



Designation: **B424 – 19^{ε1} B424 – 22**

Standard Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloys Plate, Sheet, and Strip¹

This standard is issued under the fixed designation B424; 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.

^{ε1} NOTE—An editorial correction was made to [Table 2](#) in February 2020.

1. Scope*

1.1 This specification² covers rolled nickel-iron-chromium-molybdenum-copper alloys (UNS [N08642](#), [UNS N06845](#), [UNS N08221](#), [UNS N08825](#), and [UNS N08827](#)) plate, sheet, and strip.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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 become familiar with all hazards including those identified in the appropriate Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, to establish appropriate safety, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

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.*

<https://standards.iteh.ai/catalog/standards/sist/1e41a516-b595-4a57-9278-c73520dca141/astm-b424-22>

2. Referenced Documents

2.1 *ASTM Standards:*³

[B906](#) Specification for General Requirements for Flat-Rolled Nickel and Nickel Alloys Plate, Sheet, and Strip

3. Terminology

3.1 *Descriptions of Terms Specific to This Standard*—The terms given in [Table 1](#) shall apply.

4. General Requirements

4.1 Material furnished under this specification shall conform to the applicable requirements of Specification [B906](#).

¹ This specification is under the jurisdiction of ASTM Committee [B02](#) on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee [B02.07](#) on Refined Nickel and Cobalt and Their Alloys.

Current edition approved Nov. 1, 2019/Oct. 1, 2022. Published November 2019/October 2022. Originally approved in 1964. Last previous edition approved in 2016/2019 as [B424 – 11](#) (2016); [B424 – 19^{ε1}](#). DOI: [10.1520/B0424-19E01-10.1520/B0424-22](#).

² For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-424 in Section II of that Code.

³ 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.

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

TABLE 2 Mechanical Properties for Plate, Sheet, and Strip
(All Thicknesses and Sizes Unless Otherwise Indicated)

Alloy	Condition	Tensile Strength, min, ksi (MPa)	Yield Strength ^A (0.2 % Offset), min, ksi (MPa)	Elongation in 2 in. or 50 mm (or 4 <i>D</i>), min, %
<i>Hot-Rolled Plate:</i>				
UNS N08642	annealed	85 (586)	35 (241)	30
UNS N06845	annealed	100 (690)	40 (276)	30
UNS N08221	annealed	79 (544)	34 (235)	30
UNS N08825	annealed	85 (586)	35 (241)	30
UNS N08827	annealed	85 (586)	35 (241)	30
<i>Cold-Rolled Plate:</i>				
UNS N08642	annealed	85 (586)	35 (241)	30
UNS N06845	annealed	100 (690)	40 (276)	30
UNS N08221	annealed	79 (544)	34 (235)	30
UNS N08825	annealed	85 (586)	35 (241)	30
UNS N08827	annealed	85 (586)	35 (241)	30
<i>Hot-Rolled Sheet:</i>				
UNS N08642	annealed	85 (586)	35 (241)	30
UNS N06845	annealed	100 (690)	40 (276)	30
UNS N08221	annealed	79 (544)	34 (235)	30
UNS N08825	annealed	85 (586)	35 (241)	30
UNS N08827	annealed	85 (586)	35 (241)	30
<i>Cold-Rolled Sheet:</i>				
UNS N08642	annealed	85 (586)	35 (241)	30
UNS N06845	annealed	100 (690)	40 (276)	30
UNS N08221	annealed	79 (544)	34 (235)	30
UNS N08825	annealed	85 (586)	35 (241)	30
UNS N08827	annealed	85 (586)	35 (241)	30
<i>Cold-Rolled Strip:</i>				
UNS N08642	annealed	85 (586) ^B	35 (241)	30 ^B
UNS N06845	annealed	100 (690) ^B	40 (276)	30
UNS N08221	annealed	79 (544) ^B	34 (235)	30 ^B
UNS N08825	annealed	85 (586) ^B	35 (241)	30 ^B
UNS N08827	annealed	85 (586) ^B	35 (241)	30 ^B

^A Yield strength requirements do not apply to material under 0.020 in. (0.51 mm) in thickness.

^B Not applicable for thickness under 0.010 in. (0.25 mm).

TABLE 1 Product Description

Product	Thickness, in. (mm)
Hot-rolled plate ^A	3/16 (4.76) and over
Cold-rolled plate ^A	3/16 to 3/8 (4.8 to 9.5), incl
Hot-rolled sheet ^A	0.018 to 0.250 (0.46 to 6.4), incl
Cold-rolled sheet ^B	0.018 to 0.250 (0.46 to 6.4), incl
Cold-rolled strip ^B	0.005 to 0.250 (0.13 to 6.4), incl

^A Material 3/16 to 1/4 in. (4.8 to 6.4 mm), incl, in thickness may be furnished as sheet or plate provided the material meets the specification requirements for the condition ordered.

^B Material under 48 in. (1219 mm) in width may be furnished as sheet or strip provided the material meets the specification requirements for the condition ordered.

5. Ordering Information

5.1 It is the responsibility of the purchaser to specify all requirements that are necessary for the safe and satisfactory performance of material ordered under this specification. Examples of such requirements include, but are not limited to, the following:

5.1.1 ASTM designation and year of issue.

5.1.2 Alloy name or UNS number.

5.1.3 *Condition*—Table 2 and Appendix X1.

5.1.4 *Finish*—Appendix X1.

TABLE 3 Permissible Variations From Flatness of Rectangular, Circular, and Sketch Plates

NOTE 1—Permissible variations apply to plates up to 12 ft (3.66 m) in length, or to any 12 ft (3.66 m) of longer plates. If the longer dimension is under 36 in. (914 mm), the permissible variation is not greater than ¼ in. (6.4 mm).

NOTE 2—The shorter dimension specified is considered the width, and the permissible variation in flatness across the width does not exceed the tabular amount of that dimension.

NOTE 3—The maximum deviation from a flat surface does not customarily exceed the tabular tolerance for the longer dimension specified.

Specified Thickness	Permissible Variations from a Flat Surface for Thickness and Widths Given, in. (mm)								
	To 48 (1220), excl	48 to 60 (1220 to 1520), excl	60 to 72 (1520 to 1830), excl	72 to 84 (1830 to 2130), excl	84 to 96 (2130 to 2440), excl	96 to 108 (2440 to 2740), excl	108 to 120 (2740 to 3050), excl	120 to 144 (3050 to 3660), excl	144 (3660), and over
	Inches								
3/16 to 1/4, excl	3/4	1 1/16	1 1/4	1 3/8	1 5/8	1 5/8	...	...	...
1/4 to 3/8, excl	1 1/16	3/4	1 5/16	1 1/8	1 3/8	1 7/16	1 9/16	1 7/8	...
3/8 to 1/2, excl	1/2	9/16	1 1/16	3/4	1 5/16	1 1/8	1 1/4	1 7/16	1 3/4
1/2 to 3/4, excl	1/2	9/16	5/8	5/8	1 3/16	1 1/8	1 1/8	1 1/8	1 3/8
3/4 to 1, excl	1/2	9/16	5/8	5/8	3/4	1 3/16	1 5/16	1	1 1/8
1 to 2, excl	1/2	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	3/4	1
2 to 4, incl	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8
	Millimetres								
4.8 to 6.4, excl	19.05	27.0	31.7	34.9	41.3	41.3	...	...	...
6.4 to 9.5, excl	17.5	19.0	23.8	28.6	35.0	36.5	39.7	47.6	...
9.5 to 12.7, excl	12.7	14.3	17.5	19.0	23.8	28.6	31.7	35.0	44.4
12.7 to 19.0, excl	12.7	14.3	15.9	15.9	20.6	28.6	28.6	28.6	34.9
19.0 to 25.4, excl	12.7	14.3	15.9	15.9	19.0	20.6	23.8	25.4	28.6
25.4 to 50.8, excl	12.7	14.3	14.3	14.2	17.5	17.5	17.5	19.0	25.4
50.8 to 101.6, incl	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

5.1.5 *Dimensions*—Thickness, width, and length.

5.1.6 *Quantity*.

5.1.7 *Optional Requirements*:

ASTM B424-22

5.1.7.1 *Sheet and Strip*—Whether to be furnished in coil, in cut straight lengths, or in random straight lengths.

5.1.7.2 *Strip*—Whether to be furnished with commercial slit edge, square edge, or round edge.

5.1.7.3 *Plate*—Whether to be furnished specially flattened (see 8.7); also how plate is to be cut (Table 3).

5.1.8 *Certification*—State if certification is required (Specification B906, section on Material Test Report and Certification).

5.1.9 *Samples for Product (Check) Analysis*—Whether samples for product (check) analysis should be furnished (see Specification B906, section on Sampling).

5.1.10 *Purchaser Inspection*—If the purchaser wishes to witness tests or inspection of material at the place of manufacture, the purchase order must so state, indicating which tests or inspections are to be witnessed (Specification B906, section on Inspection).

6. Chemical Composition

6.1 The material shall conform to the composition limits specified in Table 4.

6.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis per Specification B906.

7. Mechanical Properties

7.1 *Mechanical Properties*—The material shall conform to the mechanical properties specified in Table 2.

TABLE 4 Chemical Requirements^A

Element	UNS N06845	UNS N08221	UNS N08825	UNS N08827
Nickel	44.0 to 50.0	39.0 to 46.0	38.0 to 46.0	39.0 to 43.0
Chromium	20.0 to 25.0	20.0 to 22.0	19.5 to 23.5	21.0 to 23.0
Iron	Remainder ^B	Balance ^B	22.0 min ^B	Balance ^B
Manganese	0.5	1.0	1.0	0.5 to 0.9
Carbon	0.05	0.025	0.05	0.015
Copper	2.0 to 4.0	1.5 to 3.0	1.5 to 3.0	1.6 to 2.3
Silicon	0.5	0.5	0.5	0.2 to 0.5
Sulfur	0.010	0.03	0.03	0.005
Aluminum	...	0.2	0.2	0.06 to 0.25
Titanium	...	0.6 to 1.0	0.6 to 1.2	...
Molybdenum	5.0 to 7.0	5.0 to 6.5	2.5 to 3.5	4.5 to 6.5
Tungsten	2.0 to 5.0	...	...	...
Cobalt	...	...	...	0.5
Nitrogen	...	...	...	0.03
Columbium	...	...	...	0-15
Boron	...	...	...	0.002 to 0.004
Magnesium	...	...	...	0.006 to 0.015

TABLE 4 Chemical Requirements^A

Element	UNS N08642	UNS N06845	UNS N08221	UNS N08825	UNS N08827
Nickel	42.0 to 46.0	44.0 to 50.0	39.0 to 46.0	38.0 to 46.0	39.0 to 43.0
Chromium	21.0 to 23.0	20.0 to 25.0	20.0 to 22.0	19.5 to 23.5	21.0 to 23.0
Iron	Balance ^B	Remainder ^B	Balance ^B	22.0 min ^B	Balance ^B
Manganese	1.0	0.5	1.0	1.0	0.5 to 0.9
Carbon	0.030	0.05	0.025	0.05	0.015
Copper	0.5 to 2.0	2.0 to 4.0	1.5 to 3.0	1.5 to 3.0	1.6 to 2.3
Silicon	0.75	0.5	0.5	0.5	0.2 to 0.5
Sulfur	0.010	0.010	0.03	0.03	0.005
Aluminum	0.2	...	0.2	0.2	0.06 to 0.25
Titanium	...	...	0.6 to 1.0	0.6 to 1.2	...
Molybdenum	5.0 to 6.5	5.0 to 7.0	5.0 to 6.5	2.5 to 3.5	4.5 to 6.5
Tungsten	...	2.0 to 5.0	...	...	...
Cobalt	1.0 to 3.0	...	...	...	0.5
Nitrogen	0.15	...	...	...	0.03
Niobium ^C	0.15	...	...	...	0.15
Boron	...	...	...	...	0.002 to 0.004
Magnesium	...	...	...	...	0.006 to 0.015

^A Maximum unless range or minimum is given. Where ellipses (...) appear in this table, there is no requirement and analysis for the element need not be determined or reported.

^B Element shall be determined arithmetically by difference.

^C The terms Niobium (Nb) and Columbium (Cb) are alternate names for the same element.

<https://standards.itech.ai/catalog/standards/sist/1e41a516-b595-4a57-9278-c73520dca141/astm-b424-22>

8. Dimensions and Permissible Variations

8.1 Thickness and Weight:

8.1.1 *Plate*—For plate up to 2 in. (50.8 mm), inclusive, in thickness, the permissible variation under the specified thickness and permissible excess in overweight shall not exceed the amounts prescribed in Specification **B906**, Permissible Variations in Thickness and Overweight of Rectangular Plates Table.

8.1.1.1 For use with Specification **B906**, Permissible Variations in Thickness and Overweight of Rectangular Plates Table, plate shall be assumed to weigh 0.294 lb/in.³ (8.138 (8.138 g/cm³)).

8.1.2 *Plate*—For plate over 2 in. (50.8 mm) in thickness, the permissible variations over the specified thickness shall not exceed the amounts prescribed in Specification **B906**, Permissible Variations in Thickness for Rectangular Plates Over 2 in. (51 mm) in Thickness Table.

8.1.3 *Sheet and Strip*—The permissible variations in thickness of sheet and strip shall be as prescribed in Specification **B906**, Permissible Variations in Thickness of Sheet and Strip Table. The thickness of strip and sheet shall be measured with the micrometer spindle $\frac{3}{8}$ in. (9.5 mm) or more from either edge for material 1 in. (25.4 mm) or over in width and at any place on the strip under 1 in. (25.4 mm) in width.

8.2 Width or Diameter: