

## Description

The 838 *Total Ground Carbon Conductive Coating* is an economical acrylic paint that is used to create conductive, static free surfaces. Coated surfaces also serve to reduce electromagnetic or radio frequency interference (EMI/RFI) to some degree. The durable acrylic resin affords long-term protection that minimizes loss of carbon through rubbing. The cured coat withstands large temperature changes and marine environmental conditions without cracking, which makes it suitable for a wide range of application.

## Applications & Usages

Its primary applications are to ground working surfaces and to avoid static, but it can also be used to provide low cost EMI/RFI shielding, as a conductive base for some electroplating process, or anywhere in a manufacturing process where it is necessary to impart conductivity to a surface.

## Benefits and Features

- **Conductive Material Classification—Low Surface resistivity** of 250  $\Omega$ /sq for one coat (1 mil)
- **Tough and durable coating, salt spray tested with excellent weatherability**
- **Repairable and removable thermoplastic paint system**
- **Stronger adhesion than water based coatings**
- **Corrosion-proof coat**—slows or prevents substrate oxidation
- **Rub off resistant**

**ENVIRONMENT**  
Meets RoHS directive

## Curing & Work Schedule

<i>Properties</i>	<i>Value</i>
Dry to Touch (liquid) <sup>a)</sup>	3 to 5 min
Recoat time (liquid) <sup>a)</sup>	5 min
Full Cure at room temp.	24 h
Full Cure at 65 °C	30 min
Shelf Life	3 y
Storage Temperature Limits <sup>b)</sup>	-5 to +40 °C [+23 to +104°F]

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

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

## Service Ranges

<i>Properties</i>	<i>Value</i>
Service Temperature	-40 to +120 °C [-40 to +248 °F]
Maximum coverage for 25 $\mu$ m [1.0 mil] <sup>b)</sup>	<70,000 cm <sup>2</sup> [<75 ft <sup>2</sup> ]

c) Theoretical coverage per Liter assuming 50% transfer efficiency.

## Principal Components

<b>Name</b>	<b>CAS Number</b>
Carbon Black	1333-86-4
Acrylic Resin	9003-01-4
Acetone	67-64-1
Ethanol	64-17-5
Toluene	108-88-3

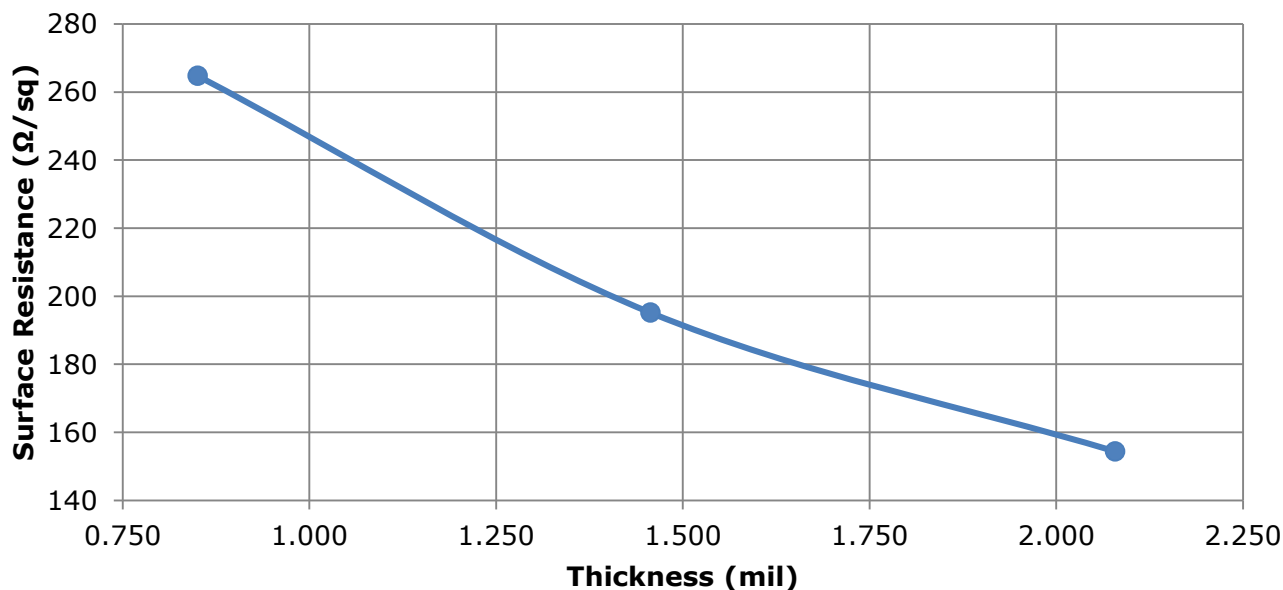
## Properties of Cured 838

<i>Electric Properties</i>	<i>Method</i>	<i>Value</i>
Surface Resistance : 1 × coat @ 1.0 mil : 2 × coats @ 1.5 mil : 3 × coats @ 2.0 mil	Square probe Square probe Square probe	<i>Resistance</i> <sup>a)</sup> <i>Conductance</i> <sup>a)</sup> 250 Ω/sq        3.8 mS 190 Ω/sq        5.1 mS 160 Ω/sq        6.5 mS
<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Color Paint type Abrasion resistant Blister resistant Peeling resistant	Visual — — — —	Greyish Black Lacquer (thermoplastic) Yes Yes Yes
<i>Environmental &amp; Ageing Study</i> <sup>a)</sup>	<i>Method</i>	<i>Value</i>
Salt Spray Test: 7 day @35 °C +Salt/Fog Cross-hatch adhesion Cracking, unwashed area Visual Color, unwashed area Peeling, unwashed area	ASTM B117-2011 ASTM D3359-2009 ASTM D661-93 ASTM D1729-96 ASTM D1729-96	5B = 0% area removed None Unchanged None

Note: The first coat thickness is typically around 25 μm [1 mil].

a) Surface resistance is given in Ω/sq and the corresponding conductance in Siemens (S or Ω<sup>-1</sup>)

## Surface Resistance by Coating Thickness



**Figure 1.** Carbon conductive coating surface resistance for one, two, and three coats thickness (the dots indicate typical successive coat thicknesses)



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## Properties of Uncured 838

<i>Physical Property</i>	<i>Mixture</i>
Color	Greyish Black
Density	0.902 g/mL
Solids Percentage (wt/wt) <sup>a</sup>	~17.9%
Flash Point	-16 °C [3.2 °F]
Odor	Ethereal

a) Percentage for liquid only (without propellant)

## Compatibility

**Chemical**—Carbon doesn't oxidize or deteriorate under a normal environment and conditions, including marine environments as seen by the salt spray test results (see page 2).

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 offer great repair and rework characteristics.

**Adhesion**—The 838 coating adheres to most materials 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.

## 838 Adherence Compatibility

<i>Substrate</i>	<i>Note</i>
Acrylonitrile Butadiene Styrene (ABS)	<i>Chemically etches <sup>a)</sup> and adheres well to this substrate.</i>
Polybutylene Terephthalate (PBT)	"
Polycarbonate	"
Polyvinyl Acetate (PVA)	"
Acrylics or acrylic paints	Adheres well to clean surface
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!** Do not use on thin plastics or on plastics where you want to keep original surface intact. The 838 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. Using the 4351-1L thinner lessens the etching effects for chemically sensitive substrates.

## Storage

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

## Health, Safety, and Environmental Awareness

Please see the 838 **Safety Data Sheet** (SDS) for greater details on transportation, storage, handling and other security guidelines.

**Environmental Impact:** The volatile organic content is 57% (517 g/L) by EPA and WHMIS standards. After dilution with 435 Thinner Cleaner, the regulated VOC drops to 34% (~330 g/L).

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

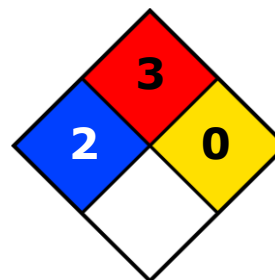
**Health and Safety:** The solvents in 838 can ignite if exposed to flames or sparks and can cause respiratory track irritation. If ignited, then flame flash back is possible. Use in well-ventilated area.

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

### HMIS® RATING

<b>HEALTH:</b>	* 2
<b>FLAMMABILITY:</b>	3
<b>PHYSICAL HAZARD:</b>	0
<b>PERSONAL PROTECTION:</b>	

### 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 838 Total Ground™ Carbon 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.

### 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** HVLP spray gun **OR** dip tank system
- Thinner/Cleaner solvent
- Personal protection equipment (See 838-Liquid safety data sheet)

## 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 mil [25 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

<b>Air Cap</b>	#3 HVLP		
<b>Pressure</b>	<i>Inlet</i> 23 psi	<i>Air flow<sup>b)</sup></i> 13.5	<i>Air cap</i> 10 psi
<b>Fluid Tip</b>	1.3 mm (1.5 mm) <sup>a)</sup>		

*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.

b) SCFM = standard cubic foot per minute

### To apply the required thickness by weight

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.

### 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 heat cure

- Wait 20 min or more for the coating to be dry to handle.
- Put in an oven or under heat lamp at 65 °C for 30 min.



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

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838-Liquid

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

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## Packaging and Supporting Products

<i>Cat. No.</i>	<i>Form</i>	<i>Net Volume</i>	<i>Net Weight</i>	<i>Shipping Weight</i>
<b>838-900ML</b>	Liquid	0.9 L 0.24 gal	0.81 kg 1.8 lb	1.2 kg 2.7 lb
<b>838-1G</b>	Liquid	3.8 L 1.0 gal	3.4 kg 7.5 lb	5.1 kg 15 lb

## Supporting Products

- Thinner—Cat No. 435-1L, 435-4L (*for quick cure and most normal substrates*)
- Thinner 1—Cat No. 4351-1L, 4351-4L (*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](http://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.

## Disclaimer

This information is believed to be accurate. It is intended for professional end users having the skills to evaluate and use the data properly. *M.G. Chemicals Ltd.* does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred while using it.