

Carbon Conductive Pen

Description

The 838AR-P pen dispenses an acrylic lacquer pigmented with conductive carbon. The cured traces are durable and corrosion resistant. They adhere well to plastics and most electronic substrates. The traces are flexible, but the product works best on a smooth, flat, hard surface. The valve tip opens when pressed against the surface, and the flow is controlled by squeezing the barrel.

This pen repairs traces on keyboards, game controllers or remote controls. It is also good for making small connections, such as jumpers, through-holes, bridges, and links. It is great for drawing resistors too, and it can be used to increase the surface area of contacts by painting the area around them.

Use this pen when high conductivity is not required. For applications requiring lower resistance, use the 841AR-P Nickel Conductive Pen or the 842AR-P Silver Conductive Pen.

Features and Benefits

- *Creates durable, reliable and conductive connections*
- *Resistivity of 0.46 $\Omega \cdot cm$*
- *Typical trace width: 1.0 mm*
- *Dries in 2 minutes at room temperature*
- *Superior corrosion resistance*

Usage Parameters

Properties	Value
Touch dry	1 min
Full cure @22 °C [72 °F]	24 h
Full cure @65 °C [149 °F]	30 min
Shelf life	3 y
Typical trace width	1.0 mm
Theoretical pen coverage ^{a)}	≤70 cm ² [≤10 in ²]

a) Estimate based on a coat thickness of 25 µm [1.0 mil] and 100% 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	0.46 Ω ·cm [2.2 S/cm]
Surface resistance ^{a)} 1 coat @0.97 mil 2 coats @1.7 mil 3 coats @2.3 mil	Square probe Square probe Square probe	170 Ω /sq 60 Ω /sq 50 Ω /sq
Magnetic class	—	Diamagnetic (non-magnetic)
Relative permeability	—	<1.0
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	4B
(Glass)	ASTM D 3359	0B
(Copper)	ASTM D 3359	1B
(Aluminum)	ASTM D 3359	1B
(Stainless steel)	ASTM D 3359	1B
(FR4)	ASTM D 3359	4B
(PP)	ASTM D 3359	0B
Pencil hardness (ABS)	ASTM D 3363	6H, hard

NOTE: Values are based on liquid format. Pen format values may vary slightly.

a) Surface resistance is given in Ω /sq and the corresponding conductance in Siemens (S or Ω).

Surface Resistance by Coating Thickness

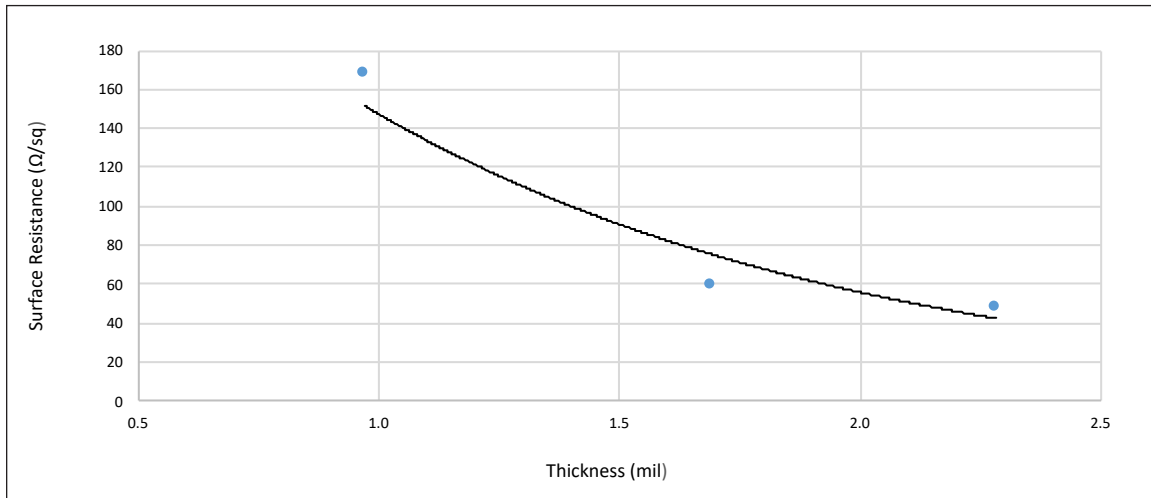


Figure 1. Carbon coating surface resistance at different thicknesses (the dots indicate typical successive coat thicknesses).

Uncured Properties

Physical Properties	Method	Value
Color	Visual	Black
Odor	—	Ketone-like
Viscosity @25 °C [77 °F] ^{a)}	Brookfield viscometer	319 cP [368 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	15%

a) Brookfield viscometer at 100 RPM with spindle LV S63.

Compatibility

Chemical Resistance—Carbon doesn't oxidize or deteriorate under a normal environment and conditions, including marine environments.

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. Store pen with the tip up after use.

Health and Safety

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

Application Instructions

Pen:

1. Shake pen vigorously until the ball moves freely inside.
2. Hold pen at angle and depress tip against surface.
3. Draw pen across surface while gently squeezing barrel.
4. Let dry 2 min before handling or heat cure.
5. Clean tip, replace cap and store tip up after use.

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-P	Pen	5 mL [0.16 fl oz]	4.21 g [0.14 oz]	30 g [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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