



Designation: **B893–98 (Reapproved 2013) B893 – 98 (Reapproved 2018)**

# Standard Specification for Hard-Coat Anodizing of Magnesium for Engineering Applications<sup>1</sup>

This standard is issued under the fixed designation B893; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers requirements for electrolytically formed oxide coatings on magnesium and magnesium alloy parts where appearance, abrasion resistance, and protection against corrosion are important.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[B117 Practice for Operating Salt Spray \(Fog\) Apparatus](#)

[B244 Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments](#)

[B322 Guide for Cleaning Metals Prior to Electroplating](#)

[B374 Terminology Relating to Electroplating](#)

[B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section](#)

[B537 Practice for Rating of Electroplated Panels Subjected to Atmospheric Exposure](#)

[B602 Test Method for Attribute Sampling of Metallic and Inorganic Coatings](#)

[B697 Guide for Selection of Sampling Plans for Inspection of Electrodeposited Metallic and Inorganic Coatings](#)

[B762 Test Method of Variables Sampling of Metallic and Inorganic Coatings](#)

[D3951 Practice for Commercial Packaging](#)

[D4060 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser](#)

## 3. Terminology

3.1 *Definitions:*

3.1.1 *Definitions*—For definitions of terms relating to this specification see Terminology [B374](#).

3.1.2 *anodizing*—an electrolytic oxidation process in which the surface of a metal, when anodic, is converted to a coating having desirable protective or functional properties.

3.1.3 *hard coat*—in anodizing magnesium, an anodic oxide coating on magnesium with a higher apparent density and thickness, and a greater resistance to wear than the base metal.

## 4. Classification

4.1 *Coating Designation*—Thickness.

4.1.1 Minimum thickness of 20  $\mu\text{m}$ .

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee [B08](#) on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee [B08.07](#) on Conversion Coatings.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](#), or contact ASTM Customer Service at [service@astm.org](#). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

4.2 *TYPE*—Post treatments.

4.2.1 *TYPE A*—No post treatment.

4.2.2 *TYPE B*—Purchaser specified.

## 5. Ordering Information (to be supplied by the purchaser to the producer.)

5.1 *Alloy Designation*—When ordering articles anodized in accordance with this specification, the purchaser shall state, the alloy designation number.

5.2 *Appearance*—Unless otherwise specified by the purchaser, an off-white color shall be acceptable for TYPE A coating. The purchaser shall specify the color and surface appearance required for TYPE B coatings. All coatings shall be uniform in color and free from stains. Alternatively, samples showing the required finish, or range of finishes, shall be supplied or approved by the purchaser. When required, the basis material may be subjected to such mechanical polishing as may be required to yield the desired final surface characteristics.

5.3 *Significant Surface*—The areas of the article covered by the coating, for which the coating is essential for service or appearance or both.

5.3.1 *Contact Marks*—Contact marks will occur. The purchaser shall specify where contact marks are unacceptable.

5.4 *Tolerances*—Dimensional build-up is approximately one-half of anodic film thickness. The order document shall include any coating thickness tolerances and shall not exceed any applicable drawing dimensions.

5.5 The purchaser shall provide the number for this standard TYPE.

5.6 The purchaser shall state any special post treatments (see 4.2 and 5.2).

5.7 *Test Methods*—The purchaser shall state the test method(s) by which the coated article will be evaluated (see Section 8).

5.8 *Sampling Plan*—see Section 9.

5.9 Any requirement for certification (see Section 11).

5.10 Any requirement for packaging (see Section 12).

## 6. Materials and Process

6.1 *Process*:

6.1.1 *Basis Metal*—This specification does not specify requirements for the surface condition of the basis metal before anodizing, but agreement should preferably be reached between the purchaser and the producer that the surface condition of the basis metal is satisfactory.

6.1.2 *Surface Preparation*—Preparatory procedures and cleaning of the basis material may be necessary, see Practice B322.

6.1.3 *Hard-Coating*—Following the preparatory operations, the articles are introduced into the solution for a period of time at the current density and temperature required to produce the hard-coated surface.

NOTE 1—Hard-coating solutions and operating conditions are commercially available. The appropriate operating instructions should be followed.

NOTE 2—Intricately shaped articles may not receive the same thickness of coating in recessed areas due to lower current densities. Auxiliary cathodes, may be used to improve anodize thickness in these areas.

6.2 *Post Treatments*:

6.2.1 *Final Rinsing*—Rinsing subsequent to anodizing is necessary to remove all traces of the electrolyte that may affect the appearance and performance of the part. Deionized or distilled water may be used to avoid water spots.

6.2.2 *Post Treatment*—Surface sealers or topcoats may be specified to reduce friction, add color, or further increase performance.

## 7. Requirements

7.1 *Acceptance*:

7.1.1 *Visual Defects*—The significant surfaces of the article to be hardcoated shall be free of clearly visible defects such as pits, roughness, striations, or discoloration when examined with normal or corrected to 20/20 eyesight at a distance of approximately 0.5 m.

NOTE 3—Defects in the surface of the basis material such as scratches, porosity, inclusions, etc., may adversely affect the appearance and performance of the article.

7.1.2 *Thickness*:

7.1.2.1 *Coating Thickness for SC20*—The anodic film thickness shall be a minimum of 20  $\mu\text{m}$  and not exceed 30  $\mu\text{m}$  on the significant surface.

7.1.2.2 *Test*—Hard-coating thickness shall be evaluated by one or more of the following test methods in Section 8.

7.2 *Qualification Tests*—The process shall be evaluated monthly or more frequently if required by the purchaser using the following test methods on panels that are of the same alloy of the parts coated with TYPE A hard coat.