal	400 C	1k	92
LCD Glass	ATO - CPM10	Dip	400	Thermal	500 C	300	91
LCD Glass	ATO - CPM10	Dip	400	Thermal	600 C	190	92
LCD Glass	ATO - CPM10	Dip	400	Thermal	700 C	170	92
LCD Glass	ATO - CPM10	Dip	600	Thermal	700 C	60	80 - 85



Resistivity of ATO coatings on films / Ω

Substrate: PVC clear film

Binder System: aqueous PU Dispersion (Witcobond)

Additive: CPM10C colloidal dispersion in water

Preparation: Draw Down with Rod #8
Wet Film Thickness: 13 μm
Drying overnight at RT

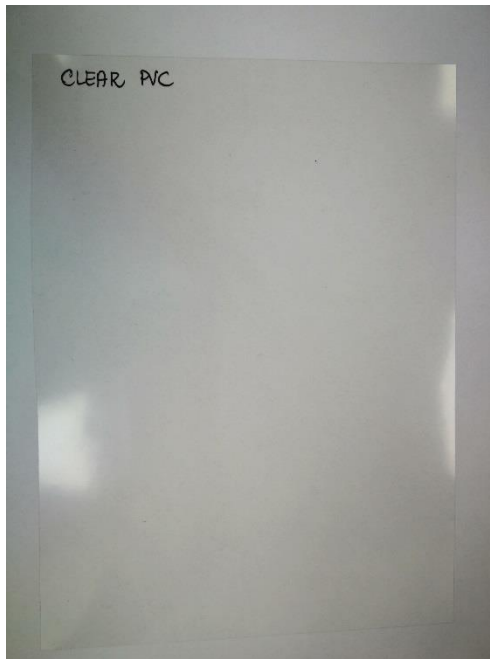
% CPM10C (solids in formulation)	% CPM10C (solids per solids in WITCOBOND)
5	2.0
10	4.0
15	5.7
20	7.5
30	11.3

% CPM10C (solids in formulation)	Surface resistance (Ohm.square)
Clear PVC	10^{12}
PVC + WITCOBOND 386-03	10^{12}
5	10^{12}
10	10^{12}
15	10^{11}
20	10^8
30	10^6

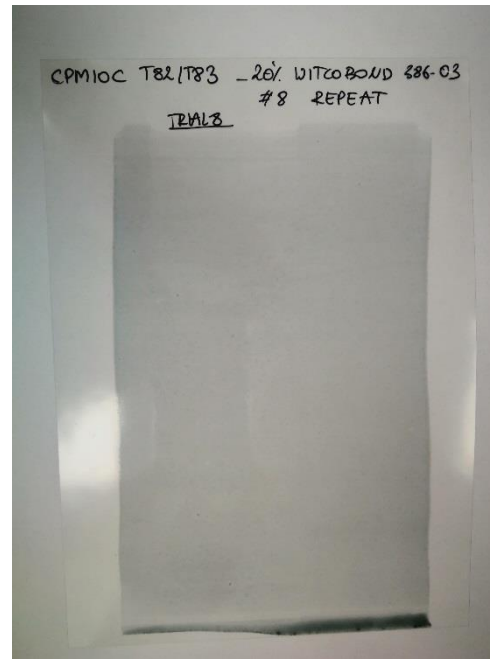


Resistivity of ATO films / Ω

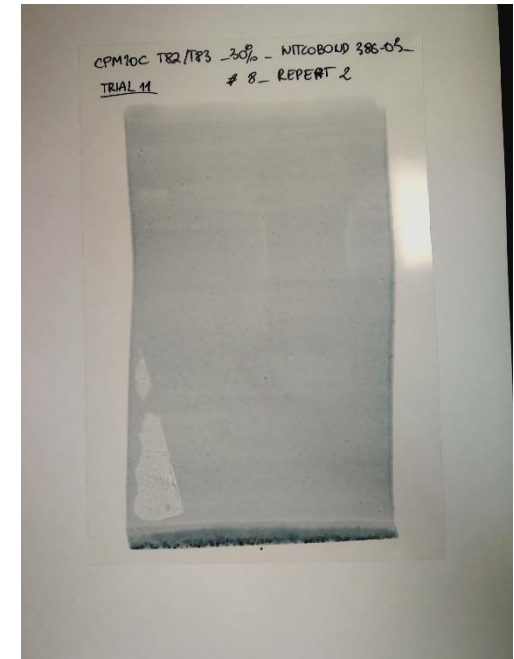
ATO loading [%]	Surface resistance [Ohm/sq]
15	1E11
20	1E8
30	1E6



Blank Film



Film coated; 20% CPM



Film coated : 30% CPM



Performance in an Solvent borne Alkyd resin system

Formulation:	Rhenaldehyd MF 4028	112 Parts
	60% in Solventnaphta	
	Bentone 38, 10 % in SN	2,2 Parts
	Disperbyk	0,3 Parts
	Solventnaphta 145 /200	18,2 Parts
	Combinationdrier 173	4,4 Parts
	Ascinin R	1,1 Parts
	StanoStat CP	variable

Processing: 1 h Scandex mixer with Glass beads
alternative:
Dispermat, 2 min. 15.000 U/min.,
Addition of 0,1 parts Airex 980 recommended

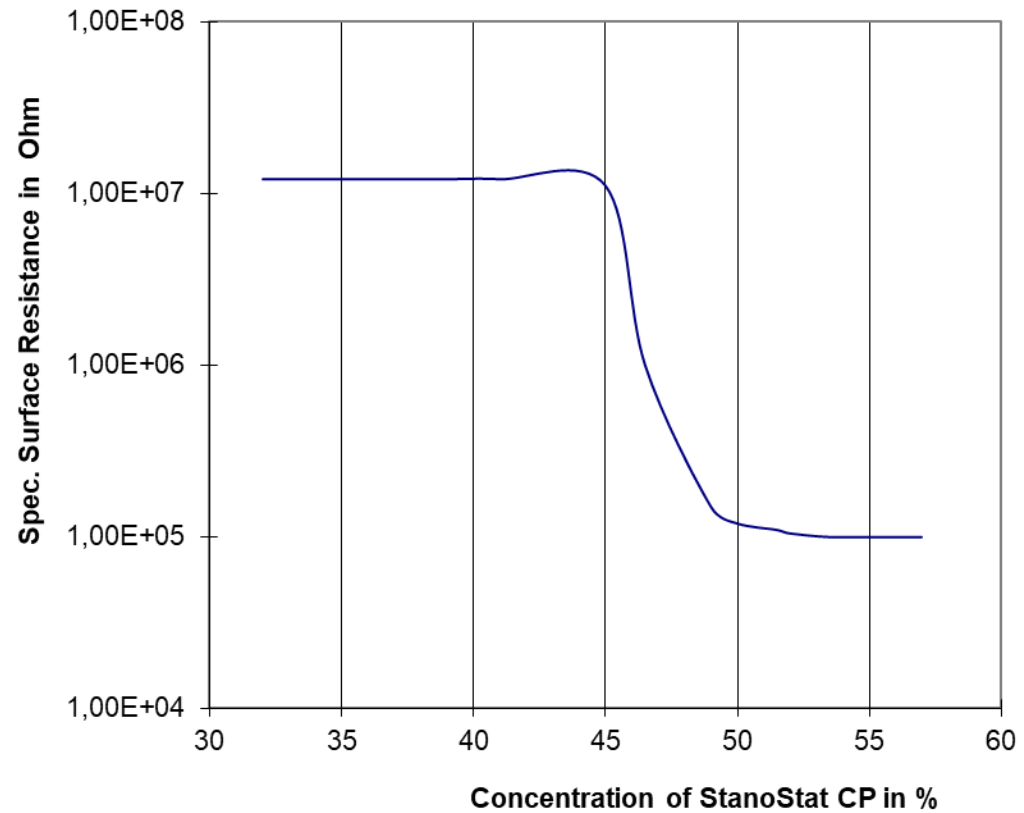
Coating Thickness: 100 µm wet

Performance: Drying Time, after 24 h dustfree



Performance in an Solvent borne Alkyd resin system

Percolationcurve:





Performance in an Solvent borne 2K Polyurethane system

Formulation:

Component A:

Joncryl 922	106 Parts
Byk 320	1 Part
Butylacetat	12,5 Part
StanoStat CP	variable

Joncryl 922	94,4 Parts
Butylacetat	86,6 Parts
DBTL	0,12 Parts
Palinol P	5 Parts

Component B:

Tolonat HDT	81,8 Parts
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Performance in an Solvent borne 2K Polyurethane system

Processing: mixing in a Dispermat,

Coating Thickness: 100 μm wet

Performance:

10% StanoStat CP on resin solids	1,2 E 12 Ohm
20% StanoStat CP on resin solids	6,2 E 11 Ohm
30% StanoStat CP on resin solids	1,8 E 11 Ohm
40% StanoStat CP on resin solids	1,4 E 7 Ohm
50% StanoStat CP on resin solids	3,0 E 6 Ohm
60% StanoStat CP on resin solids	1,7 E 6 Ohm
0 – Blank with TiO ₂ approx.1:1 on resin solids	1,1 E 11 Ohm



Summary:

Keeling & Walker is a major manufacturer of doped Tin Oxides

Key Applications for Doped Tin Oxides are:

- Heat Absorbing Films

- Antistatic Coatings

- Laser Structuring / Marking Additives

- Product Security Additives

Tailor made products is the strength of Keeling & Walker.

Thank You

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Keeling & Walker

World Leader in Tin Oxide

