



CORROSION PROTECTIVE COATING, ZINC NICKEL ALLOY, TRIVALENT PASSIVATE, SILVER	WSS-M21P44-A1
CORROSION PROTECTIVE COATING, ZINC NICKEL ALLOY, TRIVALENT PASSIVATE WITH ORGANIC SEAL, SILVER	WSS-M21P44-A2
CORROSION PROTECTIVE COATING, ZINC NICKEL ALLOY, TRIVALENT PASSIVATE WITH CATHODIC ELECTROCOAT, BLACK	WSS-M21P44-A3
CORROSION PROTECTIVE COATING, ZINC NICKEL ALLOY, TRIVALENT PASSIVATE WITH WATERBORNE TOP COAT, BLACK	WSS-M21P44-A4

1. SCOPE

The materials defined by these specifications are corrosion protective coatings applied sequentially per supplier specifications over steel. They consist of an alkaline zinc nickel alloy electrodeposit and a trivalent chromium passivate/adhesion promoter. A2, A3 and A4 are followed respectively by an organic seal, a cathodic electrocoat, or a waterborne top coat. When used with an integrally cured torque modified post dip, these processes provide consistent torque-tension control.

All processes are free of hexavalent chromium, lead and cadmium.

2. APPLICATION

These specifications were released for materials used as corrosion protective coatings over steel fasteners and small parts. The processes may induce hydrogen embrittlement and therefore these coatings must be hydrogen embrittlement relieved when applied to high hardness parts in accordance with WSS-M99A3-A.

The cure temperature of the organic seal used for A2 is 80 to 120 °C.

The cure temperature of the cathodic system for A3 is 175 to 200 °C.

The cure temperature of the waterborne system for A4 is 190 to 205 °C.

These coatings shall not be specified if this temperature adversely affects the component being coated.

2.1 SERVICE TEMPERATURE

The maximum continuous service temperature for A and A2 is 310 °C.

The maximum continuous service temperature for A3 and A4 is 260 °C.

Date	Action	Revisions
2004 09 14	Revised	Para 3.5.1 revised D. Drobnich
2004 09 08	Revised	Para 1, 3.3.1, 3.3.2, 3.3.4, 3.4.1, 3.4.3, 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.5, 3.7.1, 3.12, Table 1 and Table 1 (C) revised D. Drobnich
2004 09 02	Activated	D. Drobnich



3. REQUIREMENTS

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Quality System Requirements for Production Materials (WSS-M99P1111-A).

Part producers must use approved materials specified on the Company's Approved Source List.

3.2 APPROVED APPLICATOR QUALITY REQUIREMENTS

Applicators must follow coating manufacturer procedures and recommendations for chemical usage, equipment, analysis and processing.

3.3 APPEARANCE

3.3.1 The ZnNi coating will have a metallic silver appearance prior to passivate/adhesion promoter application.

3.3.2 The passivate/adhesion promoter will have an appearance of slight iridescence and color variation consistent with interference films (e.g. yellow, orange, green, blue, purple variegation).

3.3.3 The organic seal used for A2 will be a translucent film free from discontinuities.

3.3.4 The cathodic coating used for A3 and the waterborne coating used for A4 will be a semi-gloss black finish free from discontinuities. The gloss level for A3 shall be 25 to 55° of gloss when measured using a 60° meter.

3.4 COATING COMPOSITION

3.4.1 The alkaline ZnNi electrodeposit shall have a nickel content of 12 to 15% as measured by calibrated X-ray fluorescence spectrometers in accordance with the supplier's requirements. In some instances a 'strike' layer may be applied to the substrate prior to ZnNi electrodeposition. In such cases the presence of a strike layer must be noted so that appropriate methods for measuring composition and thickness of the ZnNi may be employed.

3.4.2 The alkaline ZnNi electrodeposit shall have a phase composition which includes substantial metallurgical gamma phase ZnNi as defined by standard reference phase diagrams such as ASM Handbook, Volume 3, 10th edition. Presence of substantial gamma phase ZnNi may be demonstrated by comparing x-ray diffraction patterns to reference materials such as ICDD PDF 06-0653. Crystallographic preferred orientations, such as 330 and/or 600 Miller index hkl for gamma phase ZnNi, should be present in accordance with the chemical supplier's requirements; and subject to periodic verification using x-ray diffraction or an alternative, preapproved, standard crystallographic determination method.

3.4.3 The passivate/adhesion promoter shall have a composition in accordance with the chemical suppliers requirements. For A3 and A4, the passivate/adhesion promoter must be cobalt and carboxylic acid free.

3.4.4 The organic seal of A2, the cathodic coating of A3, and the waterborne coating of A4 shall have a composition in accordance with the chemical suppliers requirements.