Super Shield™ Silver Conductive Coating 842 Technical Data Sheet

842-Liquid

Description

The 842 *Silver Conductive Coating* is a one-part durable acrylic lacquer pigmented with an extremely conductive silver flake. It utilizes a solvent based system with no heat cure necessary. The cured coating is smooth, hard, and abrasion resistant. It provides good adhesion to plastics, extreme conductivity, very strong high frequency shielding, and extreme corrosion resistance, even in harsh marine environments.

Applications & Usages

The 842 is designed to provide a conductive coating to the interior of plastic electronic enclosures to suppress EMI/RFI emissions. It excels when the highest level of shielding is required.

Its effectiveness at high frequencies and thin minimum layer makes it suitable for board level applications in miniaturized electronics.

It is optimal for military, medical, or other mission critical applications where the highest levels of attenuation are essential.

The 842 is commonly used by manufacturers of these devices:

- Medical Equipment
- Military equipment
- Scientific equipment
- Test Equipment
- Communication devices
- Cellphones, laptops, PDA's
- Consumer electronics
- Automotive applications
- Aerospace applications
- Drones and other RC vehicles

Other applications for 842 include:

- Repairing damage to existing shielding
- Conductive undercoat for electroplating
- Providing electric continuity for circuits
- Circuit repair

It is a simple effective solution to impart maximum conductivity to a surface.

Benefits and Features

- **Meets MIL-STD-883H**
- **Provides extreme EMI/RFI shielding over a broad frequency range**
- **Volume resistivity of 0.0002 Ω·cm**
- **Smooth, durable, and abrasion resistant**
- **Can be applied by spray or brush**
- **Available in aerosol format**
- **Can be applied very thin, 0.5 mil minimum coating thickness**
- **Quick dry time, no heat cure required**
- **Strong adhesion to acrylic, ABS, polycarbonate, and other injection molded plastics**
- **Excellent adhesion to wood, ceramics, copper, and aluminum**
- **Extremely corrosion resistant, suitable for harsh marine environments**

ENVIRONMENT
Meets RoHS directive
Low-VOC

Usage Parameters

Properties	*Value*
Dry to Touch (Liquid) [a)]	3 to 5 min
Recoat Time (liquid) [a)]	2 min
Drying Time @25 °C [77 °F]	24 h
Drying Time @65 °C [149 °F]	30 min
Theoretical HVLP Spray Coverage [b)]	≤82 400 cm^2/L ≤8 m^2/L ≤48 300 in^2/gal ≤335 ft^2/gal
Shelf Life	1 y

a) Assumes 1:0.75 let down with MG 435 Thinner Cleaner Solvent.
b) Idealized estimate based on a coat thickness of 25 μm [1.0 mil] and 65% transfer efficiency

Temperature Ranges

Properties	*Value*
Constant Service Temperature	-40 to 120 °C [-40 to 248 °F]
Intermittent Temperature Limits	-50 to 125 °C [-58 to 257 °F]
Storage Temperature Limits [c)]	-5 to 40 °C [23 to 104 °F]

c) The product must stay within the storage temperature limits stated.

Principal Components

Name	***CAS Number***
Silver	*7440-22-4*
Acrylic Resin	*9003-01-4*
Acetone	*67-64-1*
Ethanol	*64-17-5*
Toluene	*108-88-3*

Properties of Cured 842

Electric & Magnetic Properties	*Method*	*Value*	
Volume Resistivity	Method 5011.5 in MIL-STD-883H	0.0002 Ω·cm	5 000 S/cm
Surface Resistance		*Resistance* [b)]	*Conductance* [b)]
1 coat @1 mil	square probe	0.066 Ω/sq	15 S
2 coats @2 mil	square probe	0.055 Ω/sq	18 S
2.5 coats @2.5 mil	square probe	0.040 Ω/sq	25 S
Magnetic Class		Diamagnetic (Non-magnetic)	
Relative Permeability		<1.0	
Shielding Attenuation [b)] for 50 μm [2.0 mil]	IEEE STD 299-1997		
10 to 100 kHz	"	79 dB to 88 dB	
100 kHz to 1 MHz	"	81 dB to 90 dB	
1 MHz to 10 MHz	"	52 dB to 81 dB	
10 MHz to 100 MHz	"	52 dB to 77 dB	
100 MHz to 1 GHz	"	72 dB to 85 dB	
1 GHz to 10 GHz	"	66 dB to 85 dB	
10 GHz to 18 GHz	"	66 dB to 81 dB	

Physical Properties	*Method*	*Value*
Paint Type	—	Lacquer (thermoplastic)
Color	Visual	Metallic Silver Grey
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 yellowing & discoloration
Peeling, unwashed area	ASTM D1729-96	None

Note: The first coat thickness is typically around 25 μm [1.0 mil].
a) Surface resistance is given in Ω/sq and the corresponding conductance in Siemens (S or Ω^{-1})
b) Minimum and Maximum value for range as determined by external testing by an independent laboratory.

Surface Resistance by Coating Thickness

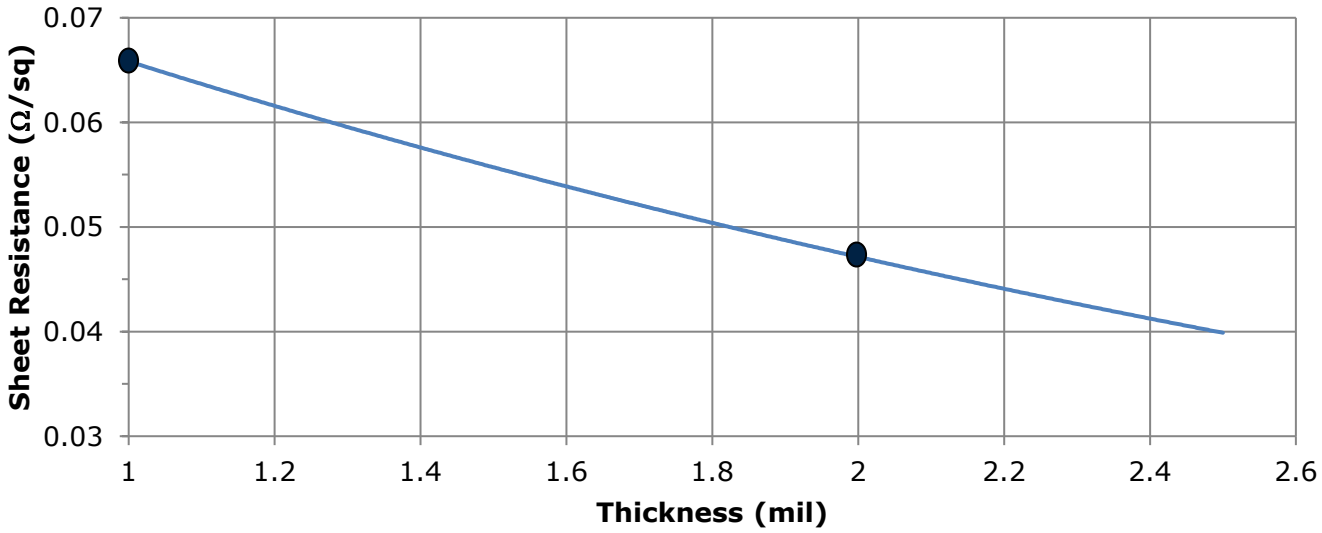


Figure 1. Silver coating surface resistance at different thicknesses (the dots indicate typical successive coat thicknesses)

Properties of Uncured 842

Physical Property	*Mixture*
Color	Silver Grey
Density @25 °C [77 °F]	2.05 g/mL
Solids Percentage (wt/wt) [a)]	73%
Viscosity @25 °C [77 °F] [b)]	≤8 000 cP
Flash Point	-16 °C [3.2 °F]
Odor	Ethereal, benzene-like

a) Percentage for liquid only (before thinning)
b) Brookfield viscometer

Compatibility

Chemical—The silver filler is quite resistant to oxidation, except in environments that contain contaminants like H_2S or ozone which tarnish its surface. Unlike many other metal oxides, silver oxide remains conductive so degradation due to oxidation is not as bad.

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 842 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.

842 Adherence Compatibility

Substrate	*Note*
Acrylonitrile Butadiene Styrene (ABS)	Chemically etches [a)] and adheres well to this substrate.
Polybutlylene 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 842 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.

Storage

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

Health, Safety, and Environmental Awareness

Please see the 842 **Safety Data Sheet** (SDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The regulated volatile organic content (VOC) is 21% (443 g/L) by EPA and WHMIS standards. After dilution with 435 Thinner Cleaner, the regulated VOC drops to 16% (~200 g/L).

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

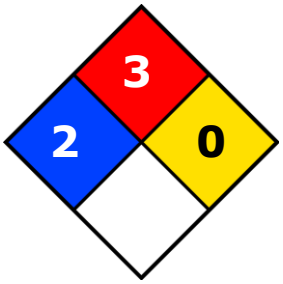
Health and Safety: The solvents in 842 can ignite if exposed to flames or sparks and can cause respiratory track irritation. If ignited, then flame flash back is possible. Use in well-ventilated area.

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 842 Silver Conductive Coating can be easily applied by the paintbrush, 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.

Material & Equipment

- Mixing spatula
- Clean paint brush ***OR*** HVLP spray gun ***OR*** dip tank systems
- Liquid agitator, agitated pot, or recirculation system
- Thinner/solvent
- Personal protection equipment (See 842-Liquid SDS)

Paint Dilution Ratios

For brush applications, the MG conductive paints are ready-to-use without dilution. You may however dilute it to help achieve better coat leveling and easier brush application.

For spray application, we recommend a 1:0.75 paint-to-thinner ratio as a starting point. To achieve the best results, adjust this dilution ratio based on the equipment and operator's preferences. The recommended thinner is the MG 435 Thinner.

Surface Preparation

Clean oil, dust, water, solvents, and other contaminants and let the surface dry fully.

Spray Gun Application Instructions

Read the procedure below fully and make necessary adjustments to get the required coat thickness for your needs. For a 2:1 dilution, one spray coat typically results in a dry film thickness of roughly 1.0 mil [25 μm].

Spray Equipment

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

Initial Setting Recommendations

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

Note: These recommendations are based on a generic paint gun and may differ by brands. Please consult your spray gun manufacturer's guide.

a) SCFM = standard cubic foot per minute

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

To apply the coating

1. Mix paint thoroughly with mechanized paint shaker, paint mixer, or spatula.
2. Let down the paint with a ***1:0.75*** (Paint:Thinner) ratio.
3. Make a test spray. Adjust the spray settings for best flow and spray quality, and establish an appropriate distance to avoid paint runs. A distance between 23 to 30 cm (9 to 12 in) is recommended.
4. Spray a thin and even coat onto a vertical surface to be coated. For best results, start your movement off-surface, press the trigger, and only release off-surface at the end of the stroke. Use a uniform movement of the spray gun parallel to the surface.
5. Wait 3 to 5 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: Ideally, your spray gun will be equipped with liquid agitation system. If not, swirling the paint gun container slightly in between spray applications slows settling.

ATTENTION! Spraying overly thick coats may cause paint runs and hamper solvent evaporation. Prefer the application of many thin 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.	*Packaging*	*Net Volume*		*Net Weight*		*Packaging Weight*	
842-20G	Jar	9.52 mL	0.32 fl oz	20 g	0.70 oz	0.8 kg [a)]	1.6 lb [a)]
842-250G	Can	119 mL	4.02 fl oz	250 g	8.81 oz	2.9 kg [a)]	6.4 lb [a)]
842-900ML	Can	900 mL	30.4 fl oz	1.89 kg	4.16 lb	1.8 kg	4.0 lb
842-1G	Can	3.78 L	127 fl oz	7.93 kg	17.5 lb	7.0 kg	15 lb

a) Pack of 10 cans

Thinners & Conductive Coating Removers

- *Thinner*: Cat. No. 435-1L, 435-4L
- *Thinner 2*: Cat. No. 4351-1L, 4351-4L

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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