

## Epoxy Coatings

CHO-SHIELD epoxy coatings provide EMI shielding, anti-static protection, corona shielding and surface grounding in a wide range of applications.

- **CHO-SHIELD 596** coatings are two-component, silver-filled systems possessing exceptionally high conductivity and generally providing EMI shielding levels of up to 60-80 dB in the 30 MHz to 1 GHz range. They can be applied with a brush or conventional spray equipment. Both offer excellent EMI and environmental protection when applied to glass, plastic or epoxy substrates. They cure at room temperature, although optimum results are achieved with elevated temperature cure. Request Technical Bulletin 51.

- **CHO-SHIELD 610** is a highly conductive, two-component silver-plated-copper filled epoxy coating for application to non-conductive plastic substrates, particularly those subject to hostile environmental conditions of abrasion, temperature extremes, high

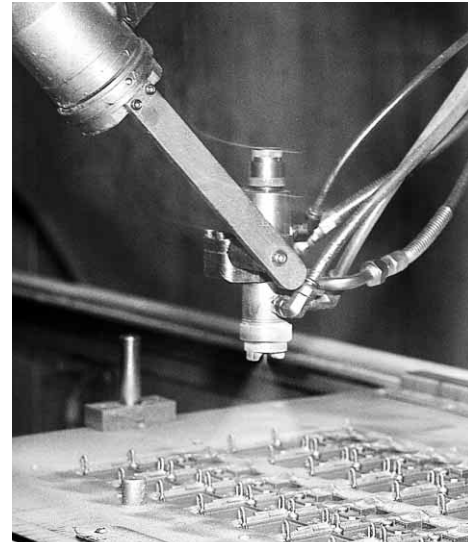
humidity, and salt fog corrosion. It dries to the touch in less than one hour, with best performance attained by using one of two accelerated cure cycles.

## Polyurethane Coating

- **CHO-SHIELD 4076** nickel-filled polyurethane is recommended for shielding an entire room. This durable coating adheres well to plaster, wood, glass, concrete, drywall and most metals. Request Technical Bulletin 29.

## Acrylic Coatings

One-component CHO-SHIELD conductive acrylic air-dry coatings are intended for EMI shielding of non-conductive substrates. They offer a choice of filler systems that meet varying performance requirements. Silver-containing systems offer lower surface resistivity for better shielding performance. Nickel-filled systems are relatively inexpensive for providing moderate levels of EMI shielding over a wide frequency range.



- **CHO-SHIELD 2052, 2054 and 2056** silver-plated-copper filled commercial-grade coatings provide high levels of EMI shielding effectiveness, abrasion resistance and excellent adhesion on a variety of materials used for electronic enclosures. A more detailed description of these products appears below.

## CHO-SHIELD 2052, 2054 and 2056 Conductive Coatings

### Expressly Formulated for Commercial Enclosures

Developed especially for commercial applications, CHO-SHIELD 2052, 2054 and 2056 conductive coatings provide high levels of EMI shielding effectiveness and excellent adhesion on a variety of plastic substrates. These include ABS, PC-ABS, Noryl\* and PVC. Recommended applications include plastic enclosures for notebook and desktop PCs, routers, servers, medical electronics, telephone handsets, etc.

Each coating has a silver-plated-copper filler. CHO-SHIELD 2052 uses a non-aqueous, one-component acrylic resin. In CHO-SHIELD 2054, the resin is water-based acrylic/urethane that offers the advantage of low VOCs.

Owing to its filler blend of pure silver and silver-plated copper, CHO-SHIELD 2056 offers <30 mohm maximum surface resistivity at the recommended 1-mil thickness. This translates to faster cycle times with fewer mask changes and spray passes.

Extensive testing has been performed to ensure that these coatings are stable at high humidity and moderate salt fog environments. Tough and abrasion-resistant, they meet the adhesion require-



ments of UL 746-C, and are UL listed for several PC/ABS substrates.

### Application

With their excellent leveling and uniformity, these coatings are compatible with all commercially available application technologies, including high volume/low pressure (HVLP) spray systems, and conventional propeller-agitated pressure pots.

As low-settling compounds, they are ready for use after simple mixing in a paint shaker. They are supplied ready-to-spray, and don't require additional thinning, although MEK can be used.

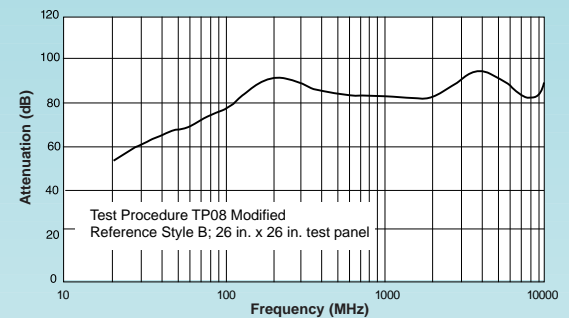


Figure 1 Shielding Effectiveness of CHO-SHIELD 2056 Coating

### Performance

Typical EMI shielding performance is shown in Figure 1. Testing was performed on PC panels with a film thickness of <0.001 inch (0.025 mm). Reliability testing was performed under high and low temperature, humidity, abrasion, and salt fog conditions. For reports on these tests, contact Chomerics' Applications Engineering Department. For more information, request Technical Bulletin.

\* Trademark of General Electric Co.

• **CHO-SHIELD 4900** silver-filled acrylic coating provides the highest levels of EMI shielding, as well as anti-static protection and grounding surfaces. It offers convenient fast tack and drying. Request Technical Bulletin **26**.

• **CHO-SHIELD 4914** nickel-filled coating is a low-cost choice for use on ABS, Noryl and polyester. It is *not* intended for use on polycarbonate or polystyrene substrates. It features high solvent resistance, fast tack and drying. Request Technical Bulletin **27**.

• **CHO-SHIELD 4916** nickel-filled coating dries to the touch in 30 minutes at room temperature. Effective on ABS, Noryl, polystyrene and polycarbonate, this formulation provides a surface resistivity of <1 ohm/sq. at 2 mils (0.05 mm). It is especially effective in applications requiring 40-50 dB

of EMI shielding.

## Corrosion-Resistant Conductive Flange Coatings

**CHO-SHIELD 2000 Series Coatings** provide corrosion protection for enclosure flanges that mate with EMI gaskets. They can also provide a corrosion-resistant conductive surface coating on aluminum or non-conductive composite substrates. These compounds offer excellent chemical resistance, including stability in jet fuel (JP4), hydraulic fluids and motor oil, along with high abrasion resistance even after jet fuel immersion.

With copper filler systems that are treated to remain electrically stable at elevated temperatures, 2000 Series coatings are three-part

urethane formulations. Request Technical Bulletin **30**.

• **CHO-SHIELD 2001 and 2003** coatings are equivalent except for color — 2001 coating is light brown, 2003 is dark brown. Both contain soluble chromate salts that minimize the effects of galvanic corrosion of the aluminum substrate, even in the event of a coating scratch.

• **CHO-SHIELD 2002** coating is chromate-free and intended for composite substrates or for use in repairing the 2001 coating.

Corrosion resistance has been evaluated in terms of electrical stability of the coatings and their ability to protect aluminum substrates. When tested in accordance with the conditions specified in ASTM B117 (or MIL-STD-810, Method 509.2) salt fog, no corrosion occurs on the aluminum substrate after

*continued*

**Table 5**

SPECIFICATIONS AND PRODUCT CHARACTERISTICS (Contact Chomerics for complete specifications and test procedures)													
CHO-SHIELD Coatings	596	610	4076	2052	2054	2056	4900	4914	4916	2001	2002	2003	1091
Binder	epoxy	epoxy	poly-urethane	acrylic	water-based acrylic/urethane	acrylic	acrylic	acrylic	acrylic	urethane	urethane	urethane	Primer for 2001, 2002, 2003
Filler	Ag	Ag/Cu	Ni	Ag/Cu	Ag/Cu	Ag, Ag/Cu	Ag	Ni	Ni	Cu	Cu	Cu	
Mix	100:37	100:28	1-part	1-part	1-part	1-part	1-part	1-part	1-part	pre-measured kit	pre-measured kit	pre-measured kit	1-part
Consistency	medium fluid	medium fluid	medium fluid	thin fluid	thin fluid	thin fluid	thin fluid	medium fluid	heavy fluid	medium fluid	medium fluid	medium fluid	thin fluid
Specific Gravity	1.8 ±0.15	1.6 ±0.15	1.1 ±0.2 (9.2 lbs./gal.)	1.1 ±0.2 (9.2 lbs./gal.)	1.4 ±0.2 (12 lbs./gal.)	1.1 ±0.2 (9.2 lbs./gal.)	1.5 ±0.15	1.7 ±0.2 (14 lbs./gal.)	1.9 ±0.1 (15 lbs./gal.)	3.1	3.1	3.1	0.78
Suggested Spraying Viscosity #2 Zahn Cup	19-26 sec.	19-27 sec.	NA	15-20 sec.	1200-1600 cPsf†	14-19 sec.	19-22 sec.	19-22 sec.	19-22 sec.	19-27 sec.	19-27 sec.	19-27 sec.	NA
Maximum Surface Resistance, ohm/sq.	0.06	0.15	0.5	0.04 @ 2 mil thickness	0.03 @ 1.5 mil thickness	< 0.03 @ 1 mil thickness	0.05	2.0	0.7	0.10	0.10	0.10	NA
Use Temperature	-85 to 257°F (-65 to 125°C)	-85 to 257°F (-65 to 125°C)	-65 to 185°F (-54 to 85°C)	-40 to 212°F (-40 to 100°C)	-40 to 167°F (-40 to 75°C)	-40 to 212°F (-40 to 100°C)	-65 to 200°F (-54 to 93°C)	-65 to 185°F (-54 to 85°C)	-65 to 185°F (-54 to 85°C)	-85 to 185°F (-65 to 85°C)	-85 to 185°F (-65 to 85°C)	-85 to 185°F (-65 to 85°C)	-67 to 180°F (-55 to 82°C)
Elevated Temperature Cure Cycle	1.0 hr. @ 250°F (121°C)	2 hrs. @ RT + 1hr. @ 150°F (66°C) + 1 hr. @ 250°F (121°C) or 2 hrs. @ RT + 4 hrs. @ 175°F (79°C)	NA	20 min. @ RT followed by 20 min. @ 140° to 167°F (60° to 75°C)	15 min. @ RT followed by 30 min. @ 150° to 185°F (65° to 85°C)	5 min. @ RT followed by 30 min. @ 140° to 160°F (60° to 71°C)	NA	NA	NA	2 hrs. @ RT followed by 30 min. @ 250°F (121°C)	2 hrs. @ RT followed by 30 min. @ 250°F (121°C)	2 hrs. @ RT followed by 30 min. @ 250°F (121°C)	NA
Room Temperature Cure Time	1 wk.	1 wk.	24 hrs.	24 hrs.	24 hrs.	24 hrs.	24 hrs.	24 hrs.	24 hrs.	1 wk.	1 wk.	1 wk.	1 hr.
Working Life	8 hrs.	8 hrs.	NA	NA	NA	NA	NA	NA	NA	2 hrs.	2 hrs.	2 hrs.	NA
Shelf Life, mos.	9	9	12	12	12	12	9 (bulk) 6 (spray)	9	12	9	9	9	15
Coverage, ft. <sup>2</sup> (m <sup>2</sup> ) @ 0.001 in. (0.025) thick*	50/lb. (10.24/kg)	453/gal. (11.1/liter)	200/gal. (4.9/liter)	194/gal. (4.8/liter)	425/gal. (10.4/liter)	192/gal. (4.7/liter)	34/lb. (6.96/kg)	225/gal. (5.5/liter)	225/gal. (5.5/liter)	40/qt. (3.5/liter)	40/qt. (3.5/liter)	40/qt. (3.5/liter)	1200/lb (245.81/kg)
Recommended Thickness, in. (mm)	0.001 min. (0.025)	0.002 min. (0.05)	0.002 min. (0.05)	0.002 min. (0.05)	0.0015 min. (0.038)	0.001 min. (0.025)	0.001 min. (0.025)	0.002 min. (0.05)	0.002 min. (0.05)	0.003 min. (0.08)	0.003 min. (0.08)	0.003 min. (0.08)	0.0001 min. (0.003)
VOC, g/liter	404	888	338 (minus water)	765	75 (minus water)	759	731 (bulk)	680	575	554	554	550	680

\* Theoretical coverage. Actual coverage will be 50-100% of this value, depending on part geometry, operator skill, etc.

† Brookfield viscosity measured at 100 rpm, spindle #3 @ 25°C NA Not Applicable

500-hour exposure for CHO-SHIELD 2001 and 2003 coatings, and 100-hour exposure for CHO-SHIELD 2002.

**Design Issues**

Flange design and surface preparation have significant impact on the corrosion resistance offered by CHO-SHIELD 2000 Series coatings. All three coatings adhere best to MIL-C-5411, Class 3 treated aluminum (use an alkaline etching cleaner to clean the aluminum before the conversion coating step) and to most plastics and composites.

For best adhesion to aluminum, Chomerics' 1091 Primer is strongly recommended. For technical and applications information on this primer, request Technical Bulletin 31. Consult Chomerics' Applications Engineering Department concerning application to other substrates, and assistance with design and material

PRODUCT	ORDERING PART NUMBER	UNIT/SIZE
CHO-SHIELD 596	52-01-0596-0000	1 pound kit (0.5 kg)
CHO-SHIELD 596	52-00-0596-0000	3 ounce kit (85 g)
CHO-SHIELD 610	52-03-0610-0000	1 gallon kit (3.8 liter)
CHO-SHIELD 1091	50-00-1091-0000	1/4 pint (0.12 liter)
CHO-SHIELD 2052	52-02-2052-0000	1 quart (0.95 liter)
CHO-SHIELD 2052	52-03-2052-0000	1 gallon (3.8 liter)
CHO-SHIELD 2052	52-05-2052-0000	5 gallons (19 liter)
CHO-SHIELD 2054	52-03-2054-0000	1 gallon (3.8 liter)
CHO-SHIELD 2054	52-05-2054-0000	5 gallons (19 liter)
CHO-SHIELD 2056	52-03-2056-0000	1 gallon (3.8 liter)
CHO-SHIELD 2056	52-05-2056-0000	5 gallons (19 liter)
CHO-SHIELD 2001	52-00-2001-0000	250 grams (1/2 pint)
CHO-SHIELD 2001	52-01-2001-0000	700 grams (1 pint)
CHO-SHIELD 2001	52-04-2001-0000	1378 grams (1 quart)
CHO-SHIELD 2002	52-00-2002-0000	250 grams (1/2 pint)
CHO-SHIELD 2002	52-01-2002-0000	700 grams (1 pint)
CHO-SHIELD 2002	52-04-2002-0000	1378 grams (1 quart)
CHO-SHIELD 2003	52-00-2003-0000	250 grams (1/2 pint)
CHO-SHIELD 2003	52-01-2003-0000	700 grams (1 pint)
CHO-SHIELD 2003	52-04-2003-0000	1378 grams (1 quart)
CHO-SHIELD 4076	52-03-4076-050A	1 gal. (25 gal. min.) (3.8 liter)
CHO-SHIELD 4900	52-01-4900-0000	1 pound can (0.5 kg)
CHO-SHIELD 4900	52-02-4900-0000	6 ounce spray can (0.17 kg)
CHO-SHIELD 4900	52-03-4900-0000	1 gallon (3.8 liter)
CHO-SHIELD 4914	52-03-4914-0000	1 gallon (3.8 liter)
CHO-SHIELD 4916	52-03-4916-0000	1 gallon (3.8 liter)

**Note:** Custom packaging can be accommodated. Please inquire.

Every shipment of Chomerics' conductive compounds is accompanied by a *Certificate of Conformance* to Chomerics specifications. Additional test reports can be obtained for a service charge. Quality control procedures conform to MIL-I-45208.