

CHO-SHIELD® 2000 Series Corrosion-Resistant Conductive Flange Coatings

DESCRIPTION

CHO-SHIELD 2001, 2002 and 2003 electrically conductive coatings provide corrosion protection for enclosure flanges which mate with EMI shielding gaskets. They can also provide a corrosion resistant conductive surface coating on aluminum or plastic substrates.

These tough, urethane coatings offer a highly conductive interface which improves overall EMI shielding performance. When used as a coating on a composite or other non-conductive surface, they provide the conductivity necessary to achieve excellent shielding effectiveness while maintaining their stability in hostile environments.

CHO-SHIELD 2000 series coatings are 3-part, copper-filled urethanes whose filler systems have been treated to remain electrically stable at elevated temperatures. A number of stabilizers prevent the copper from corroding in high humidity and/or marine environments.

CHO-SHIELD 2001 and 2003 contain soluble chromates to minimize the effects of galvanic corrosion of the aluminum substrate, even in the event of a coating scratch. The CHO-SHIELD 2002 coating, primarily intended for composite substrates or as a 2001 repair coating, is chromate free.

CHO-SHIELD 2001 is primarily intended to be used on chromate conversion coated (MIL-C-5541) aluminum substrates. If required, it may be used on non-aluminum substrates such as MIL-P-18177 glass-filled epoxy composites and will typically deliver 0.1 ohm/square surface resistance when cured for 2 hours at room temperature (70°F/21°C) plus 30 minutes at 250°F/121°C. Contact Chomerics Applications Department for details regarding any intended non-aluminum application.

MATERIAL DESCRIPTION	CHO-SHIELD 2001	CHO-SHIELD 2002	CHO-SHIELD 2003
Resin	3 Part Urethane	3 Part Urethane	3 Part Urethane
Fillers	Stabilized Copper Soluble Chromate Salts	Stabilized Copper	Stabilized Copper Soluble Chromate Salts
Color	Light Brown	Light Brown	Dark Brown
Cure Schedules	(1) 7 days @ Room Temperature (70°F/21°C) (2) 2 hrs. @ Room Temperature (70°F/21°C) + 1/2 hr. @ 250°F/121°C (3) 2 hrs. @ Room Temperature (70°F/21°C) + 2 hrs. @ 130°F/55°C		

PROPERTY*	TEST PROCEDURE (Type of Test)**	CHO-SHIELD 2001	CHO-SHIELD 2002	CHO-SHIELD 2003
Surface Resistance (ohms/sq)	(Q/C)	0.1 (Cure 1) 0.1 (Cure 2) 0.1 (Cure 3)	AI (Cure 1) 0.15 (Cure 2) 0.1 (Cure 3) 0.1	Composite*** (Cure 1) .35 (Cure 2) .35 (Cure 3) 0.1
Pencil Hardness	ASTM D3363 (Q)	4H (Cure 1) 6H (Cure 2) 5H (Cure 3)	4H (Cure 1) 6H (Cure 2) 5H (Cure 3)	4H (Cure 1) 6H (Cure 2) 5H (Cure 3)
Specific Gravity (Cured Mat'l)	ASTM D792 (Q)	3.1	3.1	3.1
Adhesion	ASTM D3359 (Q/C)	5B	5B	5B
Corrosion Resistance (ohms/sq.)	ASTM B117 Salt Fog (Q)	0.5 (No Substrate Degradation After 500 Hrs.)	AI 0.1 (No Substrate Degradation After 100 Hrs.)	Composite 1.0 (No Substrate Degradation After 500 Hrs.)
Abrasion Resistance	ASTM D4060 (Q)	See Figure 1	See Figure 1	See Figure 1
Fluid Resistance JP4	72 Hr. Immersion (Q)	0.5 ohm/sq. (Cure 1) 0.1 ohm/sq. (Cure 2) 0.1 ohm/sq. (Cure 3)	0.5 ohm/sq. (Cure 1) 0.1 ohm/sq. (Cure 2) 0.1 ohm/sq. (Cure 3)	0.5 ohm/sq. (Cure 1) 0.1 ohm/sq. (Cure 2) 0.1 ohm/sq. (Cure 3)
MIL-H-5606 Hydraulic Fluid	72 Hr. Immersion (Q)	0.1 ohm/sq. (Cure 1) 0.1 ohm/sq. (Cure 2) 0.1 ohm/sq. (Cure 3)	0.1 ohm/sq. (Cure 1) 0.1 ohm/sq. (Cure 2) 0.1 ohm/sq. (Cure 3)	0.1 ohm/sq. (Cure 1) 0.1 ohm/sq. (Cure 2) 0.1 ohm/sq. (Cure 3)
Continuous Operating Temperature	(Q)	-65°C to +85°C	-65°C to +85°C	-65°C to +85°C
VOC (g/l)	(Q)	554	550	554
Pot Life	(Q/C)	2 Hr.	2 Hr.	2 Hr.
Tack Free Time	ASTM D1650 (Q/C)	1 Hr.	1 Hr.	1 Hr.
Shelf Life		9 mos.	9 mos.	9 mos.

* Typical properties, as tested on 2024 T-3 aluminum with chromate conversion coating (per MIL-C-5541/Class III) applied after 30 sec. alkaline etch.

** Q = Qualification Test
Q/C = Quality Conformance Test
*** G-10 composite substrate.

Figure 1. Tabor Abrasion Results On Conductive Coatings (ASTM D4060)

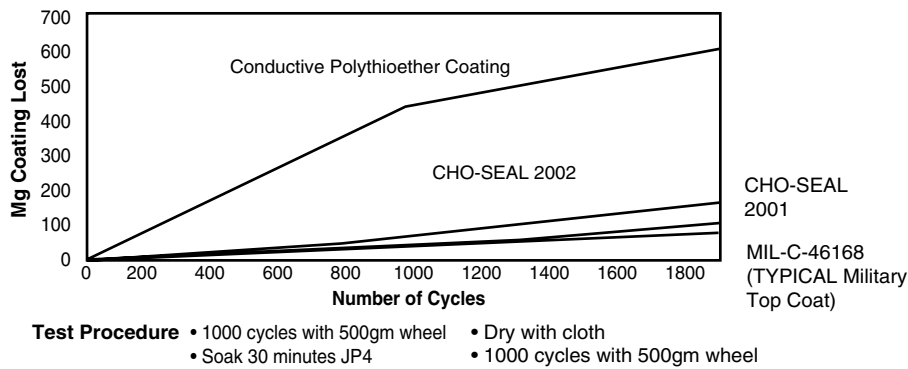
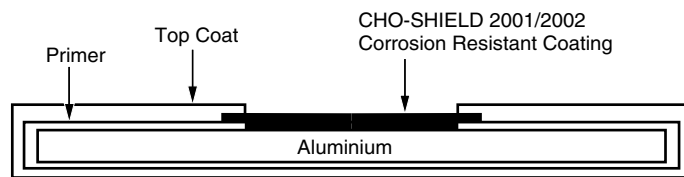


Figure 2. Recommended Application of CHO-SHIELD 2001/2002



FEATURES

- Urethane binder provides exceptional physical properties.
- Excellent chemical resistance, including stability in jet fuel (JP4), hydraulic fluids and motor oil.
- High abrasion resistance even after jet fuel immersion.
- Exceptional coating hardness and scratch resistance.
- Responds readily to a variety of substrates.
- Significantly more cost effective than silver-filled epoxies.
- No degradation of shielding effectiveness after 500 hrs. salt fog.
- Pre-measured kits allow easy mixing of components in one container.

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

DESIGN ISSUES

Flange design and surface preparation have significant impact on the corrosion resistance offered by the CHO-SHIELD 2000 series of coatings. All three coatings best adhere to MIL-C-5541, Class 3 treated aluminum (use an alkaline etching cleaner to clean the aluminum before the conversion coating step) and most plastics and composites. Chomerics provides CHO-SHIELD 1091 primer for enhancing the adhesion of CHO-SHIELD 2000 series coatings to chemically treated aluminum. CHO-SHIELD 1091 primer is a one-component, air-drying system which cures at ambient temperatures. Request Chomerics' Technical Bulletin #31 for more information on CHO-SHIELD 1091 primer. Consult Chomerics for application to other substrates. Chomerics' EMI Shielding Engineering Handbook offers valuable advice on gasket and flange design. Chomerics' Applications Engineering Department will also provide assistance with your design and material requirements.

SHIELDING EFFECTIVENESS AND COATING THICKNESS

Tests performed in accordance with a modified MIL-STD-285 procedure measured electrical field attenuation of two 26 in. x 26 in. (66 cm x 66 cm) non-conductive epoxy panels sprayed with different thicknesses of CHO-SHIELD 2001 coating. Graph 1 shows shielding effectiveness results from both 1 mil (.025 mm) and 2.5 mil (.064 mm) coating thicknesses. For superior results, Chomerics recommends 3 mil (.077 mm) coating thickness.

CORROSION PROOF FLANGE DESIGN WITH CHO-SEAL 1298 EMI SHIELDING GASKET

CHO-SHIELD 2000 series of conductive flange coatings and CHO-SEAL 1298 gaskets form a corrosion proof EMI sealing system. Chomerics' Test Report CHO-TR19F describes the results from the test used to determine if CHO-SHIELD 2001 coating provides further protection to 6061-T6 aluminum (MIL-C-5541 Class 3 conversion coated) when mated with a CHO-SEAL 1298 conductive elastomer gasket. After 1,000 hours exposure to ASTM B117 salt fog, the 6061-T6 aluminum substrate was completely protected without any evidence of galvanic corrosion.

The shielding effectiveness of a CHO-SEAL 1298 gasket against Class 3 chromate conversion coated aluminum is protected with CHO-SHIELD 2001 or 2002 coatings and is higher than the same gasket against conversion coated flanges with *no* salt fog even after 1,000 hours of ASTM B117 salt fog.

Refer to Figures 2, 4 and 5

Through the use of new proprietary particle plating and elastomer compounding technology, CHO-SEAL 1298 shielding elastomer offers a six-fold increase in corrosion resistance over products previously available. CHO-SEAL 1298 outperforms nickel, nickel-graphite and carbon-filled EMI gasket materials in aluminum joints. CHO-SEAL 1298 materials has a fluoro-silicone binder, with corrosion inhibiting additives which contain no chromates. For additional information on CHO-SEAL 1298 Corrosion Resistant EMI Shielding Gasket, request Chomerics' Technical Bulletin #19.

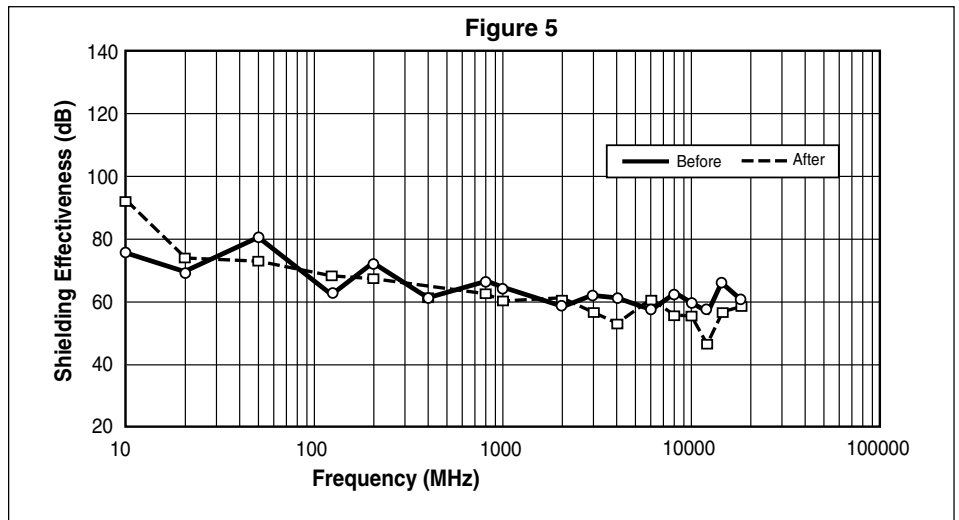
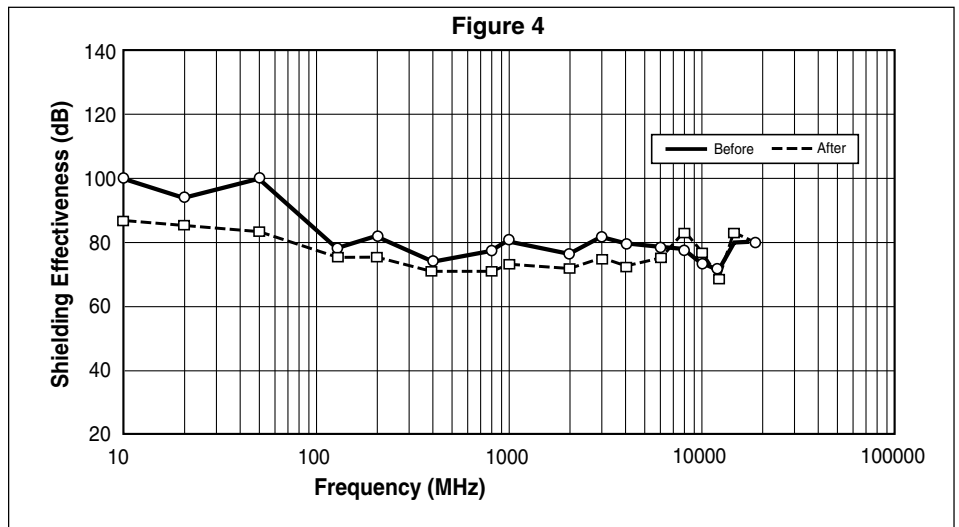
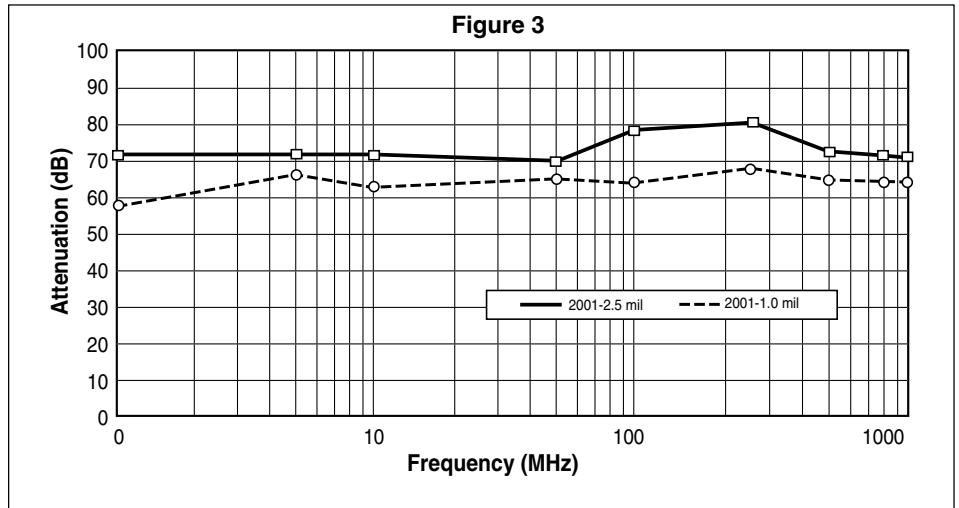
APPLICATION

These products can be applied using the same procedures as for most conductive coatings. See Figure 2 for recommended application approach. Please read the Material Safety Data Sheets before working with these or any Chomerics compound products. Specific instructions are included with the products, and are available separately from Chomerics. Basic instructions are as follows:

1. Mask as necessary.
2. Clean surfaces to be painted with MEK.
3. Mix the 3 part system. No measuring is necessary.
 - (A) Put Part A (resin and filler) container on a painted shaker for 3 minutes ± 30 sec.
 - (B) Add all of Part C (diluent) into Part A container and mix for additional 3 minutes ± 30 sec.
 - (C) Add all of Part B (catalyst) to container with mixed parts A and C. Mix for additional 3 minutes ± 30 sec.

NOTE: If the coating mixture is not homogeneous, shake for an additional 3 minutes ± 30 sec. and check for undispersed material. DO NOT SCREEN OR FILTER THE MIXED COATING.

4. Spray 3-4 passes using a DeVilbiss JGHV-530 or EGHV-530 or similar spray gun. Two coats applied 15 minutes apart will provide optimum coverage, minimizing pinholes. The coating should be applied to a final dry thickness of 0.003"-0.005". Because copper powders settle quickly, the material should be agitated continuously during spraying.
5. The preferred cure is 2 hrs. at room temperature plus 1/2 hr. at 250°F/121°C. Allow the sprayed coating to dry a minimum of 2 hrs. at ambient conditions if an accelerated cure cycle is to be used. Other cures are possible. Contact Chomerics' Applications Department for details.



ORDERING INFORMATION

Material	Package Weight	Package Volume ¹	Theoretical Coverage ²	Part Number	1091 Primer Included
CHO-SHIELD 2000	1378 gms	1 Qt. (0.95L)	40 ft ² (11.33 m ²)	52-04-2001-0000	N
	700 gms	1 Pt. (0.47L)	20 ft ² (5.76m ²)	52-01-2001-0000	N
	250 gms	1/2 Pt. (0.24L)	7 ft ² (2.04 m ²)	52-00-2001-0000	N
	250 gms	1/2 Pt. (0.24L) Brushable	N/A	52-00-2001-1000	N
CHO-SHIELD 2002	1378 gms	1 Qt. (0.95L)	40 ft ² (11.33 m ²)	52-04-2002-0000	N
	700 gms	1 Pt. (0.47L)	20 ft ² (5.76 m ²)	52-01-2002-0000	N
	250 gms	1/2 Pt. (0.24L)	7 ft ² (2.04 m ²)	52-00-2002-0000	N
	250 gms	1/2 Pt. (0.24L) Brushable	N/A	52-00-2002-1000	N
CHO-SHIELD 2003	700 gms		20 ft ² (5.76 m ²)	52-04-2003-0000	Y
	524 gms		14.6ft ² (4.27 m ²)	52-01-2003-0000	N
	250 gms	1/2 Pt. (0.24L)	7 ft ² (2.04 m ²)	52-00-2003-0000	N
	250 gms	1/2 Pt. (0.24L) Brushable	N/A	52-00-2003-1000	N

¹ Material is packaged based on weight, volume is for reference only, total contents of three part system will fill this volume.

² Coverage at mils dry coating thickness assuming 100% transfer efficiency of application, spray efficiency will vary, generally 50-75%.

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