

# Stainless Steel – EN Standards for Plate

The old BS1449 & BS1501 standards have been replaced by EN Standards:

Standard	Scope
EN10088-2	Replaces BS1449-Part 2: 1983
EN10028-7	Replaces BS1501-Part3: 1990
EN10095	Covers Heat Resisting Grades
EN10259	Tolerances for COLD Rolled material
EN10029	Tolerances for Quarto Hot Rolled Plate
EN10051	Tolerances for Coil Produced (CPP) Hot Rolled Plate

For those familiar with the old BS standards it is useful to highlight where the new EN standards differ:

- ◆ Mechanical Properties have been changed
- ◆ Tensile strengths are now higher and a maximum is stipulated
- ◆ Chemical Compositions vary slightly with Nickel contents being slightly lower
- ◆ 304S15, 304S16 & 304S31 have all been replaced by 1.4301
- ◆ EN 10088-2 states that Class A thickness tolerances shall normally be produced
- ◆ EN 10028-7 states that the normal thickness tolerance is Class B
- ◆ Surface Finish Standards have been extended and some changed

## Material Certification

Where multi-certification is required, a combination of EN10088-2, EN10028-7, EN10029 or 10051 will appear together with the appropriate ASTM Standards.

## Tolerances

- ◆ For Cold Rolled Plate please refer to the datasheet on cold rolled
- ◆ Note that there are two sets of tolerances tables – One set for Quarto Plate to EN10029 and one set for CPP plate to EN10051
- ◆ For CPP there are 3 categories of tolerances according to the grade where:
  - B = Ferritic & Martensitic Grades
  - C = Austenitic Grades without Mo
  - D = Austenitic Grades with Mo

## Flatness – Quarto Plate

Thickness mm	Tolerance in mm over given length in mm	
	1000	2000
3 to 4.9	9	14
5 to 7.9	8	12
8 to 14.9	7	11
15 to 24.9	7	10
25 to 39	6	9
40 to 250	5	8

## Flatness – CPP

Width	Tolerance* for given category		
	B	C	D**
Up to 1200	18	23	**
1200 to 1500	23	30	**
Over 1500	28	38	**

For CPP there are 3 categories of tolerances according to the grade where:

- B = Ferritic & Martensitic Grades
- C = Austenitic Grades without Mo
- D = Austenitic Grades with Mo

\*These flatness tolerances only apply for thicknesses up to 25mm

\*\*To be agreed at time of enquiry & order

## Length – Quarto Plate

Length (mm)	Tolerance in mm	
Under 4000	- 0	+ 10
4000 to 5999	- 0	+ 30
6000 to 7999	- 0	+ 40

## Length – CPP

Length (mm)	Tolerance in mm	
Under 2000	- 0	+ 20
2000 to 7999	- 0	0.05 x Length

# Stainless Steel – EN Standards for Plate

## Width – Quarto Plate

Width (mm)	Tolerance in mm	
600 to 1999	- 0	+ 20
2000 to 2999	- 0	+ 25
3000 and over	- 0	+ 30

## Width – CPP

Length	Plus tolerance in mm ( - 0)	
	Mill edges	Trimmed
Up to 1200	+ 20	+ 3
1201 to 1500	+ 20	+ 5
Over 1500	+ 20	+ 6

## Thickness – Quarto Plate

Thickness mm	Tolerance in mm		Max variation in mm within a plate for given width in mm	
	Minus	Plus	1000/1250/1500	2000
3 to 4.9	0.3	0.9	0.8	0.9
5 to 7.9	0.3	1.2	0.9	0.9
8 to 14.9	0.3	1.4	0.9	1.0
15 to 24.9	0.3	1.6	1.0	1.1
25 to 39.9	0.3	1.9	1.1	1.2
40 to 79.9	0.3	2.5	1.2	1.3
80 to 149	0.3	2.9	1.3	1.4
150 to 250	0.3	3.3	1.4	1.5

## Thickness – CPP

Thickness (mm)	Tolerance in mm (plus or minus) for given width in mm			
	Up to 1200	1201 to 1500	1501 to 1800	Over 1800
Up to 2.0	0.17	0.19	0.21	-
2.01 to 2.5	0.18	0.21	0.23	0.25
2.51 to 3.0	0.20	0.22	0.24	0.26
3.01 to 4.0	0.22	0.24	0.26	0.27
4.01 to 5.0	0.24	0.26	0.28	0.29
5.01 to 6.0	0.26	0.28	0.29	0.31
6.01 to 8.0	0.29	0.30	0.31	0.35
8.01 to 10.0	0.32	0.33	0.34	0.40
10.01 to 12.50	0.35	0.36	0.37	0.43
12.51 to 15.0	0.37	0.38	0.40	0.46
15.01 to 25.0	0.40	0.42	0.45	0.50

# Stainless Steel – EN Standards for Plate

## Comparative Grades

AUSTENITIC				FERRITIC/MARTENSITIC	
BS 1449-2	EN 10088-2	BS 1449-2	EN 10088-2	BS 1449-2	EN 10088-2
301S21	1.4310	316S13	1.4432	403S17	1.4000
304S11	1.4307	316S31	1.4401	405S17	1.4002
304S15	1.4301	316S33	1.4436	409S19	1.4512
304S16	1.4301	320S31	1.4571	430S17	1.4016
304S31	1.4301	321S31	1.4541	410S31	1.4006
316S11	1.4404	347S31	1.4550	420S45	1.4028

**N.B. The grades stated are the nearest comparisons and not direct equivalents.**

## Main Grade Differences

Grade	Carbon (%)		Chrome (%)		Nickel (%)		UTS (N/mm <sup>2</sup> )	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
304S15	-	0.06	17.5	19.0	8.0	11.0	500	-
304S16	-	0.06	17.5	19.0	9.0	11.0	500	-
304S31	-	0.07	17.0	19.0	8.0	11.0	490	690
1.4301	-	0.07	17.0	19.5	8.0	10.5	540*	750*
304S11	-	0.03	17.0	19.0	9.0	12.0	480	680
1.4307	-	0.03	17.5	19.5	8.0	10.0	520*	670*
316S31	-	0.07	16.5	18.5	10.5	13.5	510	710
1.4401	-	0.07	16.5	18.5	10.0	13.0	530*	680*
316S11	-	0.03	16.5	18.5	11.0	14.0	490	690
1.4404	-	0.03	16.5	18.5	10.0	13.0	530*	680*

\*New tensile strengths stated apply to cold rolled products only (EN10088-2) and are, therefore, purely for guidance.

# Stainless Steel – EN Standards for Plate

## Finishes according to BS EN 10088-2 / 10028-7

BS EN Finish	Old BS Finish	Description		
<b>Hot Rolled</b>				
1C	0	Hot rolled, heat treated, not descaled		
1E	1	Hot rolled, heat treated, mechanically descaled		
1D	1	Hot rolled, heat treated, pickled		
1U	-	Hot rolled, not heat treated, not descaled		
<b>Cold Rolled</b>				
2C	-	Cold rolled, heat treated, not descaled		
2E	-	Cold rolled, heat treated, mechanically descaled		
2D	2D	Cold rolled, heat treated, pickled		
2B	2B	Cold rolled, heat treated, pickled, skin passed		
2R	2A / (BA)	Cold rolled, bright annealed		
2Q	-	Cold rolled, hardened and tempered, scale-free		
<b>Special Finishes*</b>				
BS EN Finish	Old BS Finish	Description	Typical Grit	Typical R <sub>a</sub>
1G or 2G	-	Ground Grit	120	2.5 to 2.0 μ
1J or 2J	3B	Brushed - Unidirectional	180	1.2 to 1.0 μ
1J or 2J	4	Dull Polished – Unidirectional	240	0.6 μ
1K or 2K	5	Satin polished – Unidirectional	320	0.5 Max
1P or 2P	7	Bright polished – Non-Directional with a high degree of image clarity	600	0.1 μ
1P or 2P	8	Mirror Finish – Non-Directional with a very high degree of image clarity	800	0.05 μ
1M or 2M	-	Patterned		
2L	-	Coloured		
2W	-	Corrugated		
1S or 2S	-	Surface Coated (Metallic coatings such as tin, lead or aluminium)		
<p><b>*Note:</b> Special finishes indicate hot rolled (1) and cold rolled (2) sheets, e.g.: Ground polished hot rolled sheets = 1G / Ground polished cold rolled sheets = 2G</p>				

**For more information on stainless steel finishes please refer to the Aalco technical datasheet on this subject**

# Stainless Steel – EN Standards for Plate

## Stainless Steel Grades, Compositions & Typical Mechanical Properties

EN	BS	AISI	EN No.	Composition Guide					Typical Mechanical Properties (Rolled Products)		
			Obsolete	C	Cr	Ni	Mo	Others	Proof Strength 0.2% Nmm <sub>2</sub>	Tensile Strength Nmm <sub>2</sub>	Elongation %
1.4000	403S17	410S	–	0.08x	12	.	.	.	220-250	400-600	19
1.4002	405S17	405	–	0.08x	12	.	.	0.2 Al	210-250	400-600	17
1.4003	–	–	–	0.03x	11	0.5	.	.	250-320	450-650	18-20
1.4016	430S17	430	60	0.08x	17	.	.	.	240-280	430-630	18-20
1.4113	434S17	434	–	0.08x	17	.	1	.	260-280	450-630	18
1.4509	–	–	–	0.015x	18	.	.	Nb, Ti			
1.4510	–	430Ti	–	0.05x	17	.	.	0.6 Ti	230-240	420-600	23
1.4511	–	430Nb	–	0.05x	17	.	.	0.6Nb	230-240	420-600	23
1.4512	409S19	409	–	0.03x	11	.	.	0.5 Ti	210-220	380-560	25
1.4521	–	(444)	–	0.025x	17	.	2	0.6 Ti			
1.4006	410S21	410	56A	.08-.15	12	.	.	.	400-450	550-850	12-20
1.4005	416S21	416	56AM	.08-.15	12	.	.	.35xS	450	650-850	12
1.4021	420S29	420	56B	.16-.25	12	.	.	.	450-550	650-950	10-15
1.4028	420S45	420	56D	.26-.35	12	.	.	.	600	740-1000	10-15
1.4029	416S37	416	56CM	.25-.32	12	.	.	.35xS			
1.4057	431S29	431	57	.12-.22	15	2	.	.			
1.4104	416S29	416	56BM	.10-.17	16	.	0.4	.35xS	500	650-850	10
1.4112	–	440B	–	.85-.95	17	.	1.0	0.1V		900 max	12
1.4125	–	440C	–	.95-1.2	17	.	0.6	.		900 max	12
1.4594	460S52	–	–	0.7x	14	5	1.5	1.5Cu	700-1000	930-1270	10
1.4749	–	446	–	.15-.20	26	.	.	0.2N			
1.4301	304S31	304	58E	0.07x	18	8	.	.	210-260	520-750	45
1.4303	305S19	305	–	0.06x	18	11	.	.	200-250	500-650	45
1.4305	303S31	303	58M	0.10x	18	8	.	0.35xS	190-230	500-700	35
1.4306	–	304L	–	0.030x	18	10	.	.	200-250	500-670	45
1.4307	304S11	304L	–	0.030x	18	8	.	.	200-250	500-670	45
1.4310	301S21	301	–	0.05/0.1	517	6	.	.	250-280	600-950	40
1.4311	304S61	304LN	–	0.030x	18	9	.	0.22xN	270-320	550-750	40
1.4372	–	201	–	0.15x	17	4.5	.	6.5Mn	330-380	750-950	40
1.4401	316S31	316	58J	0.07x	17	11	2	.	220-270	520-680	40
1.4404	316S11	316L	–	0.030x	17	11	2	.	220-270	520-680	40
1.4406	316S61	316LN	–	0.030x	17	11	2	0.22xN	280-330	580-780	40
1.4432	316S13	316L	–	0.030x	17	11	2.5	.	220-270	520-700	40
1.4435	316S13	316L	–	0.030x	17	13	2.5	.	220-270	520-700	40
1.4436	316S33	316	58J	0.05	17	11	2.5	.	220-270	500-730	40
1.4438	317S12	317L	–	0.030x	18	13	3	.	220-270	520-720	35
1.4439	–	–	–	0.030x	17	13	4	0.22xN	270-320	580-780	35
1.4541	321S31	321	58B	0.08x	18	9	.	0.5Ti	200-250	500-720	40
1.4550	347S31	347	58F	0.08x	18	9	.	0.5Nb	200-250	500-720	40
1.4571	320S31	(316Ti)	–	0.08x	17	11	2	0.5Ti	220-270	520-690	40
1.4539	904S13	–	–	0.020x	19	24	4	2xCu	220-270	520-730	35
1.4547	–	–	–	0.020x	20	18	6	1xCu	300-350	650-850	35
1.4833	309S16	309	–	0.15x	22	12	.	.			
1.4845	310S24	310	–	0.10x	25	20	.	.			
1.4878	321S51	321H	–	0.10x	18	9	.	0.6Ti			