Designation: A 620/A620M – 97

Standard Specification for Drawing Steel (DS), Sheet, Carbon, Cold-Rolled[1]

This standard is issued under the fixed designation A 620/A620M; 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 Department of Defense.

1. Scope

1.1 This specification covers cold-rolled carbon drawing steel (DS) sheet in coils or cut lengths. This material is intended for fabricating identified parts where particularly severe drawing or forming may be involved or essential freedom from aging is required.

1.2 This specification is applicable for orders in either inch-pound units (as A 620) or SI units (as A 620M).

2. Referenced Documents

2.1 *ASTM Standards:*

A 568/A 568M Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for[2]

A 619/A 619M Specification for Non-Killed, Forming Steel (NKFS) Sheet, Carbon, Cold-Rolled[2]

3. Terminology

3.1 *Definitions:*

3.1.1 *aging*—loss of ductility with an increase in hardness, yield point, and tensile strength that occur when steel, which has been slightly cold worked (such as by temper rolling), is stored for some time. Aging also increases the tendency toward stretcher strains and fluting.

3.1.2 *drawing steel (DS)*—sheet manufactured from specially produced or selected killed steels (normally aluminum killed) specially processed to have good uniform drawing properties for use in fabricating an identified part having extremely severe deformations and to be essentially free from aging.

4. Classification

4.1 Cold-rolled sheet is supplied for either exposed or unexposed applications. Within the latter category, cold-rolled sheet is specified either "temper rolled" or "annealed last." For details on processing, attributes and limitations, and inspection standards, refer to Specifications A 568/A 568M.

5. Ordering Information

5.1 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:

5.1.1 ASTM specification number and year of issue,

5.1.2 Name of material (cold-rolled drawing steel (DS) sheet),

5.1.3 Type - When a type is not specified, Type B will be furnished,

5.1.4 Classification (either exposed, unexposed, temper rolled, or annealed last) (see 4.1),

5.1.5 Finish (matte finish will be supplied on exposed, unless otherwise specified, and on unexposed) (see 10.1),

5.1.6 Oiling (material will be oiled unless ordered not oiled) (see 10.2),

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

5.1.7.1 As agreed upon between the purchaser and the producer, material ordered to this specification will be supplied to meet the appropriate standard or restricted thickness tolerance table shown in Specification A 568/A 568M.

NOTE 1—Not all producers are capable of meeting all of the limitations of the thickness tolerance tables in Specification A 568/A 568M. The purchaser should contact the producer regarding possible limitations prior to placing an order.

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

5.1.9 Quantity,

5.1.10 Application (show part identification and description),

5.1.11 Special requirements (if required), and

5.1.12 Cast or heat analysis report (request, if required).

NOTE 2—A typical ordering description is as follows:

"ASTM A 620-XX [or A 620M-XX], Cold-Rolled Drawing Steel (DS) Sheet. Type B, exposed, oiled, 0.035 by 53 in. [or 0.8 by 1340 mm] Standard Thickness Tolerances, by coil ID 24 in., OD 48 in., max, weight

[1] This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel and Related Alloys, and is the direct responsibility of Subcommittee A01.19 on Steel Sheet and Strip.

Current edition approved June 10, 1997. Published November 1997. Originally published as A 620 – 68. Last previous edition A 620/A 620M – 96.

[2] *Annual Book of ASTM Standards,* Vol 01.03.

15 000 lb. max] or coil ID 6000 mm, OD 1200 mm, max, weight 10 000 kg, max] 100 000 lb [or 45 000 kg], for instrument panel

6. General Requirements

6.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specifications A 568/A 568M unless otherwise provided herein.

7. Manufacture

7.1 *Melting Practice*—The sheet shall be produced from special killed steel. It is normally produced from aluminum killed steel but may be otherwise deoxidized provided the material is capable of meeting the specified requirements.

8. Chemical Composition

8.1 The cast or heat analysis of the steel shall conform to the requirements prescribed in Table 1.

8.1.1 Each of the elements listed in Table 1 shall be included in the report of the heat analysis. When the amount of copper, nickel, chromium, or molybdenum is less than 0.02 %, the analysis may be reported as <0.02 %. When the amount of vanadium or columbium is less than 0.008 %, the analysis may be reported as <0.008 %.

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

9. Mechanical Properties

9.1 Typical, nonmandatory mechanical properties are founded in Table 2

TABLE 1 Chemical Composition

Element	Composition—Weight % Heat Analysis	
	Type A[A]	Type B[B,C]
Carbon	0.08 max	0.02/0.08
Manganese, max	0.50	0.50
Phosphorous, max	0.020	0.020
Sulfur, max	0.030	0.030
Aluminum, min	0.01	0.01
Silicon[D]	. . .	. . .
Copper, max[E]	0.20	0.20
Nickel, max[E]	0.20	0.20
Chromium, max[E,F]	0.15	0.15
Molybdenum, max[E]	0.06	0.06
Vanadium, max	0.008	0.008
Columbium, max[G]	0.008	0.008
Titanium, max[G]	0.008	0.008

[A] Type A may be furnished as a vacuum degassed, at the producer's option.

[B] Type B describes the most common product previously included in this Specification.

[C] Specify Type B to avoid carbon levels below 0.02 %.

[D] Where an ellipsis (. . .) appears in this table, there is no requirement, but the test result shall be reported.

[E] The sum of copper, nickel, chromium, and molybdenum shall not exceed 0.50 % on heat analysis. When one or more of these elements is specified, the sum does not apply; in which case, only the individual limits on the remaining elements will apply.

[F] Chromium is permitted at the producer's option, to 0.25 % maximum when the carbon is less than or equal to 0.05 %. In such case, the limit on the sum of the four elements in Footnote E does not apply.

[G] For carbon levels less than or equal to 0.02 %, columbium and/or titanium may be used as chemical stabilizing elements at the producer's option. When such is the case, the limits above do not apply to those elements. Rather, the limit on columbium shall be 0.10 % maximum and the limit on titanium shall be 0.15 % maximum.

TABLE 2 Typical Mechanical Properties[A,B]

Yield Strength ksi [MPa][C]	22/35 [150/240]
Elongation in 2 in. [50 mm] %[C]	≥ 36
r_m Value[D]	1.3/1.7
n Value[E]	0.17/0.22

[A] The typical mechanical property values presented here are nonmandatory. They are intended solely to provide the purchaser with as much information as possible to make an informed decision on the steel to be specified. Values outside of these ranges are to be expected.

[B] These typical mechanical properties apply to the full range of steel sheet thicknesses. The yield strength tends to increase and some of the formability values tend to decrease as the sheet thickness decreases.

[C] Yield strength and elongation are measured in the longitudinal direction in accordance with Specification A 370.

[D] Average plastic strain ratio as determined by method in Specification E 517.

[E] Strain-hardening exponent as determined by method in Specification E 646.

9.2 The sheet shall be suitable for the production of identified deep drawn parts. The manufacturer shall assume responsibility for selection of steel, control of processing, and ability of the material to form identified parts within properly established breakage limits. (Refer to Appendix X3 of Specifications A 568/A 568M.)

9.3 Drawing steel is required when forming steel (in accordance with Specification A 619/A 619M) will not provide a sufficient degree of ductility for the fabrication of parts having stringent drawing requirements.

9.4 Refer to X4 of Specification A 568/A 568M for additional information.

9.5 For the purposes of pressure vessel design, the following lowing minimum tensile properties may be assumed, 20 ksi yield strength and 40 ksi tensile strength.

10. Finish and Appearance

10.1 *Surface Finish*:

10.1.1 Unless otherwise specified, exposed sheet shall have a matte (dull) finish. When required, a controlled surface texture and condition may be specified.

10.1.2 Unexposed sheet shall have a matte (dull) finish. Surface texture or condition may not be specified.

10.2 *Oiling*:

10.2.1 Unless otherwise specified, the sheet shall be oiled.

10.2.2 When required, the sheet may be specified to be furnished not oiled (dry).

10.3 *Edges*— The sheet shall have cut edges.

11. Certification and Reports

11.1 While not normally required for this specification, upon request of the purchaser in the contract or order, a manufacturer's certification that the material was produced in accordance with this specification shall be furnished. The cast or heat analysis may be reported, if required.

12. Product Marking

12.1 In addition to the requirements of Specifications A 568/A 568M, each lift or coil shall be marked with the designation, "DS".

13. Keywords

13.1 carbon steel sheet; cold rolled steel sheet; steel sheet