



Designation: **A659/A659M—18 A659/A659M – 22**

## Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled<sup>1</sup>

This standard is issued under the fixed designation A659/A659M; 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 ( $\epsilon$ ) 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 hot-rolled carbon steel (CS) sheet and strip, in coils and cut lengths, in which the maximum of the specified carbon range is over 0.15 and not over 0.25 % and the maximum of the specified manganese range is not over 0.90 %. This material is ordered to chemical composition.

1.2 This specification is not applicable to the steels covered by Specification **A635/A635M**.

1.3 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.

1.4 *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:<sup>2</sup>

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

**A635/A635M** Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for

**A749/A749M** Specification for Steel, Strip, Carbon and High-Strength, Low-Alloy, Hot-Rolled, General Requirements for  
**E527** Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

#### 2.2 Society of Automotive Engineers Standard:<sup>3</sup>

**J 1086** Numbering Metals and Alloys

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

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

### 3. Ordering Information

3.1 It is the purchaser's responsibility to specify in the purchase order all ordering information necessary to purchase the needed material. Examples of such information include but are not limited to the following:

3.1.1 ASTM specification number and year of issue,

3.1.2 Name of material (hot-rolled commercial steel (CS) sheet, or hot-rolled commercial steel (CS) strip),

3.1.3 Grade designation or chemical composition, or both,

3.1.4 Copper-bearing steel (if required),

3.1.5 Condition (as-rolled, pickled, or blast cleaned) (see 4.1),

3.1.5.1 Material to this specification is furnished in the hot-rolled condition. Pickled (or blast cleaned) must be specified if required,

3.1.6 Oiling (see 7.2),

3.1.7 Edges (see 7.1),

3.1.8 Dimensions (thickness, width, and whether cut lengths or coils),

NOTE 1—Not all producers are capable of meeting all of the limitations of the thickness tolerance tables in Specification A568/A568M. The purchaser should contact the producer regarding possible limitations prior to placing an order.

3.1.9 Coil size (must include inside diameter, outside diameter, and maximum mass),

3.1.10 Quantity,

3.1.11 Application (show part identification and description),

3.1.12 Cast or heat analysis report (request, if required),

3.1.13 Special requirements (if required).

3.1.13.1 When the purchaser requires thickness tolerances for 3/8 in. [10 mm] minimum edge distance (see Supplementary Requirement in Specification A568/A568M), this requirement shall be specified in the purchase order or contract.

NOTE 2—A typical ordering description is as follows:

“ASTM A659-XX [or A659M-XX], Hot-Rolled Commercial Steel (CS) Sheet, Grade 1017, Pickled and Oiled, Cut Edge, 0.075 by 36 in. [or 1.85 by 900 mm], by coil, ID 24 in., OD 48 in., max weight 11 250 lb max [or ID 600 mm, OD 1200 mm, max, weight 7500 kg, max], 100 000 lb [or 45 000 kg] for Part No. 6509, Shelf Leg, Cast or heat analysis report required.”

### 4. Materials and Manufacture

4.1 *Condition*—Unless otherwise specified, the material is furnished in the as-rolled condition (not annealed or pickled).

### 5. Chemical Composition

5.1 *The Cast or Heat Analysis* of the steel shall conform to the chemical requirements shown in Table 1, or chemical compositions can be specified from carbon 0.16 maximum to 0.25 % maximum, inclusive, and manganese 0.90 % maximum, inclusive, which conform to the standard chemical ranges and limits tables in the Appendixes of Specifications A568/A568M and A749/A749M.

5.1.1 Unspecified elements may be present. Limits on elements shall be as stated in Table 2.

5.1.1.1 Each of the elements listed in Table 2 shall be included in the report of the heat analysis. When the amount of copper,

TABLE 1 Typical Grade Designations and Chemical Compositions<sup>A</sup>

Steel Designation No.	Carbon, %	Manganese, %	Phosphorus, max, %	Sulfur, max, %
1015	0.13–0.18	0.30–0.60	0.030	0.035
1016	0.13–0.18	0.60–0.90	0.030	0.035
1017	0.15–0.20	0.30–0.60	0.030	0.035
1018	0.15–0.20	0.60–0.90	0.030	0.035
1020	0.18–0.23	0.30–0.60	0.030	0.035
1021	0.18–0.23	0.60–0.90	0.030	0.035
1023	0.20–0.25	0.30–0.60	0.030	0.035

<sup>A</sup> Copper, when specified, shall have a minimum content of 0.20 % by cast or heat analysis.

TABLE 2 Limits on Unspecified Elements (see 5.1.1)

Copper, max % <sup>A</sup>	Heat analysis	0.20
	Product analysis	0.23
Nickel, max % <sup>A</sup>	Heat analysis	0.20
	Product analysis	0.23
Chromium, max % <sup>A</sup>	Heat analysis	0.15
	Product analysis	0.19
Molybdenum, max % <sup>A</sup>	Heat analysis	0.06
	Product analysis	0.07
Vanadium, max %	Heat analysis	0.008
	Product analysis	0.018
Columbium, max %	Heat analysis	0.008
	Product analysis	0.018
Columbium (Niobium), max % <sup>B</sup>	Heat analysis	0.008
	Product analysis	0.018

<sup>A</sup> The sum of copper, nickel, chromium, and molybdenum shall not exceed 0.50 % on heat analysis. When one or more of these elements are specified, the sum does not apply; in which case, only the individual limits on the remaining unspecified elements will apply.

<sup>B</sup> Columbium and niobium are interchangeable names for the same element, and both names are acceptable for use in A01 specifications.

nickel, chromium, or molybdenum is less than 0.02 %, the analysis may be reported as “<0.02 %.” When the amount of vanadium or columbium (niobium) is less than 0.008 %, the analysis may be reported as “<0.008 %.”

5.2 Where material is used for fabrication by welding, care must be exercised in selection of the chemical composition to assure compatibility with the welding process and its effect on altering the properties of the steel.

## 6. Bending Properties

6.1 The minimum forming radius (radii) that steel covered by this specification can be expected to sustain is listed in the appendix and is discussed in more detail in Specifications **A568/A568M**, and **A749/A749M**. When tighter bend radii are required, or curved or offset bends are involved, or when stretching or drawing are also a consideration, the producers shall be consulted.

## 7. Workmanship, Finish, and Appearance

### 7.1 Edge:

7.1.1 Sheet can be supplied with mill edge or cut edge.

7.1.2 Strip can be supplied with mill edge or slit (cut) edge.

7.2 *Oiling*—Hot-rolled, non-pickled material is commonly furnished not oiled, while hot-rolled pickled (or blast cleaned) material is commonly furnished oiled. When required, pickled (or blast cleaned) material may be specified to be furnished not oiled, and non-pickled material may be specified to be furnished oiled.

## 8. General Requirements for Delivery

8.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification **A568/A568M** for sheet, and Specification **A749/A749M** for strip, unless otherwise provided herein.