Super Shield™
Silver Coated Copper Conductive Coating
843 Technical Data Sheet

843-Liquid

Description

The 843 *Silver Coated Copper Conductive Coating* is a highly conductive acrylic paint designed to reduce electromagnetic or radio frequency interference (EMI/RFI). Long-term protection from EMI/RFI is assured by its durable acrylic resin that minimizes loss of metallization through rubbing, and by the oxidation resistant silver that slows down conductivity degradation with age. In addition, loss of shielding through paint peeling is unlikely since the acrylic resin system was shown—in UL related testing—to adhere to even difficult substrates like ABS and polycarbonates.

Applications & Usages

Its primary application is to provide a reasonable cost, high-conductivity EMI/RFI shielding. It may also act as a conductive base for low temperature electroplating processes or for any other manufacturing processes where it is necessary to impart conductivity to a surface. As well, the silvered copper powder is non-magnetic, offering a low relative permeability that provides reasonable skin depths, which makes it suitable for microwave transmissions applications.

Benefits and Features

- **High Conductivity—0.0011 Ω·cm;** 0.21 Ω/sq for one coat (1.0 mil)
- **Removable and repairable thermoplastic paint system**
- **Tough and durable coat, salt spray tested with excellent weatherability**
- **Stronger adhesion than water based coatings**
- **More corrosion resistant than copper alone**
- **Median attenuation 60 dB ±18 dB** per 25.4 μm (~1.0 mil) for frequency range of 10 kHz to 18 GHz

ENVIRONMENT
Meets RoHS directive
Low-VOC

Curing & Work Schedule

Properties	*Value*
Dry to Touch (Liquid)[a)]	3 to 5 min
Recoat time (Liquid)[a)]	2 min
Full Cure @25 °C [77 °F]	24 hour
Full Cure @65 °C [149 °F]	30 min
Shelf Life	3 year
Storage Temperature Limits [b)]	-5 to +40 °C [+23 to +104°F]

a) Assumes let 1:1 let down with MG 435 or 4351 Thinner Cleaner Solvent
b) The product must stay within the storage temperature limits stated.

Service Ranges

Properties	*Value*
Service Temperature	-40 to +120 °C [-40 to +248 °F]
Maximum coverage per 900 mL[c)]	<148,000 cm^2 [<160 ft^2]
Maximum coverage per US gallon[c)]	<627,000 cm^2 [<675 ft^2]

c) Idealized estimate based on a coat thickness of 25 μm [1.0 mil] and 65% transfer efficiency

Rev. Date: 26 June 2012 / Ver. 2.03

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Principal Components

Name	***CAS Number***
Silvered Copper	*7440-22-4 + 7440-50-8*
Acrylic Resin	*9003-01-4*
Acetone	*67-64-1*
Ethanol	*64-17-5*
Toluene	*108-88-3*

Properties of Cured 843

Electric & Magnetic Properties	***Method***	***Value***	
Volume Resistivity [a)]	Method 5011.5 in MIL-STD-883H	*0.0011* Ω·cm	
Surface Resistance		*Resistance* [b)]	*Conductance* [b)]
: 1 × coat @ 0.8 mil	Square probe	0.24 Ω/sq	4.0 S
: 2 × coats @ 1.5 mil	Square probe	0.15 Ω/sq	6.9 S
: 3 × coats @ 2.2 mil	Square probe	0.09 Ω/sq	11 S
Magnetic class		Diamagnetic (Non-magnetic)	
Relative permeability		<1.0	
Shielding Attenuation[a] for 33 μm [1.0 mil]	IEEE STD 299-1997		
10 to 100 kHz	"	58 dB to 78 dB	
100 kHz to 1 MHz	"	54 dB to 65 dB	
1 MHz to 10 MHz	"	53 dB to 56 dB	
10 MHz to 100 MHz	"	47 dB to 56 dB	
100 MHz to 1 GHz	"	42 dB to 65 dB	
1 GHz to 10 GHz	"	42 dB to 56 dB	
10 GHz to 18 GHz	"	48 dB to 62 dB	

Physical Properties	***Method***	***Value***
Resin technology	—	Lacquer (Thermoplastic)
Color	Visual	Light brown
Abrasion resistant	—	Yes
Blister resistant	—	Yes
Peeling resistant	—	Yes
Water resistant	—	Yes

Environmental & Ageing Study	***Method***	***Value***
Salt Spray Test: 7 day @35 °C +Salt/Fog	ASTM B117-2011	
Cross-hatch adhesion	ASTM D3359-2009	5B = 0% area removed
Cracking, unwashed area	ASTM D661-93	None
Visual Color, unwashed area	ASTM D1729-96	Severe discoloration
Peeling, unwashed area	ASTM D1729-96	None

Note: The first coat thickness is typically around 25 μm [1.0 mil].
a) Tested by an external and independent laboratory using four point probe
b) Surface resistance is given in Ω/sq and the corresponding conductance in Siemens (S or Ω^{-1})

Surface Resistance by Coating Thickness

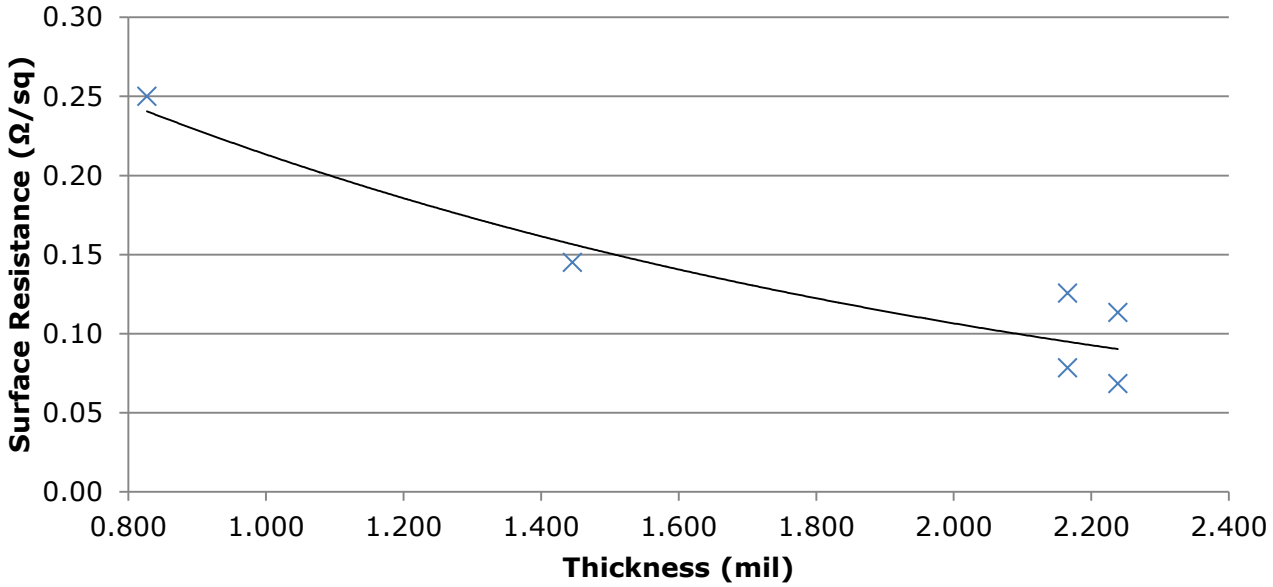


Figure 1. Silvered copper coating surface resistance at different thicknesses

Properties of Uncured 843

Physical Property	*Mixture*
Color	Brown
Density @25 °C [77 °F]	1.70 g/mL
Solids Percentage (wt/wt)[a)]	~64.5%
Viscosity @25 °C [77 °F][b)]	3,450 cP
Let down ratio (Paint:Solvent)	1:1
Flash Point	-16 °C [3.2 °F]
Odor	Ethereal

a) Percentage for liquid only (before thinning)
b) Brookfield viscometer at 100 RPM with spindle LV4

Compatibility

Chemical—The silver coated copper is quite resistant to oxidation, except in environments that contain contaminants like H_2S or ozone which tarnish its surface.

The thermoplastic resin is dissolved by common paint solvents like toluene, xylene, acetone, and MEK. This allows great coating repair and work characteristics, but it does make the coating unsuitable for solvent rich environments.

Adhesion—The 843 coating adheres to most plastics used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present, clean the surface to be coated first.

843 Adherence Compatibility

Substrate	*Note*
Acrylonitrile Butadiene Styrene (ABS)	Chemically etches[a] and adheres well to this substrate.
Polybutylene Terephtalate (PBT)	"
Polycarbonate	"
Polyvinyl Acetate (PVA)	"
Acrylics or acrylic paints	Adheres well to clean surface
Copper, lead, tin	"
Epoxy, FR4 substrate	"
Polyurethane	Adheres well to clean surface for most urethane types
Wood	Adheres well with surface preparation

a) Etching is similar to sanding, except that it also softens the surface helping to meld the paint to the plastic for superior adhesion.

ATTENTION! Use with care on thin plastics or on plastics where you want to keep original surface intact. The 843 spray contains a controlled amount of solvents designed to chemically etch plastic surfaces to help adhesion by melding the acrylic coating into the plastic substrate. This prevents flaking or peeling.

For chemically sensitive substrates, use the 4351-1L thinner lessens the etching effects.

Storage

Store between -5 °C and 40 °C [23°F and 104 °F] in dry area.

Health, Safety, and Environmental Awareness

Please see the 843 **Material Safety Data Sheet** (MSDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The volatile organic content (VOC) is 27% (466 g/L) by EPA and WHMIS standards. After dilution with 435 Thinner Cleaner, the regulated VOC drops to 19% (~210 g/L).

This product meets the European Directive
2011/65/EU Annex II (ROHS);
recasting 2002/95/EC.

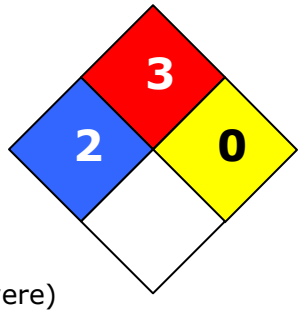
Health and Safety: The solvents in 843 can ignite if exposed to flames or sparks and can cause respiratory track irritation. If ignited, then flame flash back is possible. Use in well-ventilated area.

Solvents can cause skin irritation and have some reproductive effects. Wear safety glasses or goggles and disposable gloves to avoid exposures.

HMIS® RATING

HEALTH:	**2**
FLAMMABILITY:	**3**
PHYSICAL HAZARD:	**0**
PERSONAL PROTECTION:	

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:
0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Application Instructions

The 843 Silver Coated Copper Conductive Coating can be easily applied by the paint brush, spray gun, or dip method.

For best results, apply thin wet coats as opposed to using thick coats. We recommend a final dry film thickness of at least 1.0 mil [25 μm]. Follow the procedure below for ensure optimal conductivity.

Prerequisites

Clean and dry the surface of the substrate to remove

- Oil, dust, water, solvents, and other contaminants

Material & Equipment

- Mixing spatula
- Clean paint brush ***OR*** HPLV spray gun ***OR*** dip tank system
- Thinner/Cleaner solvent
- Personal protection equipment (See 843-Liquid MSDS)

Spray Gun Application Instructions

Read the procedure below fully and make necessary adjustments to get the required coat thickness for your needs. Typically, one coat results in a dry film thickness of roughly 0.75 to 1.25 mil [19 to 32 μm].

Spray Equipment

Use a HPLV (high-pressure low volume) spray gun using the initial settings described in the following table. Adjust these settings and recommendations as required.

Initial Setting Recommendations

Air Cap	#3 HPLV		
Pressure	*Inlet* 23 psi	*Air flow* 13.5	*Air cap* 10 psi
Fluid Tip	1.3 mm [0.051"]	1.5 mm [0.059"][a)]	

Note: These recommendations are based on a DeVilbiss FinishLine paint gun, and may differ with other brands. Please consult your spray gun manufacturer's guide.

a) If no or reduced let down is performed, this may be a better tip choice.

To apply the required thickness by weight

1. Mix paint thoroughly with mechanized paint shaker, paint mixer, or spatula.
2. Let down the paint with at a ***1:1*** (Paint:Thinner) ratio, ensuring it is well mixed.
3. Spray a test pattern. This step ensures good flow quality and helps establish appropriate distance to avoid runs.
4. At a distance of 23 to 30 cm (9 to 12 inches), spray a thin and even coat onto a vertical surface. For best results, use spray-and-release strokes with an even motion to avoid excess paint in one spot. Start and end each stroke off the surface.
5. Wait 2 to 3 minutes and spray another coat. The delay avoids trapping solvent between coats.
6. Apply additional coats until desired thickness is achieved. (Go to Step 3)
7. Let dry for 5 minutes (flash off time) at room temperature.

NOTE: Swirling the paint gun container slightly while waiting prevents settling.

ATTENTION!

- Coats that are applied too thick cause runs and hampers solvent evaporation. Prefer the application of many mist coats rather than fewer thicker wet coats.

To cure at Room temperature

- Let air dry 24 hours

To accelerate cure by heat

- After flash off, put in oven or under heat lamp at ≤65 °C for 30 min.

NOTE: Coats that are very thick require more time to dry. Heat curing ensures optimal performance.

ATTENTION! If heat curing, do not exceed 65 °C as this may cause surface defects due to solvents evaporating off too quickly.

Packaging and Supporting Products

Cat. No.	*Form*	*Net Volume*		*Net Weight*		*Shipping Weight*	
843-900ML	Liquid	0.9 L	0.24 gal	1.54 kg	3.4 lb	1.8 kg	4 lb
843-1G	Liquid	3.8 L	1.0 gal	6.4 kg	14.2 lb	7 kg	15 lb
843-140G	Aerosol	60 mL	2 fl oz	0.14 kg	3.2 oz	2 kg [a)]	4.4 lb [a)]
843-340G	Aerosol	150 mL	5 fl oz	0.34 kg	12 oz	4 kg [a)]	8.8 lb [a)]

a) Pack of 10 cans

Supporting Products

- Thinner/Cleaner 435-1L (*for quick cure and most normal substrates*)
- Thinner/Cleaner 4351-1L (*for slow cure and sensitive plastics substrates*)

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

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Warranty

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