



Designation: A1074 – 26

Standard Specification for Hot Tin and Hot Tin/Lead Dip on Ferrous and Non-Ferrous Metals¹

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1. Scope*

1.1 This specification covers tin and tin/lead coatings applied by the hot dip process on ferrous and non-ferrous metals. Hot tin and tin/lead coatings are used to provide a low contact-resistance surface, to protect against corrosion, to facilitate soldering, to provide anti-galling properties, and to be a stop-off coating in the nitriding of high-strength steels.

1.2 This specification is intended to be applicable to items that are reflowed, centrifuged or otherwise handled to remove excess tin or tin/lead bath metal. Coating thickness grade requirements reflect this.

1.3 Some corrosion can be expected from tin or tin/lead coatings exposed outdoors. In normal indoor exposure, tin or tin/lead is protective on iron, steel, nickel, copper, and their alloys. Corrosion can be expected at discontinuities in the coating (such as pores) due to galvanic couples formed between the tin or the tin/lead and the underlying metal through the discontinuities, especially in humid atmospheres.

1.4 This specification does not apply to electrodeposited coatings of tin or tin/lead.

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *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.*

1.7 *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.*

¹ This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.13 on Structural Shapes and Hardware Specifications.

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2. Referenced Documents

2.1 ASTM Standards:²

- A902 Terminology Relating to Metallic Coated Steel Products
- B32 Specification for Solder Metal
- B183 Practice for Preparation of Low-Carbon Steel for Electroplating
- B242 Guide for Preparation of High-Carbon Steel for Electroplating
- B281 Practice for Preparation of Copper and Copper-Base Alloys for Electroplating and Conversion Coatings
- B320 Practice for Preparation of Iron Castings for Electroplating
- B322 Guide for Cleaning Metals Prior to Electroplating
- B339 Specification for Pig Tin
- B374 Terminology Relating to Electroplating
- B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
- B499 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals
- B504 Test Method for Measurement of Thickness of Metallic Coatings by the Coulometric Method
- B558 Practice for Preparation of Nickel Alloys for Electroplating
- B567 Test Method for Measurement of Coating Thickness by the Beta Backscatter Method
- B568 Test Method for Measurement of Coating Thickness by X-Ray Spectrometry
- B571 Practice for Qualitative Adhesion Testing of Metallic Coatings
- B602 Guide for Attribute Sampling of Metallic and Inorganic Coatings
- B659 Guide for Measuring Thickness of Metallic and Inorganic Coatings
- B678 Test Method for Solderability of Metallic-Coated Products

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

- B697 Guide for Selection of Sampling Plans for Inspection of Electrodeposited Metallic and Inorganic Coatings
- B762 Guide of Variables Sampling of Metallic and Inorganic Coatings
- B849 Specification for Pre-Treatments of Iron or Steel for Reducing Risk of Hydrogen Embrittlement
- B851 Specification for Automated Controlled Shot Peening of Metallic Articles Prior to Nickel, Autocatalytic Nickel, or Chromium Plating, or as Final Finish
- D3951 Practice for Commercial Packaging

3. Terminology

3.1 Definitions:

3.1.1 The following terms and definitions are specific to this specification. Many of the terms used in this specification are defined in Terminologies A902 and B374.

3.1.2 *sectional, n*—screen section for placing articles into the hot tin dip so that the articles do not stick together

3.1.3 *significant surface, n*—the portion of the surface of a coated article at which the coating is required to meet all of the requirements of the coating specification for that article. Significant surfaces are usually those that are essential to the serviceability or function of the article, or that can be a source of corrosion products or tarnish films that interfere with the function or desirable appearance of the article. Significant surfaces shall be indicated on the drawing of the parts or by the provision of suitably marked samples.

3.1.4 *undercoat, n*—also call an underplate in the electronics/plating industry (see 3.1.5).

3.1.5 *underplating, n*—application of a metallic coating layer between the base metal or substrate and the topmost metallic coating or coatings. The thickness of such an undercoating is usually greater than 50 microinches. This is in contrast to strikes or flashes, whose thicknesses are generally much smaller.

4. Ordering Information

4.1 In order to make the application of this specification complete, the purchaser must supply the following information to the seller in the purchase order and drawings:

- 4.1.1 Title, ASTM designation number, and year of issue of this specification;
- 4.1.2 Coating thickness requirement;
- 4.1.3 Composition and metallurgical condition of the substrate to be coated;
- 4.1.4 Additional underplate, if required;
- 4.1.5 Location of significant surfaces;
- 4.1.6 Hydrogen embrittlement relief, if required; and
- 4.1.7 Any other items needing agreement between purchaser and coater.

5. Materials and Manufacture

5.1 The specification, grade, or designation and type as well as the degree of surface contamination of the substrate material shall be supplied by the purchaser to the coater prior to coating.

5.2 The design and fabrication of the product to be coated using the hot tin dip or hot tin/lead dip process are the

responsibility of the designer and the fabricator. Consultation between the designer, the fabricator, and the coater at appropriate stages in the design and fabrication process will reduce future problems.

5.3 The tin used in the hot tin dip process shall conform to Specification B339 and shall not be less than 99.8 % pure tin.

5.4 The tin/lead used in the hot dip tin/lead process shall conform to Specification B32 and shall contain 60 % $\pm$ 5 % tin and the balance lead.

5.5 The metal substrate shall be subject to such surface preparation, cleaning, underplating, and hot tin dip procedures as are necessary to yield deposits with the desired quality. Careful preparation of metal surfaces is necessary in order to assure good adhesion and quality. For suitable methods, see Practices B183, B242, B281, B320, B322, and B558.

5.6 Hot tin dip or hot tin/lead dip shall be applied after all basis metal heat treatments, mechanical operations, proper cleaning, and undercoats (if applicable) have been completed.

5.7 The molten metal in the working volume of the tin/lead bath shall contain not less than an average value of 96 % of lead and tin by weight.

5.8 The molten metal in the working volume of the tin bath shall conform to the chemical composition requirements in Table 1.

6. Coating Requirements

6.1 The appearance of the coated product shall be uniform throughout, insofar as the base metal will permit. The finish shall be adherent and visually free from uncoated areas, blisters, flux deposits, dross inclusions, pits, peeled areas, cracks, nodules and other types of projections that would interfere with the intended use of the articles, or other defects not consistent with good hot tin dip or hot tin/lead practice. They shall not be stained or discolored and free of dewetted areas and beads. All surfaces shall be free of grease or oil used in the process.

6.2 The hot tin dip or hot tin/lead dip coating shall be smooth and reasonably uniform in thickness. Smoothness of surface is a relative term. Minor roughness that does not interfere with the intended use of the part, or roughness that is related to the as-received surface condition of the part, shall not be grounds for rejection.

NOTE 1—Since this specification is applicable to items that are centrifuged and reflowed to remove excess bath metal (see 1.2), irregular coating distribution is not normally encountered.

6.3 The hot tin dip or hot tin/lead dip coating shall adhere tenaciously to the surface of the base metal or undercoat

TABLE 1 Chemical Composition of the Tin Bath

Element	% max
Copper	1.5
Zinc	0.70
Lead	0.09
Total Unnamed Elements	0.2
Tin	Remainder