MG Chemicals®

Professional chemical and non-chemical products for the electronics industry

MADE IN CANADA

ISO 9001:2015

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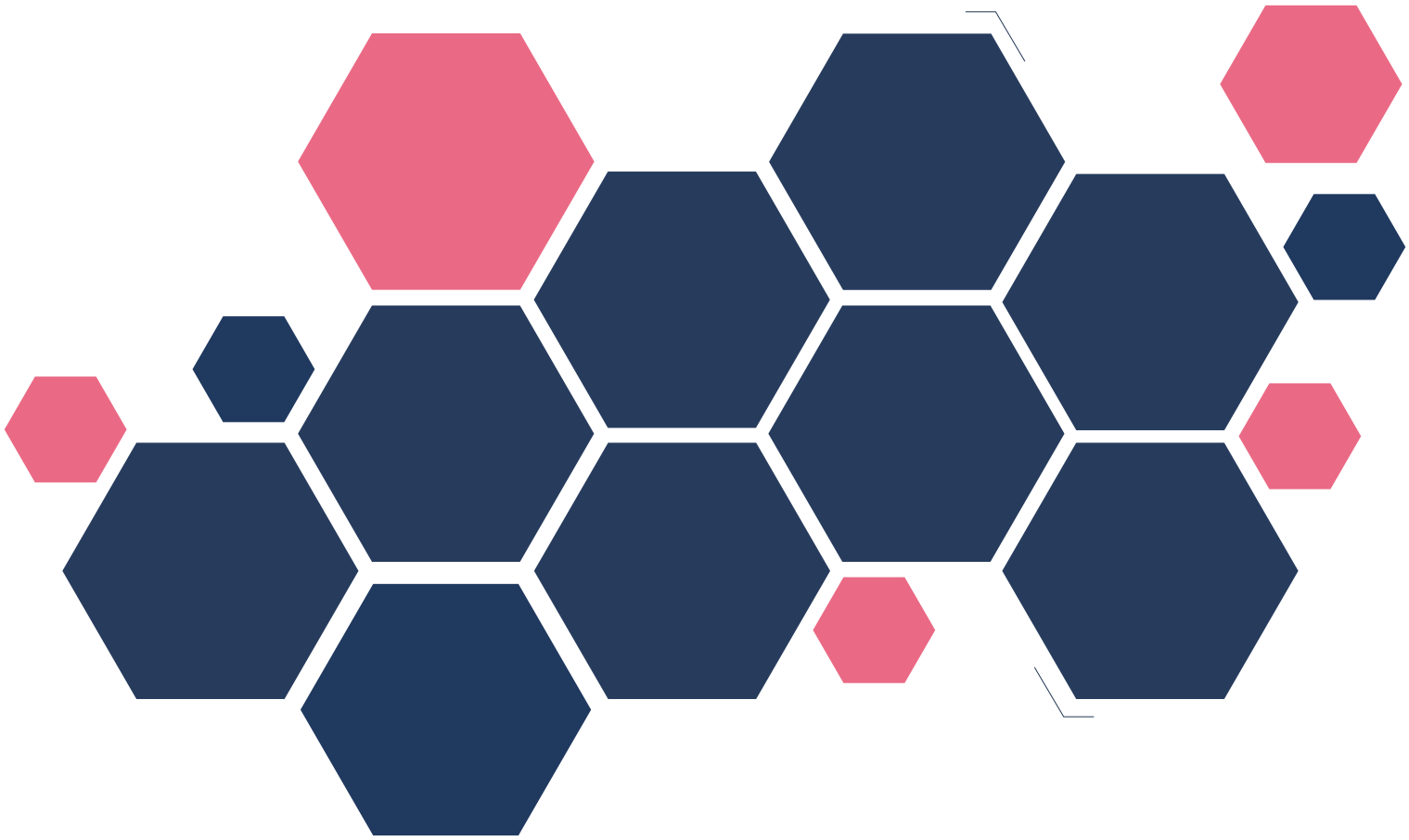

Chapter 01

Coatings

Application Guide

Conformal Coatings

This application guide describes the equipment and processes recommended for applying MG Chemicals conformal coating products. It is the user's responsibility to determine the chemical, mechanical and thermal compatibility of substrates prior to using any of the suggested methods.

All of our conformal coatings can be applied by paint brush, manual spray gun, dipping, and selective coating equipment. Several products are also available in aerosol format for ease and convenience. For large to moderate scale production runs, selective coating equipment and manual spray guns provide superior coating surfaces. The paint brush method can be used for repairs or for small scale applications, but usually will not achieve the same level of consistency and film aesthetic as spray methods. Similarly, dipping is an ideal method for low-volume projects as it is simple, yet achieves high-precision results.

The application of a conformal coating requires several subsequent processes to achieve an aesthetic finish with proper coverage.

Substrate Preparation

Most coating defects result from the presence of moisture, grease, oil, dirt, flux, and other board contaminants. Therefore, it is highly recommended that the user ensures the cleanliness and dryness of a surface prior to coating it.

1. Wipe the surface with a clean cloth, wash with soap and water, then rinse and dry.
2. Put on disposable gloves and clean the surface with MG's 824 Isopropyl Alcohol or any other degreasing solvent.
3. Let the surface dry completely. Elevated temperatures can accelerate drying.

Highly resistant plastics and non-plastics may require mechanical sanding or primers to enhance adhesion. After sanding and etching, clean the surface by following the previously listed steps. Mask areas that should not be coated by using MG's 862 Solder Mask or painter's tape. Unintended coating can be removed using MG's 8309 or 8310A Conformal Coating Strippers.

Dilution

For most brush applications, dilution is not required. However, when applying certain coatings either by manual or selective spray equipment, we recommend thinning to improve film coverage and precision. The choice of thinner will depend on the selected coating and the application method (manual or automated).

If an automated spray method is used, both the platform and individual valves must be taken into account. Refer to Table 1 (page 2) for suggested starting dilution ratios.

Application Guide

Dilution Ratio

	Brush	Dipping	Manual Spray	PVA 650		Nordson SL 940E	
				FCS300-ES	FC100-CF	SC280 N	SC350
419C	None	None	None	N/A	N/A	N/A	N/A
419D	None	None	1:1 (4352)	3:2 (4352)	2:1 (4352)	8:3 (4352)	N/A
419E	None	None	1:1 (4352)	1:1 (4352)	1:1 (4352)	4:1 (4352)	N/A
422B	None	None	1:1 (435)	N/A	N/A	None	N/A
422C	None	None	None	N/A	N/A	None	N/A
4223F	None	None	1:1 (4352)	2:1 (4354)	2:1 (435)	5:1 (4352)	N/A
4225	None	None	None	N/A	N/A	N/A	N/A
4200UV	None	None	None	None	N/A	N/A	None

Table 1: Suggested dilution ratios of MG Conformal Coatings to MG Thinners by application methods
Recommended MG Thinners are shown in brackets

Paint Brush

1. Load the brush by dipping it into the coating (one-third of the bristle length).
2. Tap both sides of the brush lightly against the side of the can. This prevents drips and runs.
3. Brush the coating onto the board using long, smooth strokes. This reduces air bubbes, helps create an even coat, and minimizes brush marks.
4. Reload the brush as soon as the coating flow begins to break.
5. Keep subsequent brush strokes in the same direction; work strokes back into the edges of previously applied, still-wet coating, but do not recoat wet areas.
6. Wait at least 3 minutes, then apply a second coat. Keep the brush from curing by dipping it in thinner and drying it before reloading.
7. Apply additional coats until the desired thickness is achieved.

Manual Spray Guns

Dilute paint as recommended in Table 1 (above). Use a standard fluid nozzle gun to spray the diluted paint. The recommended settings are listed in Table 2 (below). However, performances will vary between brands.

	LVMP	HVLP
Inlet pressure (psi)	20–40	20–40
Air flow (SCFM)	10–15	10–15
Air cap (psi)	8–10	8–10
Nozzle tip diameter (mm)	0.8–1	0.8–1

Table 2: Recommended manual spray guns setting

For best results, keep the gun-to-surface distance constant at about 20-25 cm (8-10"). To ensure full coverage, tilt the board at a 45° angle and apply the coating using spray-and-release strokes that extend slightly beyond the edges of the substrate. Move the gun in a straight line along the surface, avoiding arcing motions. Upon completion, or before extended stoppages, purge fluid lines and clean the spray gun.

Application Guide

Selective Coating Equipment

For higher volume applications, coatings can be applied using selected spray equipment. MG Chemicals has worked with companies such as PVA and Nordson Asymtek to test the compatibility of various conformal coatings using PVA's 650 platform and Nordson Asymtek's SL940E. Table 1 (page 2) provides starting points with respect to dilution ratios and suggested thinners using different valves. More in-depth information such as air pressure, fluid pressure and dispensing heights for different machine and valve systems can be found for each conformal coating (where applicable) on each product's Technical Data Sheet (TDS).

Aerosol Cans

Several of our conformal coatings also come in a convenient aerosol format. These cans are ready to spray.

1. Shake the can vigorously.
2. Spray a test pattern to ensure good flow quality.
3. Tilt the board at 45° and spray a thin, even coat from a distance of 20–25 cm (8–10"). Use spray-and-release strokes with an even motion to avoid paint buildup in one spot. Start and end each stroke off the surface.
4. To avoid trapping solvent, wait the recommended recoat time before applying each subsequent coat.
5. To ensure good coverage, rotate the board 90° and spray again.
6. Apply additional coats until desired thickness is achieved (return to step 3).
7. Allow each new coat to cure at room temperature until dry to the touch before applying heat cure.
8. After use, clear the nozzle by inverting the can and spraying short bursts until the propellant turns clear.

Curing Process

The MG Chemicals Conformal Coating portfolio comprises many chemistries which subsequently influences their cure behaviour. Thermoplastic materials such as acrylics and silicone acrylic hybrids, cure by solvent evaporation and can be cured either at room temperature or at elevated temperatures to accelerate drying. Thermoset materials such as polyurethane and epoxy conformal coatings undergo chemical reactions where new chemical bonds are formed that link polymer chains. These systems require elevated temperatures to facilitate curing within a practical time frame. UV conformal coatings cure upon exposure to certain frequencies of UV light. Cure time for these systems depends on both the wavelength and power output of the light source used. Table 3 (page 4) summarizes the cure behaviours for MG Chemicals Conformal Coatings.

Application Guide

Cure Times

	25 °C	65 °C	80 °C	100 °C	1 W/cm² @ 25 °C*	1 W/cm² @ 35 °C*
419C	24 hours	30 minutes	20 minutes	10 minutes	N/A	N/A
419D	24 hours	30 minutes	20 minutes	10 minutes	N/A	N/A
419E	24 hours	30 minutes	15 minutes	5 minutes	N/A	N/A
422B	48 hours	20 minutes	10 minutes	N/A	N/A	N/A
422C	24 hours	20 minutes	10 minutes	N/A	N/A	N/A
4223F	N/A	N/A	16 hours	2 hours	N/A	N/A
4225	N/A	4 hours	2 hours	40 minutes	N/A	N/A
4200UV	N/A	N/A	N/A	N/A	8 seconds	4 seconds

Table 3: Cure times for MG Chemicals Conformal Coatings under different curing conditions

***** UV lamp frequency 320-500 nm

Coating Thickness

Conformal coatings work optimally at a dry film thickness of between 1 and 3 mils (25-76 µm), in line with the thickness recommendations of the IPC-CC-830C Standard. Film builds beyond this range do not provide additional protection and may cause brittleness, film delamination and solvent entrapment. Table 4 (below) summarizes the typical dry film thickness of each coating for a single coat.

	Dry Film Thickness
419C	20–30 µm
419D	20–30 µm
419E	20–30 µm
422B	20–30 µm
422C	20–30 µm
4223F	20–30 µm
4225	25–50 µm
4200UV	65–85 µm

Table 4: Typical dry film thickness for a single coat

Disclaimer

This information is believed to be accurate. It is intended for professional end-users who have the skills required 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.

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Conformal Coatings

Enhanced PCB Protection

Features and Benefits

- Clear, thin, flexible, and durable
- Protects against dust, humidity, salt spray, corrosion, and chemical fogs
- Protects against electrical arching, shorts, static discharges, and thermal shocks
- Contains a UV indicator for optical inspection
- Applied by brushing, dipping, manual and selective spraying
- Available in liquid, aerosol, and pen
- IPC and UL certified versions

Applications

- Improves reliability, and lengthens the life of electronic circuitry
- Protects circuitry in coastal, tropical, marine, and other humid environments
- Allows electronic devices to operate in harsh environments
- Allows traces to be placed closer together by preventing arcing

Acrylic - One-part conformal coating which is cost-effective, and easily reworkable.

419D – Certified to IPC-CC-830B and UL94 V-0

419E – Certified to IPC-CC-830C and UL746E

Silicone-Modified Acrylic - One-part conformal coating that is both soft and flexible, and provides a wide service temperature range.

422B – Certified to UL94 V-0

422C – Certified to UL94 V-0

Polyurethane - One-part conformal coating that provides strong protection against solvents, and corrosive gases.

4223F – Certified to IPC-CC-830B and UL746E

Epoxy - Two-part conformal coating that is flexible, and provides strong protection against chemicals.

4225 – Certified to IPC-CC-830C

UV Curable - One-part UV curable conformal coating suitable for high-throughput applications.

4200UV – Certified to IPC-CC-830C and UL746E

Conformal Coatings

	419D	419E	422B	422C	4223F	4225	4200UV
BINDER SYSTEM	Acrylic	Acrylic	Silicone-modified Acrylic	Silicone-modified Acrylic	Polyurethane	Epoxy	Urethane Acrylate
UNCURED PROPERTIES							
Solids %	30	29	28	30	45	41	96
Viscosity @ 25 °C	115 cP	160 cP	10 cP	14 cP	290 cP	20 cP	160 cP
Recoat time	3 min	3 min	3 min	2 min	5 min	15 min	N/A
Dry time to handle	10 min	15 min	8 min	10 min	15 min	7 h	N/A
Cure time @ 22 °C	24 h	24 h	48 h	24 h	Heat cure only	48 h	UV cure
Cure time @ 65 °C	30 min	30 min	20 min	30 min	—	4 h	UV cure
Cure time @ 80 °C	20 min	15 min	—	10 min	16 h	2 h	UV cure
Cure time @ 100 °C	10 min	5 min	—	5 min	2 h	40 min	UV cure
CURED PROPERTIES							
IPC-CC-830	B revision	C revision	—	—	B revision	C revision	C revision
UL	94 V-0	746E	94 V-0	94 V-0	746E	Meets UL 94 V-0	746E
Dielectric strength	1 000 V/mil	1 100 V/mil	1 056 V/mil	1 076 V/mil	1 000 V/mil	566 V/mil	1000 V/mil
Dielectric withstand volt.	> 1 500 V	> 1 500 V	> 1 500 V	> 1 500 V	> 1 500 V	> 1 500 V	> 1 500 V
Resistivity	4.6 x 10^{14} Ω·cm	3.5 x 10^{13} Ω·cm	1.2 x 10^{15} Ω·cm	3.5 x 10^{13} Ω·cm	3.5 x 10^{13} Ω·cm	1.8 x 10^{12} Ω·cm	3.4 x 10^{14} Ω·cm
Constant service temp.	-65 — 125 °C	-65 — 130 °C	-40 — 200 °C	-40 — 200 °C	-65 — 125 °C	-40 — 140 °C	-65 – 150 °C
Glass transition temp. (T_g)	27 °C	38 °C	29 °C	31 °C	57 °C	42 °C	72 °C
CTE prior T_g	72 ppm/°C	160 ppm/°C	275 ppm/°C	111 ppm/°C	130 ppm/°C	210 ppm/°C	78 ppm/°C
Solderability	Excellent	Excellent	Fair	Fair	Good	Poor	Poor
Chemical resistance	Poor	Poor	Poor	Poor	Excellent	Excellent	Excellent
Pencil hardness (ABS)	HB, soft	H, hard	F, hard	F, hard	HB, soft	2H, hard	2H, hard
AVAILABLE PACKAGING							
Net contents	55 mL bottle	—	1 L can	55 mL bottle	55 mL bottle	1.35 L 2-can kit	—
	945 mL can	945 mL can	3.78 L can	945 mL can	945 mL can	10.8 L 3-can kit	945 mL can
	3.78 L can	3.78 L can	20 L pail	3.78 L can	3.78 L can	60 L 3-pail kit	3.78 L can
	18.9 L pail	18.9 L pail	340 g aerosol	18.9 L pail	18.9 L pail	540 L 3-drum kit	—
	340 g aerosol	340 g aerosol	—	340 g aerosol	312 g aerosol	—	—
	5 mL pen	—	—	5 mL pen	—	—	—

Conformal Coating Strippers

Easy Removal of Conformal Coatings for Repair and Rework

MG Chemicals features conformal coating strippers that are helpful when rework or repair is necessary. These strippers are effective at removing many different types of coatings including acrylics, alkyds, polyurethanes, silicones, and some epoxies.

Features and Benefits

- Contains no SVHC
- Effectively removes many coating types, including polyurethanes, and some epoxies
- Available in both liquid and gel format
- Fully biodegradable and environmentally safe
- HAPs-Free

Applications

- Spot removal of coating
- Full removal of coating for rework
- Revoval of some adhesives

8309 - Liquid stripper effective for coating removal of large surfaces

8310A - Gel stripper effective for spot removal of coating, and some adhesives

Available Packaging

8309

850 mL (metal can)

10 mL (pen)

8310A

55 mL (bottle)

225 mL (metal can)

850 mL (metal can)

Insulation Coatings

Insulative Varnish for High Voltage Electrical Parts

MG Chemicals Insulation Coatings line is a unique line of varnish for electronics products intended to provide added insulation to high voltage parts such as transformer coils, motor windings and sheathing for wires. Characterized by high dielectric strength, these 1-part coatings adhere to a variety of substrates and offer exceptional protection against corrosion.

Features & Benefits

- High dielectric strength
- Excellent resistance to moisture and salt water
- Excellent finish—tough, flexible, glossy, and durable

Applications

- Replacement for shrink wrap or electrical tape
- Arc and corona resistance for transformer coils and motor windings
- Insulation coatings for electrical generators

Clear Insulating Varnish

4226
- Meets UL EIS standards. Class H insulation up to 180 °C
- Dielectric strength: 4 100 V/mil

4226A
- Low VOC and HAP-free
- Toluene, xylene and MEK-free
- Dielectric strength: 3 000 V/mil

Dielectric Coating

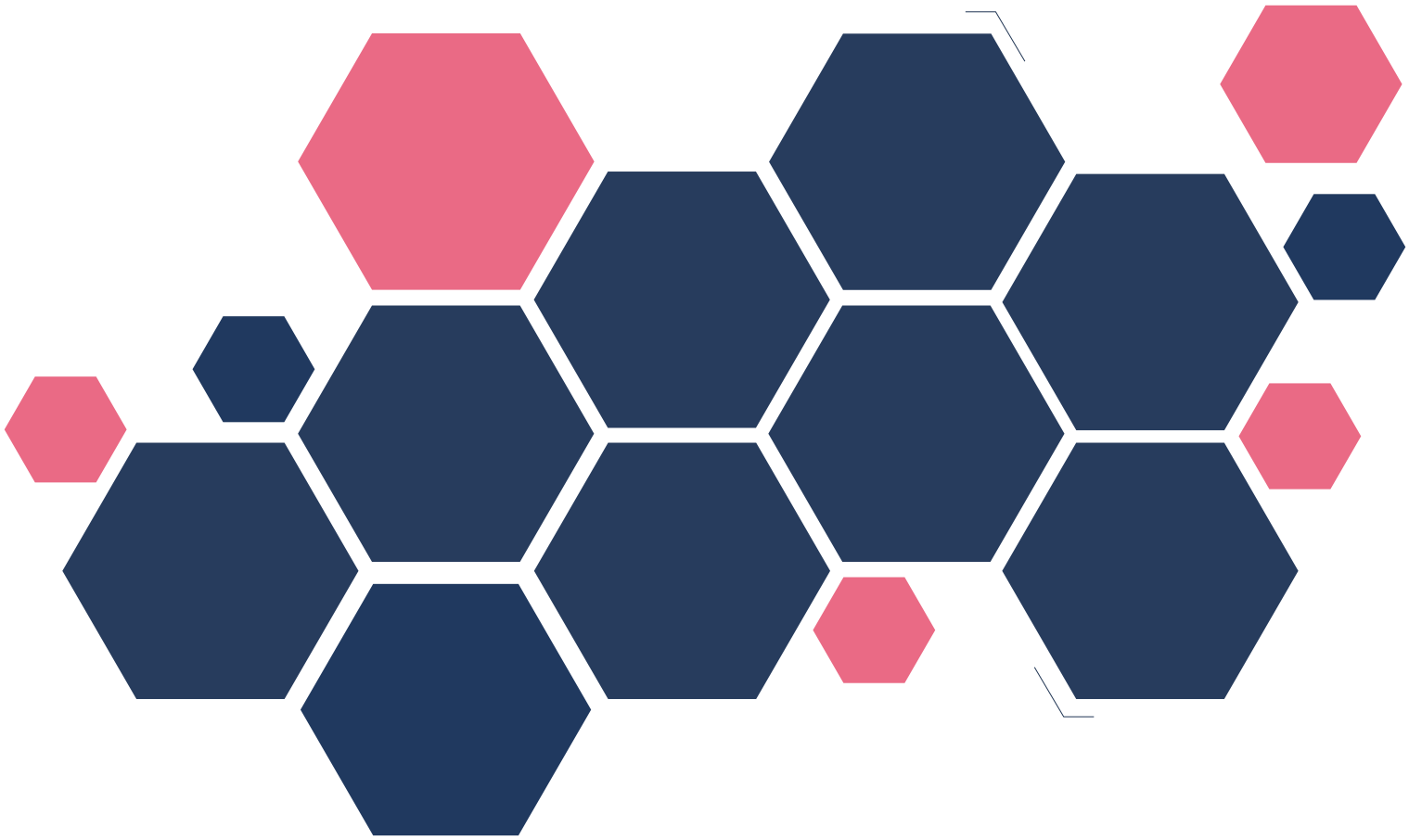
4228
- Meets UL EIS standards. Class H insulation up to 180 °C
- Dielectric strength: 3 000 V/mil
- Direct cross to Glyptal 1201A

Red Insulating Varnish

4228A
- Dielectric strength: 3 700 V/mil
- Low VOC and HAP-free
- Available as both a liquid and aerosol

Insulation Coatings

	4226	4226A	4228	4228A
PROPERTIES				
Dielectric Strength (dry) (wet)	4 100 V/mil 3 000 V/mil	3 000 V/mil —	3 000 V/mil 1 500 V/mil	3 700 V/mil —
Insulation Class	130 (B) 150 (F) 180 (H)	—	—	—
Service Temperature Range	-40–180 °C	-30–180 °C	-40–180 °C	-40–180 °C
Dry to Touch	20 min	1 h	30 min	1 h
Recoat Time	4 h	15 min	4 h	10 min
Recommended Film Thickness	25–38 µm	25–38 µm	25–38 µm	25–38 µm
Theoretical Coverage @ 25 µm (based on 65% transfer efficiency)	95 ft^2/L	100 ft^2/L	130 ft^2/L	130 ft^2/L
Viscosity @ 25 °C	77 cP	50 cP	590 cP	800 cP
Density	0.93 g/mL	0.96 g/mL	1.1 g/mL	1.0 g/mL
Percent Solids	35%	45%	52%	55%
Shelf Life	5 y	5 y	5 y	5 y
Calculated VOC	604 g/L	520 g/L	514 g/L	561 g/L
PACKAGING				
Format	55 mL (Bottle) 945 mL (Bottle)	55 mL (Bottle) 426 mL (Aerosol) 945 mL (Can) 3.78 L (Can)	55 mL (Bottle) 225 mL (Can) 850 mL (Can) 3.60 L (Can)	55 mL (Bottle) 225 mL (Can) 850 mL (Can) 3.60 L (Can)



Chapter 02

Adhesives

Adhesives

MG Chemicals Adhesives line is consisted of 1-part and 2-part epoxy systems. Our 1-part epoxies offer unlimited working time, do not require mixing, and can be stored at room temperature. 2-part epoxies are 1:1 mix ratio and are available in a variety of working times (*w.t.*).

Applications

- Electrical connections
- Thermal management
- Bonding heat sensitive components
- Providing structural support
- Bonding similar and dissimilar substrates
- Repairing circuits
- Sealing
- Potting
- Gap filling

Industries

- Battery modules and battery packs
- Consumer electronics
- Transportation
- Automotive
- Aerospace
- Defense
- Instrumentation
- Medical equipment
- Research

General Bonding

One-part	9310	• Surface mount adhesive
Two-part	8332	• Fast set epoxy, 5 min *w.t.*
	9200	• Structural, standard, 30 min *w.t.*
	9200FR	• Structural, 30 min *w.t.*, UL 94V-0 rated

Electrically Conductive

One-part	9410	• Resistivity of 1.8 x 10^{-3} Ω·cm, T_g of 96˚C
Two-part	8331D	• Resistivity of 1.8 x 10^{-3} Ω·cm, 20 min *w.t.*
	8330D	• Resistivity of 5.3 x 10^{-4} Ω·cm, 20 min *w.t.*
	8331S	• Resistivity of 6.0 x 10^{-3} Ω·cm, 4 hours *w.t.*
	8330S	• Resistivity of 7.0 x 10^{-4} Ω·cm, 4 hours *w.t.*

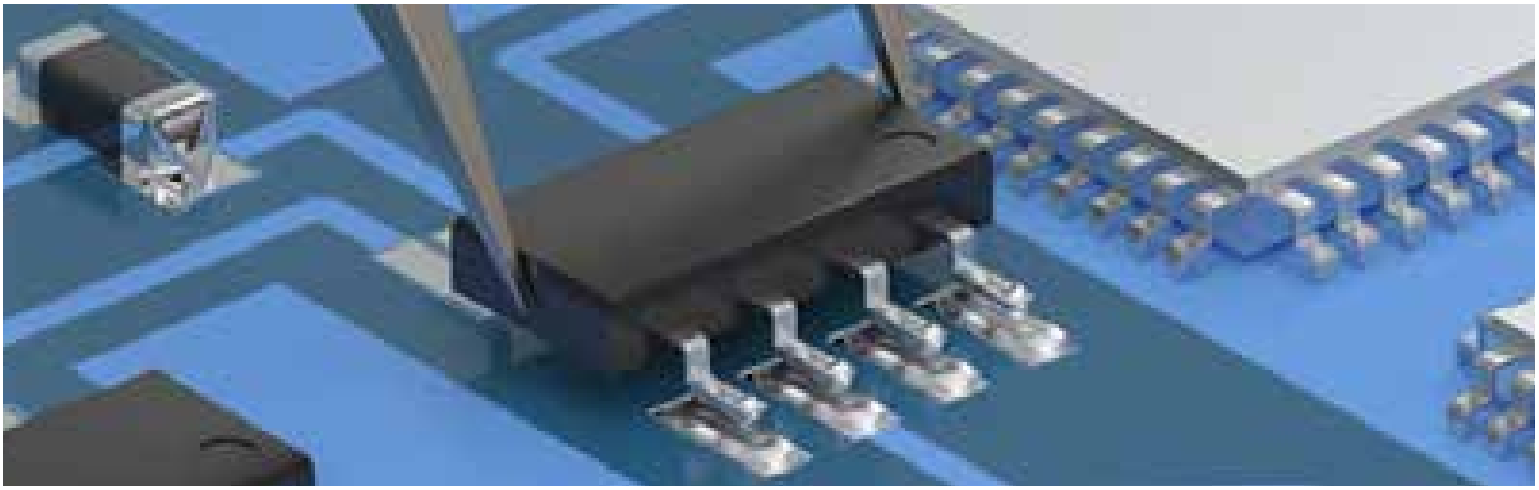
Thermally Conductive

One-part	9460TC	• *TC* of 0.8 W/(m·K)
Two-part	8329TFF	• *TC* of 0.8 W/(m·K), 5 min *w.t.*, dispensable, UL 94V-0 rated
	8349TFM	• *TC* of 0.9 W/(m·K), 20 min *w.t.*, dispensable, meets UL 94V-0
	8329TCM	• *TC* of 1.4 W/(m·K), 45 min *w.t.*, non-sagging
	8329TFS	• *TC* of 1.2 W/(m·K), 4 hours *w.t.*, dispensable
	8329TCS	• *TC* of 1.4 W/(m·K), 4 hours *w.t.*, non-sagging
	8329HTC	• *TC* of 0.9 W/(m·K), 80–120 min *w.t.*, dispensable

TC = Thermal Conductivity *w.t.* = working time

We are also the authorized master distributor for Momentive RTV silicone products. RTV silicones are desirable because of their high heat resistance, wide operating temperature range and low modulus. The silicone adhesives portfolio covers a host of options to meet your requirements like consistency, adhesive strength, flame retardancy, outgassing, thermal conductivity and more.

1-Part Epoxy Adhesives



1-Part Adhesives for Easy Manufacturing Processes

MG Chemicals offers a full line of 1-part epoxy adhesives to meet the growing demand for ease of application in the manufacturing process. These adhesives require no mixing, and offer unlimited working time. Our 1-part epoxies enhance productivity by simplifying production processes and storage requirements.

Features and Benefits

- Easy to dispense—no mixing required
- Unlimited working time
- Low to moderate cure temperatures
- Extended shelf life at room temperatures
- Excellent adhesion to common electronics substrates and components

Applications

- Surface Mount Technology (SMT)
- Chip bonding
- LED manufacturing
- Bonding dissimilar substrates
- Telecommunications equipment
- Medical devices
- Automotive components

General Bonding

9310 – Surface Mount Adhesive (SMA)

Electrically Conductive

9410 – High conductivity, high T_g

9400 – Extreme conductivity

Thermally Conductive

9460TC – High thermal conductivity

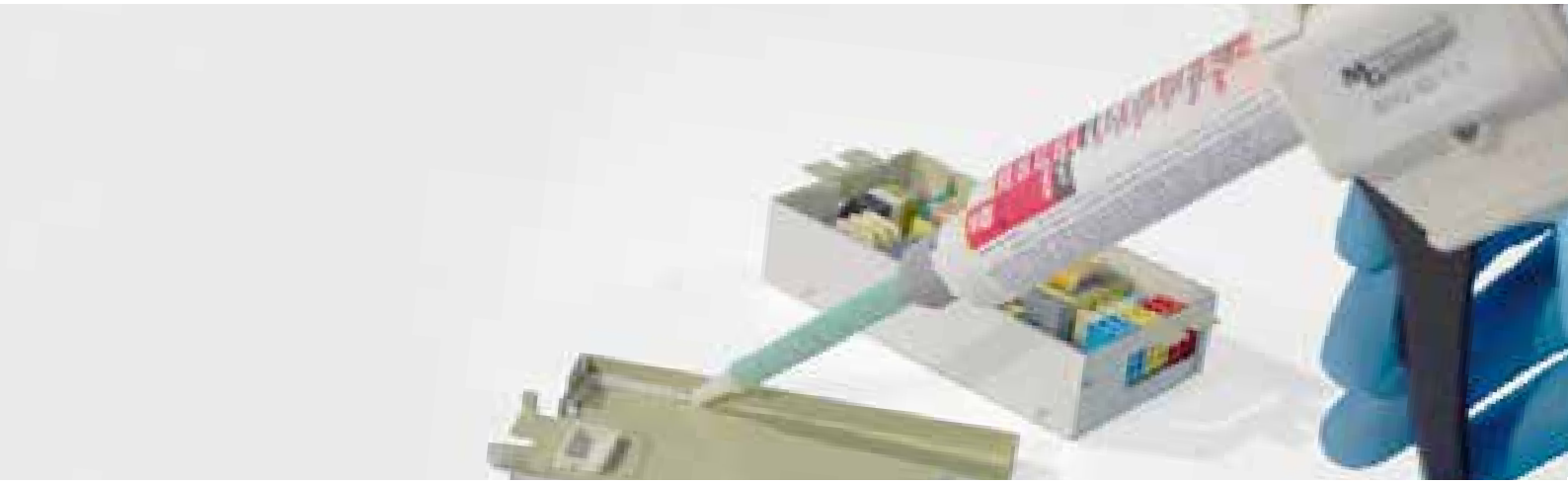
1-Part Epoxy Adhesives

	9310	9400	9410	9460TC
UNCURED PROPERTIES				
Number of components	1	1	1	1
Mixed density [g/mL]	1.15	3.14	2.34	1.64
Working time	Unlimited	Unlimited	Unlimited	Unlimited
Service cure @ 22 °C	—	N/A	N/A	—
RT cure [h]	—	N/A	N/A	—
Heat cure [min @ °C]	30 @ 100 10 @ 120	120 @ 70 30 @ 80	60 @ 90 30 @ 100 7 @ 120	120 @ 80 60 @ 100 30 @ 120
CURED PROPERTIES				
Resistivity [Ω·cm]	9.3×10^{12}	3.1×10^{-4}	1.8×10^{-3}	7.4×10^{16}
Service temperature range [°C]	-55 to 140	-55 to 140	-65 to 145	-65 to 150
Glass transition temperature (T_g) [°C]	113	36	96	106
CTE prior T_g [ppm/°C]	56	76	42	36
CTE after T_g [ppm/°C]	185	100	150	72
Thermal conductivity @ 25 °C [W/(m·K)]	0.2	4.7	1.1	0.8
Thermal diffusivity @ 25 °C [mm^2/s]	0.2	2.2	0.7	0.5
Specific heat capacity @ 25 °C [J/(g·K)]	1.4	0.7	0.8	1.2
Color	Yellow	Silver grey	Silver grey	White
Hardness	84D	74D	70D	86D
Tensile strength [N/mm^2]	9.4	2.9	N/A	9.1
Compressive strength [N/mm^2]	103	18	26	78
Lap shear (stainless steel) [N/mm^2]	8.5	2.9	2.6	6.0
Lap shear (aluminum) [N/mm^2]	6.2	3.2	2.8	3.2

Refer to TDS for more information. N/A=Not Available

AVAILABLE PACKAGING				
Net content	10 mL (syringe) 300 mL (cartridge)	3 mL (syringe) 30 mL (syringe)	3 mL (syringe) 30 mL (syringe)	3 mL (syringe) 10 mL (syringe)

Bonding Adhesives



Bonding Adhesives for Industrial Applications

MG Chemicals bonding adhesives provide significant bond strength to similar and dissimilar substrates. They are used in a wide range of industrial applications where long-lasting load bearing joints are required.

Features & Benefits

- Strong adhesion to a variety of substrates
- Excellent chemical and moisture resistance
- Exceptional durability and toughness
- Excellent sealing capacity against unwanted liquids and gases
- Weight and cost reduction through elimination of conventional metal fasteners

Applications

- Automobile body panels
- Bonding to vertical surfaces
- Battery assembly (cell-to-cell or cell-to-carrier)
- Aircraft structural adhesives
- Surface mount technology
- Gap filling, potting, and sealing
- Bonding windows

One-part

9310 – Surface mount adhesive

Two-part

9200 – Structural, standard, 30 min *w.t.*

9200FR – Structural, UL 94V-0 rated, 30 min *w.t.*

8332 – Fast set epoxy, 5 min *w.t.*

Dispensing accessories

Dispensing gun – 8DG-50-1-1

Mixing tips – 8MT-50 (standard)
8MT-50-FT (fine flow)

Bonding Adhesives

	8332	9200	9200FR	9310
UNCURED PROPERTIES				
Number of components	2	2	2	1
Mixed density [g/mL]	1.14	1.25	1.34	1.15
Working time	3 to 5 min	30 min	30 min	Unlimited
RT cure [h]	5	48	48	—
Heat cure [min @ °C]	15 @ 65	960 @ 40	960 @ 40	30 @ 100
	—	90 @ 65	180 @ 65	10 @ 120
	—	60 @ 80	90 @ 80	—
	—	15 @ 100	30 @ 100	—
CURED PROPERTIES				
Resistivity [Ω·cm]	1.7×10^{14}	2.5×10^{13}	1.1×10^{13}	9.3×10^{12}
Breakdown voltage [V]	23 200	41 500	39 800	41 600
Dielectric strength [V/mil]	250	503	497	220
Service temperature range [°C]	-40 to 150	-40 to 150	-40 to 150	-55 to 140
Glass transition temperature (T_g) [°C]	64	44	59	113
CTE prior T_g [ppm/°C]	76	95	79	56
CTE after T_g [ppm/°C]	175	215	126	185
Color	Light yellow	Grey yellow	Light yellow	Yellow
Hardness	82D	76D	78D	84D
Tensile strength [N/mm^2]	34	16	13	9.4
Compressive strength [N/mm^2]	63	64	46	103
Lap shear (stainless steel) [N/mm^2]	4.9	20	14	8.5
Lap shear (aluminum) [N/mm^2]	5.9	22	10	6.2
AVAILABLE PACKAGING				
Net contents	25 mL (dual-syringe)	25 mL (dual-syringe)	25 mL (dual-syringe)	10 mL (syringe)
	46 mL (dual-cartridge)	45 mL (dual-cartridge)	45 mL (dual-cartridge)	300 mL (cartridge)

Dispensing Accessories

Dispensing Guns and Static Mixers to Aid in Application

MG Chemicals offers dispensing accessories to aid in the application of adhesives and epoxy potting compounds. Dispensing guns allow the user to apply more pressure to the cartridge than they could by hand, allowing viscous materials to be dispensed through mixing tips.

Dispensing Guns Features & Benefits

- Solid plastic casing
- Simple slide in and slide out insertion system
- Trigger activated control provides a steady incremental flow
- Dispenses an accurate and smooth flow of materials

Static Mixers Features & Benefits

- Narrow cylindrical tubes with a stationary mixing elements
- For 2-part low to medium viscosity cartridge systems
- Provides a homogeneous and perfect mix of hardener and resin
- Eases precise application
- Single use

Dispensing Guns

8DG-30-1 Solid plastic gun, for use with 30 mL 1-part cartridges

8DG-50-1-1 Solid plastic gun, for use with 50 mL dual cartridges

8DG-400-1-1 Manual gun with two steel piston arms for use with 1:1 400 mL cartridges

8DG-450-2-1 Manual gun with two steel piston arms for use with 2:1 450 mL cartridges

Static Mixers

8MT-450 Large, standard flow tip for use with 2:1 450 mL and 1:1 400 mL cartridges

8MT-50 Standard flow tip for use with 1:1 50 mL cartridges and 1:1 25 mL syringes

8MT-50-FT Fine flow tip allowing greater precision for use with 1:1 50 mL cartridges

8MT-25 Standard flow tip for use with 832HD 1:1 50 mL cartridge and 1:1 25 mL dual syringes

Dispensing Accessories

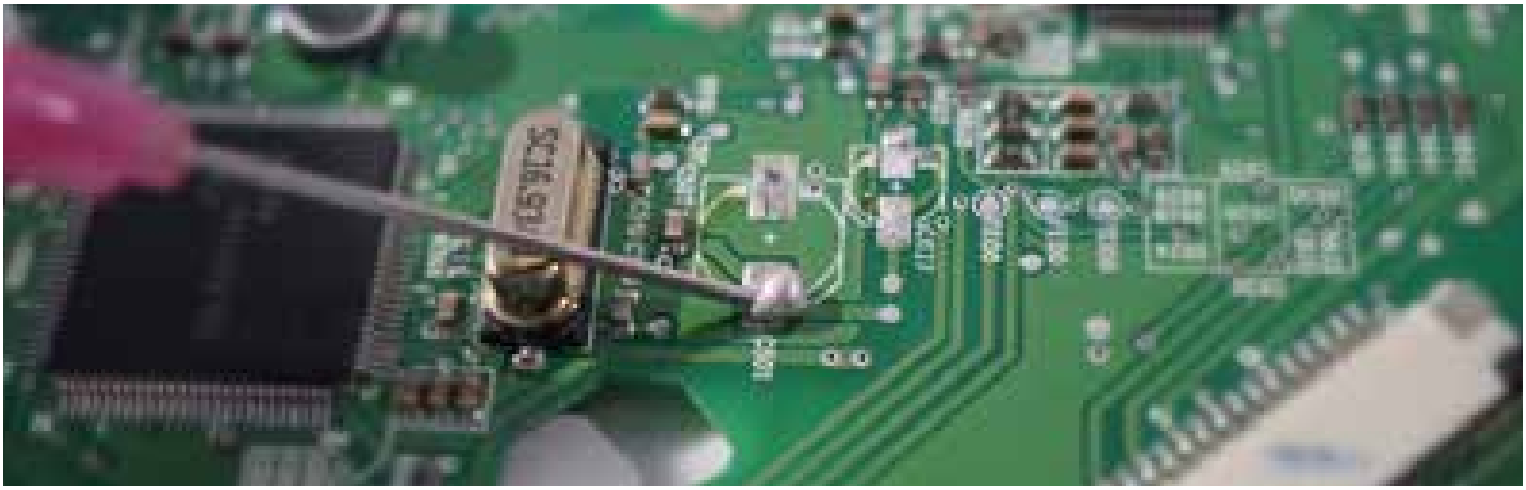
	DISPENSING GUNS				STATIC MIXERS			
	8DG-450-2-1	8DG-400-1-1	8DG-50-1-1	8DG-30-1	8MT-25	8MT-50	8MT-50FT	8MT-450
832C-450ML	Yes	—	—	—	—	—	—	Yes
832B-450ML	Yes	—	—	—	—	—	—	Yes
832HD-400ML	—	Yes	—	—	—	—	—	Yes
832HD-50ML	—	—	Yes	—	Yes	Yes	—	—
832HD-25ML	—	—	—	—	Yes	Yes	—	—
8329TFF-50ML	—	—	Yes	—	Yes	Yes	—	—
8329TFM-50ML	—	—	Yes	—	Yes	Yes	Yes	—
8329TFS-50ML	—	—	Yes	—	Yes	Yes	Yes	—
8332-25ML	—	—	—	—	Yes	—	—	—
8332-50ML	—	—	Yes	—	—	Yes	—	—
8349TFM-50ML	—	—	Yes	—	—	Yes	Yes	—
9200-50ML	—	—	Yes	—	Yes	Yes	Yes	—
9200FR-50ML	—	—	Yes	—	Yes	Yes	Yes	—
9400-30ML	—	—	—	Yes	—	—	—	—
9410-30ML	—	—	—	Yes	—	—	—	—
9510-30ML	—	—	—	Yes	—	—	—	—
AVAILABLE PACKAGING								
Content(s)	1 unit	1 unit	1 unit	1 unit	5 tips (bag)	5 tips (bag)	5 tips (bag)	5 tips (bag)








Electrically Conductive Adhesives



Silver Conductive Epoxy for the Assembly and Repair of Electronics

MG Chemicals offers silver conductive epoxy for the assembly and repair of electronics. It provides strong adhesion to many surfaces where soldering is not possible.

Features and Benefits

- Creates strong permanent electrical connections
- Excellent electrical and thermal conductivity
- Room temperature storage

Applications

- Repairing damaged circuits
- Creating jumpers, bridging, and gap filling
- Bonding heat sensitive components
- Bonding to conductive polymers
- Bonding to flexible circuits
- Bonding to gold, aluminum, brass, and bronze
- Bonding to glass
- Die attachment in LEDs and semiconductors

1-Part – Unlimited Working Time

9410 – Resistivity of 1.8 x 10^{-3} Ω·cm, T_g of 96˚C, heat cure only

2-Part – 20 Minute Working Time

8331D – Resistivity of 1.8 x 10^{-3} Ω·cm

8330D – Resistivity of 5.3 x 10^{-4} Ω·cm

2-Part – 4 Hour Working Time

8331S – Resistivity of 6.0 x 10^{-3} Ω·cm, heat cure only

8330S – Resistivity of 7.0 x 10^{-4} Ω·cm, heat cure only

Electrically Conductive Adhesives

	8330D	8331D	8330S	8331S	9410
UNCURED PROPERTIES					
Number of components	2	2	2	2	1
Mixed density [g/mL]	3.22	2.40	3.06	2.42	2.34
Working time	20 min	20 min	4 h	4 h	Unlimited
Service cure @ 22 °C	65 min	65 min	—	—	—
Room temp. cure [h]	6	6	Heat cure	Heat cure	Heat cure
Heat cure [min @ °C]	10 @ 65 5 @ 80	10 @ 65 5 @ 80	120 @ 65 60 @ 80 30 @ 100	120 @ 65 60 @ 80 30 @ 100	60 @ 90 30 @ 100 7 @ 120
CURED PROPERTIES					
Resistivity [Ω·cm]	5.3×10^{-4}	1.8×10^{-3}	7.0×10^{-4}	6.0×10^{-3}	1.8×10^{-3}
Service temperature range [°C]	-50 to 150	-50 to 150	-40 to 150	-40 to 150	-65 to 145
Glass transition temperature (T_g) [°C]	40	35	34	34	96
CTE prior T_g [ppm/°C]	63	58	97	78	42
CTE after T_g [ppm/°C]	363	234	208	158	150
Thermal conductivity @ 25 °C [W/(m·K)]	2.0	1.5	2.4	1.3	1.1
Thermal diffusivity @ 25 °C [mm^2/s]	1.1	0.9	1.2	0.7	0.7
Specific heat capacity @ 25 °C [J/(g·K)]	0.6	0.7	0.6	0.8	0.8
Color	Silver grey	Silver grey	Silver grey	Silver grey	Silver grey
Hardness	84D	78D	73D	60D	70D
Tensile strength [N/mm^2]	8.3	13	9.0	14	N/A
Compressive strength [N/mm^2]	75	69	36	65	26
Lap shear (stainless steel) [N/mm^2]	3.6	5.6	1.7	4.5	2.6
Lap shear (aluminum) [N/mm^2]	2.6	5.1	1.2	7.1	2.8

Refer to TDS for more information.

AVAILABLE PACKAGING					
Net content	6 mL (2 syringe kit)	6 mL (2 syringe kit)	6 mL (2 syringe kit)	6 mL (2 syringe kit)	3 mL (syringe)
	50 mL (2 jar kit)	50 mL (2 jar kit)	50 mL (2 jar kit)	50 mL (2 jar kit)	30 mL (syringe)
	—	—	200 mL (2 can kit)	200 mL (2 can kit)	—

Thermally Conductive Adhesives

Maximum Heat Dissipation from Electronic Assemblies

MG Chemicals offers thermally conductive epoxy adhesives for bonding heat sinks, LEDs, and other heat generating electronic components.

Features & Benefits

- Creates strong permanent thermal bonds
- Eliminates need for mechanical fasteners
- Excellent thermal conductivity (*TC*)
- Provides strong electrical insulation
- Room temperature storage
- Maintains bonds in severe environments
- Excellent chemical resistance
- Excellent mechanical stability
- A wide variety of working times (*w.t.*)

Applications

- Bonding heat sinks
- Power semiconductor devices
- Flip chip BGA heat spreaders
- Battery modules and battery packs
- LED lighting
- Power Supplies
- Automotive lighting
- Appliances

One-part

9460TC	• *TC* of 0.8 W/(m·K), unlimited *w.t.*, no mixing, heat cure only

Two-part

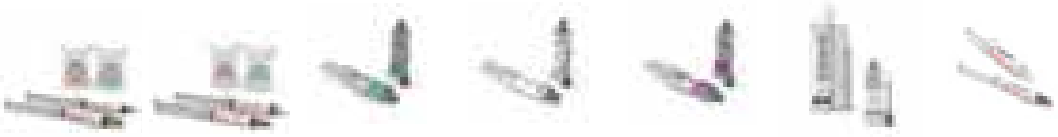
8329TFF	• *TC* of 0.8 W/(m·K), 5 min *w.t.*, dispensable, UL 94V-0 rated - flame retardant
8349TFM	• *TC* of 0.9 W/(m·K), 20 min *w.t.*, dispensable, meets UL 94V-0 - flame retardant
8329TCM	• *TC* of 1.4 W/(m·K), 45 min *w.t.*, non-sagging
8329TFS	• *TC* of 0.8 W/(m·K), 4 hours *w.t.*, dispensable, heat cure only
8329TCS	• *TC* of 1.4 W/(m·K), 4 hours *w.t.*, non-sagging, heat cure only
8329HTC	• *TC* of 0.9 W/(m·K), 80 min *w.t.*, dispensable

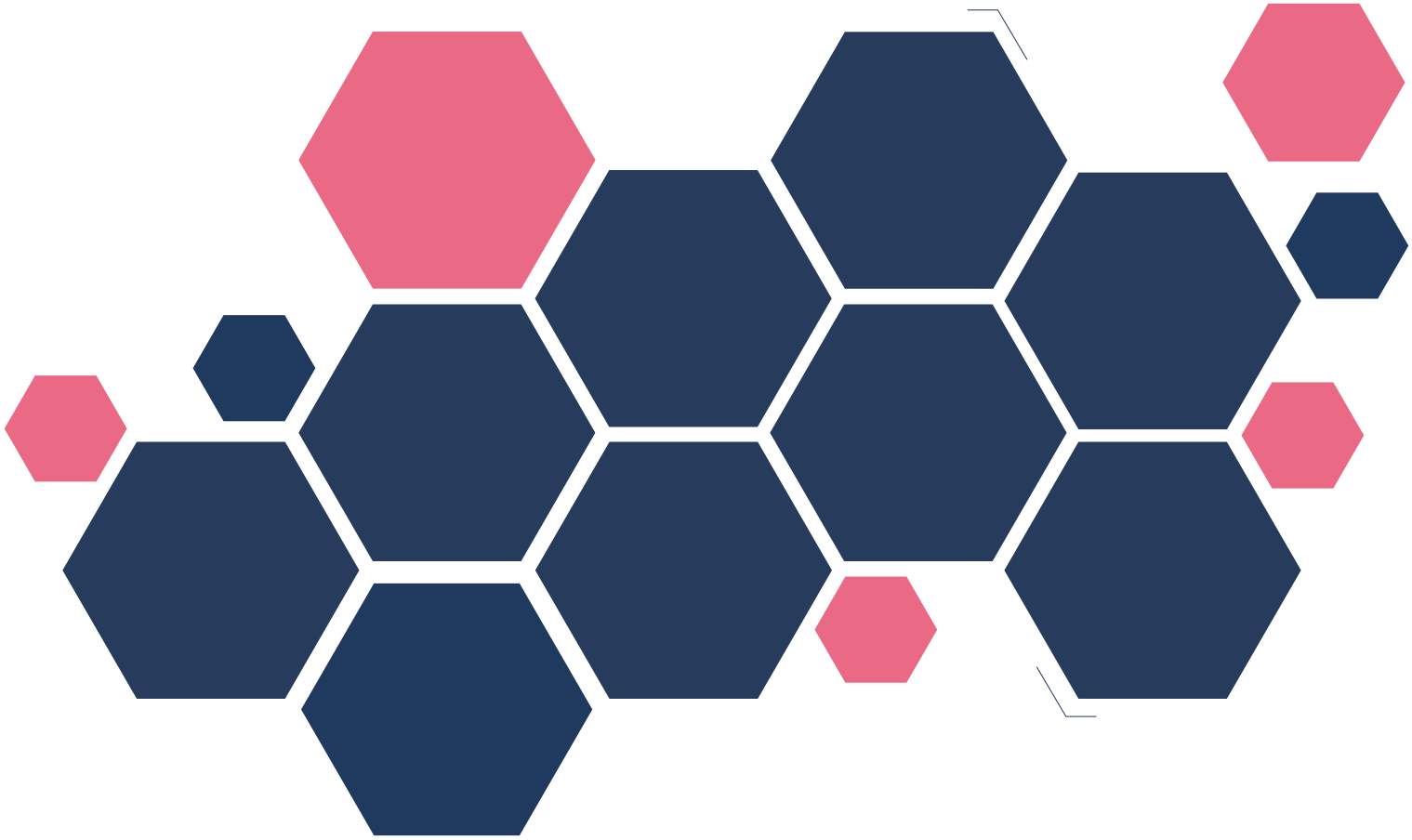
Dispensing accessories

Dispensing gun	• 8DG-50-1-1
Mixing tips	• 8MT-50 (standard) • 8MT-50-FT (fine flow)

Thermally Conductive Adhesives

	TWO-PART						ONE-PART
	8329TCS	8329TCM	8329TFS	8349TFM	8329TFF	8329HTC	9460TC
UNCURED PROPERTIES							
Number of components	2	2	2	2	2	2	1
Mix Ratio by Volume	1:1	1:1	1:1	1:1	1:1	1:1 by wt.	—
Mixed density [g/mL]	2.3	2.4	2.1	1.6	1.6	1.7	1.6
Working time	4 h	45 min	4 h	20 min	5 min	80–120 min	Unlimited
Room temperature cure [h]	Heat cure	24	Heat cure	16 hours	4 h	48 h	Heat cure
Heat cure [min @ °C]	120 @ 65	60 @ 65	180 @ 65	20 @ 65	15 @ 65	60 @ 65	120 @ 80
	60 @ 80	45 @ 80	80 @ 80	10 @ 80	10 @ 80	45 @ 80	60 @ 100
	20 @ 100	20 @ 100	30 @ 100	—	—	—	30 @ 120
CURED PROPERTIES							
Resistivity [Ω·cm]	2×10^{13}	9×10^{12}	1.0×10^{12}	6.5×10^{12}	7.9×10^{12}	10^{11}	7.4×10^{16}
Service temperature range [°C]	-40 to 150	-40 to 150	-40 to 150	-65 to 120	-40 to 150	-55 to 160	-65 to 150
Glass transition temperature (T_g) [°C]	8.8	46	9	80	25	90	106
CTE prior T_g [ppm/°C]	36	71	47	20	34	60	36
CTE after T_g [ppm/°C]	173	131	164	120	146	150	72
Thermal conductivity @ 25 °C [W/(m·K)]	1.4	1.4	1.2	0.9	0.8	0.9	0.8
Thermal diffusivity @ 25 °C [mm^2/s]	0.7	0.6	0.6	0.4	0.3	—	0.5
Specific heat capacity @ 25 °C [J/(g·K)]	0.9	0.9	1.0	1.4	1.4	—	1.2
Color	Silver grey	Silver grey	Silver grey	Black	Beige	Gray	White
Hardness	62D	77D	68D	92D	82D	86D	86D
Tensile strength [N/mm^2]	11	10	4.2	25	13	34	9.1
Compressive strength [N/mm^2]	43	34	42	115	65	160	78
Lap shear (stainless steel) [N/mm^2]	4.7	6.4	5.0	6.7	7.1	15	6.0
Lap shear (aluminum) [N/mm^2]	4.4	6.1	6.3	4.4	8.3	17	3.2
AVAILABLE PACKAGING							
Net contents	6 mL (2 syringe kit)	6 mL (2 syringe kit)	25 mL (Dual-syringe)	25 mL (Dual-syringe)	25 mL (Dual-syringe)	50 mL (Dual-cartridge)	3 mL (Syringe)
	50 mL (2 jar kit)	50 mL (2 jar kit)	45 mL (Dual-cartridge)	45 mL (Dual-cartridge)	45 mL (Dual-cartridge)	400 mL (Dual-cartridge)	10 mL (Syringe)





Chapter 03

Potting Compounds

Potting Compounds

MG Chemicals has a series of high-quality potting compounds and encapsulation resins for the electronics industry. They add mechanical strength to assembly housings, fill large voids, insulate components from static discharge, and protect against exposure to chemicals, humidity, and salt water.

Our electrical potting compound portfolio includes flame retardancy, thermal conductivity, and optical clarity.

Applications

- PCB protection
- IP protection
- Encapsulating surface mount devices
- Castings and molds

Industries

- Aerospace
- Communications
- Consumer Electronics
- Electric Vehicles
- Instrumentation
- Medical equipment

Epoxy Potting Compounds

1 and 2-part systems that cure to a tough, durable finish. Epoxies offer premium ruggedization and are unmatched for their chemical resistance and shock protection.

Silicone Potting Compounds

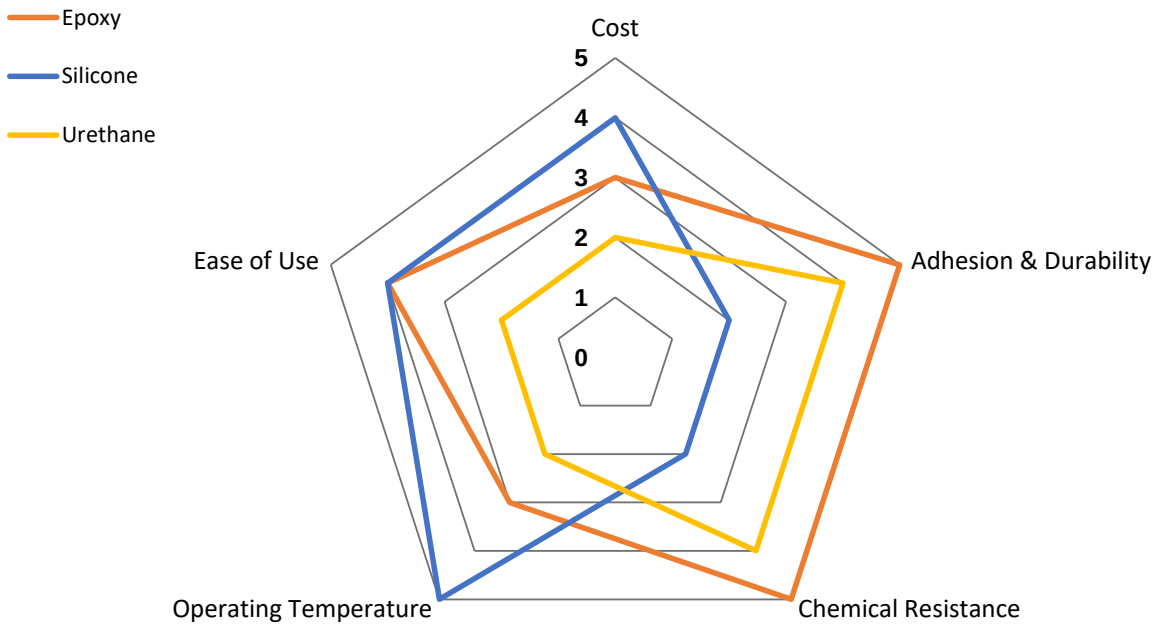
Compared with other potting materials, silicone offers premium latitude in operating temperatures ranging from -60 °C to 200 °C with short durations (~30 minutes) up to 260 °C without loss of adhesion. Their low modulus also makes them a premiere choice when encapsulating delicate surface mount components.

Urethane Potting Compounds

Polyurethanes offer superior protection against water ingression for submersion applications and retain elasticity at very low temperatures.

Potting Compounds

The general properties of potting compounds vary by their binder system. Therefore, it is important to choose the right combination for your specific application. The below graph qualitatively compare the performance of the potting compounds.



Graph 1. Performance comparison of the potting compounds based on the binder type. 5 represents the highest performance and 1 represents the lowest performance.

Product Availability

EPOXY			SILICONE*	URETHANE
1-Part	2-Part	2-Part Flame Retardant		
9510	832B	834B	RTV11	8800
	832HD	834HTC	RTV12	8810
	832C	834FX	RTV60	8820
	832WC	834BLV	RTV88	
	832FX		RTV615	
	832HT		RTV630	
	832TC			

*Products listed above are stocked items and represent a small portion of all available RTV silicones. For more options, please visit our website or contact support@mgchemicals.com.

Potting Compounds

This application guide describes the equipment and processes recommended for applying MG Chemicals' 1-part and 2-part potting compound products. It is the user's responsibility to determine the chemical, mechanical and thermal compatibility of substrates prior to using any of the suggested methods.

Epoxy potting compounds can be applied by hand mixing, meter mixing, or with the help of MG Chemicals' dispensing guns and static mixers.

Substrate Preparation

Many defects result from the presence of moisture, grease, oil, dirt, flux, and other board contaminants. Therefore, it is highly recommended that the user ensures the cleanliness and dryness of a surface prior to potting.

1. Put on disposable gloves and clean the surface with MG's 824 Isopropyl Alcohol or any other degreasing solvent.
2. Let the surface dry completely. Elevated temperatures can accelerate drying.

Crystallization/Solidification

Crystallization is the formation of solid crystals, and is common in epoxy resins. Over time the crystals may settle, causing the material to be more dense or harder at the bottom of the container. They may appear as tiny particles or cloudiness in clear resins. This phenomenon does not indicate that the material is defective, and it is easy to reverse.

If crystallization occurs, reconstitute the product by warming it to between 55 and 65 °C until it becomes fully re-liquified. Let the material cool to room temperature before mixing to prevent flash cure.

When dealing with large production volumes, contact MG Chemicals Technical Support for assistance. See Table 1 for the recommended amount of hand-mixed batches.

Cat. No.	Max. Amount for Hand-Mixed Batches
9510	Not applicable
832B	500 g
832HD	500 g
832C	500 g
832WC	500 g
832FX	500 g
832HT	500 g
832TC	3 kg
834B	1 kg
834HTC	1 kg
834FX	1 kg

Table 1. Mixing more than the amount indicated in the table above decreases working time and can lead to flash cure.

Mix Ratios and Working Time

Estimate the part A and B volumes that will be needed for the potting application prior to mixing. To avoid waste, mix required epoxy amounts only when ready to encapsulate components. Ensure the material is used and applied within the working time. If the working time is exceeded, the material will begin to gel or harden.

See Table 2 or the product's TDS for the appropriate mix ratios and working times of MG Chemicals' epoxy potting compounds.

Cat. No.	Mix Ratio by Volume (A:B)	Working Time (min)
9510	1-part	Unlimited
832B	2:1	60
832HD	1:1	45
832C	2:1	60
832WC	2:1	60
832FX	1:1	150
832HT	1.6:1	60
832TC	1:1	120
834B	2:1	60
834HTC	5:1	90
834FX	1:1	150

Table 2. Mix ratios and working time of MG Chemical's products.

Hand Mixing

Pre-Heating (Optional)

Pre-heating results in lower viscosity for easier mixing and faster de-airing; however, it will reduce the working time. To pre-heat, place individual parts into an oven at 65 °C for 90 minutes.

Pre-Stirring

Failure to properly stir individual parts before mixing them together can cause surface defects, degrade the cured properties, and even cause cure failure. Furthermore, improper pre-stirring of parts can result in inaccurate mix ratios.

1. Ensure that the individual parts are homogenous by thoroughly mixing and scraping settled material from the bottom and sides of the part A and part B containers.
2. Use a paint shaker if available.

Mixing Parts A and B

1. Measure the appropriate amount by volume of part A and pour into the mixing container. See product's TDS for mix ratios and working times.
2. Close the part A and part B containers tightly between use to prevent skinning.
3. Ensure all contents are transferred by scraping the container. To avoid cross contamination, use different mixing tools for parts A and B.
4. Repeat steps 1 and 2 for part B.
5. Thoroughly mix parts A and B together until homogenous. Avoid introducing air bubbles by gently stirring in one direction.
6. To de-air, let mixture sit for 15 minutes, or place in a vacuum chamber at 25 inHg for 2 minutes, or until bubbles are removed.
7. If bubbles are present at the top, break them gently with a mixing tool.

Potting Components

1. Pour the mixture into an enclosure holding the components to be protected.
2. Cure the mixture at the appropriate cure schedule. See the product's TDS.

Dispensing Accessories

MG Chemicals' dispensing accessories facilitate mixing, which makes the application process easier and more efficient. Static mixers eliminate the need for hand mixing. Potting compounds can be applied by hand, dispensing gun, or pneumatic applicator. Some of MG's pottinig compounds are also available in dual cartridge format.

Consult the Dispensing Accessories Catalogue when selecting the appropriate accessory for each product.

Dispensing Guns and Cartridges

Cartridges require manual dispensing guns or pneumatic applicators to dispense material. Dispensing guns are not required for MG Chemicals' 25 mL dual syringes.

8DG-30-1 and 8DG-50-1-1

Assembling the Gun

1. Lift the hinge all the way up to the top of the gun.
2. There is a tab located at the back of the gun. Push this tab up and hold it there.
3. Insert the piston all the way through the front of the gun, with the grooves facing down.
4. When the trigger is pulled, the piston moves forward. To return the piston to its original position, push up the tab on the back of the gun and pull the piston back.

Assembling the Cartridge in the Gun

1. Ensure that the gun is properly assembled with the piston fully retracted.
2. Lift the hinge on the top of the gun and insert the cartridge through the slot.
3. Once the cartridge is in place, close the hinge on the top of the gun over it.

For video instructions, click here.

8DG-400-1-1 and 8DG-450-2-1

1. Ensure that the piston is fully retracted by pulling it all the way to the back of the gun.
2. Insert the cartridge into the gun through the slot.
3. When the trigger is pulled, the piston moves forward. To return the piston to its original position, pull it back.

For video instructions, click here.

Static Mixers

Mixing tips are disposable and for single-use only. Do not store cartridges with mixing tips still attached because the material in the tip will cure.

8MT-450

1. Remove the ring cap and plug from the cartridge nozzle. Do not discard ring cap and plug.
2. Attach static mixer and place the ring cap back over the static mixer.
3. Dispense and discard 20 to 30 mL of the product to ensure a homogeneous mixture.
4. To stop the flow, pull back on the plunger.
5. Dispose of static mixer and clean nozzle to prevent contamination and material buildup.
6. Replace plug and ring cap on the cartridge.

8MT-25, 8MT-50 and 8MT-50FT

1. Twist and remove cap from the cartridge or syringe. Do not discard cap.
2. Dispense a small amount from the cartridge to ensure even flow of both parts.
3. Attach static mixer and turn clockwise to lock.
4. Dispense and discard 5 to 10 mL of the product to ensure a homogeneous mixture.
5. To stop the flow, pull back on the plunger.
6. Dispose of static mixer and clean nozzle to prevent contamination and material buildup.
7. Replace the cap on the cartridge or syringe.

Disclaimer

This information is believed to be accurate. It is intended for professional end-users who have the skills required 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.

Contact Information

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Dispensing Accessories

Dispensing Guns and Static Mixers to Aid in Application

MG Chemicals offers dispensing accessories to aid in the application of adhesives and epoxy potting compounds. Dispensing guns allow the user to apply more pressure to the cartridge than they could by hand, allowing viscous materials to be dispensed through mixing tips.

Dispensing Guns Features & Benefits

- Solid plastic casing
- Simple slide in and slide out insertion system
- Trigger activated control provides a steady incremental flow
- Dispenses an accurate and smooth flow of materials

Static Mixers Features & Benefits

- Narrow cylindrical tubes with a stationary mixing elements
- For 2-part low to medium viscosity cartridge systems
- Provides a homogeneous and perfect mix of hardener and resin
- Eases precise application
- Single use

Dispensing Guns

8DG-30-1 Solid plastic gun, for use with 30 mL 1-part cartridges

8DG-50-1-1 Solid plastic gun, for use with 50 mL dual cartridges

8DG-400-1-1 Manual gun with two steel piston arms for use with 1:1 400 mL cartridges

8DG-450-2-1 Manual gun with two steel piston arms for use with 2:1 450 mL cartridges

Static Mixers

8MT-450 Large, standard flow tip for use with 2:1 450 mL and 1:1 400 mL cartridges

8MT-50 Standard flow tip for use with 1:1 50 mL cartridges and 1:1 25 mL syringes

8MT-50-FT Fine flow tip allowing greater precision for use with 1:1 50 mL cartridges

8MT-25 Standard flow tip for use with 832HD 1:1 50 mL cartridge and 1:1 25 mL dual syringes

Dispensing Accessories

	DISPENSING GUNS				STATIC MIXERS			
	8DG-450-2-1	8DG-400-1-1	8DG-50-1-1	8DG-30-1	8MT-25	8MT-50	8MT-50FT	8MT-450
832C-450ML	Yes	—	—	—	—	—	—	Yes
832B-450ML	Yes	—	—	—	—	—	—	Yes
832HD-400ML	—	Yes	—	—	—	—	—	Yes
832HD-50ML	—	—	Yes	—	Yes	Yes	—	—
832HD-25ML	—	—	—	—	Yes	Yes	—	—
8329TFF-50ML	—	—	Yes	—	Yes	Yes	—	—
8329TFM-50ML	—	—	Yes	—	Yes	Yes	Yes	—
8329TFS-50ML	—	—	Yes	—	Yes	Yes	Yes	—
8332-25ML	—	—	—	—	Yes	—	—	—
8332-50ML	—	—	Yes	—	—	Yes	—	—
8349TFM-50ML	—	—	Yes	—	—	Yes	Yes	—
9200-50ML	—	—	Yes	—	Yes	Yes	Yes	—
9200FR-50ML	—	—	Yes	—	Yes	Yes	Yes	—
9400-30ML	—	—	—	Yes	—	—	—	—
9410-30ML	—	—	—	Yes	—	—	—	—
9510-30ML	—	—	—	Yes	—	—	—	—
AVAILABLE PACKAGING								
Content(s)	1 unit	1 unit	1 unit	1 unit	5 tips (bag)	5 tips (bag)	5 tips (bag)	5 tips (bag)








Epoxy Potting Compounds

Encapsulant for Protecting PCB's and Electronics

MG Chemicals offers a wide range of epoxy potting compounds for protecting printed circuit boards and electronic devices. It provide superior protection against water damage and chemical, mechanical, thermal or electrical shock.

Features & Benefits

- Convenient mix ratios
- UL94 V-0 and UL 746A grades available
- Thermally conductive options available
- Low exotherm
- Excellent dielectric properties
- Wide service temperature range
- Primeless adhesion to most substrates
- Superior physical and mechanical properties
- RoHS compliant

Applications

- PCBs protection in commercial transportation
- Circuit protection for oil and gas sensors
- Encapsulation of transmitter components in deep sea telecom cables
- Ruggedization for LED drivers
- IP protection

One-Part

9510	• Black, rigid, unlimited working time

Two-Part

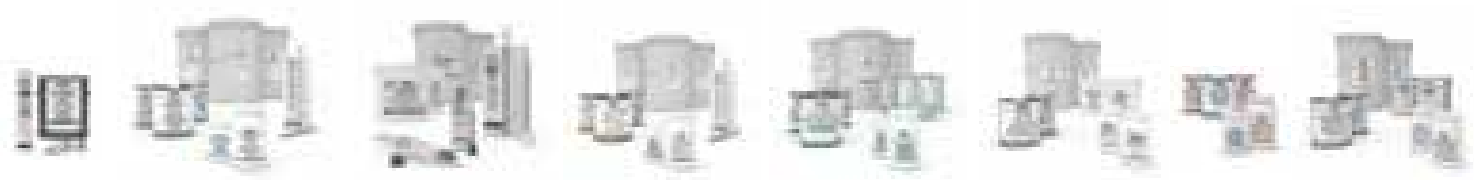
832B	• Black, 2:1 mix ratio, 1 hour working time
832HD	• Black, 1:1 mix ratio, 45 minutes working time
832C	• Translucent, 2:1 mix ratio, 1 hour working time
832WC	• Optically clear, 2:1 mix ratio, 2.5 hours working time
832FX	• Flexible, 1:1 mix ratio, 1 hour working time
832HT	• High service temperature, 1:1 mix ratio, 45 minutes working time
832TC	• Thermally conductive. 1:1 mix ratio, 2 hour working time

Two-Part Flame Retardant

834B	• Meets UL 94V-0 standard, thermal conductivity of 0.8 W/(m·K), 2:1 mix ratio, 1 hour working time
834HTC	• UL 746A certified, thermal conductivity of 0.94 W/(m·K), 5:1 mix ratio, 1.5 hour working time
834FX	• Flexible, meets UL 94V-0 standard, thermal conductivity of 0.6 W/(m·K), 1:1 mix ratio, 2.5 hour working time
834BLV	• Meets UL 94V-0 standard, thermal conductivity of 0.5 W/(m·K), 2:1 mix ratio, 2 hour working time

Epoxy Potting Compounds

	ONE-PART	TWO-PART					
	9510	832B	832HD	832C	832WC	832FX	832HT	832TC
UNCURED PROPERTIES								
Color	Black	Black	Black	Translucent	Optically clear	Black	Black	Black
Mixed density [g/mL]	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.7
Viscosity [Pa·s]								
Mixture	4.8	3.3	4.1	2.7	0.98	0.70	22	27
Part A	—	2.5	5.9	1.9	2.9	0.80	46	33
Part B	—	5.3	2.3	6.6	0.3	0.17	6.6	12
Mix ratio by volume [A:B]	—	2:1	1:1	2:1	2:1	1:1	1.6:1	1:1
Working time [min]	Unlimited	60	45	60	60	150	60	120
Cure time [min @ °C]	180 @ 80	60 @ 65	120 @ 65	60 @ 65	120 @ 65	120 @ 65	60 @ 65	120 @ 65
	60 @ 90	30 @ 80	60 @ 80	30 @ 80	60 @ 80	60 @ 80	30 @ 80	60 @ 80
	300 @ 120	20 @ 100	20 @ 100	15 @ 100	30 @ 100	30 @ 100	15 @ 100	45 @ 100
CURED PROPERTIES								
Tensile strength [N/mm^2]	20	57	32	45	10	9.6	48	23
Compressive strength [N/mm^2]	90	155	75	164	160	—	132	87
Lap shear [N/mm^2]								
Stainless steel	9.2	17	21	17	3.3	2.5	15	13
Aluminum	5.8	16	14	18	6.8	3.4	7.4	16
Hardness	84D	80D	80D	84D	82D	88A	87D	81D
TC @ 25 °C [W/(m·K)]	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.7
T_g [°C]	70	49	41	53	33	8.8	89	50
CTE prior T_g [ppm/°C]	74	79	73	150	80	114	86	142
CTE after T_g [ppm/°C]	217	196	207	161	192	218	152	114
Resistivity [Ω·cm]	2.6×10^{13}	5.3×10^{12}	1.4×10^{13}	6.7×10^{12}	1.6×10^{17}	5.8×10^{12}	1.0×10^{13}	8.2×10^{12}
Breakdown voltage [V]	36 700	51 900	41 700	60 400	41 000	36 300	>50 000	48 300
Dielectric strength [V/mil]	540	472	400	480	465	370	470	386
Service temperature [°C]	-65 to 150	-40 to 140	-40 to 150	-40 to 140	-40 to 140	-40 to 140	-40 to 225	-30 to 175
AVAILABLE PACKAGING								
Net contents	30 mL	375 mL	25 mL	375 mL	375 mL	450 mL	375 mL	450 mL
	300 mL	450 mL	50 mL	450 mL	3 L	1.7 L	3 L	2 L
	3.6 L	3 L	400 mL	3 L	12 L	7.4 L		8 L
		60 L	7.4 L	60 L	60 L	40 L		40 L
			40 L					

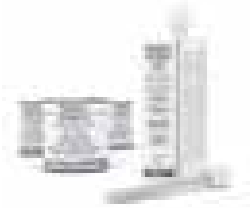


9510 832B 832HD 832C 832WC 832FX 832HT 832TC

Epoxy Potting Compounds

	TWO-PART FLAME RETARDANT			
	834B	834HTC	834FX	834BLV
UNCURED PROPERTIES				
Certification	Meets UL 94V-0	UL 746A certified	Meets UL 94V-0	Meets UL 94V-0
Color	Black	Black	Black	Black
Mixed density [g/mL]	1.6	1.7	1.6	1.4
Viscosity [Pa·s]				
Mixture	16	10	15	3.0
Part A	28	56	8.0	3.9
Part B	2.1	0.024	16	2.5
Mix ratio by volume [A:B]	2:1	5:1	1:1	2:1
Working time [min]	60	90	150	120
Cure time [min @ °C]	150 @ 65	120 @ 65	120 @ 65	120 @ 65
	60 @ 80	60 @ 80	60 @ 80	60 @ 80
	20 @ 100	30 @ 100	30 @ 100	20 @ 100
CURED PROPERTIES				
Tensile strength [N/mm^2]	17	22	5.3	20
Compressive strength [N/mm^2]	74	123	21	90
Lap shear [N/mm^2]				
Stainless steel	8.2	6.7	3.7	15
Aluminum	11	4.7	2.7	19
Hardness	85D	91D	88A	87D
TC @ 25 °C [W/(m·K)]	0.8	0.9	0.6	0.5
T_g [°C]	56	117	0.7	74
CTE prior T_g [ppm/°C]	74	34	71	78
CTE after T_g [ppm/°C]	107	116	137	111
Resistivity [Ω·cm]	2.1 x 10^{12}	3.0 x 10^{13}	7.5 x 10^{11}	1.6 x 10^{13}
Breakdown voltage [V]	40 700	37 500	36 300	40 300
Dielectric strength [V/mil]	430	395	365	395
Service temperature [°C]	-40 to 175	-50 to 150	-50 to 125	-80 to 200
AVAILABLE PACKAGING				
Net contents	375 mL	900 mL	450 mL	450 mL
	2.7 L	60 L	1.7 L	3 L
	10.8 L		7.2 L	
	60 L		40 L	



Urethane Potting Compounds

Ideal Potting Compounds for Marine Applications

MG Chemicals polyurethane resins provide cost-effective alternatives to other chemistries for protecting printed circuit boards and electronic devices. These 2-part potting compounds are especially suitable where low temperature flexibility is required. They provide strong protection from moisture, sea water, solvents, and mechanical stress. They are an ideal potting compound for underwater applications.

Features & Benefits

- 2:1 mix ratio
- Excellent dielectric properties
- Retains elastomeric properties down to -50 °C
- Superior physical and mechanical properties
- Variety of working times available
- RoHS compliant

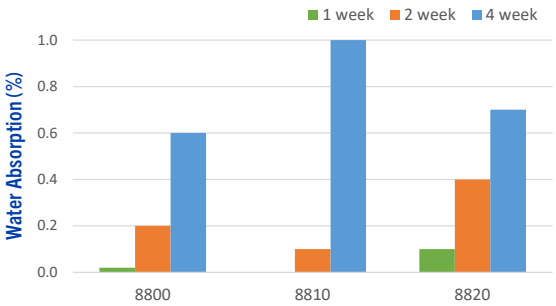
Applications

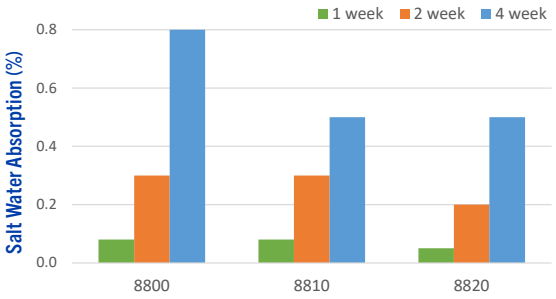
- IP protection
- Undersea telecom infrastructure
- Circuits in mining equipment
- Encapsulating delicate surface mount devices
- Cable jointing

8800 — Black, flexible, and short working time. Maintains excellent flexibility at low temperatures and creates minimum stress on circuit boards and surface-mounted devices.

8810 — Black, rigid, long working time, and low exotherm. Provides excellent moisture resistance.

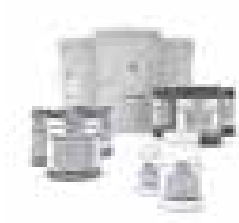
8820 — Black, rigid, high temperature, and low exotherm. Offers properties similar to epoxy compounds, but with exceptional low temperature stability.

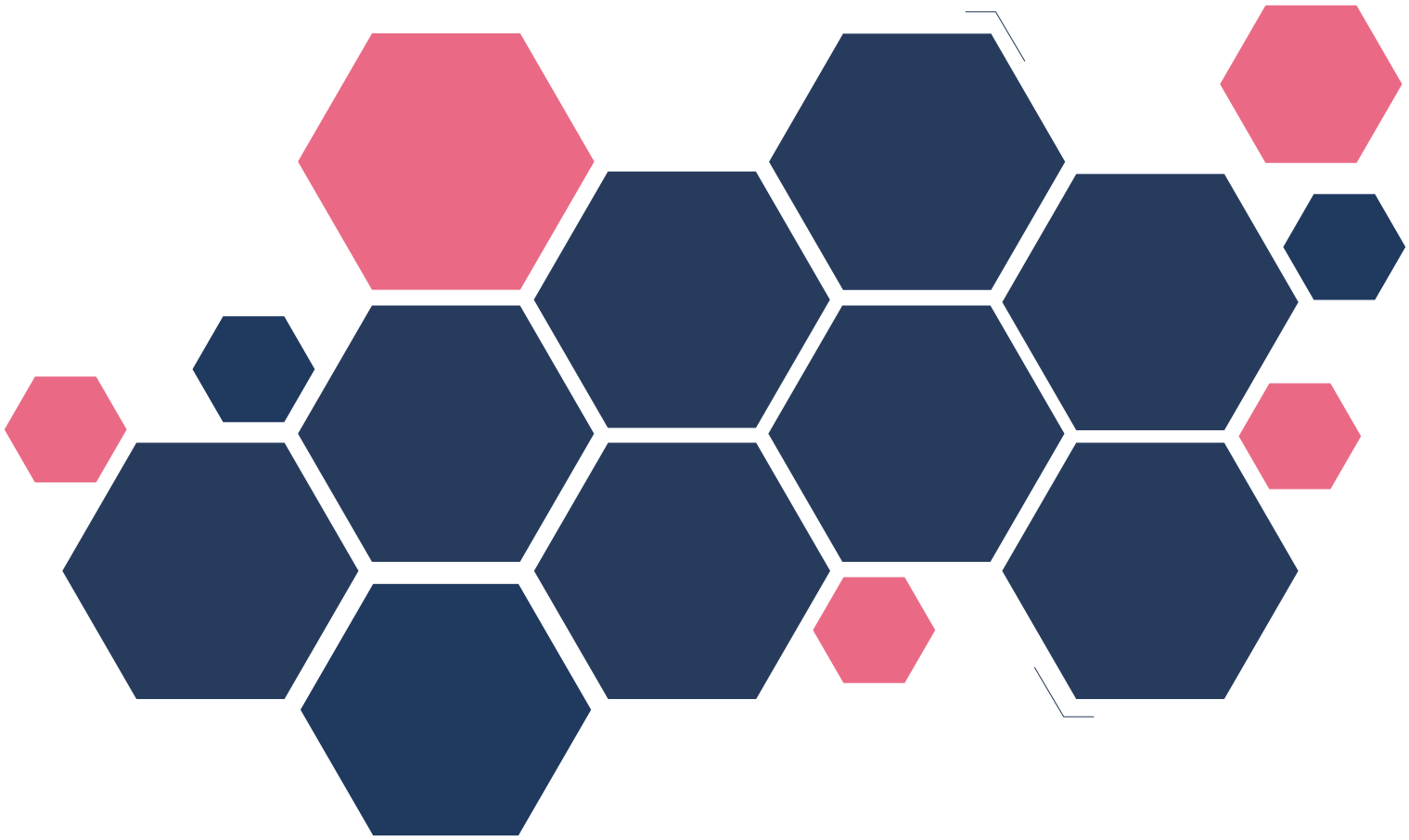




Urethane Potting Compounds

	8800	8810	8820
UNCURED PROPERTIES			
Color	Black	Black	Black
Mixed density [g/mL]	1.1	1.1	1.1
Viscosity [Pa·s]			
Part A	300	320	10 700
Part B	640	220	250
Mix ratio by volume [A:B]	2:1	2:1	2:1
Mix ratio by weight [A:B]	7.4:1	1.7:1	1.85:1
Working time [min] Based on 100 g sample. Varies by volume and geometry.	10	45	15
Cure time [min @ °C]	30 @ 65 25 @ 80	60 @ 65 45 @ 80	120 @ 65 90 @ 80
CURED PROPERTIES			
Tensile strength [N/mm^2]	4.5	10	15
Compressive strength [N/mm^2]	—	253	295
Lap shear [N/mm^2]			
Stainless steel	4.4	4.9	13
Aluminum	3.1	7.5	12
Hardness	74A	80D	73D
TC @ 25 °C [W/(m·K)]	0.3	0.3	0.3
T_g [°C]	11	44	44
CTE prior T_g [ppm/°C]	86	83	94
CTE after T_g [ppm/°C]	221	210	195
Resistivity [Ω·cm]	8.4 x 10^{12}	1.9 x 10^{13}	1.4 x 10^{13}
Breakdown voltage [V]	46 200	50 900	47 300
Dielectric strength [V/mil]	370	407	380
Service temperature [°C]	-50 — 120	-50 — 120	-50 — 150
Intermittent temperature [°C]	130	130	175
AVAILABLE PACKAGING			
Net contents	375 mL (2 bottle kit) 2.55 L (3 can kit) 10.8 L (3 can kit) 60 L (3 pail kit)	375 mL (2 bottle kit) 2.55 L (3 can kit) 60 L (3 pail kit)	375 mL (2 bottle kit) 2.55 L (3 can kit) 10.8 L (3 can kit) 60 L (3 pail kit)

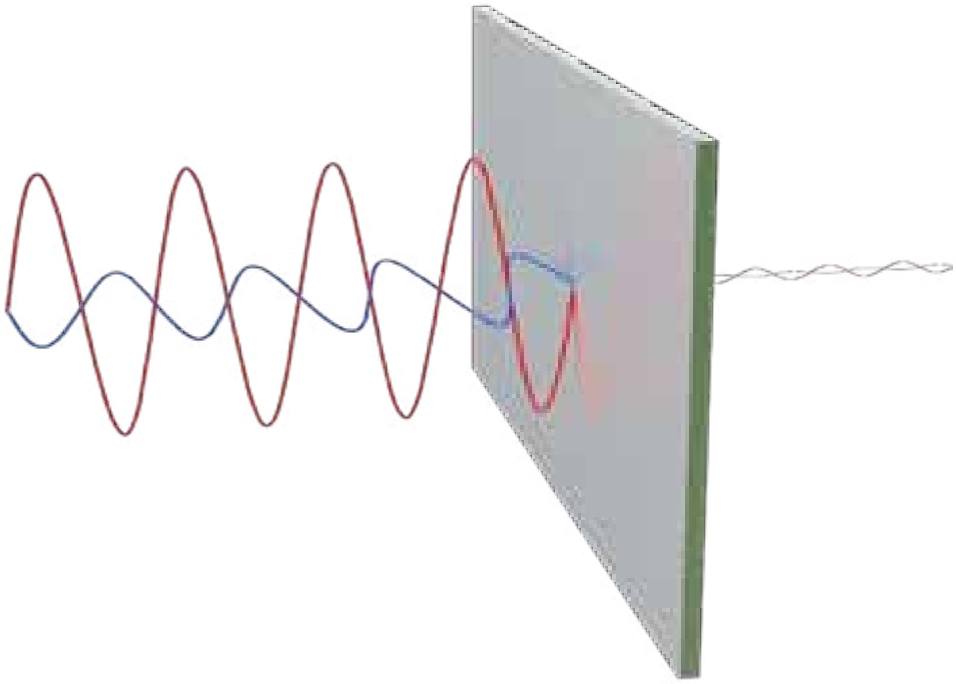




Chapter 04

Conductive Paints

Conductive Paints



Applications

- EMI / RFI Shielding
- Galvanic corrosion resistance
- ESD Protection
- Grounding
- Electroplating plastics

Industries

- Aerospace
- Communications
- Consumer Electronics
- Defence
- Electric Vehicles
- Instrumentation
- Medical equipment
- Research

Conductive Acrylic Paint - These 1-part coatings cure quickly and are most commonly used to provide EMI/RFI shielding to plastic electronic enclosures.

Conductive Epoxy Paint - These 2-part coatings offer superior adhesion, durability, and chemicals resistance. They are suitable for use in harsh environments.

Water Based Conductive Shielding Paint - These 1-part coatings are non-flammable, low VOC, and low odor. They are suitable for architectural applications, electronic enclosures, and musical instrument.

Packaging and Board Level Shielding - These coatings are suitable for high frequency EMI board and package level applications.

ESD Safe Coating - These are durable coatings that eliminate electrostatic discharge on a wide variety of substrates.

Conductive Paints

Binder Systems

Acrylic is the most used binder for plastic enclosures. It cures at room temperature, applies easily, and creates a durable coating.

Water based urethane is the only choice for architectural applications because of its low VOC content. It is non-flammable, has no noxious vapors, and is not a dangerous good when shipped by air.

Solvent based urethane creates a flexible coating and applies very thin. It adheres strongly to most substrates including plastics, metals, and glass.

Epoxy is used when extreme durability and strong chemical resistance is needed. It offers mar and scratch resistance, very strong adhesion, extreme abrasion and impact resistance. Epoxy-based paints are the best choice for coating metals and concrete.

Conductive Fillers

Carbon is best for low frequency shielding, musical instruments, and grounding.

Nickel is suitable for most device-level shielding applications. It provides modest shielding, durability, and excellent corrosion resistance.

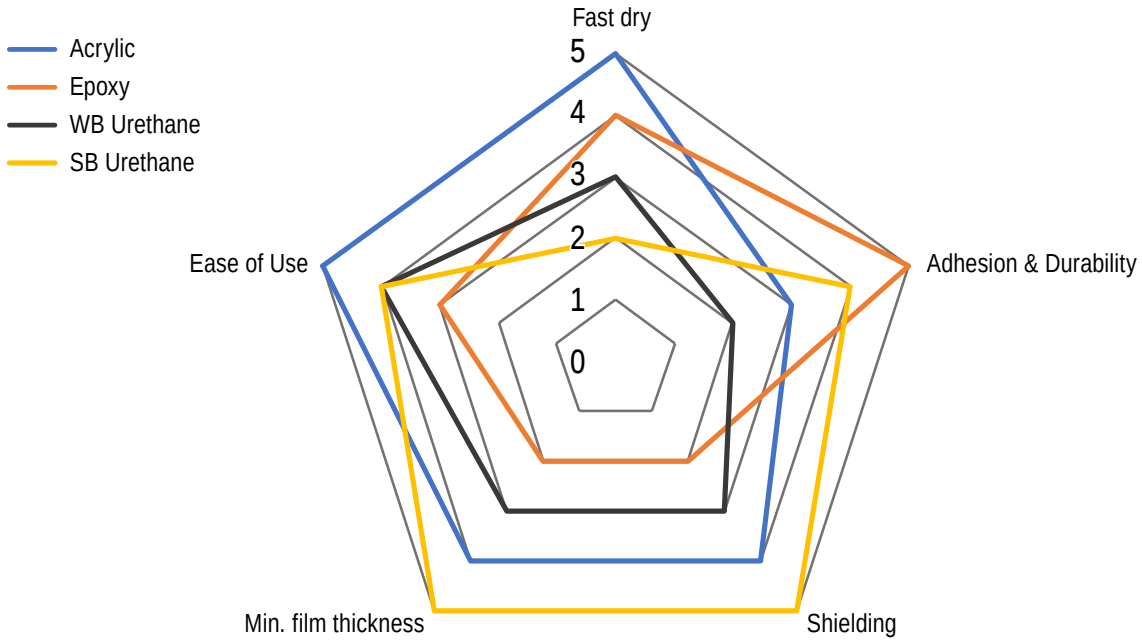
Silver offers the best shielding and corrosion resistance. It is also the best choice for board-level and package level shielding. It can be applied very thin.

Silver-coated copper provides superior shielding performance at a lower cost compared to silver.

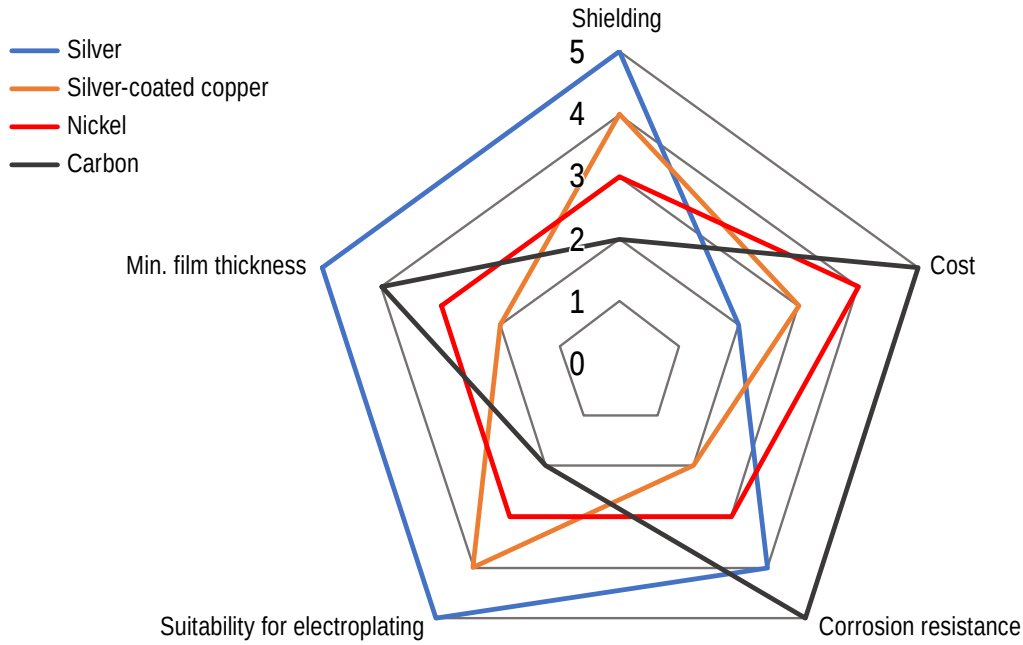
	EMI/RFI SHIELDING PAINTS				ESD COATINGS
	Carbon	Nickel	Silver	Silver-coated Copper	
Solvent based Acrylic	838AR	841AR	842AR	843AR	844AR
Water based Urethane	—	841WB	842WB	843WB	844WB
Solvent based Urethane	—	—	842UR	—	—
Solvent based Epoxy	—	841ER	842ER	843ER	—

Conductive Paints

The general properties of conductive paints vary by their binder system and conductive fillers. Therefore, it is important to choose the right combination your specific application. The below graphs qualitatively compare the performance of conductive paints based on their binder and conductive filler systems.



Graph 1. Performance comparison of conductive paints based on the binder type. 5 represents the highest performance and 1 represents the lowest performance.



Graph 2. Performance comparison of conductive paints based the filler type. 5 represents the highest performance and 1 represents the lowest performance.

Acrylic Conductive Paints

Protection against EMI/RFI

MG Chemicals AR series are acrylic-based conductive paints that are designed for protection against EMI/RFI across a broad frequency spectrum. These easy-to-use 1-part coatings cure quickly and are intended for use on commonly used plastics for PCB enclosures like ABS, Nylon and Polycarbonate.

Features & Benefits

- 1-part systems, easy to apply
- 5 options available depending on conductivity requirements
- Strong corrosion resistance
- Excellent adhesion to most plastics
- Does not contain toluene, xylene, or MEK
- Broad frequency range protection

Applications

- Shielding plastic PCB enclosures
- Board-level shielding
- Conductive coating for electro-plating
- Shielding long-range communication devices and satellites

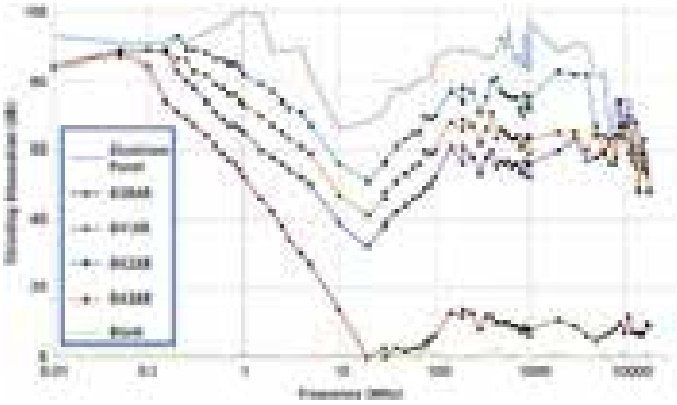
838AR • Carbon conductive paint for low frequency shielding and electrical grounding

841AR • Nickel conductive paint for broad spectrum shielding

842AR • Silver conductive paint for premium EMI vprotection

842ARL • Silver conductive paint with low film thickness

843AR • Silver-coated copper conductive paint which balances cost and EMI performance



Acrylic Conductive Paints

	838AR	841AR	843AR	842AR	842ARL
Certification	—	UL (File # E202609)	UL (File # E202609)	—	—
UNCURED PROPERTIES					
Conductive filler	Carbon	Nickel	Silver-coated Copper	Silver	Silver
Format	Liquid	Liquid	Liquid	Liquid	Liquid
Color	Black	Dark grey	Light metallic brown	Light grey	Light grey
Percent solids	15%	57%	31%	61%	39%
Density @ 25 °C	0.9 g/mL	1.7 g/mL	1.1 g/mL	1.7 g/mL	1.3 g/mL
Viscosity @ 25 °C	114 cP	1 460 cP	<30 cP	873 cP	16 cP
Calculated VOC	519 g/L	236 g/L	187 g/L	206 g/L	268 g/L
Dilution required for spray	Yes	Yes	No	Yes	Yes
Theoretical coverage @ 2 mil (based on 100% transfer efficiency)	20 016 cm^2/L	44 785 cm^2/L	23 290 cm^2/L	46 000 cm^2/L	21 000 cm^2/L
Recoat time	3 min	3 min	3 min	3 min	3 min
Cure time @ 22 °C	24 h	24 h	24 h	24 h	24 h
Cure time @ 65 °C	30 min	30 min	30 min	30 min	30 min
CURED PROPERTIES					
Resistivity	0.63 Ω·cm	0.0040 Ω·cm	0.00030 Ω·cm	0.00010 Ω·cm	0.000075 Ω·cm
Surface resistance @ 50 µm	100 Ω/sq	0.49 Ω/sq	0.080 Ω/sq	0.015 Ω/sq	—
Salt fog resistance @ 35 °C, 96 h	Excellent	Excellent	Poor	Excellent	—
Constant service temperature	-40–120 °C	-40–120 °C	-40–120 °C	-40–120 °C	-40–120 °C
Adhesion (ABS/PC)	5B	5B	5B	5B	5B
Pencil hardness	H, hard	3H, hard	F, medium	3H, hard	F, hard
Magnetic class	Diamagnetic	Ferromagnetic	Diamagnetic	Diamagnetic	Diamagnetic
AVAILABLE PACKAGING					
Net content	12 mL (glass jar)	12 mL (glass jar)	—	12 mL (glass jar)	850 mL (metal can)
	—	150 mL (metal can)	—	150 mL (metal can)	—
	850 mL (metal can)	850 mL (metal can)	850 mL (metal can)	850 mL (metal can)	—
	3.60 L (metal can)	3.60 L (metal can)	3.60 L (metal can)	3.60 L (metal can)	—

Board Level Shielding

EMI Shielding on Circuit Boards and Semiconductor Packages

MG Chemicals offers silver conductive paints for premium EMI shielding applications. These coatings are designed for large-scale, selective spray applications for both board-level shielding of circuit boards and package-level shielding for semiconductors. They are lightweight, cost-effective alternatives to processes like metal stamping and Physical Vapor Deposition (PVD)

Features & Benefits

- Cures quickly at elevated temperatures
- Excellent corrosion resistance
- Withstands wave solder temperatures exceeding 260°C (except 842AR)
- Excellent adhesion to a wide variety of substrates
- Exceptional EMI shielding
- Ready to spray

Applications

- Replacing metal stamping for board-level EMI shielding
- Replacing PVD coatings for silicon wafers
- Package-level and board-level shielding

842AR – 1-part silver acrylic conductive paint

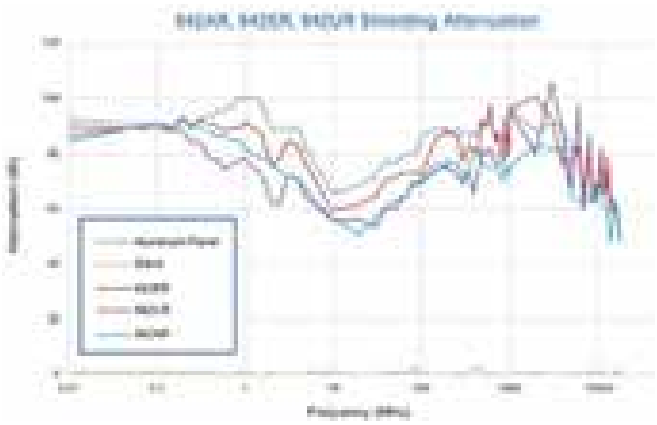
- Easy to rework
- Room temperature cure

842UR – 1-part silver polyurethane conductive paint

- Exceptional conductivity at film thicknesses as low as 7 microns
- Flexible

842ER - 2-part silver epoxy conductive paint

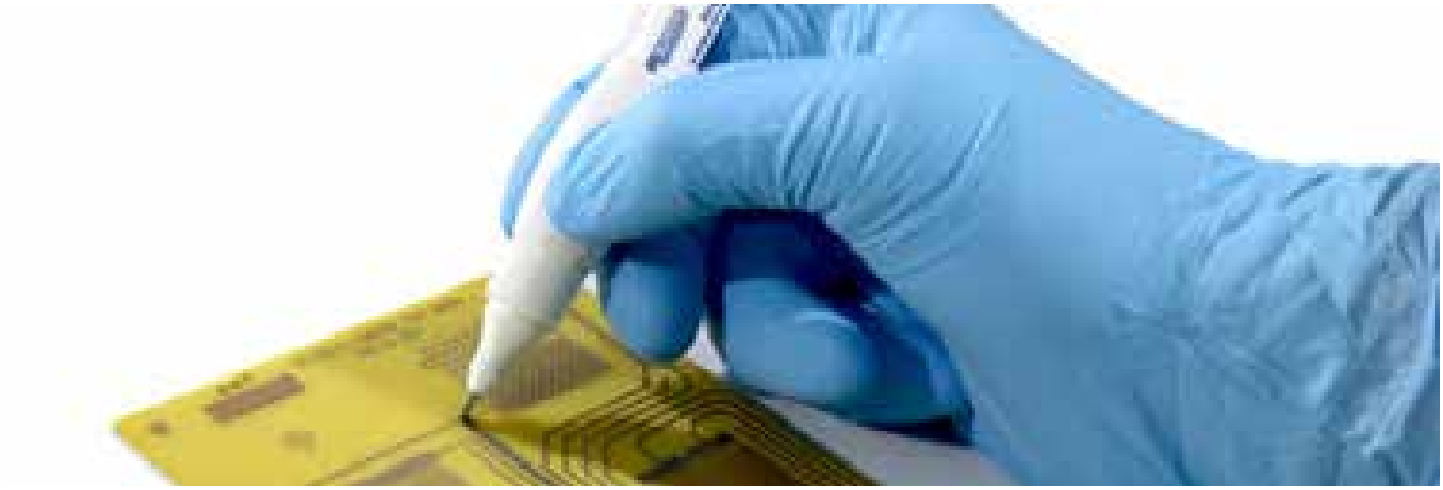
- Excellent solvent and abrasion resistance
- Flexible



Board Level Shielding

	842AR	842UR	842ER
UNCURED PROPERTIES			
Conductive filler	Silver	Silver	Silver
Binder	Acrylic	Polyurethane	Epoxy
Format	Liquid	Liquid	Liquid
Color	Light grey	Metallic silver	Metallic silver
Mix ratio by weight	1 part	1 part	100:10
Mix ratio by volume	1 part	1 part	100:20
Percent solids	61%	30%	54%
Density @ 25 °C [77 °F]	1.70 g/mL	1.33 g/mL	1.37 g/mL
Viscosity @ 25 °C [77 °F]	873 cP	4 cP	60 cP (Part A), 22 cP (Part B)
Calculated VOC	206 g/L	360 g/L	1 181 g/L
Theoretical coverage @ 2 mil (based on 100% transfer efficiency)	46 000 cm^2/L	26 570 cm^2/L	25 230 cm^2/L
Recoat time (Plastic)	3 min	20 min	5 min
Cure time (min @ °C)	1440 @ 22 30 @ 65	30 @ 125 15 @ 140	1440 @ 22 180 @ 65 120 @ 80 60 @ 100 45 @ 120
CURED PROPERTIES			
Resistivity	0.0001 Ω·cm	0.00015 Ω·cm	0.002 Ω·cm
Surface resistance @ 50 µm	0.015 Ω/sq	0.008 Ω/sq	0.13 Ω/sq
Salt fog resistance @ 35 °C [95 °F], 96 h	Excellent	Excellent	Excellent
Constant service temperature	-40—120 °C [-40—248 °F]	-40—125 °C [-40—257 °F]	-40—150 °C [-40—302 °F]
Adhesion (ABS/PC)	5B	5B	5B
Pencil hardness	3H, hard	2H, hard	4H, hard
Magnetic class	Diamagnetic	Diamagnetic	Diamagnetic
AVAILABLE PACKAGING			
Net contents	12 mL (glass jar) 150 mL (metal can) 850 mL (metal can) 3.60 L (metal can)	12 mL (glass jar) 150 mL (metal can) 850 mL (metal can) 3.60 L (metal can)	60 mL (2 glass bottle kit) 900 mL (2 metal can kit) 4.25 L (2 metal can kit)

Conductive Pens



Easily draw and repair conductive traces

MG Chemicals offers conductive pens that allow for easy and timely repair of defective circuit traces. They dispense acrylic lacquer pigmented with either carbon powder, nickel flake, or silver flake. Each pigment provides a different resistivity, making each pen suitable for different applications.

Features and Benefits

- Create durable, corrosion resistant, conductive connections
- Tack free in minutes
- Adheres to ABS, PLA, and other 3D Printer Filaments
- Adheres to copper, aluminum, ceramics, wood, and most electronic substrates
- Typical trace width: 1.5 - 2 mm
- For use on smooth, flat, and hard surfaces
- Does not contain toluene, xylene, or MEK

Applications

- Sketch on conductive traces for prototypes
- Creating jumpers, bridges and through holes
- Repair circuits in controllers, keyboards and PCBs

838AR-P - Carbon conductive pen for low conductivity repairs like keyboards

841AR-P - Nickel conductive pen for moderate conductivity repairs like bridges and PCB trace

842AR-P - Silver conductive pen for high conductivity repairs like connecting through holes

Conductive Pens

	838AR-P	841AR-P	842AR-P
UNCURED PROPERTIES			
Conductive filler	Carbon	Nickel	Silver
Format	Liquid	Liquid	Liquid
Color	Black	Dark grey	Light grey
Percent solids	15%	57%	61%
Density @ 25 °C [77 °F]	0.89 g/mL	1.70 g/mL	1.70 g/mL
Viscosity @ 25 °C [77 °F]	114 cP	1 460 cP	873 cP
Calculated VOC	519 g/L	236 g/L	206 g/L
Recoat time	1 min	1 min	1 min
Cure time @ 22 °C [71.6 °F]	24 h	24 h	24 h
Cure time @ 65 °C [149 °F]	30 min	30 min	30 min
Approximate linear coverage	74 m	30 m	50 m
CURED PROPERTIES			
Resistivity	0.63 Ω·cm	0.004 Ω·cm	0.0001 Ω·cm
Surface resistance @ 50 µm	100 Ω/sq	0.49 Ω/sq	0.015 Ω/sq
Constant service temperature	-40—120 °C [-40—248 °F]	-40—120 °C [-40—248 °F]	-40—120 °C [-40—248 °F]
Adhesion (ABS/PC)	5B	5B	5B
Pencil hardness	H, hard	3H, hard	3H, hard
Magnetic class	Diamagnetic	Ferromagnetic	Diamagnetic
AVAILABLE PACKAGING			
Net content	5 mL, 4.44 g	5 mL, 7.57 g	2 mL, 3.65 g 5 mL, 9.14 g

Conductive Spray Paints

Protection against EMI/RFI

MG Chemicals Conductive Spray Paints are acrylic-based conductive paints, packaged in aerosol cans, that are designed for protection against EMI/RFI across a broad frequency spectrum. These easy-to-use 1-part coatings cure quickly and are intended for use on commonly used plastics for PCB enclosures like ABS, Nylon and Polycarbonate. This convenient packaging option allows users to complete proof-of-concept or lower volume runs quickly and economically.

Features & Benefits

- 1-part systems, easy to apply
- 4 options available depending on conductivity requirements
- Excellent adhesion to most plastics
- Does not contain toluene, xylene, or MEK
- Broad frequency range protection

Applications

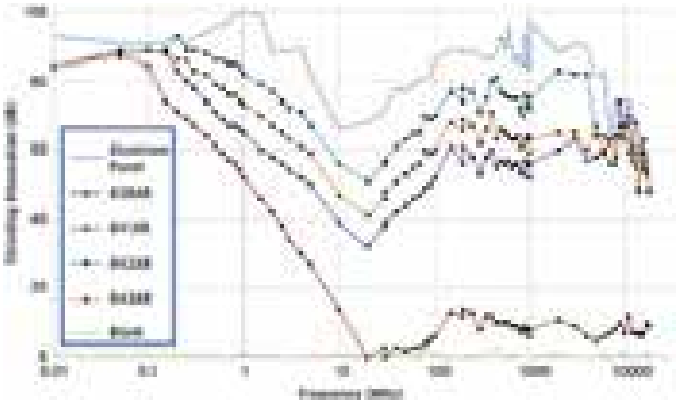
- Shielding plastic PCB enclosures
- Board-level shielding
- Conductive coating for electro-plating
- Shielding long-range communication devices and satellites

838AR-340G • Carbon conductive paint for low frequency shielding and electrical grounding

841AR-340G • Nickel conductive paint for broad spectrum shielding

842AR-140G • Silver conductive paint for premium EMI protection

843AR-340G • Silver-coated copper conductive paint which balances cost and EMI performance



Conductive Spray Paints

	838AR-340G	841AR-340G	843AR-340G	842AR-140G
UNCURED PROPERTIES				
Conductive filler	Carbon	Nickel	Silver-coated copper	Silver
Format	Aerosol	Aerosol	Aerosol	Aerosol
Color	Black	Dark grey	Light metallic brown	Light grey
Percent solids	15%	57%	31%	61%
Density @ 25 °C [77 °F]	0.84 g/mL	1.34 g/mL	0.99 g/mL	1.38 g/mL
Viscosity @ 25 °C [77 °F]	46 cP	61 cP	87 cP	80 cP
Calculated VOC	587 g/L	470 g/L	404 g/L	361 g/L
Theoretical coverage @ 2 mil (based on 50% transfer efficiency)	1 500 cm^2	2 500 cm^2	3 100 cm^2	680 cm^2
Recoat time	3 min	3 min	3 min	3 min
Cure time @ 22 °C [71.6 °F]	24 h	24 h	24 h	24 h
Cure time @ 65 °C [149 °F]	30 min	30 min	30 min	30 min
CURED PROPERTIES				
Resistivity	0.69 Ω·cm	0.0076 Ω·cm	0.00022 Ω·cm	0.00012 Ω·cm
Surface resistance @ 50 µm	110 Ω/sq	0.60 Ω/sq	0.080 Ω/sq	0.050 Ω/sq
Salt fog resistance @ 35 °C [95 °F], 96 h	Excellent	Excellent	Poor	Excellent
Constant service temperature	-40–120 °C [-40–248 °F]	-40–120 °C [-40–248 °F]	-40–120 °C [-40–248 °F]	-40–120 °C [-40–248 °F]
Adhesion (ABS/PC)	5B	5B	5B	5B
Pencil hardness	H, hard	3H, hard	F, medium	3H, hard
Magnetic class	Diamagnetic	Ferromagnetic	Diamagnetic	Diamagnetic
AVAILABLE PACKAGING				
Net contents	340 g, 442 mL	340 g, 290 mL	140 g, 129 mL	340 g, 400 mL

Epoxy Conductive Paints

Protection Against EMI/RFI: Durable and Chemically Resistant

MG Chemicals ER series are epoxy conductive paints that are designed for protection against EMI/RFI. They offer superior durability and resistance to solvents compared to other chemistries. These 2-part systems are suitable either in harsh environments with direct chemical exposure or for use on substrates like metal and concrete.

Features & Benefits

- 2-part systems
- Superior adhesion to metals and concrete
- Excellent abrasion resistance
- Enhanced resistance against solvents
- Withstands wave solder temperatures exceeding 260°C

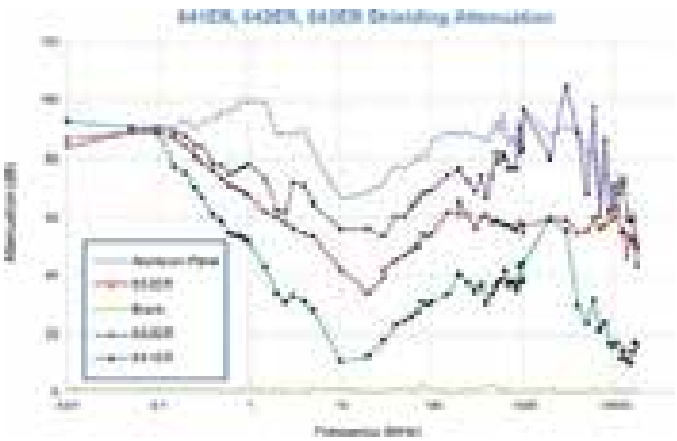
Applications

- Military and commercial electronic enclosures
- Avionic systems
- Shielding paint for flooring
- Conductive coating for electroplating metals
- Shielding in harsh environments like engine hoods

841ER - Nickel conductive paint for electroplating metals

842ER - Silver conductive paint for premium shielding performance

843ER - Silver-coated copper conductive paint which balances cost and EMI performance



Epoxy Conductive Paints

	841ER	842ER	843ER
UNCURED PROPERTIES			
Conductive filler	Nickel	Silver	Silver-coated copper
Format	Liquid	Liquid	Liquid
Color	Grey	Metallic silver	Light metallic brown
Mix ratio by weight	100:25	100:10	100:28
Mix ratio by volume	100:38	100:20	100:36
Percent solids	32%	54%	30%
Density @ 25 °C [77 °F]	1.81 g/mL	1.37 g/mL	1.00 g/mL
Viscosity @ 25 °C [77 °F]	200 cP (Part A) 18 cP (Part B)	60 cP (Part A) 18 cP (Part B)	35 cP (Part A) 9 cP (Part B)
Calculated VOC	1 294 g/L	1 181 g/L	779 g/L
Theoretical coverage @ 2 mil (based on 100% transfer efficiency)	28 000 cm^2/L	25 230 cm^2/L	47 840 cm^2/L
Working time	4 h	4 h	8 h
Recoat time (Plastic)	5 min	5 min	3 min
Cure time @ 22 °C [71.6 °F]	Heat cure only	24 h	Heat cure only
Cure time @ 65 °C [149 °F]	4 h	3 h	4 h
Cure time @ 80 °C [176 °F]	2 h	2 h	2 h
Cure time @ 100 °C [212 °F]	1 h	1 h	N/A
CURED PROPERTIES			
Resistivity	0.03 Ω·cm	0.0002 Ω·cm	0.0018 Ω·cm
Surface resistance @ 50 µm	4.3 Ω/sq	0.13 Ω/sq	0.31 Ω/sq
Salt fog resistance @ 35 °C [95 °F], 96 h	Good	Excellent	Poor
Constant service temperature	-40—150 °C [-40—302 °F]	-40—150 °C [-40—302 °F]	-40—120 °C [-40—248 °F]
Adhesion (ABS/PC)	5B	5B	5B
Pencil hardness	4H, hard	4H, hard	6H, hard
Magnetic class	Ferromagnetic	Diamagnetic	Diamagnetic
AVAILABLE PACKAGING			
Net contents	250 mL (2 metal can kit) 1.17 L (2 metal can kit) 3.25 L (2 metal can kit)	60 mL (2 glass bottle kit) 900 mL (2 metal can kit) 4.24 L (2 metal can kit)	250 mL (2 metal can kit) 810 mL (2 metal can kit) 3.25 L (2 metal can kit)

ESD Safe Coatings

Prevents Electrostatic Discharge on a Wide Variety of Substrates

An ESD safe coating is a conductive paint with a surface resistance in the range of 107 to 109 Ω. This is the “static dissipative range”, which prevents harmful buildup of static charge.

Our ESD paints adhere strongly to metals, plastics, glass, and most other surfaces.

844AR — A one-part, dark grey, quick dry solvent-based acrylic ESD coating for plastics.

844WB — A one-part, translucent, water-based ESD paint. Non-flammable, low odor, and low VOC.

Features & Benefits

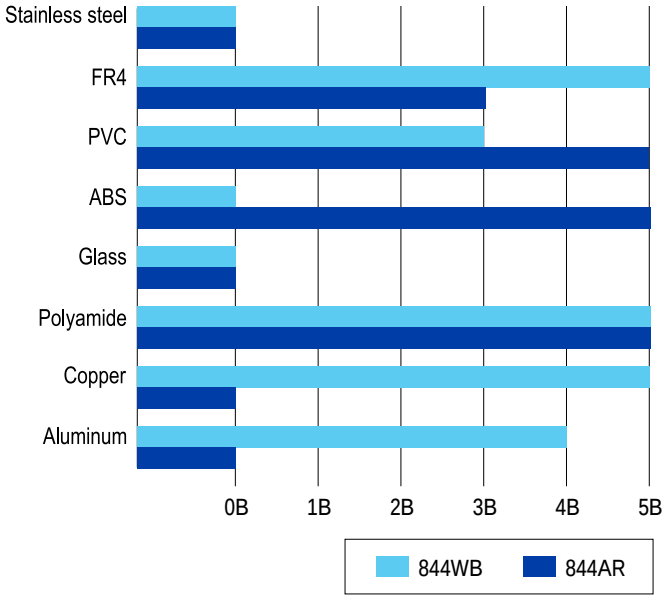
- Dissipates electrostatic charge
- Resistance of 10^7 to 10^8 Ω
- Permanent coating
- Humidity independent
- Low VOC and HAP-free
- Does not contain toluene, xylene or MEK

Applications

Preventing static buildup on:

- Bumpers, bins, trays, and tools
- Workstation surfaces
- Carts
- Monitors, keyboards, CPU holders
- Task chairs
- Clipboards

844AR vs. 844WB Adhesion



ESD Safe Coatings

	844AR	844WB
UNCURED PROPERTIES		
Format	Liquid	Liquid
Color	Dark grey	Translucent, dark tint
Percent solids	17%	29%
Density @ 25 °C [77 °F]	0.94 g/mL	1.03 g/mL
Viscosity @ 25 °C [77 °F]	8.6 cP	128 cP
Calculated VOC	423 g/L	71.3 g/L
Theoretical coverage @ 2 mil	26 800 cm^2/L	36 000 cm^2/L
Recoat time (Plastic)	5 min	5 min
Cure time @ 22 °C [71.6 °F]	24 h	N/A
Cure time @ 45 °C [113 °F]	N/A	45 min
Cure time @ 65 °C [149 °F]	30 min	30 min
Cure time @ 80 °C [176 °F]	N/A	10 min
CURED PROPERTIES		
Surface resistance @ 50 µm	2.0 x 10^8 Ω/sq	5.6 x 10^7 Ω/sq
Constant service temperature	-40—120 °C [-40—248 °F]	-40—120 °C [-40—248 °F]
Pencil hardness	H, hard	HB, hard
AVAILABLE PACKAGING		
Net contents	850 mL (metal can) 3.60 L (metal can) —	850 mL (metal can) 3.60 L (metal can) 340 g (aerosol)

Water Based Conductive Paint

Protection Against EMI/RFI: Low VOC/Environmentally Safe

MG Chemicals WB series are water-based conductive paints that are designed for protection against EMI/RFI. These easy-to-use, 1-part systems are intended for use in building interiors where shielding against EMI/RFI is a necessity. Compared to the AR series, WB paints enjoy the benefits of being non-flammable, low VOC and having low odor.

Features and Benefits

- 1-part system
- Ready to spray, no dilution required
- Low odor
- Excellent adhesion to drywall and most plastics
- Ships as non-DG by air
- Can be painted over with architectural paints

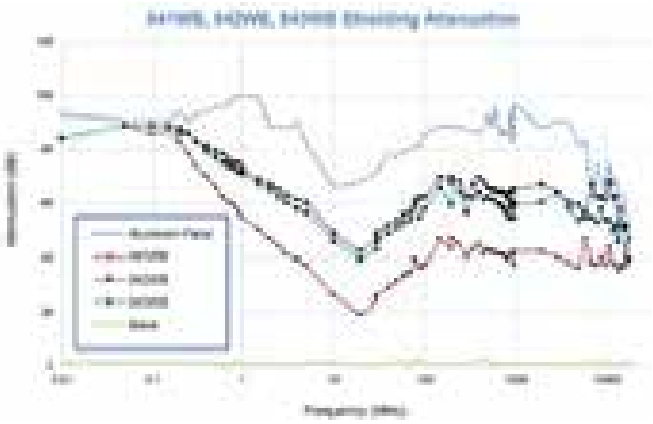
Applications

- Plastic enclosures for PCBs
- EMI shielding for operating rooms and military facilities

841WB - Nickel conductive paint for broad spectrum shielding

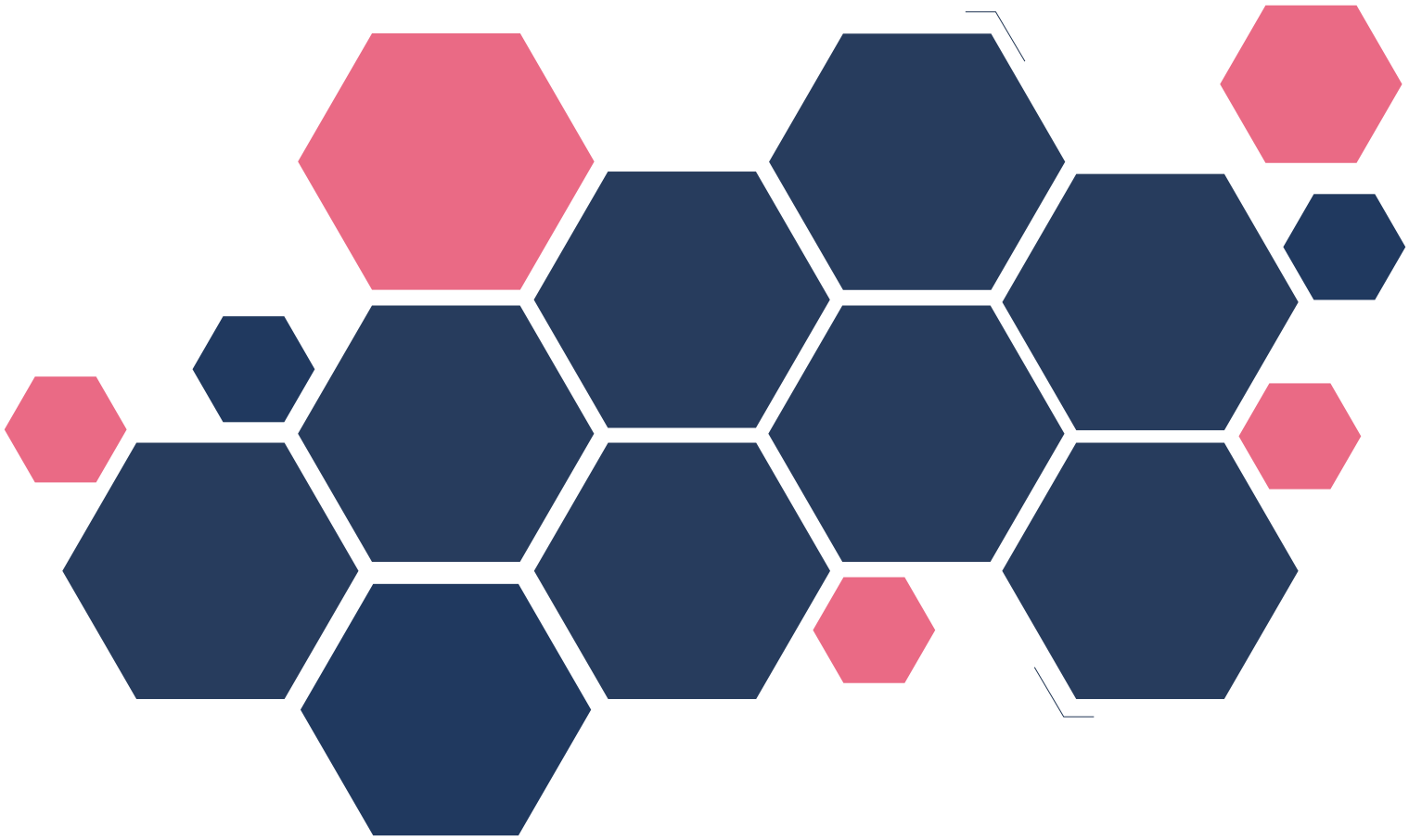
842WB - Silver conductive paint for premium shielding performance

843WB - Silver-coated copper conductive paint which balances cost and EMI performance



Water Based Conductive Paint

	841WB	842WB	843WB
UNCURED PROPERTIES			
Conductive filler	Nickel	Silver	Silver-coated copper
Format	Liquid	Liquid	Liquid
Color	Grey	Metallic silver	Light metallic brown
Percent solids	60%	60%	42%
Density @ 25 °C [77 °F]	1.81 g/mL	1.5 g/mL	1.32 g/mL
Viscosity @ 25 °C [77 °F]	143 cP	195 cP	660 cP
Calculated VOC	28 g/L	37 g/L	37 g/L
Theoretical coverage @ 2 µm (based on 100% transfer efficiency)	35 800 cm^2/L	32 655 cm^2/L	47 040 cm^2/L
Recoat time (Plastic)	30 min	20 min	20 min
Recoat time (Drywall)	7 min	5 min	5 min
Cure time @ 22 °C [71.6 °F]	24 h	24 h	24 h
Cure time @ 65 °C [149 °F]	3 h	3 h	2.5 h
CURED PROPERTIES			
Resistivity	0.027 Ω·cm	0.000075 Ω·cm	0.00053 Ω·cm
Surface resistance @ 50 µm	1.3 Ω/sq	0.0020 Ω/sq	0.020 Ω/sq
Salt fog resistance @ 35 °C [95 °F], 96 h	Excellent	Excellent	Poor
Constant service temperature	-40—120 °C [-40—248 °F]	-40—120 °C [-40—248 °F]	-40—120 °C [-40—248 °F]
Adhesion (ABS/PC)	5B	5B	5B
Pencil hardness	HB, hard	HB, hard	HB, hard
Magnetic class	Ferromagnetic	Diamagnetic	Diamagnetic
AVAILABLE PACKAGING			
	15 mL (glass jar)	15 mL (glass jar)	15 mL (glass jar)
	150 mL (metal can)	150 mL (metal can)	150 mL (metal can)
	900 mL (metal can)	900 mL (metal can)	900 mL (metal can)
	1 gal (metal can)	1 gal (metal can)	1 gal (metal can)



Chapter 05

Greases for Electronics

Greases for Electronics

MG Chemicals' comprehensive line of greases and lubricants address the many needs of the electronic components industry, such as, improving electrical and thermal conductivity, protection against mositure, corrosion and electrical shorts from arcing, and lubrication for moving parts

Applications

- Prevents pitting and arcing caused by voltage surges
- Forms electrical bridges ideal for connecting components or making ground connections
- Conducts heat away from circuits preventing overheating

Industries

- Aerospace
- Automotive
- Communications
- Consumer Electronics
- Electric Vehicles
- Instrumentation
- Medical Equipment
- Research

Dielectric Grease

8462
- Silicone grease that repels water and protects against corrosion
- Service temperature range of -50 to 250 °C

Electrically Conductive Grease

846
- Silicone-based, carbon-filled, lubricating grease
- Resistivity of 63 Ω·cm

8463A
- Silicone-based, silver-filled, lubricating grease
- Resistivity of <0.2 Ω·cm
- Service temperature range of -50 to 200 °C

8481
- Silicone-free, carbon-filled, lubricating grease
- Resistivity of 160 Ω·cm

847
- Silicone-free, carbon-filled, non-lubricating paste
- Resistivity of 23 Ω·cm

Lubricating Grease

8461
- White lithium grease with excellent lubrication and corrosion protection

Thermal Paste

860
- Silicone-based
- Service temperature range of -40 to 200 °C
- Thermal conductivity of 0.7 W/(m·K)

8616
- Silicone-free
- Service temperature range of -70 to 165 °C
- Thermal conductivity of 2.0 W/(m·K)

8617A
- Silicone-free
- Service temperature range of -55 to 200 °C
- Thermal conductivity of 3.0 W/(m·K)

8618
- Silicone-free
- Service temperature range of -55 to 200 °C
- Thermal conductivity of 6.0 W/(m·K)

Electrically Conductive Greases

MG Chemicals offers a full line of electrically conductive greases as easy-to-use options when a contact grease for electrical connection between neighboring components is required. Conductive greases for electronics efficiently lubricate moving parts, offer superior protection against corrosion and help ensure electrical continuity between irregular surfaces.

Features & Benefits

- Excellent corrosion resistance
- RoHS and REACH compliant
- Lubricates moving parts
- Prevents pitting and hotspots
- Wide operating temperature

Applications

- Connecting battery terminals
- Bridging electrical gaps on tracks
- Electrical bridging for moving parts, such as rotary switches, connectors, and potentiometers

Silicone-Based

846
- Economical, carbon-filled, conductive lubricating grease
- Resistivity of 63 Ω·cm
- Broad service temperature range of -50 to 200 °C

8463A
- Silicone-based, silver-filled, conductive lubricating grease
- Broad service temperature range of -70 to 200 °C

Silicone-Free

8481
- Carbon-filled, conductive lubricating grease
- Resistivity of 104 Ω·cm

847
- Carbon-filled, conductive, non-lubricating paste
- Resistivity of 23 Ω·cm

Emcor Rust Rating

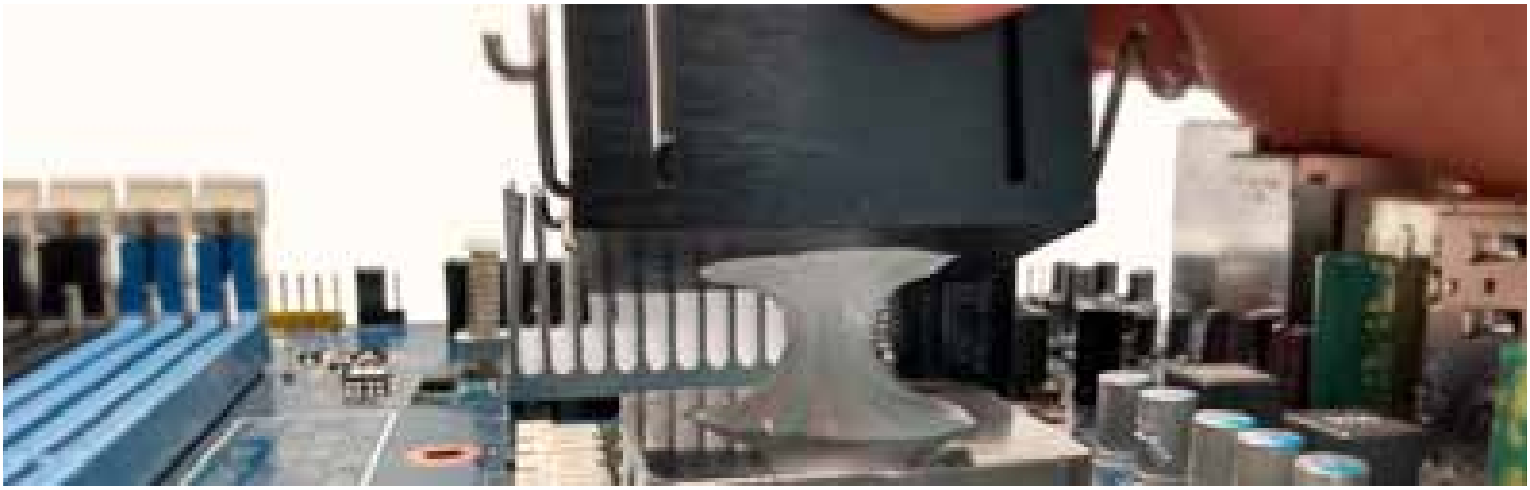
0	No corrosion
1	No more than 3 rust spots visible to the eye
2	Small corroded areas covering <1% of the running track surface
3	Corroded areas covering >1% and <5% of the running track surface
4	Corroded areas covering >5% and <10% of the running traack surface

See comparison chart on the next page for MG Chemical's product Emcor Rust rating.

Electrically Conductive Greases

	846	8463A	8481	847
PROPERTIES				
Color	Black	Greyish yellow	Black	Black
Filler	Carbon	Silver-coated aluminum	Carbon, graphite	Carbon, graphite
Base Material	Silicone oil	Silicone oil	Synthetic oil	Synthetic oil
Density	1.1 g/mL	1.8 g/mL	1.0 g/mL	1.1 g/mL
Viscosity	80.3 Pa·s	—	128 Pa·s	—
Resistivity	63 Ω·cm	<0.2 Ω·cm	104 Ω·cm	23 Ω·cm
Thermal Conductivity @ 25 °C	—	1.0 W/(m·K)	0.29 W/(m·K)	—
Evaporation Loss, 22 h @ 165 °C	2.6%	1.0%	2%	0.3%
Oil Separation, 30 h @ 165 °C	0.4%	0.11%	5%	1.8%
Dropping Point	>304 °C	—	—	>304 °C
Worked Penetration, ½ scale	269	335	—	174
Water Washout @ 38 °C Bearing Dried @ 77 °C	1.3%	—	0.9%	0.2%
Rust Preventive, 48 h @ 52 °C Bearing A Bearing B Bearing C	Fail Pass Fail Fail	—	Pass Pass Pass Pass	Fail Fail Fail Fail
Emcor Rust Test, DI Water, Bearing A	1	—	0	3
Service Temperature	-50 to 200 °C	-70 to 200 °C	-70 to 165 °C	-70 to 165 °C
AVAILABLE PACKAGING				
Net contents	76.2 mL (Tube) 495 mL (Jar) 3.78L (Pail) 18.9L (Pail)	3 mL (Syringe)	85 mL (Tube) 462 mL (Jar) 3.78L (Pail)	25 mL (Jar) 466 mL (Jar) 3.78L (Pail)

Thermal Pastes



MG Chemicals offers a full line of thermal pastes with a range of operating temperatures and thermal conductivities that enable the end-user to select the best thermal paste based on their needs. When placed between heat-generating components and heat sinks, a thermal paste displaces air pockets, which ensures full contact between the two surfaces, and prevents overheating

Features & Benefits

- High thermal conductivity
- Non-electrically conductive
- Excellent corrosion resistance
- Thixotropic, non-sagging
- Odorless

Applications

- Thermal management for computers and game system consoles
- Heat-dissipation for motors and LEDs

Silicone

860
- Service temperature range of -40 to 200 °C
- Thermal conductivity of 0.7 W/(m·K)

Silicone-Free

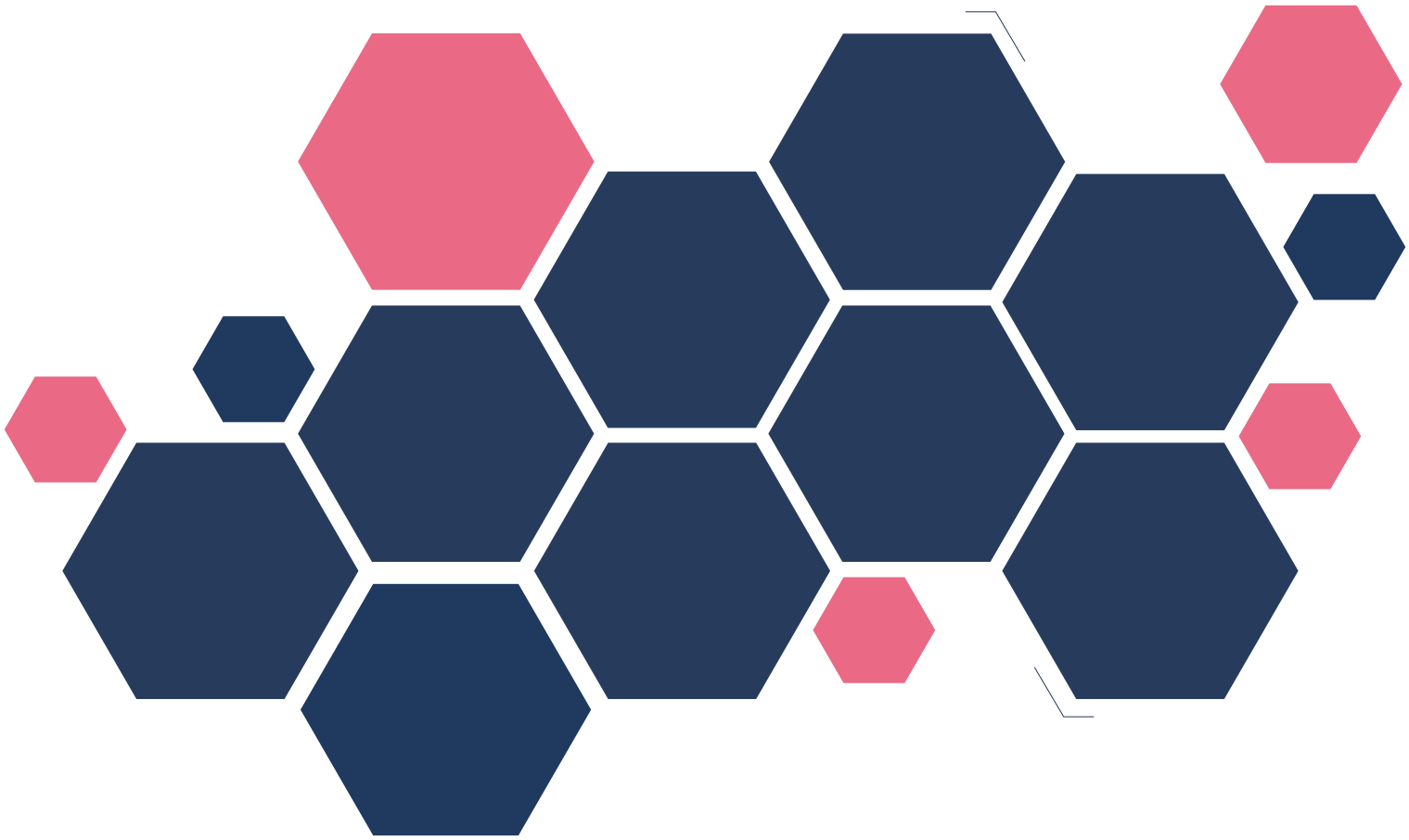
8616
- Service temperature range of -70 to 165 °C
- Thermal conductivity of 2.0 W/(m·K)

8617A
- Service temperature range of -55 to 200 °C
- Thermal conductivity of 3.0 W/(m·K)

8618
- Service temperature range of -55 to 200 °C
- Thermal conductivity of 6.0 W/(m·K)

Thermal Pastes

	SILICONE	SILICONE-FREE		
	860	8616	8617A	8618
PROPERTIES				
Color	White	White	White	Grey
Filler	Zinc oxide	Zinc oxide, alumina, boron nitride	—	—
Base Material	Silicone oil	Synthetic oil	Synthetic oil	Synthetic oil
Density	2.4 g/mL	2.6 g/mL	2.7 g/mL	2.4 g/mL
Viscosity	490 Pa·s	365 Pa·s	220 Pa·s	700 Pa·s
Resistivity	1.5 x 10^{15} Ω·cm	1.8 x 10^{11} Ω·cm	10^{14} Ω·cm	10^{9} Ω·cm
Thermal Conductivity @ 25 °C	0.7 W/(m·K)	2.0 W/(m·K)	3.0 W/(m·K)	6.0 W/(m·K)
Dissipation Factor	0.003 @ 1 000 cps	0.01 @ 1 000 cps	0.017 @ 1 kHz	0.12 @ 1 kHz
Service Temperature	-40 to 200 °C	-70 to 165 °C	-55 to 200 °C	-55 to 200 °C
AVAILABLE PACKAGING				
Net contents	860-4G, 1.7 mL (Pouch)	8616-3ML, 3 mL (Syringe)	8617A-3ML, 3 mL (Syringe)	8618-3ML, 3 mL (Syringe)
	860-60G, 25 mL (Jar)	8616-25ML, 25 mL (Jar)	8617A-10ML, 10 mL (Syringe)	8618-10ML, 10 mL (Syringe)
	860-150G, 62.5 L (Tube)	8616-85ML, 86 L (Tube)	8617A-85ML, 85 mL (Tube)	8618-85ML, 85 mL (Tube)
	860-1P, 470 mL (Jar)	8616-1P, 483 mL (Jar)	8617A-300ML, 300 mL (Cartridge)	8618-300ML, 300 mL (Cartridge)
	860-3.78L, 3.78 L (Pail)	8616-1G, 3.78 L (Pail)		



Chapter 06

Thermal Interface Materials

Thermal Interface Materials

With electronic circuits becoming smaller and more powerful, thermal management has become a critical design parameter to prevent overheating and circuit failure. Thermal Interface Materials (TIMs) work by displacing air gaps between heat-generated components and heat sinks to help conduit heat out of the system.

Thermally Conductive Adhesives

Thermally conductive and electrically insulating epoxy systems efficiently dissipate heat while providing a durable and structural permanent bond.

One-part **9460TC**

Two-part **8329TFF, 8329TFS, 8349TFM, 8329TCS, 8329TCM, 8329HTC**

Thermal Pastes

Thermal pastes create a non-permanent bond between heat-generating components and heat sinks.

Silicone **860**

Non-Silicone **8616, 8617A, 8618**

Thermal Gap Fillers

Silicone-based materials cure to a putty-like consistency that perfectly conform to gaps at the interface between heat-generating components and cooling plates.

High Thermal Conductivity **TIA225GF**

Extreme Thermal Conductivity **TIA241GF**

Thermal Potting Compounds

Thermally conductive epoxy potting compounds protects printed circuit boards and electronic devices while offering heat dissipation from the system.

Non-Flame Retardant **832TC**

Flame Retardant **834B, 834HTC, 834FX**

Liquid Thermal Gels

One-part, silicone-free gels for energy intensive devices. These products have very high thermal conductivity,

Flame Retardant **8327GL3, 8327GL5, 8327GL6**

Applications

Thermal management

Heat dissipation

Bonding heat-sensitive components

Gap filling

Industries

Battery modules and battery packs

Consumer electronics

LED manufacturing

Automotive

Aerospace

Defense

Instrumentation

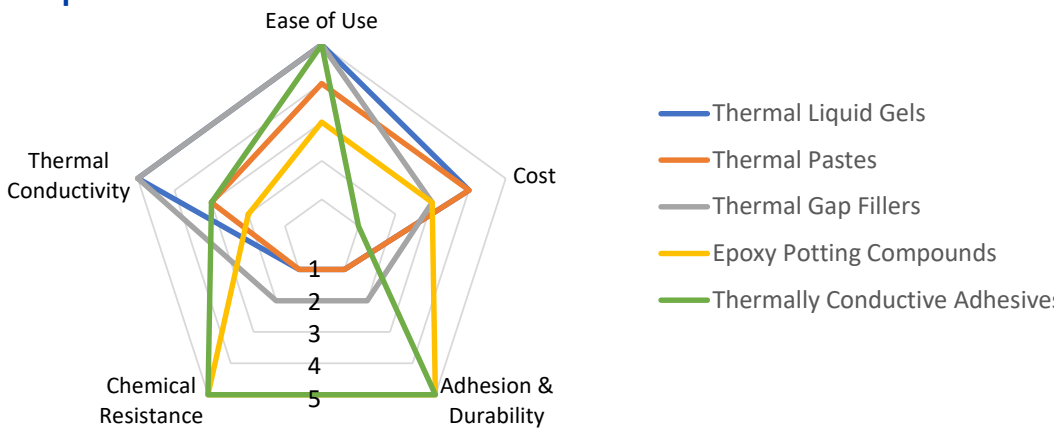
Medical equipment

Research

Thermal Interface Materials

	TC [W/(m·K)]	Working Time [min]	Mix Ratio by Vol. [A:B]	Service Temp. [°C]	Mixed Viscosity [Pa·s]
THERMALLY CONDUCTIVE ADHESIVES					
9460TC	0.8	Unlimited	1-part	-65 to 150	Thixotropic paste
8329TFF	0.8	5	1:1	-40 to 150	Thixotropic paste
8349TFM	1.1	20	1:1	-50 to 150	260
8329TCM	1.4	45	1:1	-40 to 150	Thixotropic paste
8329TFS	1.2	240	1:1	-40 to 150	Thixotropic paste
8329TCS	1.4	240	1:1	-40 to 150	Thixotropic paste
8329HTC	2.7	90–120	1:1 by wt.	-55 to 160	80–120
THERMAL PASTES					
860	0.7	—	1-part	-40 to 200	490
8616	2.0	—	1-part	-70 to 165	365
8617A	3.0	—	1-part	-55 to 200	220
8618	6.0	—	1-part	-55 to 200	700
THERMAL GAP FILLERS					
TIA225GF	2.5	240	1:1	-45 to 200	100
TIA241GF	4.1	180	1:1	-45 to 200	130
EPOXY POTTING COMPOUNDS					
832TC	0.7	120	1:1	-30 to 175	27
834B	0.8	60	2:1	-40 to 175	16
834FX	0.6	150	1:1	-50 to 125	15
834HTC	0.9	90	5:1	-50 to 150	10
THERMAL LIQUID GELS					
8327GL3	3.5	—	1-part	-55 to 120	7 000
8327GL5	5.1	—	1-part	-55 to 150	3 500–5 000
8327GL6	6.0	—	1-part	-55 to 120	7 000

Comparison Graph



Liquid Thermal Gels

MG Chemicals offers 1-part, silicone-free, thermally conductive gels for exceptional thermal management of energy intensive devices. These products have very high thermal conductivity, flame retardancy and an ideal viscosity for form-in-place application.

The low modulus of these gels makes them an ideal material for placing near delicate components or aggressive thermal cycling applications. These gels do not cure so devices can be powered up for use immediately following application.

Features & Benefits

- Flame retardant—meets UL94 V-0
- Low bond line thickness
- Low modulus—ideal for delicate components
- Wide operating temperature range
- Tack adhesion—does not run
- Reworkable

Applications

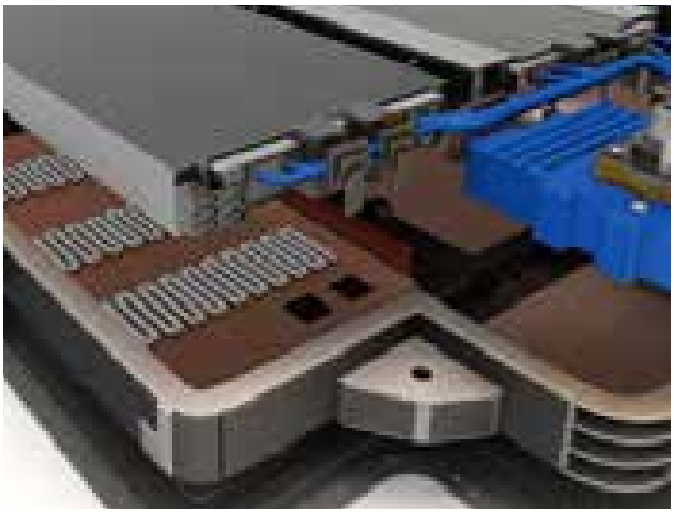
- Bonding heat sinks
- Power semiconductor devices
- Flip chip BGA heat spreaders
- Battery modules and battery packs
- LED lighting, power supplies, telecommunication towers, data servers, PCs for gamers

Thermal Gels

8327GL3
- Thermal conductivity of 3.5 W/(m·K)
- Service temperature range of -55 to 120 °C

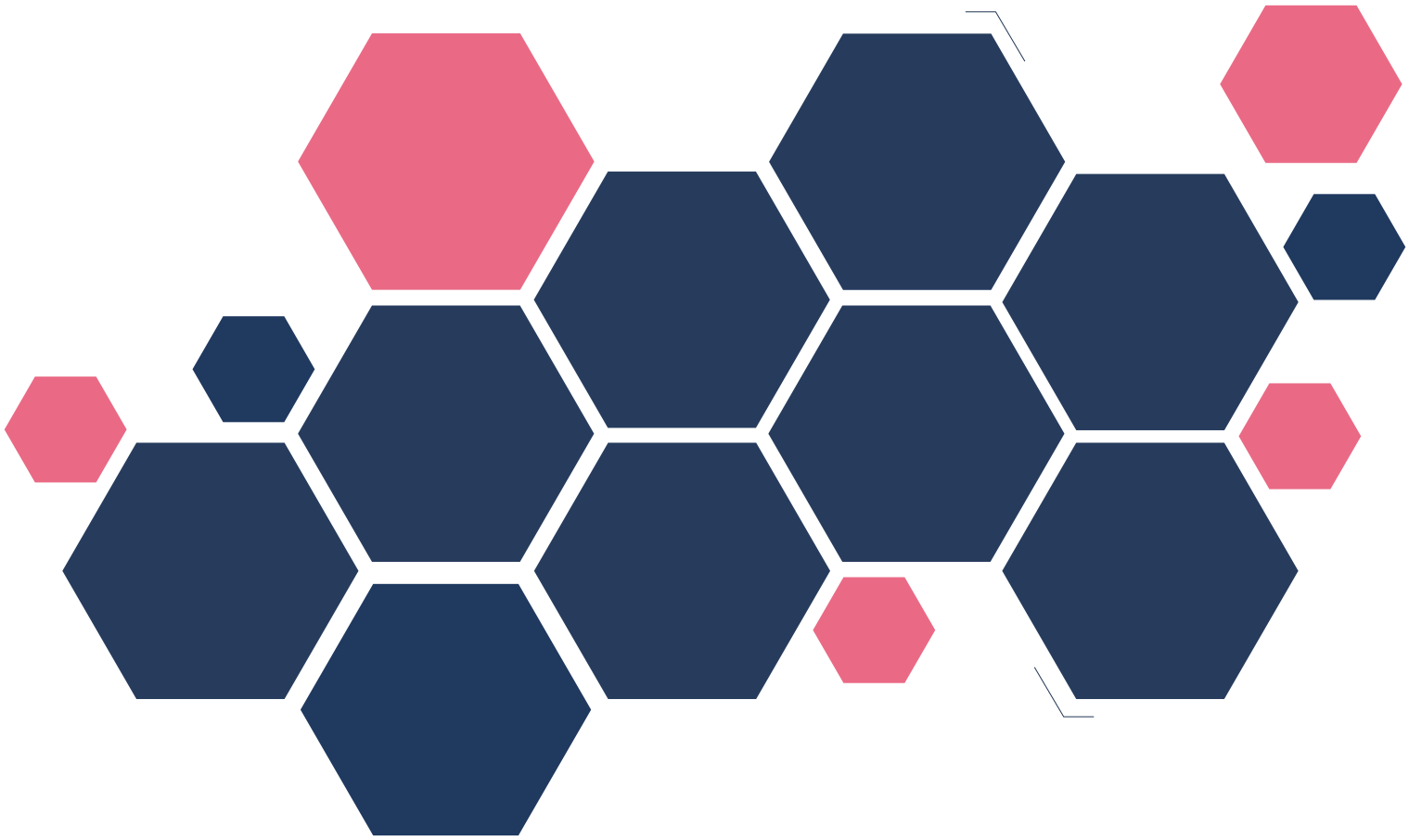
8327GL5
- Thermal conductivity of 5.1 W/(m·K)
- Service temperature range of -55 to 150 °C

8327GL6
- Thermal conductivity of 6.0 W/(m·K)
- Service temperature range of -55 to 120 °C



Liquid Thermal Gels

	8327GL3	8327GL5	8327GL6
PROPERTIES			
Color	White	Grey	Grey
Density	2.5 g/mL	2.3 g/mL	2.3 g/mL
Viscosity	7 000 Pa·s	3 500–5 000 Pa·s	7 000 Pa·s
Resistivity	10^{13} Ω·cm	10^{9} Ω·cm	10^{9} Ω·cm
Thermal Conductivity @ 25 °C	3.5 W/(m·K)	5.1 W/(m·K)	6.0 W/(m·K)
Breakdown Volage @ 2.2 mm	14 000 V	3 200 V	3 200 V
Dissipation Factor @ 1 kHz	0.005	0.005	0.005
Service Temperature	-55 to 120 °C	-55 to 150 °C	-55 to 120 °C
Intermittent Temperature	150 °C	180 °C	150 °C
AVAILABLE PACKAGING			
Net contents	10.4 mL (Syringe)	11.3 mL (Syringe)	11.3 mL (Syringe)
	26.4 mL (Cartridge)	28.7 mL (Cartridge)	28.7 mL (Cartridge)
	117 mL (Cartridge)	127 mL (Cartridge)	127 mL (Cartridge)



Chapter 07

Flame Retardant Materials

Flame Retardant Materials

Applications

- Bonding heatsinks to CPUs
- Heat dissipation in battery pack housing
- Bonding thermocouples and sensors
- Potting LED drivers
- Encapsulating thermocouples
- Create firewall from powertrain

Industries

- Battery modules and battery packs
- Consumer electronics
- Transportation
- Automotive
- Aerospace
- Defense
- Instrumentation
- Medical equipment
- Research

Flame Retardant Adhesives

MG Chemicals has 2-part flame retardant epoxy adhesives that help contain the spread of fire in the event of sudden ignition. These products are quick setting, adhere to a wide variety of substrates and contain non-halogenated fillers.

Structural	**9200FR**
Thermal	**8329TFF, 8349TFM**

Flame Retardant Potting Compounds

These products contain non-halogenated fillers and self-extinguish when exposed to open flames. They have a flowable consistency and can withstand harsh environments. The flexible compounds are great for aggressive thermal cycling and rigid plastics are for added protection from shocks and impacts.

Rigid	**834B, 834HTC**
Flexible	**834FX**

Flammability Testing and Certification

UL94 V-0 Certified	**9200FR, 8329TFF, 834HTC**
***Meets UL94 V-0**	**8349TFM, 834B, 834FX**

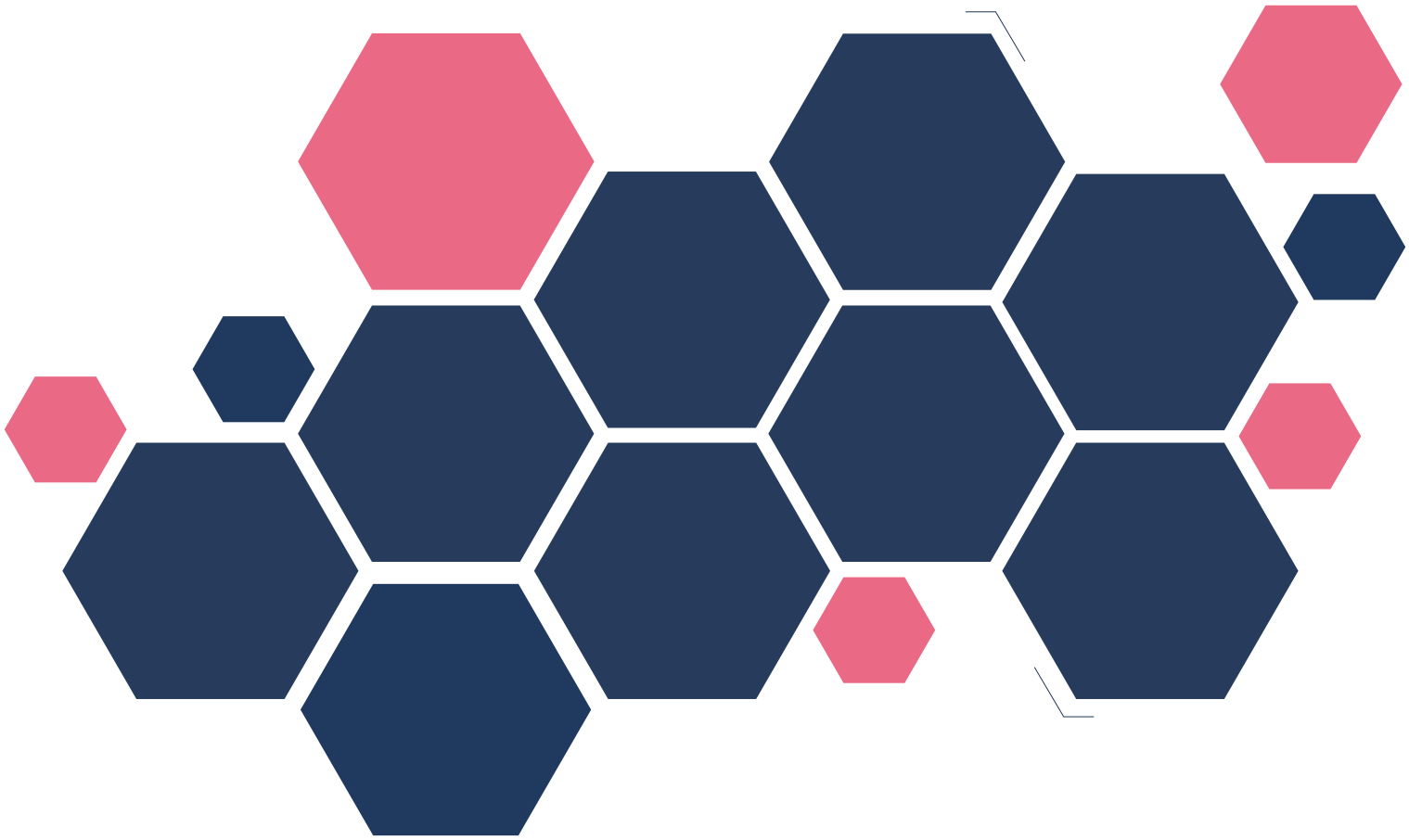
Certified products were tested by UL laboratories as compliant and listed under file no. E334302. *Products listed as meets comply to UL94 V-0 classification when tested by MG Chemicals but are not recognized by UL.

Flame Retardant Materials

	ADHESIVES			POTTING COMPOUNDS		
	9200FR	8329TFF	8349TFM	834B	834HTC	834FX
UNCURED PROPERTIES						
Number of components	2	2	2	2	2	2
Color	Light yellow	Beige	Black	Black	Black	Black
Mixed density [g/mL]	1.3	1.6	1.6	1.6	1.7	1.6
Viscosity [Pa·s]						
Mixture	—	—	—	16	10	15
Part A	380	77	—	28	56	8.0
Part B	370	115	—	2.1	2.4	16
Mix ratio by volume [A:B]	1:1	1:1	—	2:1	5:1	1:1
Working time [min]	30 min	5 min	20 min	60	90	150
Cure time [min @ °C]	48 h @ 22	240 @ 22	260 @ 22	72 h @ 22	24 h @ 22	48 h @ 22
	960 @ 40	—	—	—	—	—
	180 @ 65	15 @ 65	20 @ 65	150 @ 65	120 @ 65	120 @ 65
	90 @ 80	10 @ 80	10 @ 80	60 @ 80	60 @ 80	60 @ 80
	30 @ 100	—	—	20 @ 100	30 @ 100	30 @ 100
CURED PROPERTIES						
Tensile strength [N/mm^2]	13	13	25	17	22	5.3
Compressive strength [N/mm^2]	46	65	115	74	123	21
Lap shear [N/mm^2]						
Stainless steel	14	7.1	6.7	8.2	6.7	3.7
Aluminum	10	8.3	4.4	11	4.7	2.7
Hardness	78D	82D	92D	85D	91D	88A
TC @ 25 °C [W/(m·K)]	0.4	0.8	0.9	0.8	0.9	0.6
T_g [°C]	59	25	80	56	117	0.7
CTE prior T_g [ppm/°C]	79	34	20	74	34	71
CTE after T_g [ppm/°C]	126	146	120	107	116	137
Resistivity [Ω·cm]	—	7.9 x 10^{12}	6.5 x 10^{12}	2.1 x 10^{12}	3.0 x 10^{13}	7.5 x 10^{11}
Breakdown voltage [V]	39 800	43 700	43 700	40 700	37 500	36 300
Dielectric strength [V/mil]	497	375	368	430	395	365
Service temperature [°C]	-40 — 150	-40 — 150	-65 — 120	-40 — 175	-50 — 150	-50 — 125
AVAILABLE PACKAGING						
Net contents	25 mL (dual syringe)	25 mL (dual syringe)	25 mL (dual syringe)	375 mL (2 bottle kit)	900 mL (2 can kit)	450 mL (2 bottle kit)
	45 mL (dual cartridge)	45 mL (dual cartridge)	45 mL (dual cartridge)	2.7 L (3 can kit)	4.25 L (2 can kit)	1.7 L (2 can kit)
				10.8 L (3 can kit)		7.2 L (2 can kit)





Chapter 08

Soldering Supplies

Soldering Supplies

MG Chemicals offers a complete line of soldering supplies and soldering accessories for all your soldering needs. Whether you're a hobbyist, a small-scale operator designing a prototype, or a large-scale manufacturer, MG Chemicals' soldering supplies have all your needs covered.

Desoldering Braids

400 Series – Fine braid SUPER WICK™
400-LF Series – Lead-free SUPER WICK™
400-NS Series – No-clean SUPER WICK™
400-NF Series – Unfluxed SUPER WICK™

Flux Pens

835-P – Rosin-based liquid flux with moderate activity
836-P – Halogen-free organic flux with low activity
837-P – Water soluble flux with high activity

Flux Removers

Heavy Duty

413C – Removes the most stubborn, encrusted, hard, baked-on fluxes and residues

Plastic-Safe

4140 – Blend of mild solvents to create an eco-friendly dry cleaning flux remover.
4150 – A plastic-safe, high-purity printed circuit board cleaner.
4140A – Cleans post solder residues quickly and conveniently.

Solder Mask

862 – Water soluble synthetic latex

Tip Tinner

4910 – SAC305 powder with thermally stable compounds

Solder Pastes

4860P – Sn63/Pb37 No-clean
4900P – SAC305 No-clean
4902P – Sn42/Bi57/Ag1 No-clean low temperature

Solder Wires

Lead Solders

4870-4875 – Sn60/Pb40 No-clean
4890-4898 – Sn60/Pb40 RA
4860-4865 – Sn63/Pb37 No-clean
4880-4888 – Sn63/Pb37 RA

Lead-Free Solders

4900 – SAC305 No-clean
4901 – Sn99 No-clean
49500WS – Sn100e Water-soluble

Soldering Fluxes

Liquid

835 – Rosin-based
8351 – No-clean, halogen-free
836LFNC – Lead-free, no-clean
837LFWS – Lead-free, water-soluble

Paste

8341 – No-clean, halogen-free
8342 – Rosin-based

Desoldering Braids

Desoldering Braids for Solder Removal, Rework and Repairs

MG Chemicals Super Wicks™ are desoldering braids made of clean, oxide-free copper wire with a tight weave. The best solder wick is designed for solder removal to ease the replacement of electronics components without damaging the board or components. They reduce rework/repair time and minimize the risk of heat damage to the board.

Our desoldering braids' exceptional weave design and heat transfer capacities result in very fast and large capacity wicking, faster than any other competitive brand on the market.

Features & Benefits

- Copper wick – high purity oxide free copper
- Tight weave and fast wicking
- Environmentally stable
- ESD safe bobbins for 1.5 m size
- NSF – Non-Food Compounds Program listed

Applications

- Solder removal
- Reworking and repair of circuit boards
- Benchtop repair and service
- Surface mount assembly touch-up

400 Series—Fine Braid Super Wick™

- RMA flux and economical

400-LF Series—Lead Free Super Wick™

- No clean flux
- Flux residue is non-conductive and non-corrosive

400-NS Series—No Clean Super Wick™

- Designed for use with lead-free solder
- No-clean flux with high activation temperature
- Flux residue is non-conductive and non-corrosive

400-NF Series—Unfluxed Super Wick™

- Allows custom flux use

Flux Properties*

Flux classification	Rosin (R) ROL0
Flux percentage	<5%
Cleaning requirements	Recommended

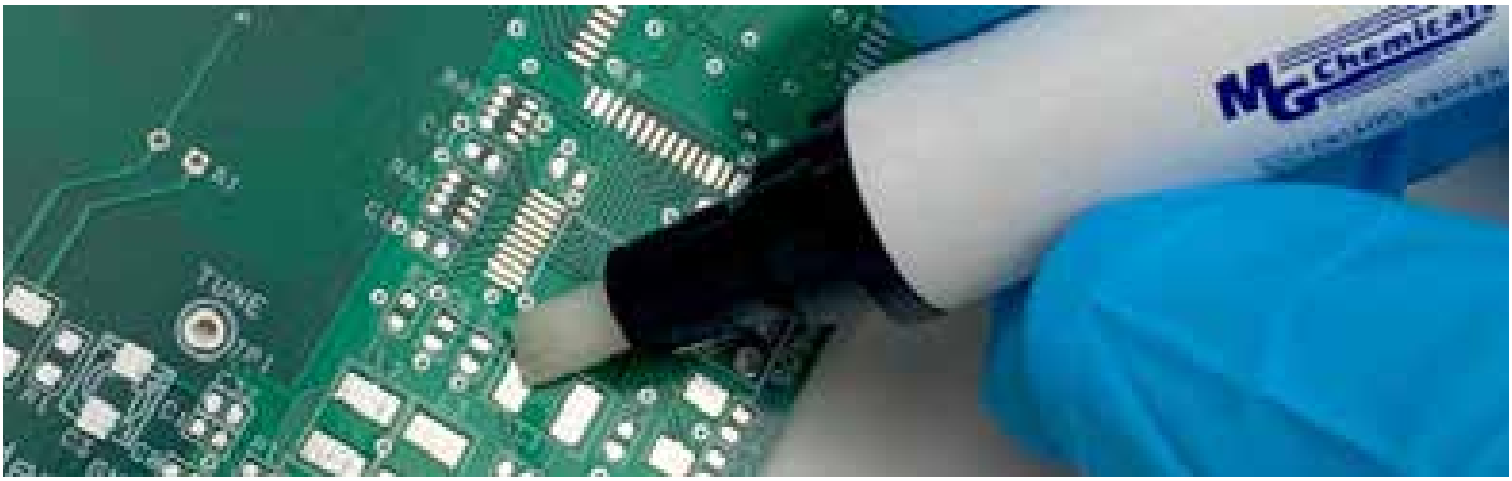
*These properties do not apply to the 400-NF Series.

Desoldering Braids

Selection Guide

Cat. No.	Type	Width	Length	ESD Safe	Label Color
423	Fine braid	0.04 in (1 mm)	5 ft (1.5 m)	Yes	White
424	Fine braid	0.06 in (1.5 mm)	5 ft (1.5 m)	Yes	Yellow
442	Fine braid	0.06 in (1.5 mm)	25 ft (7.5 m)	No	Yellow
452	Fine braid	0.06 in (1.5 mm)	50 ft (15 m)	No	Yellow
425	Fine braid	0.08 in (2 mm)	5 ft (1.5 m)	Yes	Green
443	Fine braid	0.08 in (2 mm)	25 ft (7.5 m)	No	Green
453	Fine braid	0.08 in (2 mm)	50 ft (15 m)	No	Green
426	Fine braid	0.10 in (2.5 mm)	5 ft (1.5 m)	Yes	Blue
444	Fine braid	0.10 in (2.5 mm)	25 ft (7.5 m)	No	Blue
454	Fine braid	0.10 in (2.5 mm)	50 ft (15 m)	No	Blue
427	Fine braid	0.12 in (3 mm)	5 ft (1.5 m)	Yes	Brown
424-LF	Lead free	0.06 in (1.5 mm)	5 ft (1.5 m)	Yes	Yellow
425-LF	Lead free	0.08 in (2 mm)	5 ft (1.5 m)	Yes	Green
426-LF	Lead free	0.10 in (2.5 mm)	5 ft (1.5 m)	Yes	Blue
424-NS	No clean	0.06 in (1.5 mm)	5 ft (1.5 m)	Yes	Yellow
424-NS-10FT	Unfluxed	0.06 in (1.5 mm)	10 ft (3.1 m)	Yes	Yellow
425-NS	No clean	0.08 in (2 mm)	5 ft (1.5 m)	Yes	Green
426-NS	No clean	0.10 in (2.5 mm)	5 ft (1.5 m)	Yes	Blue
426-NS-10FT	Unfluxed	0.10 in (2.5 mm)	10 ft (3.1 m)	Yes	Blue
453-NS	No clean	0.08 in (2 mm)	50 ft (15 m)	No	Green
424-NF-10FT	Unfluxed	0.06 in (1.5 mm)	10 ft (3.1 m)	Yes	Yellow
426-NF-10FT	Unfluxed	0.10 in (2.5 mm)	10 ft (3.1 m)	Yes	Blue

Flux Pens



Designed for Prototyping, Rework and Repair of Circuit Boards

MG Chemicals flux pens enable convenient dispensing for high-precision application of flux for improved solder wetting. Our pens are designed to work with both leaded and non-leaded solder, providing an effective (remove “oxygen”) barrier against oxidation. Pens are available in Rosin Activated (RA), NoClean (NC) and Water Soluble (WS) flux versions. These fluxes can be readily removed by our flux removers.

835-P – Rosin Flux Pen
Rosin-based liquid flux with moderate activity

836-P – No-Clean Flux Pen
Halogen-free organic flux with low activity

837-P – Water Soluble Flux Pen
Water soluble flux with high activity

Features & Benefits
- Compatible with leaded and non-leaded solder
- No-clean options available
- Meets J-STD-004B
- RoHS compliant

Applications
- Repairs and rework
- Through-hole and surface mounting
- Solder touchups

Flux Pens

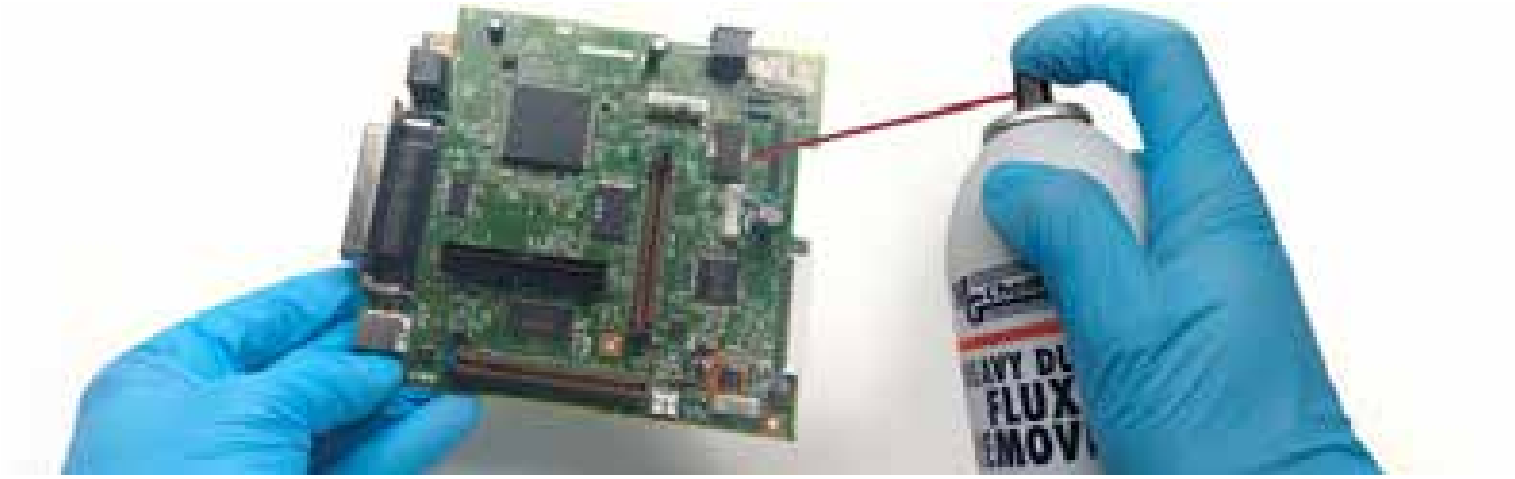
	835-P	836-P	837-P
PROPERTIES			
Flux classification	ROM1 RA	ORL0	ORH1
Flux type	Rosin	Organic	Organic
Flux activity	Moderate	Low	High
Halides by weight	0.44%	<0.5%	2.2% ±0.3%
Copper mirror	Partial removal	Pass	Complete removal of copper film
Corrosion	Pass	N/A	Pass
Cleaning requirements	Recommended	Recommended	Required
Solid percentage	50%	1.9—2.5%	17.5% ±1%

Refer to TDS for more information

SUPPORTING PRODUCTS

Flux Removers	Plastic-safe	Heavy Duty
	4050A	413B
	4140	413C
	4140A	

Flux Removers



Dissolves and Removes Stubborn Post Soldering Residue

MG Chemicals' flux removers are suitable for maintenance and repair operations, service centers, prototyping, maker projects, and small scale electronics production. We offer two options for dissolving and rinsing flux residue.

Features & Benefits

- Powerful flux removal
- Zero residue, non-corrosive, and fast drying
- Available in aerosol, liquid, and pen formats
- Plastics-safe versions are available
- RoHS compliant

Applications

- Cleaning flux residue
- Repair, rework, and maintenance
- Service centers
- Prototyping
- Maker projects

Flux Removers for PCBs (Plastic-Safe)

4050A – A plastic-safe, high-purity PCB cleaner that removes both polar and non-polar contaminants

4140 – Ethyl alcohol, isopropanol and ethyl acetate blended to create an eco-friendly dry cleaning solvent

4140A – Its plastic safe formula removes rosin, non-rosin, and no clean fluxes, as well as both ionic and non-ionic type

Heavy Duty

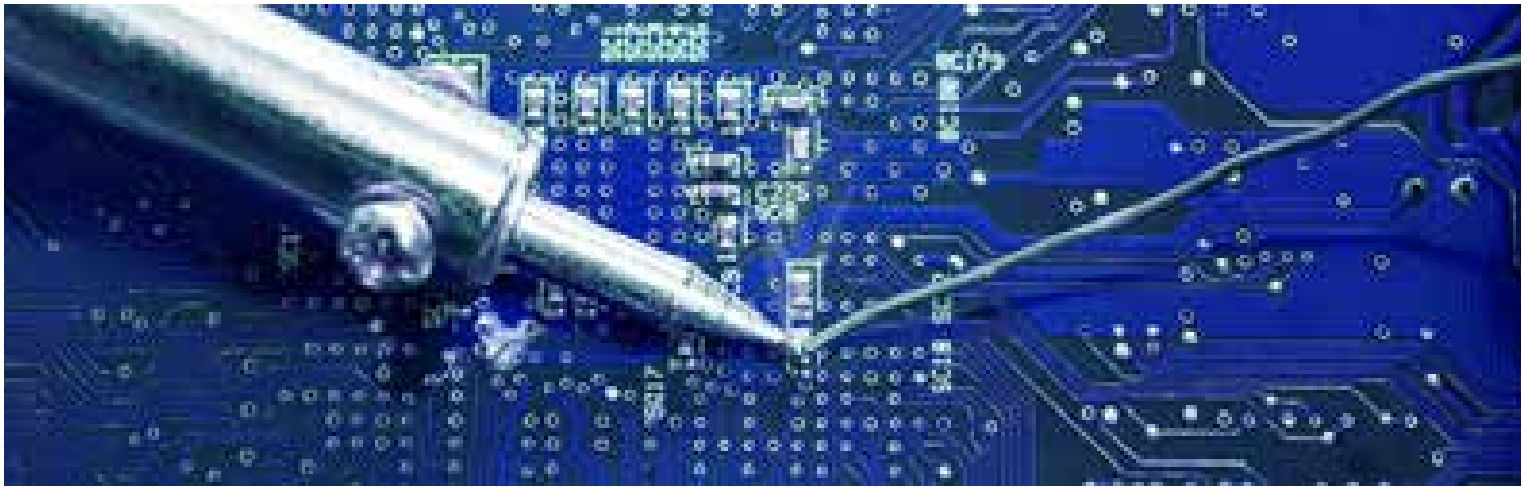
413B – Dissolves and removes stubborn, encrusted, hard, baked-on fluxes and residues

413C – Cleans post solder residues quickly and conveniently

Flux Removers

	413B	413C	4050A	4140	4140A
PROPERTIES					
Viscosity @ 25 ˚C	<20.5 mm^2/s	<20.5 mm^2/s	<20.5 mm^2/s	3.1 mm^2/s	<20.5 mm^2/s
Density	0.75–0.83 g/mL	0.84 g/mL	0.77 g/mL	0.79 g/mL	0.76 g/mL
Shelf Life	5 y	5 y	5 y	5 y	5 y
Flash Point	-18 °C	11 °C	-29 °C	13 °C	-4 °C
Boiling Point	≥56 °C	83 °C	≥52 °C	≥78 °C	>83 °C
Auto-ignition Temperature	425 °C	456 °C	363 °C	≥363 °C	285 °C
Water Miscibility	Partially miscible	Miscible	Miscible	Miscible	Partially miscible
AVAILABLE PACKAGING					
Net contents	425 g (Aerosol)	945 mL (Bottle) 18.9 L (Pail)	450 g (Aerosol)	400 g (Aerosol)	945 mL (Bottle) 3.78 L (Jug) 18.9 L (Pail) 11.5 mL (Pen)

Solder Wires



Wide Range of Leaded and Lead-Free Solder Wires Available

MG Chemicals offers an extensive portfolio of solder wire designed to cover the needs of all users, from hobbyists to large manufactures. From traditional leaded solder to more advanced alloys that melt at higher temperatures, MG Chemicals offers a wide range of flux types, gauges and package sizes.

Features & Benefits

- Meets or exceeds J-STD-004B and J-STD-006C
- Multiple alloys, gauge sizes and fluxes available

Applications

- Hobbyist, prototyping and academic projects
- Manufacturing operations of all sizes

Available Sizes

Diameter	Gauge (AWG)
0.062" (1.57 mm)	16
0.050" (1.27 mm)	18
0.040" (1.01 mm)	19
0.032" (0.81 mm)	21
0.025" (0.63 mm)	23

Leaded Solder Wires

4870–4875 — Sn60/Pb40 No-Clean Solder wire

4890–4898 — Sn60/Pb40 RA Solder wire

4860–4865 — Sn63/Pb37 No-Clean Solder wire

4880–4888 — Sn63/Pb37 RA Solder wire

This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Lead-Free Solder Wires

4900 — SAC305 No-Clean Solder wire

4901 — Sn99 No-Clean Solder wire

49500WS — Sn100e Water Soluble Solder wire

Solder Wires

	LEADED SOLDER WIRES				LEAD-FREE SOLDER WIRES		
	4870–4875	4890–4898	4860–4865	4880–4888	4900	4901	49500WS
PROPERTIES							
Flux Classification	REL0	ROM1	REL0	ROM1	REL0	REL0	ORH1
Flux Type	Resin	Rosin	Resin	Rosin	Resin	Resin	Organic
Flux Activity	Low	Moderate	Low	Moderate	Low	Low	High
Copper Mirror	No removal	—	No removal	—	No removal	No removal	—
Corrosion Test	Pass	Pass	Pass	Pass	Pass	Pass	—
Electromigration	Pass	—	Pass	—	Pass	Pass	—
Silver Chromate Cl^- + Br^-	Pass	Detection	Pass	Detection	Pass	Pass	Detection
Flux Residue Dryness	Pass	—	Pass	—	Pass	Pass	—
Acid Number (mgKOH/g sample)	100	150–160	190–210	150–160	190–210	190–210	180–200
Softening Point of Flux Extract	24 °C	80 °C	24 °C	80 °C	24 °C	24 °C	60 °C
Solder Spread	130 mm^2	—	130 mm^2	N/A	130 mm^2	130 mm^2	—
Splitting of Flux-Cored Wire Solder	0.30%	—	0.30%	N/A	0.30%	0.30%	—
Halides (by weight)	<0.05%	0.5–0.2%	<0.05%	0.5–0.2%	<0.05%	<0.05%	>2%
Post Reflow Flux Reside	45%	N/A	55%	—	55%	55%	—
Surface Insulaltion Resistance (SIR)	2.4 x 10^{10} Ω	>1.0 x 10^9 Ω	2.3 x 10^{11} Ω	>1.0 x 10^9 Ω	2.3 x 10^{11} Ω	2.3 x 10^{11} Ω	>1.0 x 10^9 Ω
Bellcore (Telecordia)	4.1 x 10^{10} Ω	—	6.1 x 10^{11} Ω	—	6.1 x 10^{11} Ω	6.1 x 10^{11} Ω	—
Cleaning	No-clean	Required	No-clean	Required	No-clean	No-clean	Required
AVAILABLE PACKAGING							
Net contents	4870-18G 4875-227G	4890-18G 4894-227G 4894-454G 4895-227G 4895-454G 4896-227G 4897-227G 4898-227G 4898-454G	4860-18G 4865-227G 4865-454G	4880-18G 4884-227G 4884-454G 4885-227G 4885-454G 4886-227G 4886-227G 4887-227G 4887-454G 4888-227G 4888-454G	4900-18G 4900-112G 4900-227G 4900-454G	4901-112G 4901-227G 4901-454G	49500WS-454G




Solder Pastes

No-Clean Pastes Available in Lead and Lead-Free Versions

MG Chemicals' solder pastes ensure strong adhesion when connecting PCB components to copper pads during board fabrication. Our solder pastes contain a non-conductive flux, making cleaning afterwards unnecessary, plus solder powder with a particle size distribution that complies with the J-STD-005 Type 3 (80% min. between 25-45 µm).

4860P— Sn63/Pb37 No-clean solder paste

4900P— SAC305 No-clean solder paste

4902P— Sn42/Bi57/Ag1 No-clean low temp. solder paste

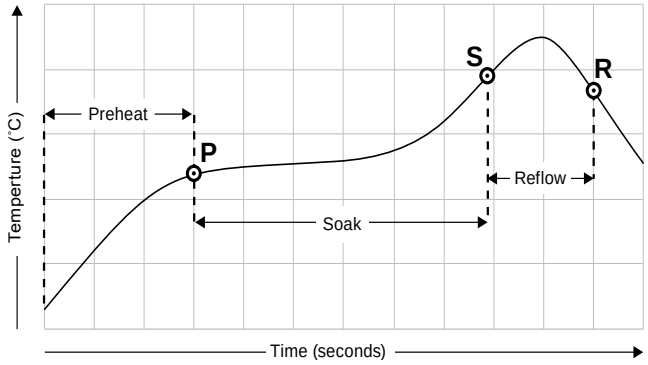
Features & Benefits

- Leaded and non-leaded options available
- Alloy exceeds J-STD-006C and meets ASTM B 32 purity requirements
- No-clean residues, residues are not harmful to assemblies
- Flux meets J-STD-004B
- RoHS-compliant

Applications

- Repairs and rework
- Through-hole and surface mount
- Solder touch-ups
- Component bonding

Typical Reflow Profile

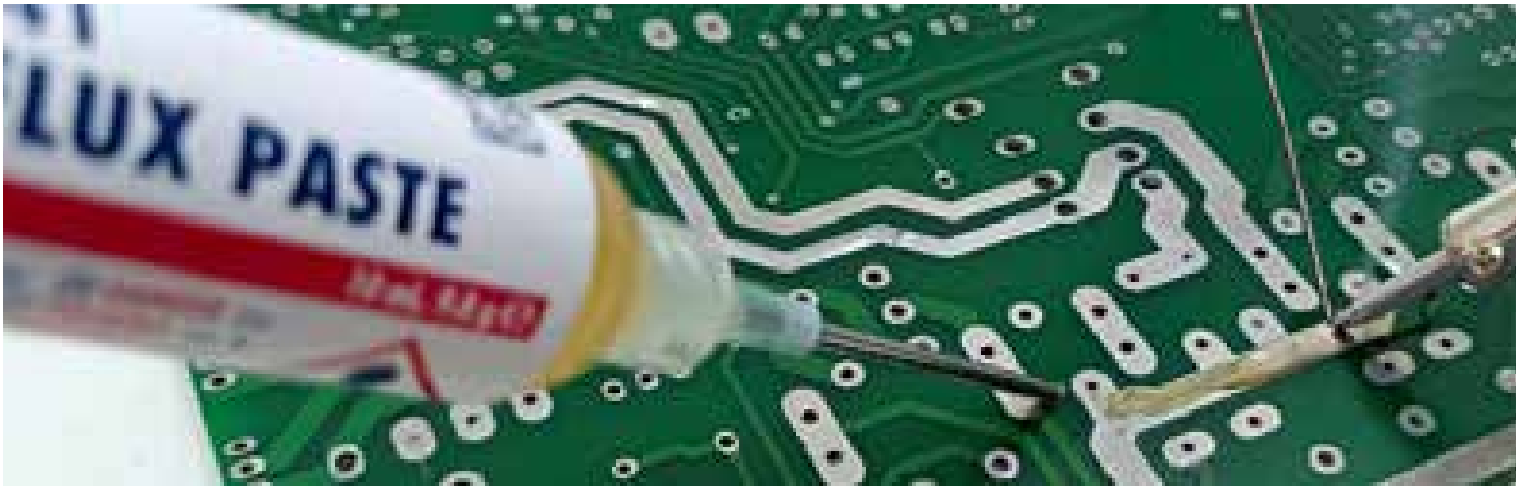


	P (Preheat)	S (Soak)	R (Reflow)
4860P	120 °C @ 90 s	200 °C @ 270 s	180 °C @ 330 s
4900P	120 °C @ 90 s	200 °C @ 270 s	180 °C @ 330 s
4902P	115 °C @ 100 s	150 °C @ 155 s	130 °C @ 225 s

Solder Pastes

	4860P	4900P	4902P
PROPERTIES			
Flux Classification	REL0	ROL0	ROM1
Flux Type	Resin	Rosin	Rosin
Flux Activity	Low	Low	Moderate
Copper Mirror	No removal	No removal	No penetration
Corrosion Test	Pass	Pass	Minor corrosion
Electromigration	Pass	Pass	4×10^9 Ω @ 96 h 4×10^9 Ω @ 596 h
Solder Ball Test	Pass	Pass	—
Slump Test			
@ 25 °C, 0.63 vert./horiz.	No bridges	No bridges	—
@ 150 °C, 0.63 vert./horiz.	No bridges	No bridges	—
@ 25 °C, 0.33 vert./horiz.	0.20/0.20	No bridges	—
@ 25 °C, 0.33 vert./horiz.	0.20/0.20	Pass	—
Viscosity, poise	850–1100	1600–1900	153 000 cP
Acid Number (mgKOH/g sample)	100	117	142
Halides (by weight)	<0.05%	<0.05%	≤0.15%
Post Reflow Flux Reside	45%	5.5%	N/A
Metal Loading	88%	88.5%	N/A
Surface Insulation Resistance (SIR)	2.4×10^{10} Ω	2.0×10^{10} Ω	≥2×10^9 Ω @ 96 h Pass @ 168 h
Bellcore (Telecordia)	4.1×10^{10} Ω	5.3×10^{10} Ω	N/A
Tack			
Initial	85 g	124 g	—
Retention @ 24 h	90 g	111 g	—
Retention @ 72 h	92 g	98 g	—
AVAILABLE PACKAGING			
Net contents	35 g (syringe) —	25 g (syringe) 250 g (jar)	15 g (syringe) 25 g (syringe)

Soldering Flux



Compatible with Lead and Lead-Free Solders

MG Chemicals soldering flux provides high tack-force and superior wetting for both leaded and non-leaded solder alloys. The flux comes in both liquid and paste formats, and in Rosin Activated (RA), No Clean (NC) and Water Soluble (WS) flux chemistries. Our fluxes provide exceptional adhesion to copper, and form an effective barrier against oxidation of circuit traces.

Features & Benefits

- No-clean options available
- Meets J-STD-004B
- RoHS compliant
- Available as liquid or paste

Applications

- General purpose soldering of PCBs, wire, cable, and semiconductors
- Repair and rework
- Through-hole and surface mount
- Solder touch-ups

Liquid Flux

835 — Rosin-based flux

8351 — No-clean, halogen-free flux

836LFNC — Lead-free, no-clean flux

837LFWS — Lead-free, water soluble flux

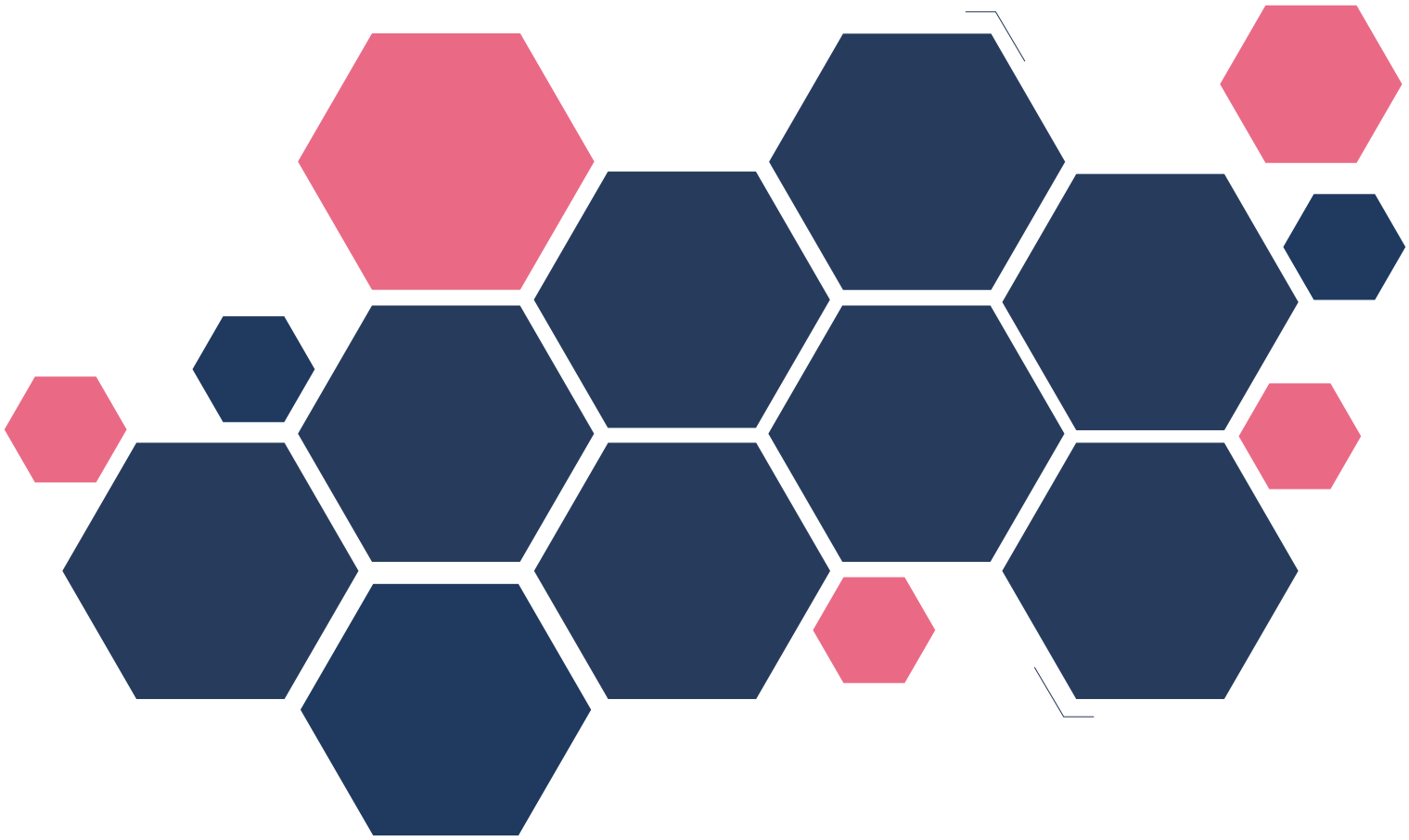
Paste Flux

8341 — No-clean, halogen-free flux

8342 — Rosin-based flux

Soldering Flux

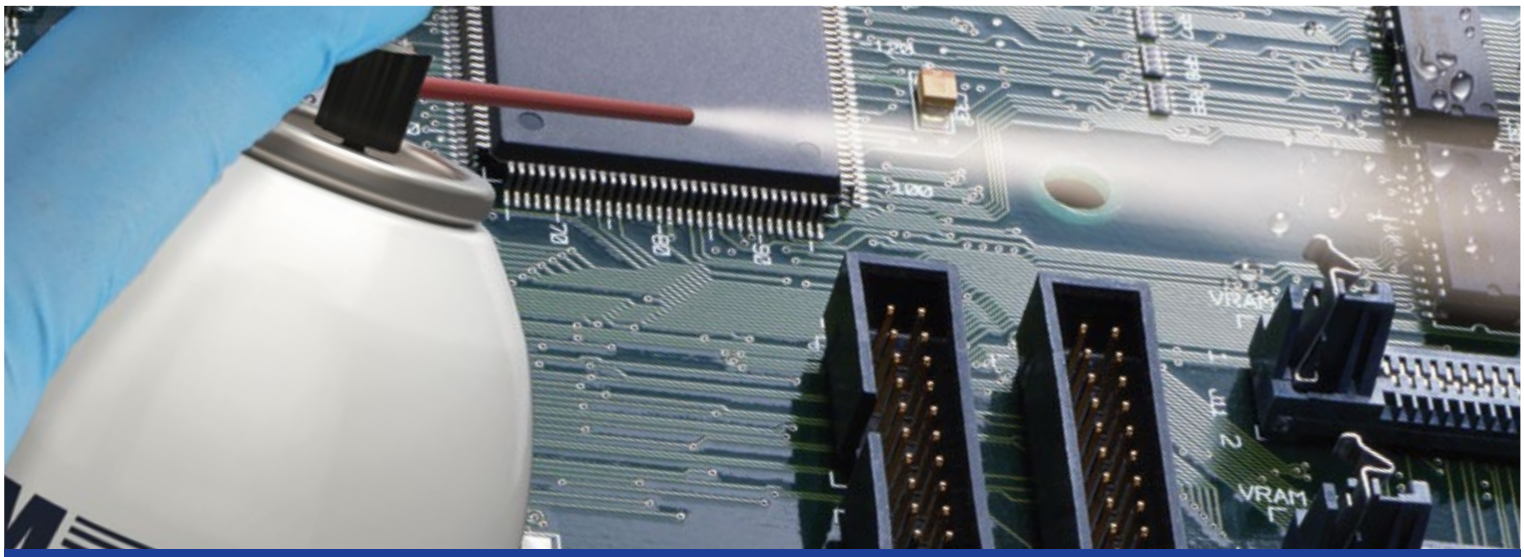
	LIQUID FLUX				PASTE FLUX	
	835	8351	836LFNC	837LFWS	8341	8342
PROPERTIES						
Flux Classification	ROM1	ORL0	ORL0	ORH1	ROL1	RA
Flux Type	Rosin	Organic	Organic	Organic	Rosin	Rosin
Flux Activity	Moderate	Low	Low	High	Low	Moderate
Copper Mirror	Partial removal	Pass	Pass	Removal	Pass	—
Corrosion Test	Pass	—	—	Pass	Pass	—
Acid Number (mgKOH/g sample)	—	14–16	14–16	—	126	—
Halides (by weight)	0.44%	<0.5%	<0.5%	2.2%	<0.5%	—
Surface Insulation Resistance (SIR)	—	2.1 x 10^9 Ω	2.1 x 10^9 Ω	1.8 x 10^{10} Ω	—	—
Cleaning Requirements	Recommended	Not required	Not required	Recommended	Not required	Required
AVAILABLE PACKAGING						
Net contents	835-100ML	8351-125ML	836LFNC-1L	837LFWS-1L	8341-10ML	8342-10ML
	835-100MLCA	8351-1L			8341-50ML	8342-50G
	835-1L	8351-4L				
		8351-20L				



Chapter 09

Electronics Cleaners

ELECTRONICS CLEANERS - AEROSOL



The right cleaning product for each application

Features and Benefits:

- *Convenient aerosol packaging*
- *VOC free propellant*
- *CARB compliant*
- *Zero residue*

Applications:

- *Electronics maintenance and repair*
- *Post production PCB cleaning*

We offer a choice of five aerosol electronics cleaners:

824 - 450G - Isopropyl Alcohol

99.95% pure isopropyl alcohol in aerosol format.

406B - 425G Super Wash™ Aerosol

A very fast drying, plastic-safe electronics cleaner.

4050A - 450G Safety Wash™ II

A blend of polar and non-polar plastic-safe cleaning solvents.

4120 - 450G Super HFE™ Electronics Cleaner

A non-flammable-aerosol cleaner with excellent cleaning strength.

411 - 300G HFE Solvent

A non-flammable, non-toxic and plastic safe cleaner degreaser. Suitable for use on energized circuits.

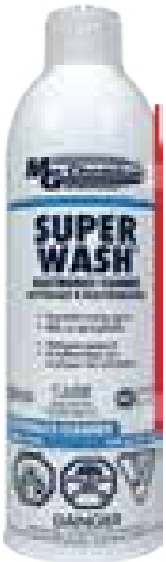
Electronics Cleaners Comparison Chart

Cat. Number	824	4050A	406B	411	4120
Cleaning Characteristics					
PLASTIC SAFE	Yes	Yes	Yes	Yes	Test
FLAMMABLE	Yes	Yes	Yes	No	No
STRENGTH	Regular	Enhanced	Extra	Low	Extra
EVAPORATION	Moderate	Moderate	Fast	Fast	Fast
Regulatory Status					
NSF COMPLIANT	No	Yes	Yes	Yes	No
VOC FREE	No	No	No	Yes	Yes
Physical Properties					
FLASH POINT	12 °C / 54°F	-29 °C / -20 °F	-29 °C / -20 °F	None	None
BOILING POINT	81.8 °C / 179 °F	50 °C / 121 °F	50 °C / 121 °F	60 °C / 140 °F	40 °C / 104 °F
Contaminants Cleaning Efficiency					
NON-POLAR RESIDUES	Fair	Good	Good	Poor	Good
POLAR RESIDUES	Good	Good	Fair	Poor	Good
IONIC RESIDUES water soluble	Good	Good	Poor	Poor	Good
FLUX RESIDUES	Good	Good	Poor	Poor	Excellent
OILS	Good	Good	Good	Fair	Excellent
GREASES	Good	Good	Fair	Poor	Excellent
INKS	Fair	Good	Good	Poor	Good
DIRT & GRIMES	Good	Good	Good	Fair	Excellent

Available Packaging

824-450G

4050A-450G



406B-425G

411-300G

4120-450G

CONTACT CLEANERS

Maintain optimal connectivity

Features and Benefits:

- *Plastic safe*
- *Convenient aerosol can packaging*
- *Variable valve allows user to control rate of flow*
- *RoHS compliant*
- *Ozone safe*

Applications:

- *Clean*
- *Lubricate*
- *Protect*
- *Improve performance*
- *Prolong Conductivity*

We offer a choice of four Contact Cleaners:

401B - Nutrol Control Cleaner

A unique blend of high purity solvent and special lubricating oil, perfect for cleaning and lubricating moving parts in electronics.

404B - Contact Cleaner with Silicones

A very fast drying contact cleaner that leaves a thin film of dry electronic grade silicone behind providing lubrication and preventing wear and tear, as well as a layer of protection from oxidation and the elements.

409B - Electrosolve Contact Cleaner

A very fast drying and zero residue contact cleaner that cleans connectors, contacts, circuit breakers, microprocessors, and LED and PCB components.

801B - Super Contact Cleaner with PPE

A slow drying contact cleaner that cleans, lubricates, protects, and removes stubborn residues. It also bonds onto the surface of metals and is particularly effective on gold, protecting gold contacts for life.
A must have for audio systems.
Also available in pen format (801C-P)

Contact Cleaners Comparison Chart

Cat. Number	401B	404B	409B	801B	801C-P
Cleaning Characteristics					
PLASTIC SAFE	Yes	Yes	Yes	Yes	Yes
EVAPORATION	Moderate	Fast	Very fast	Slow	Slow
LUBRICANT	Mineral oil	Silicone	None	Mineral oil/PPE	Mineral oil/PPE
Regulatory Status					
NSF COMPLIANT	Yes	Yes	Yes	No	No
CARB compliant	Yes	Yes	Yes	Yes	Yes
Physical Properties					
FLASH POINT	-29 °C / -20 °F	-29 °C / -20 °F	-29 °C / -20 °F	58 °C / 137 °F	58 °C / 137 °F
BOILING POINT	52 °C / 126 °F	52 °C / 126 °F	52 °C / 126 °F	183 °C / 362 °F	183 °C / 362 °F

Available Packaging

801B-125G
Aerosol

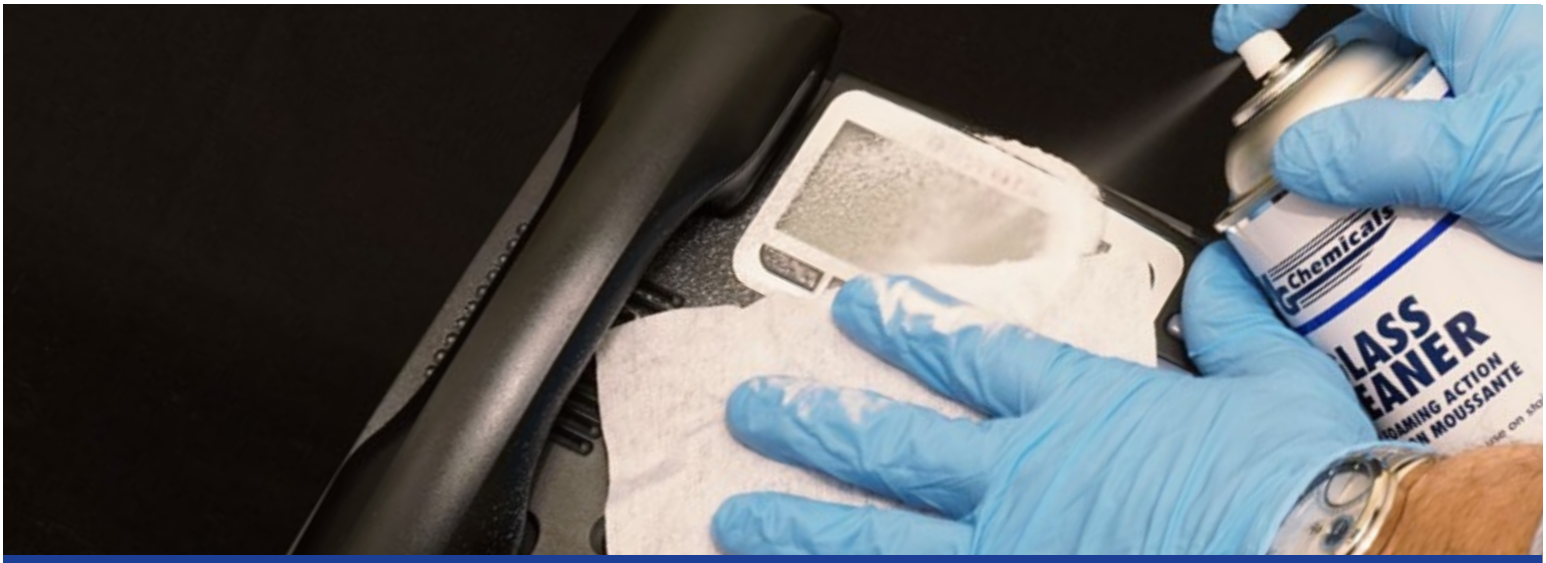
801C-P

401B-140G 401B-340G
Aerosol

404B-140G 404B-340G
Aerosol

409B-140G 409B-340G
Aerosol

DRY WIPES



Great for wet or dry dusting and cleaning

Features and Benefits:

- *Strong and durable*
- *Solvent resistant*
- *Excellent absorbency and strength when cleaning up spills and cleaning solutions.*
- *Low to no-lint formation*

Applications:

- *Controlled environments*
- *Clean rooms*
- *Offices*
- *Laboratories*
- *General surface cleaning*
- *Equipment cleaning*

We offer a choice of three types of Dry Wipes:

828 - Optiwipes

General purpose wipes made of a soft, 100% hydroentangled polyester fiber recommended for cleaning lenses, precision instrumentation, and many other sensitive surfaces.

Cat. No	cm	in	Quantity
828-4x4	10.16 x 10.16	4 x 4	100

8282 - Hydrowipes

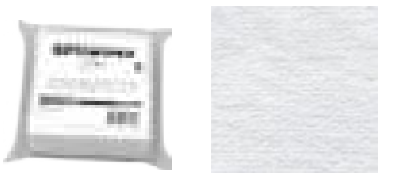
General purpose, clean room wipes made of a hydroentangled blend of 55% cellulose and 45% polyester fibers. They are intended for use in clean rooms,offices, and laboratories.

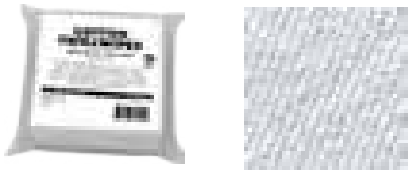
Cat. No	cm	in	Quantity
8282-300	20.32 x 22.86	8 x 9	300

829 - Twillwipes

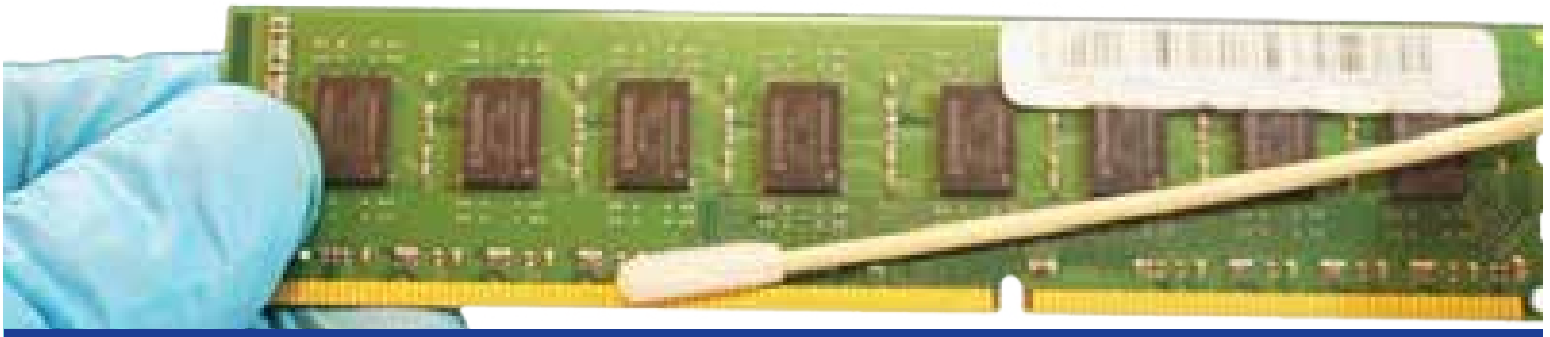
100% cotton in a tightly woven twill that effectively traps contamination. These wipes are lymanized, a cleaning treatment processed at a neutral pH without any starch or binders, to insure cleanliness and quality.

Cat. No	cm	in	Quantity
829-4x4	10.16 x 10.16	4x4	100





CLEANING SWABS



Clean electronics with precision

Features and Benefits:

- *Soft and non-abrasive*
- *Bonded securely*
- *Strong shafts*

Applications:

- *Printed circuit board rework and cleanup*
- *Electronic equipment*
- *Pharmaceutical operations*
- *Optical & magnetic heads*
- *Contacts and controls*
- *Connectors*
- *Office equipment maintenance*

Seven Swabs Available:

810/810D - CHAMOIS SWABS

The ideal swab for your audio/video magnetic heads and optical pick ups. Made from a lint free, synthetic suede bonded to a bendable ABS plastic handle it facilitates access to hard to reach areas. Available in single or double headed formats.

811 - DOUBLE HEADED COTTON SWAB

A double headed low lint, extra absorbent U.S.P. pharmaceutical grade purified round cotton tip swab. Bonded on a 6” rigid white birch shaft for extra resistance when applying pressure is needed.

812 - FOAM OVER COTTON SWAB

A highly absorbent precision cleaning applicator. Shred resistant, 100% urethane foam heads with 100 PPI porosity over extra absorbent U.S.B. pharmaceutical grade purified cotton. Bonded securely to a 6" birch shaft providing extra strength when additional pressure needs to be applied.

812AS - ANTI-STATIC FOAM OVER COTTON SWAB

Antistatic foam heads over extra absorbent U.S.B. pharmaceutical grade purified cotton. Bonded securely to a 6" birch staff. Compatible with most solvents.

813 - FOAM SWAB

A durable precision cleaning applicator, shred resistant made from 100% urethane foam head with 100PPI porosity. Bonded securely to a 6” birch shaft providing extra strength when additional pressure needs to be applied.

814 - RECTANGULAR FOAM SWAB

A large rectangular foam head bonded to sturdy handle for aggressive cleaning applications. Large shred resistant, 100% urethane foam heads with 100PPI porosity. Bonded securely to a 5 inch polypropylene shaft.

8112 - TAPERED COTTON SWAB

A double headed low lint, extra absorbent U.S.P. pharmaceutical grade purified tapered cotton tip swab providing added precision. Bonded on a 6” rigid white birch shaft for extra resistance when applying pressure is needed.

Cleaning Swabs Selection Chart

Cat. Number	Handle Material	Overall Length		Handle Length		Tip Length		Tip End	Tip Shape	Qantity per bag
		In.	cm	In.	cm	In.	cm			
Chamois Swabs										
810-15	ABS Plastic	4	10.16	3.2	8.12	0.9	2.28	Single	Rectangular	15
810-50	ABS Plastic	4	10.16	3.2	8.12	0.9	2.28	Single	Rectangular	50
810-500	ABS Plastic	4	10.16	3.2	8.12	0.9	2.28	Single	Rectangular	500
810D-15	ABS Plastic	5	12.17	4	10.16	1.0	2.54	Double	Rectangular	15
810D-50	ABS Plastic	5	12.17	4	10.16	1.0	2.54	Double	Rectangular	50
810D-500	ABS Plastic	5	12.17	4	10.16	1.0	2.54	Double	Rectangular	500
otton Swab										
811-100	Wood	6	15.24	5	12.7	0.5	1.27	Double	Round	100
8112-100	Wood	6	15.24	5	12.7	0.4	1.02	Double	Tapered	100
Foam Swabs										
813-10	Wood	6	15.24	5.5	13.97	0.6	1.52	Single	Round	10
813-50	Wood	6	15.24	5.5	13.97	0.6	1.52	Single	Round	50
813-250	Wood	6	15.24	5.5	13.97	0.6	1.52	Single	Round	250
813-1000	Wood	6	15.24	5.5	13.97	0.6	1.52	Single	Round	1000
814-10	Polypropylene	5.5	13.97	4.5	11.43	0.9	2.28	Single	Rectangular	10
814-50	Polypropylene	5.5	13.97	4.5	11.43	0.9	2.28	Single	Rectangular	50
814-250	Polypropylene	5.5	13.97	4.5	11.43	0.9	2.28	Single	Rectangular	250
814-1000	Polypropylene	5.5	13.97	4.5	11.43	0.9	2.28	Single	Rectangular	1000
Foam Over Cotton Swabs										
812-10	Wood	6	15.24	5.3	13.46	0.5	1.27	Single	Rectangular	10
812-50	Wood	6	15.24	5.3	13.46	0.5	1.27	Single	Rectangular	50
812-250	Wood	6	15.24	5.3	13.46	0.5	1.27	Single	Rectangular	250
812-1000	Wood	6	15.24	5.3	13.46	0.5	1.27	Single	Rectangular	1000
Anti-Static Foam Over Cotton										
812AS-10	Wood	6	15.24	5.3	13.46	0.8	2.03	Single	Rectangular	10
812AS-250	Wood	6	15.24	5.3	13.46	0.8	2.03	Single	Rectangular	250
812AS-1000	Wood	6	15.24	5.3	13.46	0.8	2.03	Single	Rectangular	1000

810

810D

811

8112

813

814

812

812AS

CLEANING BRUSHES

Clean electronics with efficiency

Features and Benefits:

- *Durable*
- *Secured bristles eliminating bristle loss and contamination*
- *Strong handles*

Applications:

- *Printed circuit board rework and cleanup*
- *Male and female connectors*
- *Electronic equipment*
- *Electronic repair*
- *Electrical cleaning*
- *Soldering*
- *Plant maintenance*
- *Office equipment maintenance*

Eight Brushes Available:

850 - STAINLESS STEEL CLEANING BRUSH

A heavy-duty brush with stainless steel bristles and a wooden handle, great for cleaning soldering iron tips, cutting corrosion, and surface preparation.

851 - BRASS CLEANING BRUSH

A heavy-duty brush with brass steel bristles, and a wooden handle, great for cleaning soldering iron tips, removing oxides and corrosion from connector ends, and burnishing without removing base metal.

852 - HOG HAIR BRUSH

A general cleaning brush with stiff hog hair bristles and a wooden handle. Can be used dry or wet and works well with sticky or crusty materials. Great for removing flux, and general clean up.

853 - LARGE HOG HAIR BRUSH

A general cleaning brush with stiff hog hair bristles, and a wooden handle, like the 852, but with a large tuft, making cleaning large areas easier.

855 - HORSE HAIR CLEANING BRUSH

An inexpensive brush with soft horse hair bristles and a sturdy tin handle. Excellent for dusting, cleaning with fluids, and general cleanup.

856 - DOUBLE-ENDED HORSE HAIR CLEANING BRUSH

A double ended cleaning brush made of short natural horse hair bristles and a cad plated steel handle. Its short bristles make it ideal for heavy duty scrubbing. One end is chiseled to clean hard to reach and tight corners and the other is straight for precision cleaning and coating.

857 - CHISEL HOG HAIR CLEANING BRUSH

A hog hair brush with a short vertical plywood handle. Can be used dry or wet. Excellent for removing flux and general clean up.

859 - HORSE HAIR CLEANING BRUSH

A general cleaning brush with natural soft horse hair bristles and a wooden handle. Excellent for delicate cleaning tasks.

Cleaning Brushes Selection Chart

Cat. Number	Handle Material	Handle Length (L x W)		Trim Length		Brush Face		Bristle Kind	Bristle Type	Bristle Rows	
		In.	cm	In.	cm	In.	cm			Width	Length
Cleaning brushes											
850	Plywood	7 ¾x 7/16	20 x 1.1	5/16	0.7	1 3/8 x 7/16	3.5 x 1.1	Stainless	Stiff	3	7
851	Plywood	7 ¾ x 7/16	20 x 1.1	¾	1.9	1 3/8 x 7/16	3.5 x 1.1	Brass	Stiff	3	7
852	Plywood	7 ¾ x 7/16	20 x 1.1	5/16	0.7	1 3/8 x 7/16	3.5 x 1.1	Hog Hair	Stiff	3	7
853	Plywood	8 ¼ x 1 1/16	21 x 2.7	¾	1.9	2 1/8 x 7/8	5.4 x 2.2	Hog Hair	Stiff	4	9
855	Tin	5 ¼ x 3/8	15 x 2.5	¾	1.9	¼ x 3/8	0.6 x 1	Horse Hair	Soft	1	1
856	CAD Plated Steel	4 ½ (L)	11.5	¾ / 3/16	1.9 / 0.4	¼ x 5/16	0.6 x 1.7	Horse Hair	Soft / Stiff	1	1
857	Plywood	4 15/16 x 1 1/16	12 x 2.7	½	1.3	¾ x 5/16	1.8 x 1.7	Hog Hair	Soft	2	6
859	Plywood	7 ¾ x 7/16	20 x 1.1	5/16	0.7	1 3/8 x 7/16	3.5 x 1.1	Horse Hair	Stiff	3	7

850 - STAINLESS STEEL CLEANING BRUSH

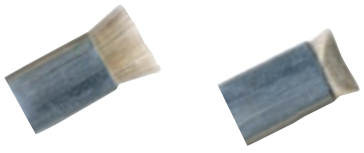
851 - BRASS CLEANING BRUSH

852 - HOG HAIR CLEANING BRUSH

853 - LARGE HOG HAIR CLEANING BRUSH

855 - HORSE HAIR CLEANING BRUSH

856 - DOUBLE-ENDED HORSE HAIR CLEANING BRUSH



857 - CHISEL HOG HAIR CLEANING BRUSH

859 - HORSE HAIR CLEANING BRUSH

Air Dusters

High Cleaning Power

MG Chemicals air dusters deliver high velocity air to remove microscopic dust, lint, and foreign particles from electronics and electrical equipment safely and effectively.

Our air duster is available either as an aerosol spray or electronic device and is suitable for use in labs, work benches, maintenance and service shops, off-site servicing, residential homes, offices, and industry.

Features and Benefits

- Ideal for removing lint, dust, and other debris
- Prevents malfunctions and lengthens operating life
- Compatible with electrical equipment and electronic components

Applications

- Electrical and electronics boards and systems
- Ventilation and heat sink systems
- Audio visual equipment
- Lab equipment
- Equipment cleaning

SUPER DUSTER™

402A
- Non-flammable duster with pure HFC 134a
- Used on live electronic and electrical equipment

402B
- General purpose with pure 1,1-difluorethane 152a

402C
- Non-flammable duster with 100% HFO-1234ze
- Recommended for use in home or office

Electronic SUPER DUSTER™

402E
- Portable air blower with multiple settings, digital display and long battery life

Available Packaging

402A	402B	402C	402E
285 g (aerosol)	285 g (aerosol)	235 g (aerosol)	Electronic duster
450 g (aerosol)	400 g (aerosol)		

Alcohol Wipes

High Purity for Safe Cleaning

Features and Benefits

- Quickly removes oils, light greases, grime, and flux residues
- Made with strong, durable materials
- Saturated with high purity isopropyl alcohol (IPA)
- Safe on most plastics
- NSF-registered versions are available

Applications

- Audio, video, magnetic, and optical heads
- Cables
- Electrical contacts and connectors
- Fiber optics
- Optical equipment
- POS devices and scanners
- Precision instruments
- Printed circuit boards
- Production equipment and workstations
- Smartphones, pads, laptops, keyboards, and office equipment
- SMT stencils and screens
- Surfaces being prepared for coating application

824-W – Individually packaged alcohol wipes made with a polyester/wood pulp blend, presaturated with 99.9% IPA

8241-W – Individually packaged alcohol wipes made with a viscose/polyester blend, presaturated with 70% IPA

8241-T – Dispensing tub containing 75 alcohol wipes made with a polyester/wood pulp blend, presaturated with 70% IPA

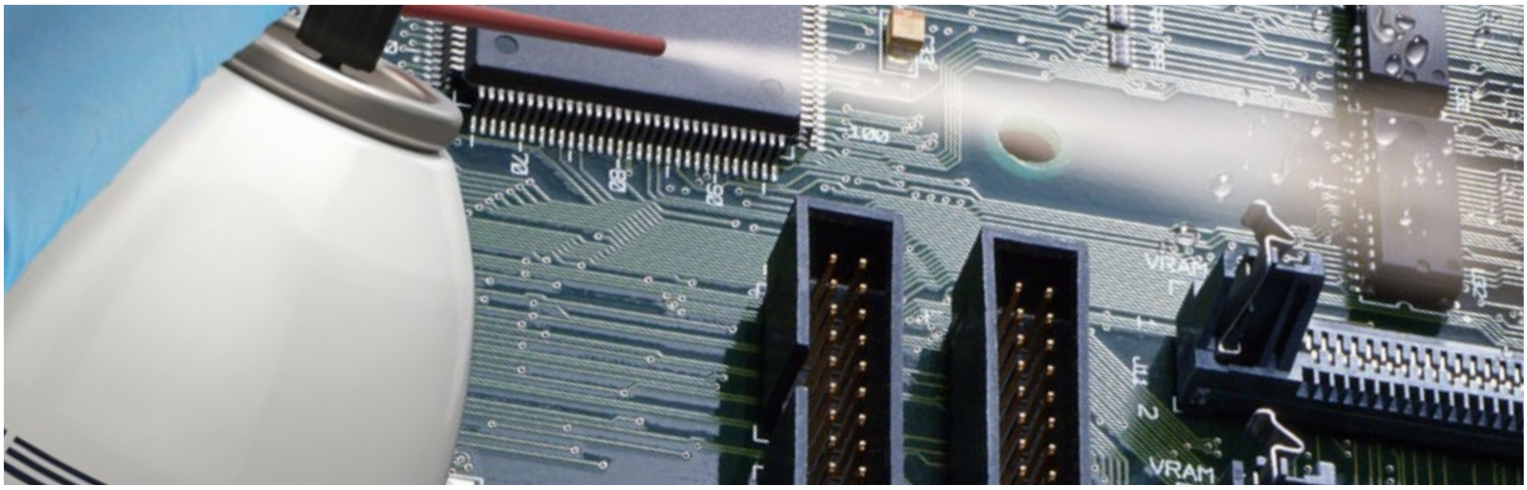
8241-110 – Dispensing tub containing 110 polyester alcohol wipes presaturated with 70% IPA

8241-140 – Soft dispensing pack containing 140 alcohol wipes made with spunlace wood pulp, presaturated with 70% IPA

Alcohol Wipes

	824-W	8241-W	8241-T	8241-110	8241-140
PROPERTIES					
Solution	99.9% IPA	70% IPA	70% IPA	70% IPA	70% IPA
Material	Wood pulp/ polyester	Viscose/ polyester	Wood pulp/ polyester	Polyester	Spunlace wood pulp
Wipe size	13 cm x 15 cm 5" x 6"	13 cm x 15 cm 5" x 6"	15 cm x 18 cm 6" x 7"	15 cm x 20 cm 6" x 8"	18 cm x 20 cm 7" x 8"
Wipe density	60 GSM	60 GSM	56 GSM	80 GSM	56 GSM
RoHS compliant	Compliant	Compliant	Compliant	Compliant	Compliant
CARB compliant	—	Compliant	Compliant	—	Compliant
NSF registered	—	—	Registered	—	—
PACKAGING					
Format	Individually wrapped wipe	Individually wrapped wipe	Tub	Tub	Soft pack
Quantity	25 wipes/pack 50 wipes/pack 500 wipes/pack	25 wipes/pack 2500 wipes/pack	75 wipes/tub 12 x 75 wipes/tub	110 wipes/tub	140 wipes/soft pack

Isopropyl Alcohol



High Purity Electronics Cleaning Solvent

Features & Benefits

- Safe on most plastics and elastomers
- Fast dry time
- Zero residue
- Low toxicity
- Low surface tension

Applications

- Audio, video, magnetic, and optical heads
- Cables
- Electrical contacts and connectors
- Fiber optic connectors
- Optical equipment
- Precision instruments
- Printed circuit boards
- Production equipment and workstations
- Smartphones, pads, laptops, keyboards, and office equipment
- SMT stencils and screens
- Surfaces being prepared for coating application

824 (liquid) — 99.9% ACS reagent grade isopropyl alcohol, anhydrous

8241 (liquid) — 70% Isopropyl alcohol

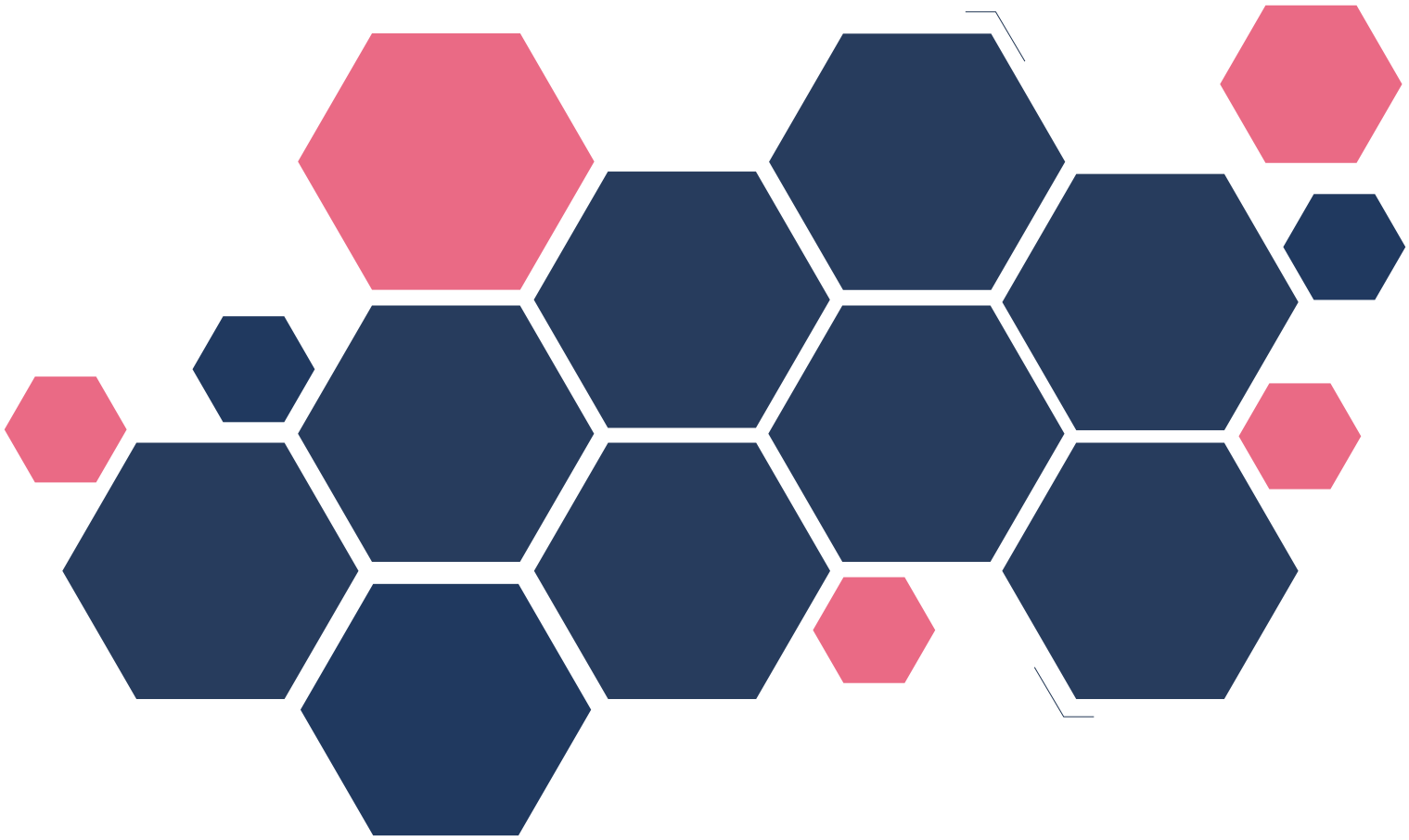
824-450G (aerosol) — Isopropyl alcohol 99.9% IPA and HFC 152A propellant

824-400ML (UK aerosol) — Isopropyl alcohol 99.9% IPA and hydrocarbon propellant

Also available in 99.9% and 70% IPA Presaturated Wipes (Individually wrapped, or soft-pack and tub dispenser packaging).

Isopropyl Alcohol

	824	8241	824-450G	824-400ML (UK)
PROPERTIES				
Solution	99.9% IPA	70% IPA	99.9% IPA	99.9% IPA
Format	Liquid	Liquid	Aerosol	Aerosol
Plastics safe	Safe	Safe	Safe	Safe
Flammability	Highly flammable	Highly flammable	Highly flammable	Highly flammable
Strength	Regular	Regular	Regular	Regular
Evaporation	Moderate	Moderate	Moderate	Moderate
CARB compliant	Compliant	Compliant	Compliant	Compliant
NSF registered	Yes (#144029)	—	—	—
VOC free	—	—	—	—
Flash point	12 °C [54°F]	18 °C [65°F]	12 °C [54°F]	12 °C [54°F]
Boiling point	81.8 °C [179°F]	81 °C [177°F]	82 °C [180°F]	82 °C [180°F]
Non-polar residues	Good	Fair	Good	Good
Polar residues	Fair	Good	Fair	Fair
Ionic residues	Fair	Good	Fair	Fair
Flux residues	Good	Fair	Good	Good
Oils	Good	Fair	Good	Good
Greases	Fair	Fair	Fair	Fair
Inks	Fair	Fair	Fair	Fair
Dirt and grime	Fair	Fair	Fair	Fair
AVAILABLE PACKAGING				
Net contents	125 mL (bottle) 475 mL (spray bottle) 945 mL (bottle) 20 L (pail)	475 mL (spray bottle) 945 mL (bottle)	450 g (aerosol)	400 mL (aerosol)

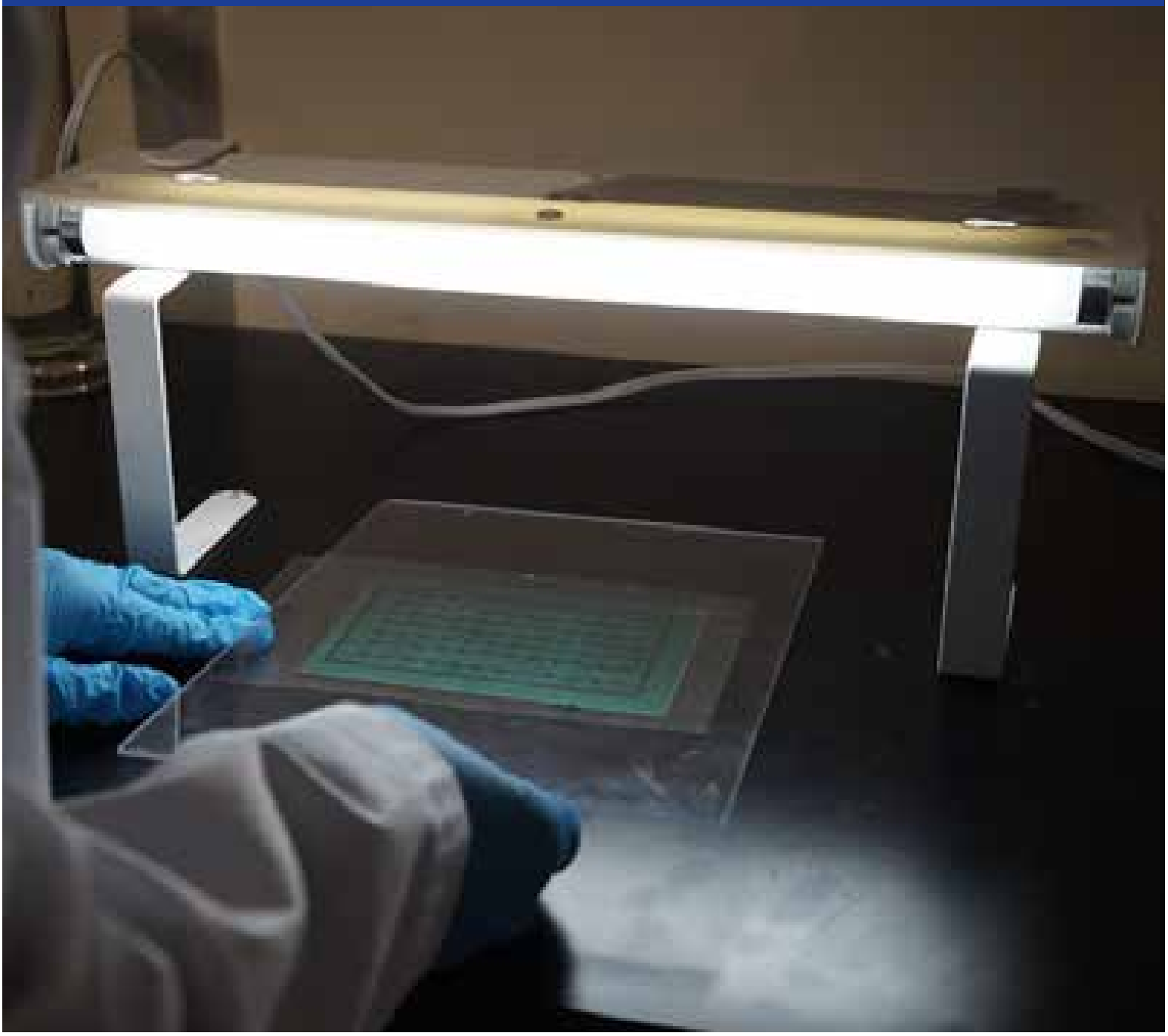


Chapter 10

Prototyping

PROTOTYPING EQUIPMENT & CHEMICALS

Prototyping made simple



Prototyping Equipment, Accessories & Chemicals

416-K - PHOTOFABRICATION KIT

A 9-piece set of items needed for producing a printed circuit board using positive photofabrication.

Includes:

- *3 x 5" PCB*
- *4 x 6" PCB*
- *6 x 6" PCB*
- *1 418-500ML Positive Developer*
- *1 415-500ML ferric chloride*
- *2 Foam brushes*
- *Plastic development tray*
- *Rubber gloves*
- *Instruction sheet*

This kit requires one of the following copper etchants:

- Exposure source and transparent weight
- Etchant tank, or glass tray, or plastic tray (for etching purposes)
- Artwork laser printed on a transparency.
- Eye protection

416-T - TRANSPARENCY FILM

8½" x 11" heat stabilized film sheets for use in most laser printers

410 - AMMONIUM PERSULFATE

Copper Etchant Ammonium Persulfate crystals are used as an alternative to the traditional ferric chloride to produce a cleaner copper etchant solution. One kilogram of crystals will produce four liters of etching solution when mixed with water.

Cat. No.	Net Volume	
410-1KG	1 kg	2.2 lbs

415 - FERRIC CHLORIDE

Ready to use solution designed for etching printed circuit boards and other metals.

Cat. No.	Net Volume	
415-500ML	475 mL	1 pt
415-1L	945 mL	1.99 pt
415-4L	4 L	1.06 gal
415-20L	20 L	5.3 gal

418 - POSITIVE DEVELOPER

For removing exposed resist during the positive photofabrication process

Cat. No.	Net Volume	
418-500ML	500 mL	17 fl oz

421 - LIQUID TIN

Quickly tinplates copper circuits on PC boards in 5 minutes or less at room temperature.

Cat. No.	Net Volume	
421-125ML	125 mL	4.2 oz
421-500ML	500mL	17 oz

Boards

500 SERIES - COPPER CLAD BOARDS

Made of a translucent laminate consisting of a continuous woven glass cloth impregnated with epoxy resin. The boards are made of FR4, which is a flame retardant version of G-10 material.

- *Complies with UL (file number E214381) and IPC-4101C/21 DICY (dicyandiamide) Cured System*
- *Easy to cut with no specialized equipment required*
- *UV blocking*
- *Available in 1 oz (1.37 mil, 35 µm) and ½ oz (0.67 mil, 17 µm) copper cladding*
- *Comes in 1/16" (1.60 mm) and 1/32" (0.80 mm) laminate thicknesses*

Cat. No	Size mm	Size in.
FR4 1/16" (1.60mm), single sided		
503	76 x 127	3 x 5
506	101 x 152	4 x 6
509	152 x 152	6 x 6
512	152 x 228	6 x 9
515	203 x 254	8 x 12
521	304 x 304	12 x 12
575	609 x 914	24 x 36
580	914 x 1219	36 x 48
FR4 1/16" (1.60mm), double sided		
540	76 x 127	6 x 6
550	152 x 152	6 x 6
555	304 x 304	12 x 12
FR4 1/32" (0.80mm), single sided		
586	101 x 152	4 x 6
588	152 x 228	6 x 9
590	304 x 304	12 x 12
FR4 1/32" (0.80mm), double sided		
587	101 x 152	4 x 6
589	152 x 228	6 x 9

500 SERIES - COPPER CLAD BOARDS (HALF OUNCE)

- *1/16" thickness*
- *½ oz copper*
- *Flame retardant laminant*

Cat. No	Size mm	Size in.
Single sided		
510	152 x 152	3 x5
516	203 x 254	8 x 10
Double sided		
551	152 x 152	6 x 6

600 SERIES - POSITIVE PRESENSITIZED COPPER CLAD BOARDS

Made of a translucent laminate consisting of a continuous woven glass cloth impregnated with epoxy resin. The boards are made of FR4, which is a flame retardant version of G-10 material.

- *1 oz copper boards (1.37 mil, 35 µm)*
- *Flammability meets UL 94V-0 (file # E98983)*
- *High heat resistance*
- *UV blocking*
- *Comes in single-sided and double-sided boards of 1/16" (1.60 mm), 1/32" (0.80 mm), and 1/64" (0.40 mm) thicknesses*

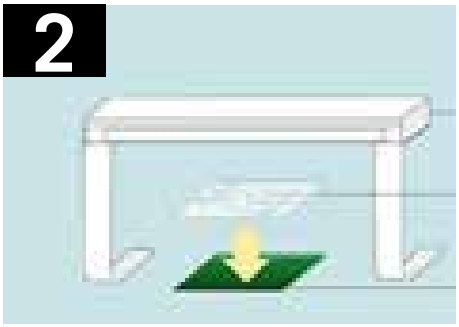
Cat. No	Size mm	Size in.
FR4 1/16" (1.60mm), single sided		
603	75 x 125	3 x 5
606	100 x 150	4 x 6
609	150 x 150	6 x 6
612	150 x 228	6 x 9
630	200 x 300	8 x 12
FR4 1/16" (1.60mm), double sided		
650	150 x 150	6 x 6
660	150 x 230	6 x 9
FR4 1/32" (0.80mm), single sided		
687	100 x 150	4 x 6
689	150 x 230	6 x 9
FR4 1/32" (0.80mm), double sided		
690	150 x 230	6 x 9
FR4 1/64" (0.40mm), double sided		
698	150 x 230	6 x 9

Prototyping process using pre-sensitized boards to prototype single sided circuits.

1

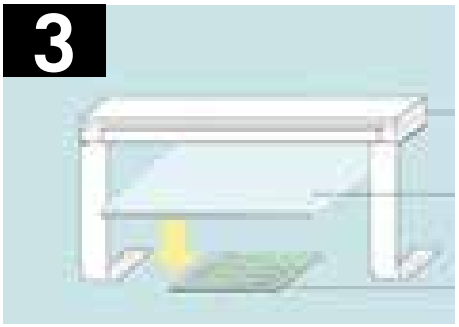
Peel the white protective coating off of your Presensitized Copper Clad Board (600 Series)

2



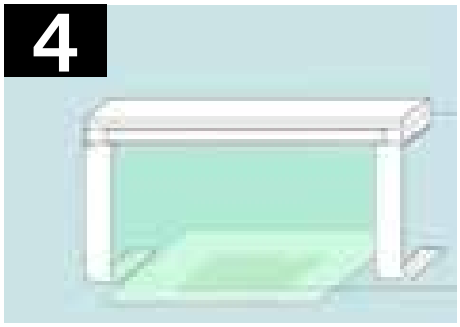
Place artwork on board

3



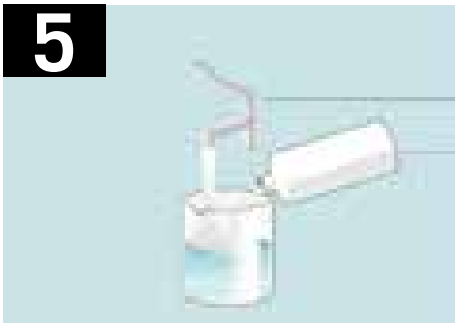
Secure artwork with an acrylic weight

4



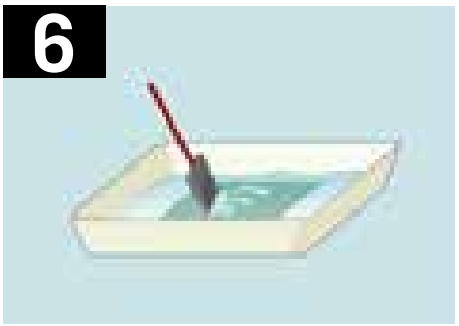
Expose board for 10 minutes using a 15W daylight fluorescent bulb 6 inches above the board.

5



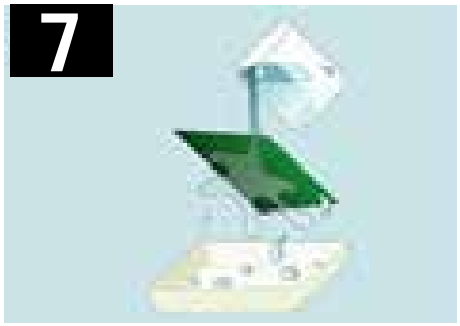
Dilute the developer 1:10 with water.

6



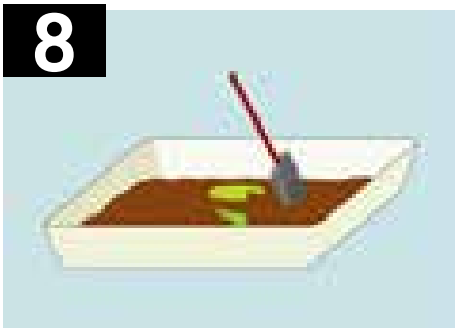
Put on rubber gloves. Peel protective covering and place your exposed board in the diluted developer solution. Brush lightly with smoother brush until exposed resist is removed. (1 - 2 min)

7



Rinse board in water. Dispose of the residue solution properly.

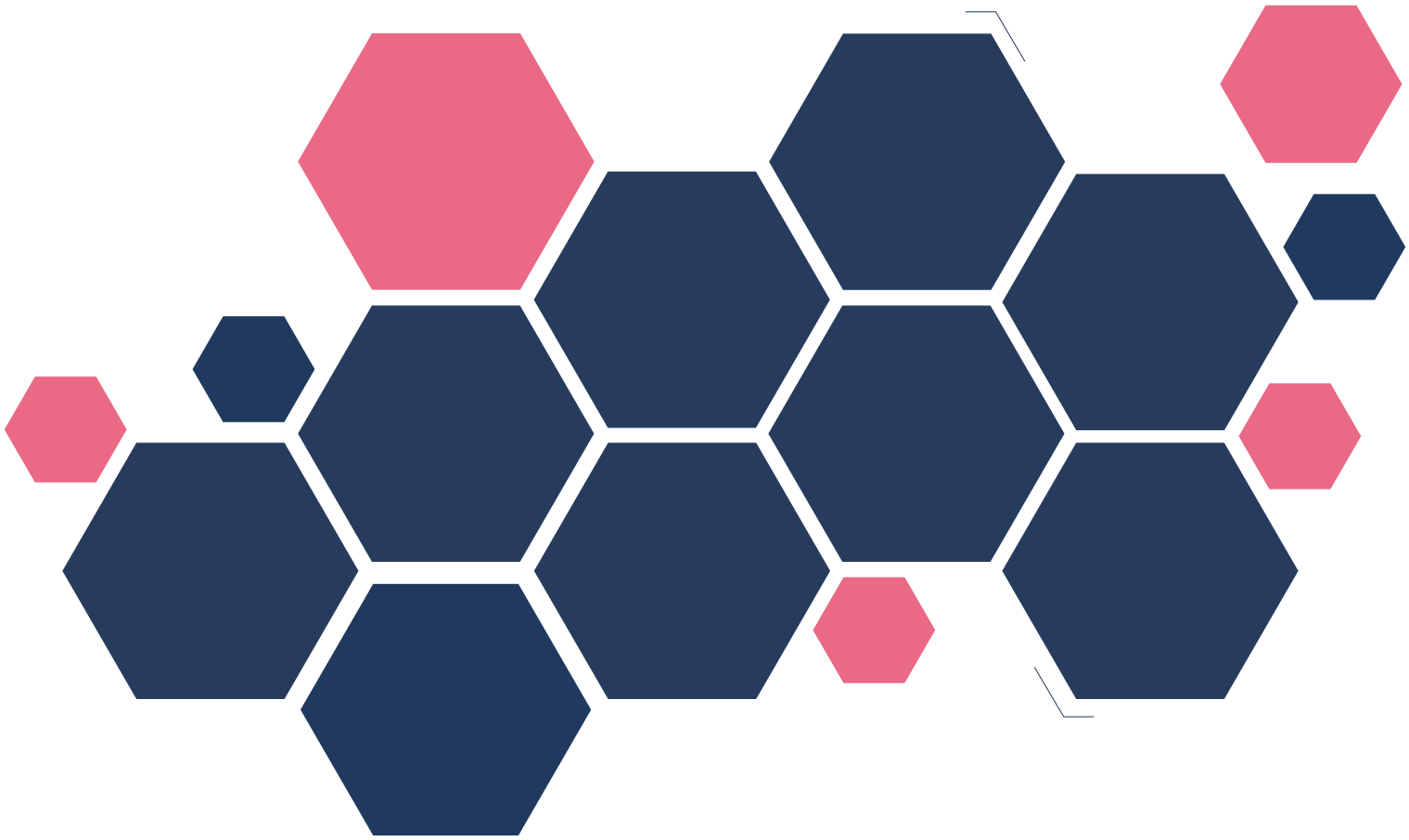
8



Place board in Ferric Chloride until the unprotected copper is removed and your artwork becomes visible on the board. (10 - 15 min). use the Economy Etching Kit

9

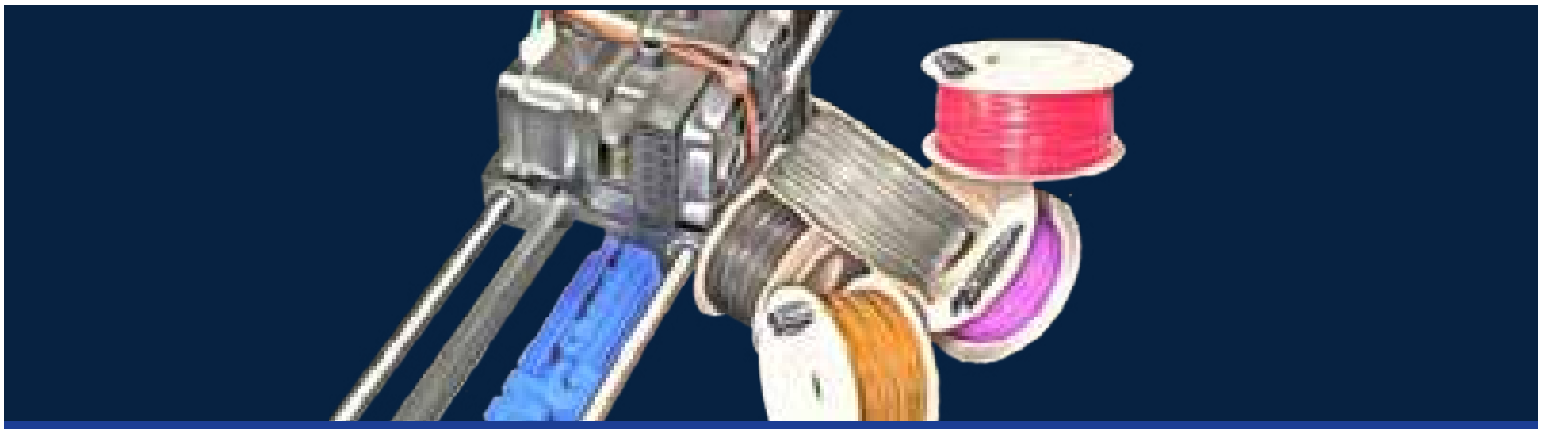
Rinse board in water to finish your board. Dispose of the residue etchant according to your local regulations.



Chapter 11

3D Printer Filaments, Chemicals & Accessories

3D Printer Filaments, Chemicals & Accessories



High quality products for high quality results

ABS

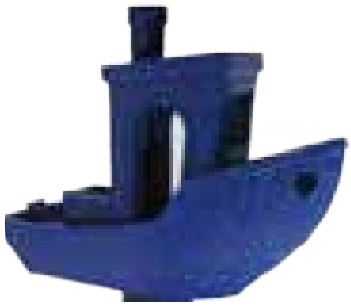
MG Chemicals ABS 3D printing filaments are made of high purity Acrylonitrile Butadiene Styrene pellets. They resist higher temperatures and offer great machinability, flexibility and strength making it the preferred choice of engineers and professionals. ABS plastic can be dissolved and welded in our 434 Acetone making post processing easy. Acetone can also be used to vapor or dip smooth ABS prints to give them a cast plastic finish.

It is important to note that a heated bed is required to work with this type of material and because it is petroleum based it emits a slight odour when heated, making it less desirable for home use. It is recommended that this product be printed in a well ventilated area.

- High purity Acrylonitrile butadiene styrene (ABS)
- Higher temperature resistance
- Flexible and strong
- Can be welded and smoothed using acetone
- Low diameter variance
- RoHS compliant
- Print temperature: 230 °C - 240° C [446 °F - 464 °F]
- Bed temperature: 90°C - 110 °C [194 °F - 230 °F]
- Bed surface: Polyimide tape or glass (treated)

PLA

MG Chemicals Polylactic Acid or Polylactide (PLA) 3D printing filaments are a corn based product made from high purity, high temperature pellets. It does not require a heated print bed and easily adheres to masking tapes. It is very hard, acetone resistant and can achieve faster print speeds and lower layer heights when properly used. It releases a mild, non-offensive sweet smell when heated and is the optimal choice for use in homes, schools and makers / hobbyists workshops or studios.



- High Purity Polylactic Acid or Polylactide (PLA)
- Made from renewable resources
- Can be used in high resolution applications
- Acetone resistant
- 1.75mm and 3.0mm diameters
- 18 Vivid colors
- Low diameter variance
- RoHS compliant
- Print temperature: 210 °C - 220 °C [410 °F - 428 °F]
- No heated bed required
- Bed surface: Masking tape

BLACK BLUE BROWN GLOW IN THE DARK GOLD GREEN GREY LIGHT SKIN LIME NAVY ORANGE PINK PURPLE RED SILVER TRANSLUCENT YELLOW WHIT

SPECIALTY FILAMENTS

FLUORESCENT

MG Chemicals Fluorescent Polylactic Acid or Polylactide (PLA) 3D printing filaments are filaments made from high purity, high temperature corn based pellets. It is a normal PLA in which we incorporated a fluorescence formula that makes your print 'glow' under black light. It does not require a heated print bed and easily adheres to masking tapes.

It is the optimal choice for use in homes, schools and makers / hobbyists workshops or studios.

- **Glows under black light**
- **Can achieve faster print times**
- **Acetone resistant**
- **Low Diameter variance**
- **RoHS compliant**
- **No heated bed required**
- **Print temperature: 180 °C - 230 °C [356 °F - 446 °F]**
- **Bed surface: Masking tape**

ABS / PLA THERMOCHROMIC

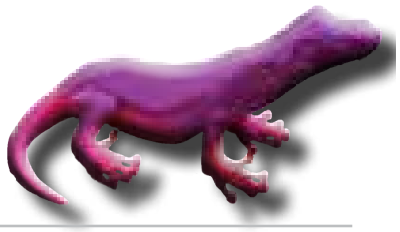
MG Chemicals Thermochromic 3D printer filaments are made of high purity Acrylonitrile Butadiene Styrene (ABS) or Polylactic Acid or Polylactide (PLA) pellets with a tight diameter tolerance. It is formulated to provide a discoloration effect when exposed to heat.

ABS

- **Green colour changes to yellow at 31 °C [88 °F]**
- **Purple colour changes to red at 31 °C [88 °F]**
- **Higher temperature resistance**
- **Flexible and strong**
- **Can be welded and smoothed using acetone**
- **Low diameter variance**
- **Print temperature: 210 °C - 240° C [410 °F - 464 °F]**
- **Bed temperature: 110°C [230 °F]**
- **Bed surface: Polyimide tape or glass (treated)**

PLA

- **Red colour changes to natural at 43 °C / 109 °F**
- **Can be used in high resolution applications**
- **Low diameter variance**
- **RoHS compliant**
- **Acetone resistant**
- **Print temperature: 180 °C - 230 °C [356 °F - 446 °F]**
- **No heated bed required**



ABS / PLA GLOW / SUPER GLOW IN THE DARK

MG Chemicals Glow / Super Glow in the Acrylonitrile Butadiene Styrene (ABS) or Dark Polylactic Acid or Polylactide (PLA) 3D printing filaments are made from high purity pellets in which we incorporated a luminescent formula to provide a lighting effect in the dark by absorbing natural or manmade light. It is the optimal choice for use in homes, schools and makers / hobbyists workshops or studios.

ABS

- **Higher temperature resistance**
- **Flexible and strong**
- **Can be welded and smoothed using acetone**
- **Low Diameter variance**
- **RoHS compliant**
- **Print temperature: 230 °C - 250° C [446 °F - 482 °F]**
- **Bed temperature: 110°C [230 °F]**
- **Bed surface: Polyimide tape or glass (treated)**

PLA

- **Made from renewable resources**
- **Can be used in high resolution applications**
- **Acetone resistant**
- **Low Diameter variance**
- **RoHS compliant**
- **Print temperature: 180 °C - 230° C [356 °F - 446 °F]**
- **No heated bed required**
- **Bed surface: Masking tape**

WOOD

MG Chemicals Wood 3D printing filaments is biodegradable, can be sanded and painted and has a sweet odour of wood. It has the ease of use similar to PLA and is great for artists and hobbyists who are looking to experiment with different printing materials. It is highly recommended this product be used with 0.4 mm nozzles or larger to avoid clogging. Smaller nozzles require higher heat to avoid clogging.

- **Blend of high purity Polylactic Acid (Polylactide) (PLA) and wood**
- **Sandable and paintable**
- **Easy to use**
- **Low diameter variance**
- **RoHS compliant**
- **Print temperature: 185 °C - 230 °C [365 °F - 446 °F]**
- **No heated bed required**
- **Offered in both 1.75mm and 2.85mm diameter**
- **Bed surface: Masking tape**

PETG

MG Chemicals PETG 3D Printing filaments are a high strength thermoplastic with excellent moisture and chemical resistance. They are easy to use because of their low shrinkage properties and are excellent for applications where strong prints are desired. They are widely used in mechanical parts fabrication and robotics.

- **High purity Polyethylene terephthalate glycol-modified (PETG)**
- **Print times comparable to PLA**
- **High strength and flexibility**
- **Minimal shrinkage and warping**
- **Recyclable**
- **Low Diameter variance**
- **RoHS compliant**
- **Print temperature: 210 °C - 240 °C [410 °F - 464 °F]**
- **No heated bed required**

HIPS

MG Chemicals High Impact Polystyrene (HIPS) 3D Printing filaments is made of high grade dissolvable High Impact Polystyrene pellets with a tight diameter tolerance. The HIPS filaments are used as stable support material for prints. Being easily soluble in d-Limonene, HIPS support can be freed from ABS by simply immersing the object in d-Limonene (Time to dissolve may vary depending on size and complexity of print). To print objects with HIPS support dual extrusion printer with heated bed is required. HIPS print temperature is 235° C / 455 °F on a heated bed at 115° C / 239 °F (Temperatures may very between printers).

- **High Impact Polystyrene**
- **Dissolvable in d-Limonene**
- **Use as support in ABS**
- **Low diameter variance**
- **RoHS compliant**
- **Print temperature: 235 °C [455 °F]**
- **Bed temperature: 115 °C [239 °F]**
- **Bed Surface: Polyimide tape**
- **Available 1.75mm and 3.0 mm diameters**

ACCESSORIES AND CHEMICALS

TAPES

MG Chemicals offers 3D printing high temperature masking tapes and polyimide tapes to assist adhering the printed object to the print bed to help achieve the best possible results.

MASKING TAPE

MG Chemicals high temperature masking tape is made from 8 mils beige crepe paper coated with a rubber adhesive designed for 3D printers heated beds. It is specifically designed to be heat resistant and provide superior print adhesion while allowing easy removal of completed objects. It also provides protection for the bed, while making clean up simple. It works excellent with PLA, Wood, PETG, ABS and many other 3D printing materials. It is available in 4 in. width on 49 ft rolls.

- **Low thickness variation**
- **Strong heat resistant rubber adhesive**
- **Superior print adhesion**
- **Easy object removal**
- **Protection for 3D printer bed**
- **4” width**

POLYIMIDE TAPE

MG Chemicals Polyimide film is a lightweight, flexible crystalline film with a silicone adhesive designed for 3D printers heated beds when using ABS and HIPS filaments and perfect for applying ABS slurry. It works well at low temperatures, does not soften when submitted to heat and provides an excellent release surface at elevated temperatures. It offers superior tensile strength, good elongation and is chemical resistant. It also serves as a printer bed surface protector. Available in 4 in. and 8 in. widths and offered in 49 ft splice free rolls.

- **2 mils thick**
- **Silicone adhesive**
- **Very high heat resistant**
- **Superior tensile strength**
- **Eases release of heated objects**
- **Protects printer bed**
- **RoHS and REACH compliant**
- **4” or 8” width**

CHEMICALS

MG Chemicals 3D printing liquid solutions are formulated to assist in the 3D modeling process. They are designed to act as dissolving agents, a post printing smoothing solutions or as cleaning solvents.

d-LIMONENE PURE GRADE

MG Chemicals d-Limonene Pure Grade is a colourless liquid made from 100% pure natural citrus oils. It is ideal for dissolving HIPS when used as a support within 3D printed pieces

d-Limonene can also be used as a solvent to clean and degrease equipment. Extracted from natural fruits it releases a pleasant citrus smell when exposed to ambient air.

- **100% citrus oil**
- **Dissolves HIPS support filaments**
- **Biodegradable**

ACETONE

MG Chemicals Acetone is a superfast drying, VOC exempt and zero residue solvent. It is ideal for use in 3D printing. ABS dissolved in acetone, when applied to a print bed, can improve adhesion and reduce print warping. The acetone can also be used to smooth and weld the surface of finished ABS prints.

- **Fast Evaporation Rate**
- **Dissolves ABS plastic to make a slurry for use on print beds when printing with ABS filaments**
- **ABS Smooth finishing agent**
- **ABS plastic welding agent**
- **Highly Miscible with Other Common Organic Solvents**
- **VOC exempt**

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