



Standard Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process¹

This standard is issued under the fixed designation A875/A875M; 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 steel sheet, in coils and cut lengths, metallic-coated by the hot-dip process, with zinc-5 % aluminum alloy coating. The Zn-5Al alloy coating also contains small amounts of elements other than zinc and aluminum that are intended to improve processing and the characteristics of the coated product.

1.2 The coating is produced as two types: zinc-5 % aluminum-mischmetal alloy (Type I) and zinc-5 % aluminum-0.1 % magnesium alloy (Type II), and in two coating structures (classes). The coated sheet is produced in several coating designations (coating weight [mass]).

1.3 The material is intended for applications requiring corrosion resistance, formability, and paintability.

1.4 The steel sheet is produced in a number of designations, types, grades, and classes designed to be compatible with differing application requirements.

1.5 Coated sheet material furnished under this specification shall conform to the applicable requirements of the latest issue of Specification [A924/A924M](#), unless otherwise provided herein.

1.6 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes, excluding tables and figures, shall not be considered as requirements of this specification.

1.7 This specification is applicable to orders in either inch-pound units (as A875) or metric (SI) units [as A875M]. Values in inch-pound and SI units are to be regarded separately 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 shall be used independently of the other.

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 A05.11 on Sheet Specifications.

Current edition approved April 1, 2013. Published April 2013. Originally approved in 1987. Last previous edition approved in 2010 as A875/A875M - 10. DOI: 10.1520/A0875_A0875M-13.

1.8 Unless the order specifies the “M” specification designation (SI units), the material shall be furnished to inch-pound units.

1.9 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

[A90/A90M Test Method for Weight \[Mass\] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings](#)
[A902 Terminology Relating to Metallic Coated Steel Products](#)

[A924/A924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process](#)

[B750 Specification for GALFAN \(Zinc-5 % Aluminum-Mischmetal\) Alloy in Ingot Form for Hot-Dip Coatings](#)

[E47 Test Methods for Chemical Analysis of Zinc Die-Casting Alloys \(Withdrawn 1997\)³](#)

[E517 Test Method for Plastic Strain Ratio \$r\$ for Sheet Metal](#)

[E646 Test Method for Tensile Strain-Hardening Exponents \(\$n\$ -Values\) of Metallic Sheet Materials](#)
[E1277 Test Method for Chemical Analysis of Zinc-5 % Aluminum-Mischmetal Alloys by ICP Emission Spectrometry](#)

2.2 ISO Standard:⁴

[ISO 14788 Continuous Hot-Dip Zinc-5 % Aluminum Alloy Coated Steel Sheet and Coils](#)

2.3 Other Document:⁵

[GF-1 Standard Practice for Determination of Cerium and Lanthanum Compositions in Galfan Alloy \(5 % Al-0.4 %](#)

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁵ Available from International Lead Zinc Research Organization, Inc., 2525 Meridian Parkway, P.O. Box 12036, Research Triangle Park, NC 27709-2036.

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

La-0.4 % Ce-Bal SHG ZN)
3. Terminology

3.1 *Definitions*—See Terminology **A902** for definitions of general terminology relating to metallic-coated steel products.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *minimized coating structure, n*—a coating characterized by a finer metallurgical coating structure obtained by a treatment designed to restrict the formation of the normal coarse grain structure formed during solidification of the Zn-5Al alloy coating.

3.2.2 *regular coating structure, n*—the normal coating structure resulting from unrestricted grain growth during normal solidification of the Zn-5Al alloy coating.

3.3 *Abbreviations:*

3.3.1 *MM*—mischmetal.

3.3.2 *Zn-5Al*—zinc-5 % aluminum.

3.3.3 *Zn-5Al-Mg*—zinc-5 % aluminum-0.1 % magnesium.

3.3.4 *Zn-5Al-MM*—zinc-5 % aluminum-mischmetal.

4. Classification

4.1 The material is classified in terms of the base metal and in terms of the coating.

4.2 *Base Metal Classifications:*

4.2.1 The material is available in the designations as follows:

4.2.1.1 Commercial Steel (CS Types A, B, and C),

4.2.1.2 Deep Drawing Steel (DDS),

4.2.1.3 Extra Deep Drawing Steel (EDDS),

4.2.1.4 Forming Steel (FS Types A and B),

4.2.1.5 High-Strength Low-Alloy Steel (HSLAS),

4.2.1.6 High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), and

4.2.1.7 Structural Steel (SS).

4.2.2 Structural Steel and High Strength Low Alloy Steel are available in several grades based on mechanical properties. Structural Steel Grade 50 [340] is available in three classes based on tensile strength.

4.3 *Coating Classifications:*

4.3.1 The coating is available in two types, as follows:

4.3.1.1 *Type I*—Zinc-5 % aluminum-mischmetal (Zn-5Al-MM), and

4.3.1.2 *Type II*—Zinc-5 % aluminum-0.1 % magnesium (Zn-5Al-Mg).

4.3.2 The coating is available in two coating classes, or structures, as follows:

4.3.2.1 *Class A*—Minimized coating structure, and

4.3.2.2 *Class B*—Regular coating structure.

4.3.3 The coating is available in several coating designations, or weights [masses] of coating, as shown in **Table 1**.

4.3.3.1 The coated sheet is available with the same or different coating designations on each surface.

TABLE 1 Weight [Mass] of Coating Requirements ^{A,B,C}

NOTE 1—Use the information provided in 8.1.2 to obtain the approximate coating thickness from the coating weight [mass].

Coating Designation	Minimum Requirements ^D		
	Triple-Spot Test		Single-Spot Test
	Inch-Pound Units		
	Total Both Sides, oz/ft ²	One Side, oz/ft ²	Total Both Sides, oz/ft ²
GF01	no minimum	no minimum	no minimum
GF15	0.15	0.05	0.12
GF20	0.20	0.07	0.16
GF30	0.30	0.10	0.25
GF45	0.45	0.14	0.35
GF60	0.60	0.20	0.50
GF75	0.75	0.26	0.65
GF90	0.90	0.32	0.80
GF115	1.15	0.40	1.00
GF140	1.40	0.48	1.20
GF165	1.65	0.56	1.40
GF185	1.85	0.64	1.60
GF210	2.10	0.72	1.80
GF235	2.35	0.80	2.00

Coating Designation	SI Units		
	Total Both Sides, g/m ²	One Side, g/m ²	Total Both Sides, g/m ²
ZGF001	no minimum	no minimum	no minimum
ZGF45	45	15	35
ZGF60	60	20	50
ZGF90	90	30	75
ZGF135	135	45	113
ZGF180	180	60	150
ZGF225	225	78	195
ZGF275	275	94	235
ZGF350	350	120	300
ZGF450	450	154	385
ZGF600	600	204	510
ZGF700	700	238	595

^AThe coating designation number is the term by which this material is specified. Because of the many variables and changing conditions that are characteristic of continuous hot-dip coating lines, the zinc-5 % aluminum alloy coating is not always evenly divided between the two surfaces of a coated sheet; nor is it always evenly distributed from edge to edge. However, the minimum triple-spot average coating [mass] on any one side shall not be less than 40 % of the single-spot requirement.

^BAs it is an established fact that the atmospheric corrosion resistance of zinc-5 % aluminum alloy-coated sheet products is a function of coating thickness (weight [mass]), the selection of thinner (lighter) coating designations will result in reduced corrosion performance of the Zn-5Al coating. For example, the heavier zinc-5 % aluminum alloy coatings perform adequately in bold atmospheric exposure whereas the lighter coatings are often further coated with paint or a similar barrier coating for increased corrosion resistance. Because of this relationship, material carrying the statement “meets ASTM A875/A875M requirements” should also specify the particular coating type and designation.

^CThe corrosion performance of Type I Zn-5Al-MM coated sheet products is nonlinear as the corrosion rate decreases with time, due to the formation of a characteristic passivation layer.

^DNo minimum value means that there are no established minimum requirements for triple- and single-spot tests.

5. Ordering Information

5.1 Zinc-5 % aluminum alloy-coated sheet in coils and cut lengths is produced to thickness requirements expressed to 0.001 in. [0.01 mm]. The thickness of the sheet includes both the base metal and the coating.

5.2 Orders for coated sheet to this specification shall include the following information, as necessary, to adequately describe the desired product.

5.2.1 Name of material (steel sheet, Zn-5Al alloy coated),

5.2.2 Designations of sheet steel [CS (Type A, B, or C), FS (Type A or B), DDS, EDDS, SS, HSLAS, or HSLAS-F].

5.2.2.1 When a CS type is not specified, Type B will be furnished.

5.2.2.2 When a FS type is not specified, Type B will be furnished.

5.2.3 When a SS, HSLAS, HSLAS-F designation is specified, state the grade or combination thereof.

5.2.4 ASTM designation number and year of issue, as A875-____ for inch-pound units or A875M-____ for SI units,

5.2.5 Coating type (I or II) (see 4.3.1),

5.2.6 Coating designation (see 4.3.3),

5.2.7 Class of coating structure (for example, Class A—Minimized, etc.) (see 4.3.2),

5.2.8 Chemically treated or not chemically treated,

5.2.9 Oiled or not oiled,

5.2.10 Extra smooth (if required),

5.2.11 Phosphatized (if required),

5.2.12 Dimensions (show thickness, minimum or nominal, width, flatness requirements and length, if cut lengths).

5.2.13 Coil size requirements (specify maximum outside diameter (OD), acceptable inside diameter (ID), and maximum weight [mass]),

5.2.14 Packaging,

5.2.15 Certification, if required, and heat analysis and mechanical property report,

5.2.16 Application (part identification and description), and

5.2.17 Special requirements (if any).

5.2.17.1 When the purchaser requires thickness tolerances for 3/8-in. [10-mm] minimum edge distance (see Supplementary Requirement in Specification A924/A924M), this requirement shall be specified in the purchase order or contract.

NOTE 1—Typical ordering descriptions are as follows:

Steel sheet, Zn-5Al alloy coated to ASTM A875-____, Commercial Steel—CS Type B, Type I coating, designation GF 115, Class A (minimized coating structure), chemically treated, oiled, 0.040 min by 34 by 117 in., for stock tanks.

Steel sheet, Zn-5Al alloy coated to ASTM A875M-____, Structural Steel—SS Grade 230, Type II coating, designation ZGF 275, Class B (regular coating structure), chemically treated, not oiled, phosphatized, 1.00 nominal by 900 mm by coil, 1200 mm max OD, 600 mm ID, 9000 kg max, for roof deck.

NOTE 2—The purchaser should be aware that there are variations in manufacturing practices among the producers and therefore is advised to establish the producer's standard (or default) procedures for thickness tolerances.

6. Chemical Composition

6.1 Base Metal:

6.1.1 The heat analysis of the base metal shall conform to the requirements shown in Table 2 for CS (Types A, B, and C), FS (Types A and B), DDS, and EDDS; and in Table 3 for SS, HSLAS, and HSLAS-F.

6.1.2 Each of the elements listed in Tables 2 and 3 shall be included in the report of heat analysis. When the amount of copper, nickel, chromium, or molybdenum is less than 0.02 %, report the analysis either as <0.02 % or the actual determined value. When the amount of vanadium, titanium, or columbium is less than 0.008 %, report the analysis either as <0.008 % or the actual determined value. When the amount of boron is less than 0.0005 %, report as <0.0005 % or the actual determined value.

6.1.3 See Specification A924/A924M for cast and product analysis procedures.

6.2 Coating Bath Analysis:

6.2.1 The bath metal used in continuous hot-dip Zn-5Al-MM alloy coating of Type I shall meet the chemical composition limits specified in Specification B750.

6.2.2 The bath metal used in the continuous hot-dip Zn-5Al-Mg alloy coating of Type II shall conform to the requirements of Table 4.

6.3 Methods of Analysis:

6.3.1 Coating Bath Metal—The determination of chemical composition shall be made in accordance with suitable chemical (Test Method E47 for tin), ICP argon plasma spectrometric (Test Method E1277), or other methods. In case of dispute, the results secured by Test Method E1277 shall be the basis of acceptance.

6.3.1.1 A practice for X-ray fluorescence spectrometry for the determination of cerium and lanthanum in a zinc-5 %

TABLE 2 Chemical Requirements^A

Designation	Composition, %—Heat Analysis Element, Maximum, Unless Otherwise Shown													
	C	Mn	P	S	Al	Cu	Ni	Cr	Mo	V	Cb	Ti ^B	N	B
CS Type A ^{C,D,E}	0.10	0.60	0.030	0.035	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025	...	...
CS Type B ^{F,C}	0.02 to 0.15	0.60	0.030	0.035	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025	...	...
CS Type C ^{C,D,E}	0.08	0.60	0.10	0.035	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025	...	...
FS Type A ^{C,G}	0.10	0.50	0.020	0.035	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025	...	...
FS Type B ^{F,C}	0.02 to 0.10	0.50	0.020	0.030	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025	...	...
DDS ^{D,E}	0.06	0.50	0.020	0.025	0.01 min	0.20	0.20	0.15	0.06	0.008	0.008	0.025	...	...
EDDS ^H	0.02	0.40	0.020	0.020	0.01 min	0.20	0.20	0.15	0.06	0.10	0.10	0.15	...	...

^AWhere an ellipsis (. . .) appears in this table, there is no requirement, but the analysis shall be reported.

^BFor steels containing more than 0.2 % carbon, titanium is permitted to 0.025 % provided the ratio of % titanium to % nitrogen does not exceed 3.4.

^CWhen a deoxidized steel is required for the application, the purchaser has the option to order CS and FS to a minimum of 0.01 % total aluminum.

^DSteel is permitted to be furnished as a vacuum degassed or chemically stabilized steel, or both, at the producer's option.

^EFor carbon levels less than or equal to 0.02 %, vanadium, columbium, or titanium, or combinations thereof are permitted to be used as stabilizing elements at the producer's option. In such cases, the applicable limit for vanadium and columbium shall be 0.10 % and for titanium 0.15 %.

^FFor CS and FS, specify Type B to avoid carbon levels below 0.02 %.

^GShall not be furnished as a stabilized steel.

^HShall be furnished as a stabilized steel.