



Designation: A1008/A1008M – 26

Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable¹

This standard is issued under the fixed designation A1008/A1008M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers cold-rolled, carbon, structural, high-strength low-alloy, high-strength low-alloy with improved formability, required hardness, full hard, solution hardened, and bake hardenable steel sheet, in coils and cut lengths.

1.2 Cold rolled steel sheet is available in the designations as listed in 4.1.

1.3 This specification does not apply to steel strip as described in Specification A109/A109M.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *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:²

A109/A109M Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled

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 A01.19 on Steel Sheet and Strip.

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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.

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

A1092 Specification for Steel Sheet, as Cold-Reduced, for Conversion to Annealed Cold-Rolled Steel Sheet, and Hot Dip Metallic-Coated Steel Sheet

E18 Test Methods for Rockwell Hardness of Metallic Materials

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

2.2 ISO Standards:³

ISO 3574 Cold-Reduced Carbon Steel Sheet of Commercial and Drawing Qualities

ISO 4997 Cold-Reduced Steel Sheet of Structural Quality

ISO 13887 Cold-Reduced Steel Sheet of Higher Strength with Improved Formability

3. Terminology

3.1 Definitions:

3.1.1 For definitions of other terms used in this specification, refer to Terminology A941.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *aging, n* —loss of ductility with an increase in hardness, yield strength, and tensile strength that occurs when steel that has been slightly cold worked (such as by temper rolling) is stored for some time.

3.2.1.1 *Discussion*—Aging increases the tendency of a steel to exhibit stretcher strains and fluting.

³ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

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

3.2.2 *bake hardenable steel (BHS)*, *n*—steel in which significant aging is realized when moderate heat treatment, such as that used for paint baking, follows straining or cold working.

3.2.3 *full hard steel (FHS)*, *n*—steel that is cold reduced and exhibits a microstructure consisting of non-recrystallized grains.

3.2.3.1 *Discussion*—Chemical composition shall be determined by the producer unless there is prior agreement between producer and user, or seller and buyer.

3.2.4 *inclusion control*, *n*—the process of reducing the volume fraction of inclusions or modifying the shape of inclusions to improve formability, weldability, and machinability.

3.2.4.1 *Discussion*—Inclusions, especially those elongated during the rolling process, create the conditions for initiating or propagating cracks, or both, when the material is stretched or bent during the manufacture of a part. The adverse effects of inclusions are minimized by reducing the content of inclusions in the steel or by altering the shape of inclusions, or both, through the use of additions during the steelmaking process that change the elongated shape of the inclusions to less harmful small, well dispersed globular inclusions.

3.2.5 *required hardness steel (RHS)*, *n*—steel that adheres to a specified hardness range, at the time of shipment; may also be referenced as specified hardness steel.

3.2.5.1 *Discussion*—Chemical composition shall be determined by the producer unless there is prior agreement between producer and user, or seller and buyer.

3.2.6 *solid-solution hardened steel or solution hardened steel (SHS)*, *n*—steel strengthened through additions of elements, such as Mn, P, or Si, that can be dissolved within the crystalline structure of steels.

3.2.6.1 *Discussion*—Alloying elements that form a solid-solution with iron provide strengthening as a result of local distortions in atomic arrangements, which arise as a result of the mismatch between the atomic sizes of such elements and that of iron.

3.2.7 *special forming steel (SFS)*, *n*—steel ordered to 1010 chemistry or greater levels of carbon, manganese or both, which exhibits enhanced formability or mechanical properties.

3.2.7.1 *Discussion*—Steel grades such as CS – 1010 or CS – 1020 for example, adhere to chemistry requirements only, whereas SFS – 1010 or SFS – 1020, also provide enhanced formability. Due to greater carbon content, SFS – 1020 is not as formable as SFS – 1010.

3.2.8 *stabilization*, *n*—addition of one or more nitride- or carbide-forming elements, or both, such as titanium and niobium, to control the level of the interstitial elements of carbon and nitrogen in the steel.

3.2.8.1 *Discussion*—Stabilizing improves formability and increases resistance to aging.

3.2.9 *vacuum degassing*, *n*—process of refining liquid steel in which the liquid is exposed to a vacuum as part of a special technique for removing impurities or for decarburizing the steel.

4. Classification

4.1 Cold-rolled steel sheet is available in the following designations:

4.1.1 Commercial steel (CS Types A, B, and C).

4.1.2 Commercial steel (CS Types A and B combined with chemistry grade in accordance with Specification **A568/A568M** Table X2.3.

4.1.3 Drawing steel (DS Types A and B, as specified in Table 1).

4.1.4 Drawing steel (DS Type A and B combined with chemistry grade in accordance with Specification **A568/A568M** Table X2.3.

4.1.5 Commercial steel chemistry grade in accordance with Specification **A568/A568M** Table X2.1, with no type specified (CS – 1005, CS – 1008, CS – 1020, and so forth).

4.1.6 Special forming steel (SFS), chemistry as specified in Table 1 with carbon and manganese limits in accordance with

TABLE 1 Chemical Composition for Cold Rolled Steel Sheet Designations CS, DS, DDS, EDDS, and SFS

Designation	% Heat Analysis, Element Maximum Unless Otherwise Shown														
	C	Mn	P	S	Al	Si	Cu	Ni	Cr ^A	Mo	V	Nb ^B	Ti	N	B
CS Type A ^{C,D,E,F}	0.10	0.60	0.025	0.035	^G	^G	0.20 ^H	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
CS Type B ^C	0.02–0.15	0.60	0.025	0.035	^G	^G	0.20 ^H	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
CS Type C ^{C,D,E,F}	0.08	0.60	0.10	0.035	^G	^G	0.20 ^H	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
DS Type A ^{D,I}	0.08	0.50	0.020	0.020	0.01 min	^G	0.20	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
DS Type B	0.02–0.08	0.50	0.020	0.020	0.02 min	^G	0.20	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
DDS ^{E,F}	0.06	0.50	0.020	0.020	0.01 min	^G	0.20	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
EDDS ^J	0.02	0.40	0.020	0.020	0.01 min	^G	0.10	0.10	0.15	0.03	0.10	0.10	0.15	^G	^G
SFS	^K	^K	0.020	0.020	0.01 min	^G	0.20	0.20	0.15	0.06	0.008	0.008	0.025	^G	^G
RHS	^G	^G	^G	^G	^G	^G	^G	^G	^G	^G	^G	^G	^G	^G	^G

^A Chromium is permitted, at the producer's option, to 0.25 % maximum when the carbon content is less than or equal to 0.05 %.

^B Columbium (Cb) is a legacy alternate name for niobium (Nb) and both names refer to element 41 in the periodic table of elements.

^C When an aluminum deoxidized steel is required for the application, it is permissible to order commercial steel (CS) to a minimum of 0.01 % total aluminum.

^D Specify Type B to avoid carbon levels below 0.02 %.

^E It is permissible to furnish as a vacuum degassed or chemically stabilized steel, or both, at the producer's option.

^F For carbon levels less than or equal to 0.02 %, it is permissible to use vanadium, niobium or titanium, or a combination thereof, as stabilizing elements at the producer's option. In such cases, the applicable limit for vanadium or niobium shall be 0.10 % max. and the limit on titanium shall be 0.15 % max.

^G There is no specified limit, but the analysis shall be reported.

^H When copper steel is specified, the copper limit is a minimum requirement. When copper steel is not specified, the copper limit is a maximum requirement.

^I If produced utilizing a continuous anneal process, stabilized steel is permissible at the producer's option, and Footnotes E and F apply.

^J Shall be furnished as a vacuum degassed and stabilized steel.

^K Carbon and manganese chemistry limits shall be specified in accordance with Specification **A568/A568M** Tables X2.1 or X2.2.