



Corrosion Protective Coating for Spring Hose Clamps

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

This specification covers the basic requirements for a corrosion protective coating system for spring hose clamps per GMW15184. This coating is corrosion resistant and provides excellent adhesion properties for glued-on clamp applications.

1.1 Material Description. The coating system is free of hexavalent chromium and is in compliance with GMW3059 requirements.

The coating system does not induce hydrogen embrittlement.

1.2 Symbols. Not applicable.

1.3 Applicability. The coating is suitable for constant tension clamps. The maximum continuous service temperature is 200 °C.

1.4 Remarks. This coating may affect the frictional properties of the part. It is recommended that a study of the joint be performed before releasing this finish on any new application.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM B117	ISO 9227	SAE/USCAR 5
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2.2 GM Standards/Specifications.

9985010	9986086	GMW3420	GMW15184
9985670	9986153	GMW14729	GMW15827
9985809	9986360	GMW14829	
9985912	GMW3059	GMW14872	

3 Requirements

The parts coated to this specification shall meet the following technical requirements and demonstrated by the test methods described. The appropriate test for different situations: New chemical approval, new applicator approval, Production Part Approval Process (PPAP), and regular process control testing are described in Appendix A.

3.1 Appearance. The coating shall have uniform appearance and shall be free from tears, sags, and excessive coating that would affect performance. It shall not be oily or tacky to the touch. The coating is available in silver (gray) and black. Unless otherwise specified on the drawing, the color shall be silver.

3.2 Coating Thickness. The minimum coating thickness shall be 14 µm. The maximum coating thickness is determined to be that which the coating will not inhibit the assembly, installation, and function of the clamp.

3.3 Corrosion Resistance. Expose as-coated clamps to neutral salt spray and test per ISO 9227 (optional ASTM B117). Fixturing during test shall be such that accumulation of salt solution is minimized. After 120 h, no white corrosion is allowed. After 480 h, no red rust is allowed. In this test, all surfaces are considered significant.

3.4 Sample Preparation for Cyclic Corrosion, Stress Corrosion Cracking Test, and Chip Resistance Test.

Before testing per 3.5, 3.6, and 3.8, coated parts shall be prepared as follows:

3.4.1 Fill a cardboard box 75% full of clamps sized according to GMW15184. The box shall be approximately 250 mm² in size.

3.4.2 Seal and secure the box to prevent it from breaking open.

3.4.3 Drop the box from 0.75 m onto a solid floor 30 times, alternating the orientation of the box between top, sides, and bottom.

3.4.4 Assemble clamps on a plastic mandrel with a diameter 0.2 mm to 0.3 mm smaller than the full open clamp diameter. The mandrel shall be 110 mm to 120 mm long and have five clamps per mandrel. Multiple mandrel assemblies may be used, depending on sample size.

3.5 Resistance to Stress Corrosion Cracking in 5% Sodium Hypochlorite (Bleach). There shall be no evidence of cracks or fracturing of clamps after 28 h immersion in 5% sodium hypochlorite solution, as described in the following.

3.5.1 Each clamp and mandrel assembly shall be immersed in 2000 mL $\pm$ 50 mL of 4.9% to 5.1% sodium hypochlorite solution at 23 °C $\pm$ 3 °C in a vented plastic container.

3.5.2 The 5.0% sodium hypochlorite (NaOCl) Stress Corrosion Cracking (SCC) test solution shall be assayed within 72 h prior to test.

3.5.3 Weigh accurately, in a glass flask, 2.2 g of sodium hypochlorite SCC test solution, and dilute with 50 mL water.

3.5.4 Add 2.5 g potassium iodide and 10 mL 6 N acetic acid. Titrate the liberated iodine with 0.100 N sodium thiosulfate, adding 3 mL of starch test solution as the endpoint is approached.

Note: The solution is dark with a clear endpoint, so a white background is required for an accurate end point determination.

3.5.5 Perform a blank determination and make any necessary corrections. Each milliliter of 0.100 N sodium thiosulfate is equivalent to 3.722 mg of NaOCl.

3.5.6 Calculation.

$$\% \text{ NaOCl} = ((A \times 0.003722B) \times 100)/C$$

Where:

A = milliliter (mL) 0.100 N sodium thiosulfate

B = grams/milliliter (g/mL) sodium thiosulfate

C = grams (g) bleach test solution

Examine for cracks while holding the clamp in full open position with pliers after 28 h.

3.6 Resistance to Cyclic Corrosion and Stress Corrosion Cracking. Expose the prepared clamps (see 3.4) to GMW14872 Vehicle Area: Underhood (UH), Mounting Location: All, four (4) salt sprays per cycle, Method 1/2. After Exposure B, the clamps shall be free of red rust. After Exposure E, there shall be no evidence of cracks or broken clamps.

3.6.1 Significant surfaces for evaluation of clamps shall be all exposed surfaces of the clamp when installed on the mandrel. Corrosion on the clamp ears shall be excluded from the evaluation.

3.7 Resistance to Underhood Fluids. Coated clamps in as-received condition shall be tested against common automotive fluids per the tests described in 3.7.1 thru 3.7.7. After exposure, the coating shall not exhibit any blistering or signs of softening or dulling.

3.7.1 Gasoline Resistance. Immerse clamps in current factory-fill gasoline (9986086) for 24 h at 23 °C $\pm$ 2 °C.

3.7.2 Hot Oil Resistance. Immerse clamps in engine oil (GMW15827, SAE 10W30 or equivalent) for 24 h at 66 °C $\pm$ 3 °C.

3.7.3 Engine Coolant Resistance. Immerse clamps in a 50% solution of water and Dex-Cool® long-life coolant concentrates (GMW3420/9985809) for 24 h at 23 °C $\pm$ 2 °C.

3.7.4 Brake Fluid Resistance. Immerse clamps in brake fluid (9986360) for 24 h at 23 °C $\pm$ 2 °C.

3.7.5 Power Steering Fluid Resistance. Immerse clamps in power steering fluid (9985010) for 24 h at 66 °C $\pm$ 3 °C.