

Description

The 841 *Super Shield Nickel Conductive Coating* is a one-part durable acrylic lacquer pigmented with a highly conductive nickel flake. It utilizes a solvent based system with no heat cure necessary. The cured coating is smooth, hard, and abrasion resistant. It provides strong adhesion to plastics, excellent conductivity, and strong corrosion resistance, even in marine environments.

Applications & Usages

The 841 is designed to provide a conductive coating to the interior of plastic electronic enclosures to suppress EMI/RFI emissions. It excels when corrosion resistance is a concern.

The 841 is commonly used by manufacturers of these devices:

- Sensors
- Controllers
- Receivers
- Test Equipment
- Scientific equipment
- Medical Equipment
- Communication devices
- Satellite dishes and radar systems
- Antennas
- Aerospace applications
- Electric vehicles
- Cable boxes
- Networking gear, firewalls
- Military equipment
- Cellphones, laptops, PDA's
- GPS's, navigation systems
- TV's, monitor's, and displays
- Consumer electronics
- Electronic sporting equipment
- Audio equipment
- Electric guitars and other amplified instruments
- Drones and other RC vehicles

Other applications for 841 include:

- Repairing damage to existing shielding
- Conductive undercoat for electroplating
- Protecting metal surfaces from oxidation
- Providing electric continuity for circuits
- Grounding

Benefits and Features

- **UL Recognized** (File # [E202609](#))
- **Tested in compliance with IEEE Std. 299-1997**
- **Provides effective EMI/RFI shielding over a broad frequency range**
- **Volume resistivity of 0.0042 Ω·cm**
- **Smooth, durable, and abrasion resistant**
- **Can be applied by spray or brush**
- **Available in aerosol format**
- **Quick dry time, no heat cure required**
- **Mild solvent system, safe on polystyrenes**
- **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
RoHS Compliant
Low-VOC



ISO 9001 Registered Quality System.
Burlington, Ontario, Canada QMI File # 004008

Super Shield™ Nickel Conductive Coating 841 Technical Data Sheet

841-Liquid

Usage Parameters

<i>Properties</i>	<i>Value</i>
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
Shelf Life	3 y
Theoretical HVLP Spray Coverage ^{b)}	≤84 500 cm ² /L ≤8.4 m ² /L ≤49 500 in ² /gal ≤345 ft ² /gal

a) Assumes let 1:1 let down with MG 435 or 4351 Thinner Cleaner Solvent

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

Temperature Ranges

<i>Properties</i>	<i>Value</i>
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
Nickel Flake (high purity)	7440-02-0
Acrylic Resin	9003-01-4
Talc	14807-96-6
Toluene	108-88-3
Acetone	67-64-1

Properties of Cured 841

<i>Electric Properties</i>	<i>Method</i>	<i>Value</i>	
Volume Resistivity ^{a)}	Method 5011.5 in MIL-STD-883H	<i>Resistance</i> ^{b)} 0.0042 Ω·cm	<i>Conductance</i> ^{b)} 240 S/cm
Surface Resistance			
1 coat @~1.5 mil	Square probe	≤0.60 Ω/sq	1.7 S
2 coats @~3.0 mil	Square probe	≤0.25 Ω/sq	4.0 S
3 coats @~4.5 mil	Square probe	≤0.15 Ω/sq	6.7 S
Magnetic Class		Ferromagnetic (magnetic)	
Relative Permeability		≥100	
Shielding Attenuation ^{c)} for 50 µm [2 mil]	IEEE STD 299-1997		
10 to 100 kHz	"	79 dB to 88 dB	
>100 kHz to 1 MHz	"	53 dB to 88 dB	
>1 MHz to 10 MHz	"	19 dB to 53 dB	
>10 MHz to 100 MHz	"	19 dB to 39 dB	
>100 MHz to 1 GHz	"	36 dB to 49 dB	
>1 GHz to 10 GHz	"	32 dB to 48 dB	
>10 GHz to 18 GHz	"	30 dB to 48 dB	

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)



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c) Shield attenuation (with respect to a reference sample without shield isolation) is given for adjacent frequency ranges and provides the minimal and maximal value registered within these ranges.

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Paint Type	—	Lacquer (Thermoplastic)
Color	Visual	Steel grey
Abrasion Resistant	—	Yes
Blister Resistant	—	Yes
Peeling Resistant	—	Yes
Water and Salt Spray Resistant	—	Yes
<i>Environmental & Ageing Study</i>	<i>Method</i>	<i>Value</i>
Salt Spray Test: 7 day @35 °C +Salt/Fog	ASTM B117-2011	5B = 0% area removed
Cross-Hatch Adhesion	ASTM D3359-2009	
Cracking, unwashed area	ASTM D661-93	
Visual Color, unwashed area	ASTM D1729-96	
Peeling, unwashed area	ASTM D1729-96	

Note: One coat thickness is typically around 38 µm [1.5 mil].

Surface Resistance by Coating Thickness

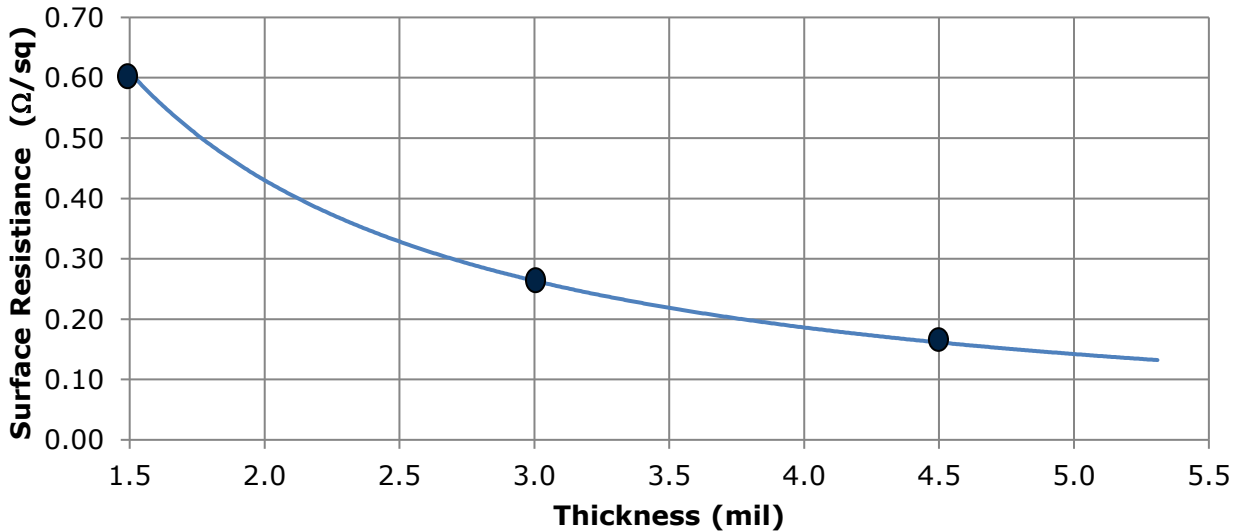


Figure 1. Nickel conductive coating surface resistance at different thicknesses (the dots indicate typical successive coat thicknesses)



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Properties of Uncured 841

<i>Physical Properties</i>	<i>Mixture</i>
Color	Dark Grey
Viscosity @25 °C [77 °F] ^{a)}	≤3 920 cP [3.92 Pa·s]
Density	1.67 g/mL
Solids Percentage (wt/wt)	65%
Flash Point ^{b)}	-18 °C [-0.4 °F]
Odor	Ethereal

a) Brookfield viscometer at 30 RPM with spindle LV4

b) Based on flash point acetone

Compatibility

Chemical—Nickel has good resistance to oxidation in a variety of corrosive environments, including marine environments. In normal atmosphere or freshwater, nickel typically corrodes less than 0.0025 mm per year. Since nickel forms a passive protective film on its surface that slows down or stops further corrosion, the passive nickel resists corrosion better than pure copper fillers. In addition, nickel is harder than its silver or copper filled counterparts, helping provide greater durability.

The thermoplastic acrylic resin is incompatible common paint solvents like toluene, xylene, acetone, and MEK. Further, it will not withstand chronic exposures to engine oils, fuels and other similar hydrocarbons. While this makes the coating unsuitable for solvent rich environments, it does offers great repair and rework characteristics.

Adhesion—The 841 coating adheres to ABS, PBT, and most materials found on 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.

841 Adherence Compatibility

<i>Substrate</i>	<i>Note</i>
Acrylonitrile Butadiene Styrene (ABS)	UL tested substrate, superior adhesion ^{a)}
Polybutylene Terephthalate (PBT)	UL tested substrate, superior adhesion ^{a)}
Acrylics or Acrylic Paints	Adheres well to clean surface ^{a)}
Polycarbonate	Adheres well to clean surface ^{a)}
Polyvinyl Acetate (PVA)	Adheres well to clean surface ^{a)}
Polyurethane	Adheres well to clean surface for most urethane types
Wood	Adheres well with surface preparation

a) Adhesion is improved through chemical etchants. Etchants normally removes the need for extra surface preparation steps. Etchant have similar effect to sanding, except that it not only roughens but it also softens the surface helping the paint meld directly into the plastic for superior adhesion.

ATTENTION! Use with care on thin plastics or on plastics where you want to keep original surface intact. The 841 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 and 40 °C [23 and 104 °F] in dry area.

Health, Safety, and Environmental Awareness

Please see the 841 **Safety Data Sheet** (SDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The volatile organic content (VOC) is 27.5% (453 g/L) by EPA and WHMIS standards. After dilution with 435 Thinner Cleaner, the regulated VOC drops to 19% (~310 g/L).



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

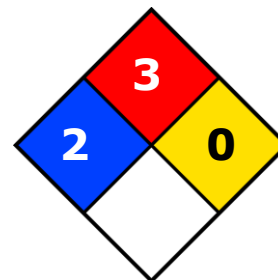
Health and Safety: The solvents in 841 can ignite if exposed to flames or sparks and can cause respiratory track irritation. Use in well-ventilated area.

Solvents and Nickel can cause skin irritation or allergies. Wear safety glasses or goggles and disposable gloves to avoid exposures. Do not ingest.

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 841 Super Shield can be easily applied by the paintbrush, spray gun, or dip method.

NOTE: In all cases, the mixture should be kept slightly agitated during use to avoid premature settling of the solids.

For best results, apply many thin coats as opposed to using fewer thick coats. We recommend a coat with a dry film thickness of roughly 1.5 mil [33 µm]. Follow the procedure below for ensure optimal conductivity.



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Prerequisites

Clean and dry the surface of the substrate to remove

- Oil, dust, water, solvents, and other contaminants
- Mixing spatula
- Clean paint brush **OR** HPLV spray gun **OR** dip tank system
- Thinner/Cleaner solvent
- Personal protection equipment (See 841-Liquid SDS)

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 1 to 1.5 mil [25 to 38 µm].

Spray Equipment

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

Initial Setting Recommendations

Air Cap	#3 HVLP		
Pressure	<i>Inlet</i> 23 psi	<i>Air flow</i> 13.5 SCFM ^{a)}	<i>Air cap</i> 10 psi
Fluid Tip	1.3 mm [0.051"]	1.5 mm [0.059"] ^{b)}	

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) 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 a spatula or with mechanized paint mixer.
2. Let down the paint with at a **1:1** (Paint:Thinner) ratio.
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.



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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.
- Spraying onto horizontal surfaces is not recommended due to possible uneven settling of metallic filler.

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.

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

<i>Cat. No.</i>	<i>Packaging</i>	<i>Net Volume</i>		<i>Net Weight</i>		<i>Packaging Weight</i>	
841-900ML	Can	900 mL	30.4 fl oz	1.49 kg	3.3 lb	1.9 kg	4.2 lb
841-1G	Can	3.6 L	0.96 gal	5.99 kg	13.2 lb	7.0 kg	15 lb
841-340G	Aerosol	277 mL	9.36 fl oz	340 g	11.9 lb	0.3 kg ^{a)}	0.6 lb ^{a)}

a) Pack of 6 cans

Thinners & Conductive Coating Removers

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



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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

M.G. Chemicals Ltd. warrants this product for 12 months from the date of purchase by the end user. *M.G. Chemicals Ltd.* makes no claims as to shelf life of this product for the warranty. The liability of *M.G. Chemicals Ltd.* whether based on its warranty, contracts, or otherwise shall in no case include incidental or consequential damage.

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