

GEOMET[®]

Global Water-Based Coating Technology For Rotors, Drums and Assembly Components



Reprinted with permission from DaimlerChrysler



**METAL COATINGS
INTERNATIONAL**

World Class Corrosion Protection For Over 30 Years



Registered to
ISO 9001

GEOMET® **chromium-free, water-based, VOC compliant** coating comprised of many overlapping zinc and aluminum flakes which is totally inorganic after curing. A transmission electron micrograph of a cross-section of the film at high magnification is shown at right. Ten microns of coating contains > 100 layers of overlapping zinc and aluminum flakes. Free of all other highly regulated toxic metals including barium, nickel, cadmium, lead, or mercury.



TEM of a cross-section of GEOMET®



Surfaces can selectively remain uncoated



Induction curing is compact and efficient

SURFACE PREPARATION

The surface of the part is cleaned by washing it with alkaline cleaners. High pressure spray removes machining fluids and casting residue. No phosphates, chromates or acids are necessary.

ADVANTAGES OF SPRAY APPLICATION

- ◆ Multiple spray guns are aligned to precisely control coating thickness on various surfaces of the rotor (i.e., more coating directed into the vanes and less coating on the braking surface).
- ◆ Coating selective surfaces of the rotor.
- ◆ New precision guns virtually eliminate masking

CURING METHODS

GEOMET® is cured using a standard convection oven or induction heating. Oven curing requires that the parts maintain peak metal temperature for 15 minutes at 290-330°C (550-625°F) for optimum corrosion performance. Induction curing elevates the temperature to 300-360°C (570-680°F) in a matter of 20-60 seconds.

COATING PERFORMANCE

- ◆ **Corrosion Resistant** - Excellent performance in Salt Spray, Cyclic and Proving Grounds.
- ◆ **Heat Resistant** - Maintains corrosion resistance when exposed to heat shock.
 - Passes Ford's test of 842°F (450°C) 30 minutes at peak metal temperature + ice water quench + salt spray
 - Passes DaimlerChrysler test of 662°F (350°C) 30 minutes at peak metal temperature + SAE J2334 cyclic test
- ◆ **Solvent Resistant** - Resistant to brake fluid, antifreeze, gasoline, motor oil, power steering fluid, transmission fluid, windshield washer solvent, and wheel cleaners.
- ◆ **Bi-metallic Corrosion Resistant** - Aluminum flake eliminates the typical bi-metallic cell of most zinc coatings when mated with aluminum or steel.
- ◆ **Thin & Functional**
 - No problems with mounting, runout or bolt tension.
- ◆ **Water-based**
 - Non-Flammable, no offensive solvent odor.



Only the braking surface is considered significant for evaluation in this test



80 cycles SAE J2334, 10 microns



Heated to 662°F (350°C) prior to 60 cycles of SAE J2334, 14.6 microns



GEOMET® L 10 cycles of APGE. Uncoated internal threads were waxed before testing.



GEOMET® L 80 cycles GM 9540P



GEOMET® L 80 cycles GM 9540P

FOUR WAY CORROSION PROTECTION

- ◆ **Barrier Protection** - Overlapping zinc and aluminum flakes provide an excellent barrier between the steel substrate and corrosive media.
- ◆ **Galvanic Action** - Zinc corrodes to protect steel.
- ◆ **Passivation** - Metal oxides slow down the corrosion reaction of zinc and steel to provide 3 times greater corrosion protection than pure zinc.
- ◆ **Self-Repair** - Zinc oxides and carbonates migrate to damaged areas of the coating to actively repair the coating and restore barrier protection.

ENVIRONMENTAL COMPLIANCE

- Environmental Protection Agency
- Occupational Safety & Health Administration
- DaimlerChrysler CS-9003
- General Motors GMW 3059
- Ford WSS-M99P9999-A1
- EC Directive on End of Life Vehicles

EUROPE/MEXICO GEOMET® ROTORS



In the first commercial application for GEOMET®, Europe and Mexico began coating rotors in 1998 using a spray application of GEOMET®. No sealer is used on these parts.

UNITED STATES GEOMET® L WHEEL BOLTS



BRAZIL GEOMET® L WHEEL BOLTS



Wheel bolts and other small parts can be coated in bulk by dip-spin in a perforated basket

BRAKE EFFECTIVENESS

To determine the influence of the coating on initial brake effectiveness, Link Testing Laboratory, was contracted to conduct dynamometer testing.

Baseline (uncoated) rotors and GEOMET® coated rotors were tested. The GEOMET® coated rotors had an average dry film thickness of 6.5 to 8.9 microns on the braking surfaces. Each rotor was subjected to the same sequence of stops. New brake pads from the same lot of lining material were used for each rotor.

Throughout the dynamometer test, no significant differences were seen when comparing coated rotors to uncoated rotors.

Results from the early stages of the test are important because this is where the influence of the coating is expected to be the greatest. Visual observations indicated that the majority of the coating was removed from the brake surface within the first five stops. However, it is important to coat the brake surface to help prevent rust during shipment, reduce lot rot, pitting, corrosion and pulsation.



Inboard surface of GEOMET® coated rotor in dynamometer test after the first five instrument check stops.

		Base line	GEOMET®
After first 5 stops	Coefficient of Friction	.26	.29
2 stop effectiveness @ 30 mph	Coefficient of Friction	.29	.33
2 stop effectiveness @ 60 mph	Coefficient of Friction	.37	.39
After 50 stop burnish @ 40 mph	Coefficient of Friction	.41	.44
Final Effectiveness	Coefficient of Friction	.35	.36

WORLDWIDE - OVER 25 MILLION ROTORS ANNUALLY ARE COATED WITH MCII PRODUCTS

◆ North America ◆ Asia

- DaimlerChrysler
- Diamond Star
- Ford/Mazda
- Isuzu
- Mitsubishi
- Subaru
- Toyota
- Auto Alliance
- Daewoo
- Daihatsu
- Ford/Mazda
- Hyundai
- Isuzu
- KIA
- Mazda

◆ Europe

- Alfa-Romeo
- Audi
- BMW
- Fagor
- Fiat
- Ford
- Jaguar
- Land Rover
- Lotus
- Peugeot
- Renault
- Rolls Royce
- Rover
- Toyota
- Volkswagen
- Volvo
- Mitsubishi
- Nissan
- Proton
- Renault-Samsung
- Subaru
- Suzuki
- Toyota

◆ Mexico

- Volkswagen

◆ South Africa

- BMW
- Toyota
- Volkswagen

GLOBAL AVAILABILITY

The Metal Coatings International Inc. (MCII) coating systems are marketed through licensing agreements to over 175 captive and job shop coaters worldwide. With 30 years experience, MCII is a pioneer in the development of Water-Based Coating Technology. By virtue of research and development, chemical manufacturing and technical service, we continue to develop new specialty coatings to serve the evolving needs of the automotive industry. Additional information on MCII products for brake components may be found in the SAE Technical Paper "Validation of an Environmentally Friendly, Corrosion-Resistant Coating for Brake Rotors," #2001-01-3157. For more information, or a list of Licensees, please visit our website at www.metal-coatings.com.



Metal Coatings International Inc.
440-285-2231
sales@metal-coatings.com



Nippon Dacro Shamrock
81-45-864-3551
sales@n-d-s.co.jp



DACRAL S.A.
33-3-44-64-63-62
info@dacral.com



Metal Coatings Brasil Ind. e Com.Ltda
55-11-4071-5651
dacromet@terra.com.br