Designation: A 599/A 599M – 07

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 0.036 in., or SI units [as A 599M], which is supplied in thicknesses from 0.381 mm to 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

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/m²)[B]	Minimum Average Coating Weight [Mass] (Each Surface Test Value) lb/base box (g/m²)[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).

A 623M Specification for Tin Mill Products, General Requirements [Metric]

A 624/A 624M Specification for Tin Mill Products, Electrolytic Tin Plate, Single Reduced

A 630 Test Methods for Determination of Tin Coating Weights for Electrolytic Tin Plate

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

A 1008/A 1008M 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.

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless 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* 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.**

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3.2 *Finishes*:

3.2.1 *No. 5 Finish*—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.

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 of the applicable quality designations of Specification A 1008/A 1008M.

7. Mechanical Requirements

7.1 Structural steel (SS) sheet, high-strength low-alloy steel (HSLAS) sheet and high-strength low-alloy steel with improved formability (HSLAS-F) are approved to tensile property values as specified in Table 4 of Specification A 1008/A 1008M.

7.2 Commercial steel (CS) sheet, drawing steel (DS) sheet, deep drawing steel (DDS) sheet, and extra deep drawing steel (EDDS) sheet are produced to typical nonmandatory mechanical properties found in Table 3 of Specification A 1008/A 1008M.

8. Weight [Mass] of Coating

8.1 The weight [mass] of coating shall conform to the requirements prescribed in Table 1 for the coating designation. The weight of coating is the total amount on both sides of a sheet, expressed in pounds per base box [or in grams per square metre].

8.2 *Determination of Tin Coating Weights*—Typical methods for determination of tin coating weights are described in Test Methods A 630. In cases of dispute, Method D, referee method, shall be used.

9. Weight [Mass] of Coating Tests

9.1 When the purchaser wishes to make tests to ascertain compliance of this specification for tin coating weight on a lot of any specific item of electrolytic tin-coated sheet, the procedure to be employed shall be that described in Test Methods A 630.

10. Dimensions and Tolerances

10.1 Except for thickness and width tolerances shown in Tables 2 and 3, material furnished to this specification shall conform to the applicable requirements of the latest edition of Specification A 568/A 568M.

11. Workmanship and Quality Level Requirements

11.1 The production of coils does not afford the same opportunity for inspection, grading, and sorting as does the production of cut lengths. Accordingly, appropriate processing and quality control procedures are required by the purchaser to obtain optimum utilization of the product. The hazard of

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TABLE 2 Thickness Tolerances for Electrolytic Tin-Coated Steel Sheet

NOTE 1—Thickness is measured at any point across the width not less than ⅜ in. (9.5 mm) from a side edge.

Specified Width, in. [mm]	Thickness Tolerance, Over and Under, in. [mm]	
	Specified Thickness, in. [mm]	
	Over 0.020 to 0.036 [0.508 to 0.914]	Over 0.015 to 0.020 [0.381 to 0.508], incl
Over 12 to 36 [300 to 900], incl	0.003 [0.08]	0.002 [0.05]

TABLE 3 Width Tolerance for Electrolytic Tin-Coated Sheet

Specified Width, in. [mm]	Tolerance over Specified Width, in. [mm] (No Tolerance Under)
Over 12 to 30 [300 to 600]	⅛ [3]
Over 30 to 48 [600 to 1200]	3⁄16 [5]

abrasion on coils is greater than on cut lengths and may occur during coiling, shipping, or uncoiling.

12. General Requirements for Delivery

12.1 Material furnished under this specification shall conform to the applicable requirements of the latest edition of Specification A 568/A 568M unless otherwise specified herein.

12.2 Tin-coated steel sheet shall be ordered to a base metal decimal thickness for both coils and cut lengths, exclusive of the coating thickness.

13. Rejection and Rehearing

13.1 Rejection and rehearing are subject to the same procedure as described in Specification A 568/A 568M.

14. Marking

14.1 Marking shall be in accordance with the requirements of Specification A 568/A 568M.

15. Packaging and Loading

15.1 It is normal to ship coils with the eye vertical. Experience has shown that transit abrasion is minimized by shipping with the eye of the coil vertical.

15.2 It is common practice to use the methods shown in the latest edition of Practices A 700.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 599/A 599M – 02) that may impact the use of this standard. (November 1, 2007)

(*1*) In 1.2, changed maximum thickness from 0.033 to 0.036 to be consistent with Table 2.
(*2*) In 1.2 and Table 2, changed equivalent metric limits from two significant figures to three significant figures.
(*3*) In 3.2.1 and 4.1.3, inserted the words "and/or otherwise textured" to be consistent with other ASTM standards for Tin Mill products.
(*4*) In 10.1, deleted the last sentence of the paragraph since it is no longer necessary due to previous changes in Specification A 623.

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