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Standard Specification for Tin Mill Products, Electrolytic Tin-Coated, Cold-Rolled Sheet[1]

This standard is issued under the fixed designation A 599/A 599M; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers cold-rolled steel sheet in coils or in cut lengths, tin-coated by electrodeposition. The product is commonly known as electrolytic tin-coated sheet, and is for applications that need good solderability, good surface appearance, and a degree of corrosion resistance. Tin-coated sheet is produced to various designations of tin coating, as outlined in Table 1.

1.1.1 Electrolytic tin-coated sheet is customarily available as commercial steel (CS); drawing steel (DS); deep drawing steel (DDS); extra deep drawing steel (EDDS), and structural steel (SS). The tin coating is available as unmelted or melted.

1.2 *Limitations*—This specification is applicable to orders in either inch-pound units (as A 599), which is supplied in thicknesses from 0.015 in. to ~~0.033~~0.036 in., or SI units [as A 599M], which is supplied in thicknesses from 0.381 mm to ~~0.84~~0.914 mm. For thicknesses lighter than 0.015 in. [0.381 mm], refer to A 624 [A 624M].

1.3 Unless the order shows the "M" designation [SI units], the product shall be furnished to inch-pound units. The values stated in either inch-pound or SI units are to be regarded as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with this specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 568/A 568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A 623 Specification for Tin Mill Products, General Requirements

A 623M Specification for Tin Mill Products, General Requirements ~~(Metric)~~[3] [Metric]

A 624/A 624M~~Specification for Tin Mill Products, Electrolytic Tinplate, Single-Reduced~~[3] Specification for Tin Mill Products, Electrolytic Tin Plate, Single Reduced

A 630 Test Methods for Determination of Tin Coating Weights for ~~Hot-Dip and~~ Electrolytic Tin Plate

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for ~~Domestic~~ Shipment

A 1008/A 1008M~~Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability~~[2] Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *chemical treatment*—a passivating chemical treatment, normally applied to the tinned surface to stabilize the surface to control tin oxide formation and growth. Sodium dichromate is most commonly used. Without such treatment, severe tin oxide growth, and its resultant discoloration, is a hazard. Excessive oxide growth may also cause poor solderability and poor adhesion of organic coatings. If a special surface treatment is required, it should be negotiated with the supplier.

3.2 *Finishes*:

3.2.1 *No. 5 Finish*—~~a shot-blasted roll base metal finish usually employed on unmelted tin-coated sheet.~~ — a shot-blasted and/or otherwise textured roll base metal finish usually employed on unmelted tin-coated sheet.

3.2.2 *No. 7 Finish*— a ground-roll base metal finish usually employed on melted tin-coated sheet.

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[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless ~~Steel,~~Steel and Related Alloys and is the direct responsibility of Subcommittee A01.20 on Tin Mill Products.

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[2] 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* ~~, Vol 01.03.~~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.**

TABLE 1 Electrolytic Tin-Coated Sheets Coating Weight [Mass]

NOTE 1—Listed below are the commonly produced coating weights [mass] upon agreement between the producer and the purchaser. Other combinations of coatings may be specified and the appropriate minimum average test values[A] apply.

Designation No.	Nominal Tin Coating Weight [Mass] (Each Surface) lb/base box (g/m^2)[B]	Minimum Average Coating Weight [Mass] (Each Surface Test Value) lb/base box (g/m^2)[B,C]
5 (0.6/0.6)	0.025/0.025 (0.6/0.6)	0.02/0.02 (0.5/0.5)
10 (1.1/1.1)	0.05/0.05 (1.1/1.1)	0.04/0.04 (0.9/0.9)
15 (1.7/1.7)	0.075/0.075 (1.7/1.7)	0.06/0.06 (1.4/1.4)
20 (2.2/2.2)	0.10/0.10 (2.2/2.2)	0.08/0.08 (1.8/1.8)
25 (2.8/2.8)	0.125/0.125 (2.8/2.8)	0.11/0.11 (2.5/2.5)
50 (5.6/5.6)	0.25/0.25 (5.6/5.6)	0.23/0.23 (5.2/5.2)
75 (8.4/8.4)	0.375/0.375 (8.4/8.4)	0.35/0.35 (7.8/7.8)
100 (11.2/11.2)	0.50/0.50 (11.2/11.2)	0.45/0.45 (10.1/10.1)

[A] Refer to Specifications A 623 and A 623M.
[B] A base box is defined as a unit of area equivalent to 112 sheets 14 in. by 20 in. or 31 360 $in.^2$ (refer to Specification A 623).
[C] The minimum single spot value shall not be less than 80 % of the minimum average tin coating weight [mass] (see 8.1 and 8.2).

3.2.2.1 *Discussion*—It is possible to produce either No. 5 or No. 7 Finish as unmelted or melted; however, end application is important and should be negotiated with the producer.

3.3 *melted tin coating*—tin coated by electrodeposition on a base steel normally having a ground-roll finish (see 3.2), and then melted to reflow the tin. The resultant coating has a brighter appearance than unmelted tin. An iron-tin alloy layer is developed during the melting operation, thus reducing the amount of free tin available. Due to the limitations of the reflow section of the plating lines, certain thicknesses may not be available with a melted finish.

3.4 *oil*—an extremely thin oil film furnished on both surfaces of tinned sheet to minimize abrasion in shearing, coiling or uncoiling, shipping, and handling. Usually dioctyl sebecate (DOS) or acetyl tributyl citrate (ATBC) is used. Surface active agents such as glycerol mono-oleate may be incorporated into the lubricant for application on tinned sheet. Oil film other than normal should be negotiated with the producer. The oil film is not a drawing lubricant.

3.5 *unmelted tin coating*—tin-coated by electrodeposition on a base steel normally having a dull, blasted-roll surface texture (see 3.2). The deposited tin also has a dull gray appearance.

4. Ordering Information

4.1 Orders for material under this specification shall include the following, as required, to adequately describe the required material.

4.1.1 Name of material (electrolytic tin-coated sheet) and quality.

4.1.2 Coating designation (melted or unmelted).

4.1.3 *Base Metal Finish*—Specify either No. 5 (blasted and/or otherwise textured roll) or No. 7 (ground roll) base metal finish. If a special finish is required, it should be negotiated with the supplier.

4.1.4 Dimensions (show thickness, width, and length, if cut lengths).

4.1.5 *Coil Size Requirements*—Specify maximum outside diameter (OD), acceptable inside diameter (ID), and maximum coil weight [mass]; specify whether welds are acceptable or not.

4.1.6 Application (show part identification and description).

4.1.7 ASTM designation number and year of issue.

4.1.8 Special requirements, if required.

NOTE 1—A typical ordering description is as follows: Electrolytic Tin-Coated Sheet—Deep Drawing Steel (DDS), Coating Designation 25, Unmelted, No. 5 Finish, 0.018 by 26 3/16 in. by coil, 60 in. max OD, 16 in. ID, 18 000 lb max, coil for oil-filter shells. ASTM A 599–____ . [Tin-Coated Sheet—Deep Drawing Steel (DDS), Coating Designation 2.8/2.8, Unmelted, No. 5 Finish, 0.50 mm by 668 mm by coil, 1530 mm max OD, 408 mm ID, 8.2 metric tons max, coil for oil-filter shells. ASTM A 599M–____ .]

5. Manufacture

5.1 *Base Metal*—The base metal is produced in conformance to that described for cold-rolled sheet in Specification A 568/A 568M.

5.2 *Coil Preparation*—Normal coil inside diameter is 16 in. [400 mm]; any other should be negotiated. Requirements as to the maximum outside diameter and to the maximum weight should be indicated. The leading ends of lap welds shall not exceed 1 in. [25 mm].

6. Chemical Requirements

6.1 The chemical composition of base metal furnished in accordance with this specification shall conform to the requirements