

Total Ground™ Carbon Conductive Coating

Description

838AR is an economical conductive coating that consists of a one-part, solvent-based acrylic lacquer, pigmented with highly conductive carbon powder. It is smooth, durable, and abrasion resistant. It has a quick dry time, with no heat cure necessary. It adheres strongly to most injection-molded plastics, such as ABS, PBT and PVA. It provides strong corrosion resistance and is suitable for use in marine environments.

838AR is excellent for creating grounded surfaces and in low frequency RFI shielding applications, such as pickup cavities on electric guitars. It is also perfect for shielding metal detectors and other devices where a metal-filled conductive coating would cause malfunction.

Features and Benefits

- Provides >50 dB of RFI shielding at frequencies <1 MHz
- Surface resistance of 0.69 Ω /sq for one coat (~1 mil)
- Quick dry time, no heat cure required, and easy to apply
- Mild solvent system, and safe on polystyrenes
- HAP free—does not contain toluene or xylene

Usage Parameters

Properties	Value
Touch dry or recoat time	3 min
Full cure @22 °C [72 °F]	24 h
Full cure @65 °C [149 °F]	30 min
Shelf life	3 y
Theoretical 340G spray can coverage ^{a)}	≤1 520 cm ² [≤236 in ²]

a) Estimate based on a coat thickness of 50 μ m [2.0 mil] and 50% transfer efficiency

Temperature Ranges

Properties	Value
Constant service temperature	-40–120 °C [-40–248 °F]
Intermittent temperature limit	-50–125 °C [-58–257 °F]
Storage temperature limits	-5–40 °C [23–104 °F]

Cured Properties

Electric & Magnetic Properties	Method	Value
Resistivity	Method 5011.5 in MIL-STD-883H	0.69 Ω ·cm [1.4 S/cm]
Surface resistance ^{a)} 1 coat @0.7 mil 2 coats @1.5 mil 3 coats @2.0 mil	Square probe Square probe Square probe	215 Ω /sq 110 Ω /sq 84 Ω /sq
Magnetic class	—	Diamagnetic (non-magnetic)
Relative permeability	—	<1.0
Shielding attenuation, 51 μ m [2.0 mil] >10–100 kHz >100 kHz–1 MHz >1–10 MHz >10–100 MHz >100 MHz–1 GHz >1–10 GHz >10–18 GHz	IEEE STD 299-1997 IEEE STD 299-1997 IEEE STD 299-1997 IEEE STD 299-1997 IEEE STD 299-1997 IEEE STD 299-1997 IEEE STD 299-1997	84–88 dB 52–74 dB 14–46 dB 0–6 dB 6–14 dB 5–11 dB 6–12 dB

a) Surface resistance is given in Ω /sq and the corresponding conductance in Siemens (S or Ω^{-1}).

Cured Properties

Physical Properties	Method	Value
Paint type	—	Lacquer (thermoplastic)
Color	Visual	Black
Abrasion resistant	—	Yes
Blister resistant	—	Yes
Peeling resistant	—	Yes
Water resistant	—	Yes
Mechanical Properties	Method	Value
Adhesion (ABS)	ASTM D 3359	5B
(PC)	ASTM D 3359	5B
(PVC)	ASTM D 3359	5B
(Polyamide)	ASTM D 3359	0B
(Glass)	ASTM D 3359	0B
(Copper)	ASTM D 3359	3B
(Aluminum)	ASTM D 3359	0B
(Stainless steel)	ASTM D 3359	1B
(FR4)	ASTM D 3359	3B
(PP)	ASTM D 3359	0B
Pencil hardness (ABS)	ASTM D 3363	H, hard
Environmental & Ageing Study	Method	Value
Salt fog test @35 °C [95 °F], 96 h ^{a)}	ASTM B 117-2011	
Surface resistance before	MG-ELEC-120	70 Ω/sq
Surface resistance after	MG-ELEC-120	70 Ω/sq
Cross-hatch adhesion	ASTM D 3359-2009	5B
Cracking, unwashed area	ASTM D 661-93	None
Visual color, unwashed area	ASTM D 1729-96	No change

a) HVLP spray gun application on ABS coupons.

Surface Resistance by Coating Thickness

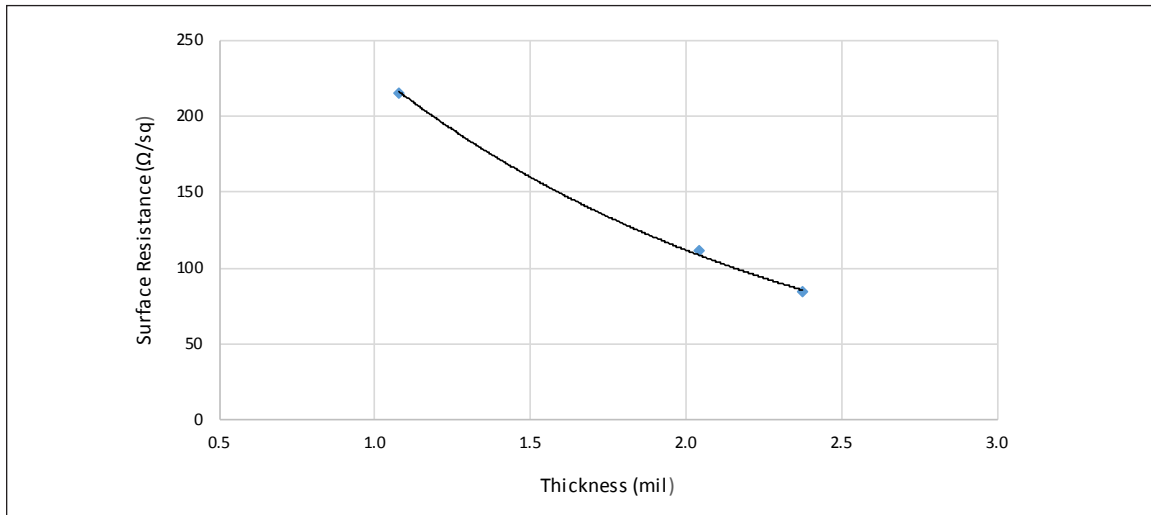


Figure 1. Carbon coating surface resistance at different thicknesses (the dots indicate typical successive coat thicknesses).

Shielding Attenuation

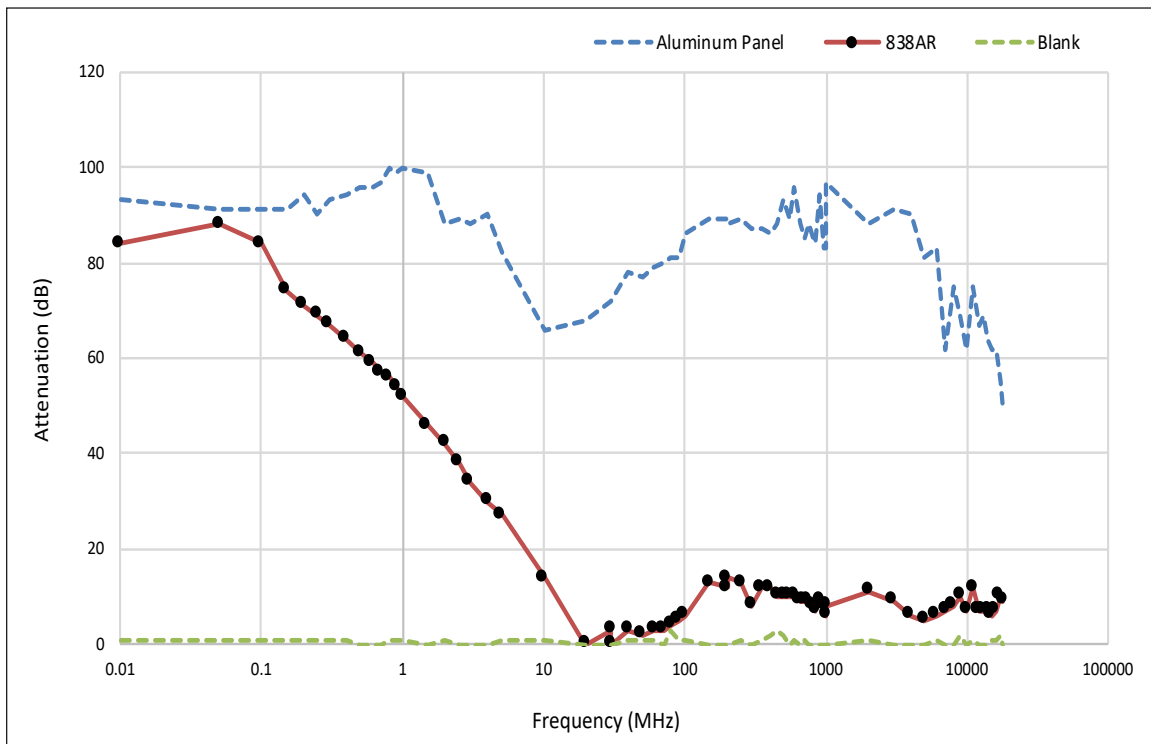


Figure 2. Attenuation of 838AR coating at different frequencies. Test performed with a 2 coat thickness.

Uncured Properties

Physical Properties	Method	Value
Color	Visual	Black
Odor	—	Ethereal
Viscosity @25 °C [77 °F] ^{a)}	Brookfield viscometer	46 cP [55 mm ² /s]
Density @25 °C [77 °F]	ASTM D 1475	0.84 g/mL
Flash point	—	-17 °C [1.4 °F]
Solids content (wt/wt)	Calculated	7.6%

a) Brookfield viscometer at 100 RPM with spindle LV S61.

Compatibility

Chemical Resistance—Carbon doesn't oxidize or deteriorate under a normal environment and conditions, including marine environments as per salt spray test results.

The thermoplastic resin is dissolved by common paint solvents like toluene, xylene, acetone and MEK. This allows for easy repair and rework of the coating, but makes it unsuitable for use in solvent-rich environments.

Adhesion—The coating adheres to most plastics used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, or greasy flux residues that may affect adhesion. If contamination is present, first clean the surface to be coated with MG Chemicals 824 Isopropyl alcohol.

Storage

Store between -5 and 40 °C [23 and 104 °F] in a dry area, away from sunlight. Temperatures below or above these outer limits will result in the container being crushed and/or ruptured.

Health and Safety

Please see the 838AR-Aerosol Safety Data Sheet (SDS) for further details on transportation, storage, handling, safety guidelines, and regulatory compliance.

Application Instructions

For best results, follow the procedure below. If you have little or no experience, refer to the [Application Guide](#).

Spraying:

1. Shake the can vigorously.
2. Spray a test pattern to ensure good flow quality.
3. At an approximate distance of 20–25 cm (8–10 in), tilt the board 45° from a vertical position and spray a thin and even coat. Use spray-and-release strokes with an even motion to avoid excess paint in one spot. Start and end each stroke off the surface.
4. Wait 3 min before applying another coat to avoid trapping solvent.
5. Rotate the board 90° and spray again to ensure good coverage.
6. Apply other coats until desired thickness is achieved (go to step 3).
7. Let dry for 3 min at room temperature before heat cure.

Clearing nozzle between use:

1. Invert the can upside down.
2. Hold button until clear propellant comes out. The propellant should clear in seconds.

Cure Instructions

Room temperature cure:

- Let cure at room temperature for 24 h.

Heat cure:

- Put in oven at 65 °C [149 °F] for 30 min.

Packaging and Supporting Products

Cat. No.	Packaging	Net Volume	Net Weight	Packaged Weight
838AR-340G	Aerosol	442 mL [14.9 fl oz]	340 g [12 oz]	445 g [1.00 lb]
838AR-900ML	Can	850 mL [1.79 pt]	725 g [1.59 lb]	1.10 kg [2.43 lb]
838AR-3.78L	Can	3.60 L [3.8 qt]	3.07 kg [6.77 lb]	3.86 kg [8.51 lb]
838AR-P	Pen	5 mL [0.16 fl oz]	4.21 g [0.14 oz]	30 kg [0.06 lb]

Thinners & Conductive Coating Removers

- *Thinner: Cat. No. 435-1L*
- *Thinner 1: Cat. No. 4351-1L*

Technical Support

Please contact us regarding any questions, suggestions for improvements, or problems with this product. Application notes, instructions and FAQs are located at www.mgchemicals.com.

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