



Designation: B 625 – 99

Standard Specification for UNS N08904, UNS N08925, UNS N08031, UNS N08932, UNS N08926, and UNS R20033 Plate, Sheet, and Strip¹

This standard is issued under the fixed designation B 625; 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 alloys UNS N08904, UNS N08925,* UNS N08031, UNS N08932, UNS N08926, and UNS R20033 plate, sheet, and strip in the annealed temper.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following safety hazards caveat pertains only to the test methods portion, Section 12, of this specification: *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:

E 8 Test Methods for Tension Testing of Metallic Materials²
E 10 Test Method for Brinell Hardness of Metallic Materials²

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications³

E 38 Methods for Chemical Analysis of Nickel-Chromium and Nickel-Chromium-Iron Alloys⁴

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁵

E 140 Hardness Conversion Tables for Metals²

E 353 Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys⁵

¹ This specification is under the jurisdiction of ASTM Committee B-2 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

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* New designation established in accordance with Practice E 527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

² Annual Book of ASTM Standards, Vol 03.01.

³ Annual Book of ASTM Standards, Vol 14.02.

⁴ Discontinued—See 1989 Annual Book of ASTM Standards, Vol 03.05.

⁵ Annual Book of ASTM Standards, Vol 03.05.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *plate*—material $\frac{3}{16}$ in. (4.76 mm) and over in thickness and over 10 in. (254 mm) in width.

3.1.2 *sheet*—material under $\frac{3}{16}$ in. (4.76 mm) in thickness and 24 in. (609.6 mm) and over in width. Material under $\frac{3}{16}$ in. (4.75 mm) in thickness and in all widths with No. 4 finish.

3.1.3 *strip*—material under $\frac{3}{16}$ in. (4.76 mm) in thickness and under 24 in. (609.6 mm) in width.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Quantity (weight or number of pieces),

4.1.2 Alloy name or UNS number,

4.1.3 Form, plate, sheet or strip,

4.1.4 Dimensions,

4.1.5 Type edge required, for strip only (see 7.4.1),

4.1.6 Finish (Section 8)—For sheet with No. 4 finish, specify whether one or both sides are to be polished,

4.1.7 ASTM designation,

4.1.8 Additions to the specification or special requirements,

4.1.9 Certification or test reports—State if certification or test reports are required (Section 15), and

4.1.10 Source inspection—State if inspection is required (Section 13).

5. Chemical Composition

5.1 The material sampled, in accordance with 9.2, shall conform to the composition limits specified in Table 1.

5.2 If a product analysis is subsequently made, the material shall conform to the composition limits with the product analysis variation specified in Table 2.

6. Mechanical Properties and Other Requirements

6.1 *Tensile and Hardness Requirements*—The material shall conform to the mechanical property requirements specified in Table 3.



TABLE 1 Chemical Requirements

Elements	Composition, %					
	UNS N08904	UNS N08925	UNS N08932	UNS N08031	UNS N08926	UNS R20033
Carbon, max	0.020	0.020	0.020	0.015	0.020	0.015
Manganese, max	2.00	1.00	2.00	2.0	2.00	2.0
Phosphorus, max	0.045	0.045	0.025	0.020	0.03	0.02
Sulfur, max	0.035	0.030	0.010	0.010	0.01	0.01
Silicon, max	1.00	0.50	0.40	0.3	0.5	0.50
Nickel	23.00–28.00	24.00–26.00	24.0–26.0	30.0–32.0	24.00–26.00	30.0–33.0
Chromium	19.00–23.00	19.00–21.00	24.0–26.0	26.0–28.0	19.00–21.00	31.0–35.0
Molybdenum	4.0–5.0	6.0–7.0	4.5–6.5	6.0–7.0	6.0–7.0	0.50–2.0
Copper	1.0–2.0	0.8–1.5	1.0–2.0	1.0–1.4	0.5–1.5	0.30–1.20
Nitrogen	...	0.10–0.20	0.15–0.25	0.15–0.25	0.15–0.25	0.35–0.60
Iron	balance	balance	balance	balance	balance	balance

TABLE 2 Product Analysis Tolerances

Elements	Tolerances Over the Max Limit or Under the Min Limit, %				
	UNS N08904 UNS N08925 UNS N08932	UNS N08031	UNS N08926	UNS R20033	
Carbon	0.005	0.005	0.005	0.005	
Manganese	0.04	0.04	0.04	0.04	
Phosphorus	0.005	0.005	0.005	0.005	
Sulfur	0.005	0.003	0.003	0.003	
Silicon	0.05	0.03	0.03	0.05	
Chromium	0.20	0.30	0.25	0.30	
Nickel	0.20	0.30	0.25	0.30	
Molybdenum	0.10	0.15	0.15	0.05	
Copper	0.10	0.04	0.04	0.10	
Nitrogen	...	0.01	0.01	0.03	

7. Dimensions and Permissible Variations

7.1 Sheet—The material referred to as sheet shall conform to the variations in dimensions specified in Tables 4-9, inclusive.

7.2 Cold-Rolled Strip—The material referred to as cold-rolled strip shall conform to the permissible variations in dimensions specified in Tables 10-13, inclusive.

7.3 Plate—The material referred to as plate shall conform to the permissible variations in dimensions specified in Tables 14-19, inclusive.

7.4 Edges for Cold-Rolled Strip:

7.4.1 The various types of edges procurable shall be as follows:

7.4.1.1 No. 1 Edge—Rolled edge, contour as specified.

7.4.1.2 No. 3 Edge—An edge produced by slitting.

7.4.1.3 No. 5 Edge—Approximately square edge produced by rolling or filling, or both, after slitting.

8. Workmanship, Finish, and Appearance

8.1 The material shall be free of injurious imperfections and shall correspond to the designated finish as described below.

8.1.1 Sheet—The various types of finish procurable on sheet products shall be as follows:

8.1.1.1 No. 1 Finish—Hot rolled, annealed, and descaled; produced by hot rolling to specified thicknesses followed by annealing and descaling (see 8.2).

8.1.1.2 No. 2D Finish—Dull, cold-rolled finish; produced by cold rolling to the specified thickness, annealing, and descaling. The dull finish results from the descaling and pickling operations.

8.1.1.3 No. 2B Finish—Bright, cold-rolled finish; produced by giving a final light cold-rolled pass with polished rolls, to a sheet which has been annealed and descaled.

8.1.1.4 No. 4 Finish—General purpose, polished finish. Following initial grinding with coarser abrasives, sheets are generally finished last with abrasives approximately 120 to 150 mesh. Sheets can be produced with one or two sides polished. When polished on one side only, the other side may be rough ground in order to obtain the necessary flatness.

8.1.1.5 Bright Annealed—Bright finish produced by cold rolling to thickness, then annealing in a protective atmosphere.

8.1.2 Strip—The type of finish procurable on cold-rolled strip shall be as follows:

8.1.2.1 No. 1 Finish—Cold rolled to specified thickness, annealed, and pickled (see 8.2). Appearance of this finish is a dull gray.

8.1.2.2 Bright Annealed—Bright finish produced by cold rolling to thickness, then annealing in a protective atmosphere.

8.1.3 Plate—The types of finish procurable on plates shall be as follows:

8.1.3.1 Hot Rolled, Annealed—Scale not removed.

8.1.3.2 Hot Rolled, Annealed, Descaled—Scale removed by a blast cleaning or pickling operation.

8.1.3.3 Cold Rolled, Annealed—Scale not removed.

8.1.3.4 Cold Rolled, Annealed, Descaled—Scale removed by a blast cleaning or pickling operation.

8.2 Sheet, Strip, and Plate—Material may be ground to remove surface imperfections, provided such grinding does not reduce the thickness or width at any point beyond the permissible variations in dimensions.

9. Sampling

9.1 Lots for Chemical Analysis and Mechanical Testing:

9.1.1 A lot for chemical analysis shall consist of one heat.

9.1.2 Plate—A lot of plate for testing and inspection purposes shall consist of the products resulting from the rolling of one heat of material in the same condition (temper) and specified thickness.

9.1.3 Sheet and Strip—A lot of sheet or strip for testing and inspection purposes shall consist of material from one heat in the same form (sheet or strip), condition (temper), finish, and specified thickness but in no case more than 25 000 lb (11 340 kg).

NOTE 1—Where material cannot be identified by heat, a lot shall consist of not more than 500 lb (227 kg) of material in the same thickness and



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TABLE 3 Mechanical Property Requirements

Alloy	Form	Tensile Strength, min, ksi (MPa)	Yield Strength (0.2 % offset), min, psi (MPa)	Elongation in 2 in. or 50.8 mm, or 4D, min, %	Rockwell Hardness (or equivalent) ^A
UNS N08904	sheet	71 (490)	31 000 (215)	35	70–90 HRB
	strip	71 (490)	31 000 (215)	35	70–90 HRB
	plate	71 (490)	31 000 (215)	35	70–90 HRB
UNS N08925	sheet	87 (600)	43 000 (295)	40	...
	strip	87 (600)	43 000 (295)	40	...
	plate	87 (600)	43 000 (295)	40	...
UNS N08932	plate	87 (600)	44 000 (305)	40	...
UNS N08031	sheet	94 (650)	40 000 (276)	40	...
	strip	94 (650)	40 000 (276)	40	...
	plate	94 (650)	40 000 (276)	40	...
UNS N08926	sheet	94 (650)	43 000 (295)	35	...
	strip	94 (650)	43 000 (295)	35	...
	plate	94 (650)	43 000 (295)	35	...
UNS R20033	sheet	109 (750)	55 000 (380)	40	...
	strip	109 (750)	55 000 (380)	40	...
	plate	109 (750)	55 000 (380)	40	...

^A Hardness values are shown for information only and shall not constitute a basis for acceptance or rejection as long as the other mechanical properties are met.

TABLE 4 Thickness Tolerances for Hot-Rolled and Cold-Rolled Sheets

Specified Thickness, ^A in. (mm)	Tolerance Over and Under, in. (mm)
Over 0.145 (3.68) to less than 3/16 (4.76)	0.014 (0.36)
Over 0.130 (3.30) to 0.145 (3.68), incl	0.012 (0.30)
Over 0.114 (2.89) to 0.130 (3.30), incl	0.010 (0.25)
Over 0.098 (2.49) to 0.114 (2.89), incl	0.009 (0.23)
Over 0.083 (2.10) to 0.098 (2.49), incl	0.008 (0.20)
Over 0.072 (1.83) to 0.083 (2.10), incl	0.007 (0.18)
Over 0.058 (1.47) to 0.072 (1.83), incl	0.006 (0.15)
Over 0.040 (1.02) to 0.058 (1.47), incl	0.005 (0.13)
Over 0.026 (0.66) to 0.040 (1.02), incl	0.004 (0.10)
Over 0.016 (0.41) to 0.026 (0.66), incl	0.003 (0.08)
Over 0.007 (0.18) to 0.016 (0.41), incl	0.002 (0.05)
Over 0.005 (0.13) to 0.007 (0.18), incl	0.0015 (0.04)
0.005 (0.13)	0.001 (0.02)

^A Thickness measurements are taken at least 3/8 in. (9.5 mm) from the edge of the sheet.

TABLE 5 Width and Length Tolerances for Hot-Rolled and Cold-Rolled Resquared Sheets (Stretcher Levelled Standard of Flatness)^A

Specified Dimensions	Tolerance, in.		Tolerance, mm	
	Over	Under	Over	Under
For thicknesses under 0.131 in. (3.33 mm):				
Widths up to 48 in. (1.22 m), excl	1/16	0	1.6	0
Widths 48 in. (1.22 m) and over	1/8	0	3.2	0
Lengths up to 120 in. (3.05 m), excl	1/16	0	1.6	0
Lengths 120 in. (3.05 m) and over	1/8	0	3.2	0
For thicknesses 0.131 in. (3.33 mm) and over:				
All widths and lengths	1/4	0	6.4	0

^A Polished sheets with finishes No. 4 are produced to tolerances given in this table.

TABLE 6 Width, Length, and Camber Tolerances for Hot-Rolled and Cold-Rolled Sheets not Resquared

Width Tolerances		
Specified Thickness	Tolerance for Specified Width	
	24 to 48 in. (0.61 to 1.2 m), excl	48 in. (1.2 m) and over
Less than 3/16 in. (4.7 mm)	1/16 in. (1.6 mm)	1/8 in. (3.2 mm)
	over, 0 under	over, 0 under
Length Tolerances		
Specified Length	Tolerance	
	Over	Under
Up to 10 ft (3.0 m), incl	1/4 in. (6.4 mm)	0
Over 10 ft (3.0 m) to 20 ft (6.1 m), incl	1/2 in. (12.7 mm)	0
Camber Tolerances ^A		
Specified Width	Tolerance per Unit Length of	
	Any 8 ft (2.4 m)	
24 in. (0.61 m) to 36 in. (0.9 m), incl	1/8 in. (3.17 mm)	
Over 36 in. (0.9 m)	3/32 in. (2.38 mm)	

^A Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight edge.