

TOLERANCES

Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate

1. **SCOPE:** This specification covers established inch/pound manufacturing tolerances applicable to sheet, strip, and plate of nickel, nickel alloys, and cobalt alloys ordered to inch/pound dimensions. These tolerances apply to all conditions, unless otherwise noted. The term "excl" is used to apply only to the higher figure of a specified range.
 - 1.1 Where the terms "nickel", "nickel-copper", "nickel-chromium", "nickel-molybdenum", "nickel-molybdenum-chromium", and "cobalt" are used without qualification, they refer to both non-heat-treatable and heat treatable alloys as applicable, unless otherwise noted.
2. **THICKNESS:** Thickness for sheet and strip is measured at any place on widths less than 1 in., at any place 3/8 in. and over from an edge on widths 1 in. and over, and for plate at least 3/8 in. but not more than 3 in. from an edge.
 - 2.1 **Sheet:**
 - 2.1.1 **Nickel, Nickel-Chromium, and Nickel-Copper Alloys:** For thickness 0.018 in. and under, tolerances apply only to widths of 36 in. and under in lengths 96 in. and under. Cold rolled tolerances do not apply to precipitation-hardenable nickel-chromium alloys over 44 in. width.

TABLE I

Specified Thickness Inch	Thickness Tolerance, Inch, Plus and Minus			
	Cold Rolled		Hot Rolled	
	Width Ranges, Inches		Width Ranges, Inches	
	48 and Under	Over 48 to 60, incl	48 and Under	Over 48 to 60, incl
0.010 to 0.018, incl	0.002	--	--	--
Over 0.018 to 0.025, incl	0.002	0.003	0.003	0.004
Over 0.025 to 0.034, incl	0.003	0.004	0.004	0.005
Over 0.034 to 0.056, incl	0.004	0.005	0.005	0.006
Over 0.056 to 0.070, incl	0.005	0.006	0.006	0.007
Over 0.070 to 0.078, incl	0.006	0.007	0.007	0.008
Over 0.078 to 0.093, incl	0.007	0.008	0.008	0.009
Over 0.093 to 0.109, incl	0.007	0.009	0.009	0.010
Over 0.109 to 0.125, incl	0.008	0.010	0.010	0.012
Over 0.125 to 0.140, incl	0.008	0.010	0.012	0.014
Over 0.140 to 0.171, incl	0.009	0.012	0.014	0.016
Over 0.171 to 0.187, incl	0.010	0.013	0.015	0.017
Over 0.187 to 0.218, incl	0.011	0.015	0.017	0.019
Over 0.218 to 0.234, incl	0.012	0.016	0.018	0.020
Over 0.234 to 0.250, incl	0.013	0.018	0.020	0.022

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2.1.2 Nickel-Molybdenum, Nickel-Molybdenum-Chromium, and Cobalt Alloys (Widths 48 In. and Under): For specified thicknesses over 0.187 in., plate tolerances of Table V apply.

TABLE II

Specified Thickness Inch	Thickness Tolerance, Inch	
	Plus	Minus
0.010 to 0.018, incl	0.002	0.002
Over 0.018 to 0.025, incl	0.003	0.003
Over 0.025 to 0.034, incl	0.004	0.004
Over 0.034 to 0.056, incl	0.005	0.005
Over 0.056 to 0.070, incl	0.006	0.006
Over 0.070 to 0.078, incl	0.007	0.007
Over 0.078 to 0.093, incl	0.008	0.008
Over 0.093 to 0.109, incl	0.009	0.009
Over 0.109 to 0.125, incl	0.010	0.010
Over 0.125 to 0.140, incl	0.013	0.010
Over 0.140 to 0.171, incl	0.016	0.010
Over 0.171 to 0.187, incl	0.018	0.010

2.2 Cold-Rolled Strip:

2.2.1 Nickel, Nickel-Chromium, and Nickel-Copper Alloys: Table III does not apply to precipitation-hardenable nickel-chromium alloys for specified thicknesses over 0.025 in. or to any alloy in widths over 12 inches.

TABLE III

Specified Thickness (T) Inch	Thickness Tolerance, Inch, Plus and Minus
	All Widths
Up to 0.006, excl	0.10T
0.006 to 0.015, incl	0.001
Over 0.015 to 0.050, incl	0.0015
Over 0.050 to 0.093, incl	0.0025
Over 0.093 to 0.125, incl	0.004

2.2.2 Nickel-Molybdenum, Nickel-Molybdenum-Chromium, and Cobalt Alloys: Not produced.

2.3 Hot-Rolled Plate: Minus tolerance shall be 0.010 in. for all widths and all thicknesses in all alloys; plus tolerances shall be as shown in 2.3.1 and 2.3.2.

2.3.1 Nickel, Nickel-Chromium, and Nickel-Copper Alloys: Tolerances shown in Table IV are only approximate for precipitation-hardenable nickel-chromium alloys; failure to meet these tolerances shall not be cause for rejection of such alloy product.

TABLE IV

Specified Thickness (T) Inches	Thickness Tolerance, Inch, Plus Only For Width Ranges Shown, Inches			
	Up to 48, excl	48 to 60, excl	60 to 72, excl	72 to 84, excl
0.1875 to 0.3125, excl	0.113T	0.132T	0.150T	0.169T
0.3125 to 0.375, excl	0.094T	0.113T	0.132T	0.150T
0.375 to 0.4375, excl	0.088T	0.094T	0.113T	0.132T
0.4375 to 0.500, excl	0.075T	0.088T	0.094T	0.113T
0.500 to 0.625, excl	0.063T	0.075T	0.088T	0.094T
0.625 to 0.750, excl	0.057T	0.069T	0.075T	0.088T
0.750 to 1.000, excl	0.050T	0.057T	0.069T	0.075T
1.000 and over	0.050T	0.050T	0.057T	0.069T

2.3.2 Nickel-Molybdenum, Nickel-Molybdenum-Chromium, and Cobalt Alloys (Widths 48 In. and Under):

TABLE V

Specified Thickness (T) Inches	Thickness Tolerance, Inch, Plus Only
0.1875 to 0.3125, excl	0.132T
0.3125 to 0.375, excl	0.113T
0.375 to 0.4375, excl	0.094T
0.4375 to 0.500, excl	0.088T
0.500 to 0.625, excl	0.075T
0.625 to 0.750, excl	0.069T
0.750 to 1.000, excl	0.057T
1.000 and over	0.050T

3. WIDTH:

3.1 Sheet (All Alloys, Widths 60 In. and Under): Shall not vary in width more than +1/8 in., -0.

3.2 Cold-Rolled Strip:

3.2.1 Nickel, Nickel-Chromium, and Nickel-Copper Alloys:

TABLE VI

Specified Thickness Inch	Specified Width Inches	Width Tolerance, Inch Plus and Minus
Up to 0.009, incl	12 and under	0.005
Over 0.009 to 0.024, incl	12 and under	0.007
Over 0.024 to 0.075, incl	14 and under	0.007
Over 0.075 to 0.100, incl	14 and under	0.009
Over 0.100 to 0.125, incl	14 and under	0.012

3.2.2 Nickel-Molybdenum, Nickel-Molybdenum-Chromium, and Cobalt Alloys: Not produced.

3.3 Hot-Rolled Plate:

3.3.1 Nickel, Nickel-Chromium, Nickel-Copper, Nickel-Molybdenum, Nickel-Molybdenum-Chromium, and Cobalt Alloys:

3.3.1.1 Sheared Plate 240 In. and Under in Length: Minus tolerance shall be 0.125 in. for all widths and all thicknesses; plus tolerance shall be as shown in Table VII. The minimum available width of sheared plate is 24 inches.

TABLE VII

Specified Thickness Inches	Width Tolerance, Inch, Plus Only Width Ranges, Inches		
	Up to 30, incl	Over 30 to 72, incl	Over 72 to 84, incl
	0.1875 to 0.3125, excl	0.1875	0.250
0.3125 to 0.500, excl	0.250	0.375	0.375
0.500 to 0.750, excl	0.375	0.375	0.500
0.750 to 1.000, excl	0.500	0.500	0.625
1.000 to 1.250, excl	0.625	0.625	0.750

3.3.1.2 Sheared Plate Over 240 In. in Length: Minus tolerance shall be 0.1875 in. for all widths and all thicknesses; plus tolerance shall be 0.0625 in. greater than those of Table VII.

3.3.1.3 Abrasive-Cut Plate: Plates over 1.250 in. in specified thickness are supplied only with abrasive-cut edges. Standard width tolerances for abrasive-cut plate shall be ± 0.125 in. for specified thicknesses 1.250 in. and under and ± 0.1875 in., -0.125 in. for specified thicknesses over 1.250 to 2.750 in., inclusive.

3.3.1.3.1 Minimum available width of abrasive-cut plate is 2 in. and increases to 4 in. for thick plate.

3.3.2 Tolerances for width of powder or inert-arc cut plate and for diameter of machined, powder, or inert-arc cut circular plate shall be as agreed upon by purchaser and vendor.

4. LENGTH:

4.1 Sheet and Strip: Definite lengths shall vary not more than $+1/8$ in., -0 from the length ordered.

4.2 Hot-Rolled Plate:

4.2.1 Nickel, Nickel-Chromium, Nickel-Copper, Nickel-Molybdenum, Nickel-Molybdenum-Chromium, and Cobalt Alloys:

4.2.1.1 Sheared Plate: Minus tolerance shall be 0.125 in. for all lengths and all thicknesses; plus tolerances shall be as shown in Table VIII.

TABLE VIII

Specified Thickness Inches	Length Tolerance, Inch, Plus Only For Length Ranges Shown, Inches			
	24 to 60, incl	Over 60 to 96, incl	Over 96 to 120, incl	Over 120 to 240, incl
0.1875 to 0.3125, excl	3/16	1/4	3/8	1/2
0.3125 to 0.500, excl	3/8	1/2	1/2	1/2
0.500 to 0.750, excl	1/2	1/2	5/8	5/8
0.750 to 1.000, excl	5/8	5/8	5/8	3/4
1.000 to 1.250, incl	3/4	3/4	3/4	7/8