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Date: May 30, 2019	<b>FASTENAL</b>	C.1000.ECO



## 1. SCOPE

- a. This specification covers the basic requirements for a corrosion resistant non-electrolytically applied inorganic zinc/aluminum dispersion base coat with topcoat (sealer) applied for fasteners.
- b. These coatings are applied by conventional dip-spin or dip-drain or spray methods which can be handled through a cleaning, coating and baking operation per coating manufacturer's specified requirements.

## 2. PROCESS REQUIREMENTS

- a. The coating process shall not induce the possibility of internal hydrogen embrittlement.
- b. Prior to coating, the parts shall be free from oil, scale and similar foreign materials. The cleaning process shall have no detrimental effect on the base material. Any process used for cleaning such as acid pickling which can promote hydrogen absorption shall be prohibited. (Except for parts which are not under tensile stress in the assembled condition, such as nuts. Written approval from Fastenal Quality Control will be required for this exception).

## 3. COATING REQUIREMENTS

- a. Appearance –
  - i. The coating shall have a uniform appearance free from tears, blisters, uncoated areas, and other discontinuities which may affect the appearance or performance of the coating.
  - ii. The color shall be silver-gray unless otherwise specified.
  - iii. The coating shall not be tacky to the touch and shall not leave particulate residue on equipment hands or gloves.
- b. The complete coating including topcoat shall be free of chromium, cadmium, lead, barium and mercury, as well as meet the requirements of EU Directives on End of Life Vehicles (ELV), Electrical Equipment (RoHS), and Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

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- c. Topcoat – A topcoat applied to the zinc/aluminum flake coating is required and must meet the requirements defined in this specification.
- d. Thickness - The coating shall not have any adverse effects on normal installation and removal practices. For reference, typical coating thickness is 6-12  $\mu\text{m}$ , based on an average of individual measurements when measured on the significant surface as defined by ASTM F1941/F1941M or ISO 10683.
- e. Adhesion – Adhesion of the coating shall be tested in accordance with ASTM D3359 Test Method A (*with an X-Cut*) or ISO 2409 and visually rated to classify the adhesion result. The coating shall show only trace peeling and removal when performing the adhesive tape test.
- f. Corrosion Resistance – The coating shall be capable of withstanding exposure to salt spray when tested in accordance with ASTM B117 or ISO 9227 to the minimum hours specified in Table 1 prior to red rust. Unless otherwise defined, acceptable corrosion resistance shall be Rust Grade 6 or higher ASTM D610 on significant surfaces.

**Table 1 Salt Spray Requirements**

Product Description and Size	Minimum Salt Spray Hours
Hex Cap Screws, Hex Bolts, Flange Bolts, Carriage Bolts, Nuts, 1/2 -in. (M12) diameter and larger and all washers	1000
Socket Head including socket, flat and button head socket cap screws of all sizes and hex head cap screws, hex bolts, flange bolts, carriage bolts, nuts, and machine screws less than 1/2. (M12) diameter	720

- g. There shall be no signs of blistering after salt spray testing.
- h. Cathodic Protection - The cathodic protection capability of the coating shall be tested utilizing the salt spray test above for a duration of 72 hours with a specimen which has been scratched down to the base metal. The scratch shall have a maximum width of 0.02-in (0.5mm). After the salt spray test, there shall be no red rust in scratched area.
- i. Coefficient of Friction and Torque Coefficient (Threaded Fasteners only) - The average coefficient of friction shall be 0.11 +/-0.03. The average torque coefficient shall be 0.15 +/-0.03.
- j. Washers – Coating processes must be employed for flat washers that minimize quality concerns of product sticking together during the coating process.

#### **4. THREAD GAGING**

- a. For thread gaging requirements, See Table 2

- b. Screws, bolts and nuts with thread fit 2B, 2A , 3A and 6g with nominal thread diameters smaller than 1/4" (m6) having coarse threads, and all diameters of 2B, 2A, 3A and 6G fine thread, may not conform to the gaging practice of Table 2

**Table 2 Thread Gaging Requirements**

ASME B1.1 Thread Class Designation	Thread Condition Prior to Coating Application	Thread Acceptance Inspection After Coating Application <sup>1</sup>
2B	Shall gage 2B	Shall be accepted if the nut screws onto a standard 2A, Hex Cap Screw. (plain finish), until 4 threads emerge through the nut
2A	Shall gage 2A	Shall be inspected with 3A Go and 2A nogo gages
3A	Shall gage 3A	Shall be accepted if the screw turns into a standard 2B Finished Hex Nut (plain finish) for the full thread length
ISO 965-1 Thread Class Designation	Thread Condition Prior to Coating Application	Thread Acceptance Inspection After Coating Application
6g	Shall gage 6g	Shall be accepted if the screw turns into a standard 6H Finished Hex Nut (plain finish) for the full thread length
4g6g	Shall gage 4g6g	
6H	Shall gage 6H	Shall be accepted if the nut screws onto a standard 6g, Hex Cap Screw, (plain finish), until 4 threads emerge through the nut

<sup>1</sup> Torque values not exceeding those of ASTM F788, Table 1, may be used to facilitate the thread acceptance