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# 05

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# TOLERANCES

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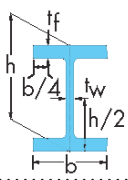
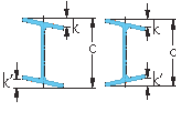
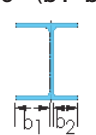
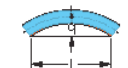
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# Overview

Dimensional tolerance refers to the permissible variation of steel from the specified dimensions of the product. The degree of accuracy expected depend upon a number of factors - whether the product is hot or cold rolled, the type of mill equipment used, unavoidable operating contingencies, the specified size or edge condition, and in some cases the steel composition. The table below list some of the common product wise standards that define the acceptable tolerances or limits on variation in dimensions.

Product	Section	Standard
<b>Long Products</b>		
Beams	IPE, HE, UB, UC	EN 10034
	IPN	EN 10024
	W	ASTM A6
	JIS	JIS G3192
Channels	UPN, UPE, U, PFC, CH	EN 10279
	C, MC	ASTM A6
	JIS	JIS G3192
Merchant bars	Angles	EN 10056-2, ASTM A6, JIS G 3192
	Flats	EN 10058, ASTM A6, JIS G3194
	Square	EN 10059, ASTM A6, JIS G3191
	Round	EN 10060, ASTM A6, JIS G3191
	Hexagonal	EN 10061, ASTM A6, JIS G3191
<b>Flat Products</b>		
Hot rolled plate		EN 10029, ASTM A6, JIS G3193
Hot rolled coil		EN 10111, EN 10051, ASTM A568, A635, JIS G3193
Cold rolled sheets		EN 10131, ASTM A6, JIS G3141
Galvanised coil and sheets		ASTM A924, JIS G3302
<b>Tubes and Pipes</b>		
Structural tubing	SHS, CHS	EN 10210-2, EN 10219-2, ASTM A500, A501
Ordinary piping		EN10255, ASTM A53, A135, A795
Line pipe		API 5L, ASTM A106

# Rolling Tolerances for Beams

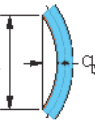
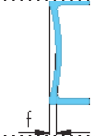
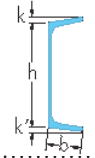
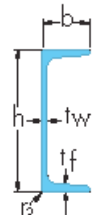
Profile	IPE, HE, UB, UC		IPN		W		JIS	
Standard	EN 10034:1993		EN 10024:1995		ASTM A6/A6M		JIS G3192:2014	
<b>Depth</b> <b>h (mm) [in.]</b> 	$h \leq 180$ $180 < h \leq 400$ $400 \leq h \leq 700$ $h > 700$	$+3/-2$ $+4/-2$ $+5/-3$ $+5/-5$	$h \leq 200$ $200 < h \leq 400$ $h > 400$	$\pm 2$ $\pm 3$ $\pm 4$	$+4/-3$ $[+1/8 / -1/8]$	$h < 800, b \leq 400$ $h < 800, b > 400$ $h \geq 800$	$\pm 2$ $\pm 3$ $\pm 3$	
<b>Flange width</b> <b>b (mm) [in.]</b>	$b \leq 110$ $110 < b \leq 210$ $210 < b \leq 325$ $b > 325$	$+4/-1$ $+4/-2$ $+4/-4$ $+6/-5$	$b \leq 75$ $75 < b \leq 100$ $100 < b \leq 125$ $b > 125$	$\pm 1,5$ $\pm 2$ $\pm 2,5$ $\pm 3$	$+6/-5$ $[+1/4 / -3/16]$	$b \leq 400$ $b > 400$	$\pm 2$ $\pm 3$	
<b>Web thickness</b> <b>t<sub>w</sub> (mm)</b>	$t_w < 7$ $7 \leq t_w < 10$ $10 \leq t_w < 20$ $20 \leq t_w < 40$ $40 \leq t_w < 60$ $t_w \geq 60$	$\pm 0,7$ $\pm 1$ $\pm 1,5$ $\pm 2$ $\pm 2,5$ $\pm 3$	$t_w \leq 7$ $7 < t_w \leq 10$ $t_w > 10$	$+0,5/-1$ $+0,7/-1,5$ $+1/-2$		$t_w < 16$ $16 \leq t_w < 25$ $25 \leq t_w < 40$ $t_w \geq 40$	$\pm 0,7$ $\pm 1$ $\pm 1,5$ $\pm 2$	
<b>Flange thickness</b> <b>t<sub>f</sub> (mm)</b>	$t_f < 6,5$ $6,5 \leq t_f < 10$ $10 \leq t_f < 20$ $20 \leq t_f < 30$ $30 \leq t_f < 40$ $40 \leq t_f < 60$ $t_f \geq 60$	$+1,5/-0,5$ $+2/-1$ $+2,5/-1,5$ $+2,5/-2$ $\pm 2,5$ $\pm 3$ $\pm 4$	$t_f \leq 7$ $7 < t_f \leq 10$ $10 < t_f \leq 20$ $t_f > 20$	$+1,5/-0,5$ $+2/-1$ $+2,5/-1,5$ $+2,5/-2$	limited by mass tolerance	$t_w < 16$ $16 \leq t_w < 25$ $25 \leq t_w < 40$ $t_w \geq 40$	$\pm 1$ $\pm 1,5$ $\pm 1,7$ $\pm 2$	
<b>Out-of-square</b> <b>k+k' (mm) [in.]</b> 	$b \leq 110$ $b > 110$	$1,5$ $0,02b$ (max. 6,5)	$b \leq 100$ $b > 100$	$2$ $0,02b$	$h \leq 310$ $h > 310$ $[h \leq 12]$ $[h > 12]$	$k+k' \leq 6$ $k+k' \leq 8$ $[k+k' \leq 1/4]$ $[k+k' \leq 5/16]$ $c \leq h+6$ $[c \leq h+1/4]$	$h \leq 300$ $h > 300$	$k; k' \leq 0,01b$ (min. 1,5) $k; k' \leq 0,012b$ (min. 1,5)
<b>Web off-centre</b> <b>e (mm) [in.]</b> $e = (b_1 - b_2) / 2$ 	$tf < 40$ : $b \leq 110$ $110 < b \leq 325$ $b > 325$ $tf \geq 40$ : $110 < b \leq 325$ $b > 325$	$2,5$ $3,5$ $5$ $5$ $8$	$b \leq 100$ $b > 100$	$2$ $3$	$G \leq 634 \text{ kg/m}$ $G > 634 \text{ kg/m}$ $[G \leq 426 \text{ lbs/ft}]$ $[G > 426 \text{ lbs/ft}]$	$5$ $8$ $[3/16]$ $[5/16]$	$h \leq 300$ $b \leq 200$ $h > 300$ $b > 200$	$\pm 2,5$ $\pm 3,5$
<b>Straightness</b> <b>q<sub>y</sub>/q<sub>z</sub> (mm)</b> 	$80 < h \leq 180$ $180 < h \leq 360$ $h > 360$	$0,0030 \text{ L}$ $0,0015 \text{ L}$ $0,0010 \text{ L}$	$80 < h \leq 180$ $180 < h \leq 360$ $h > 360$	$0,0030 \text{ L}$ $0,0015 \text{ L}$ $0,0010 \text{ L}$	$b < 150$ $b \geq 150$ $[b < 6]$ $[b \geq 6]$	$0,002 \text{ L}$ $0,001 \text{ L}$ $[1/8 \times L(\text{ft}) / 5]$ $[1/8 \times L(\text{ft}) / 10]$	$h \leq 300$ $h > 300$	$\leq 0,0015 \text{ L}$ $\leq 0,0010 \text{ L}$

# Rolling Tolerances for Beams

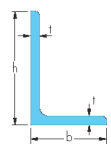
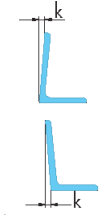
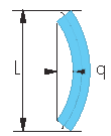
Profile	IPE, HE, UB, UC	IPN	W	JIS	
Standard	EN 10034:1993	EN 10024:1995	ASTM A6/A6M	JIS G3192:2014	
Length L (mm) [in.]	-0/+100 ±50	-0/+100 ±50	-0/+100 [-0/+4]	L ≤ 7m L > 7m	+40/-0 +(40+0.005 x (L-7))/-0
Concavity of web W (mm)				b < 400 400 ≤ b < 600 b ≥ 600	2 2.5 3
Sectional square- ness e (mm)				0.016 b or 0.016 h	
Mass G (%)	±4	±4	G < 100lbs/ft: +3.0/-2.5 G ≥ 100lbs/ft: +2.5/-2.5	t <sub>r</sub> < 10 t <sub>r</sub> ≥ 10	±5 ±4

# Rolling Tolerances for Channels

Profile	UPE, UPN, PFC, CH	C, MC	JIS			
Standard	EN 10279:2000	ASTM A6/A6M	JIS G3192:2014			
<b>Depth</b> <b>h (mm) [in.]</b>	h ≤ 65	±1.5	75 ≤ h ≤ 180 [3 ≤ h ≤ 7]	+3/-2 [+3/32 / -1/16]	h < 100	±1.5
	65 < h ≤ 200	±2	180 < h ≤ 360 [7 < h ≤ 14]	+3/-3 [+1/8 / -3/32]	65 ≤ h < 200	±2
	200 < h ≤ 400	±3	h > 360 [h > 14]	+5/-4 [+3/16 / -1/8]	200 ≤ h < 400	±3
	h > 400	±4			h ≥ 400	±4
<b>Flange width</b> <b>b (mm) [in.]</b>	b ≤ 50	±1.5	75 ≤ h ≤ 180 [3 ≤ h ≤ 7]	+3/-3 [+1/8 / -1/8]	b < 50	±1.5
	50 < b ≤ 100	±2	180 < h ≤ 360 [7 < h ≤ 14]	+3/-4 [+1/8 / -5/32]	50 ≤ b < 100	±2
	100 < b ≤ 125	±2.5	h > 360 [h > 14]	+3/-5 [+1/8 / -3/16]	100 ≤ b < 200	±3
	b > 125	±3			≥ 200	±4
<b>Web thickness</b> <b>t<sub>w</sub> (mm)</b>	t <sub>w</sub> ≤ 10	±0.5			<b>h &lt; 130</b>	
	10 < t <sub>w</sub> ≤ 15	±0.7			t < 6.3	±0.6
	15 < t <sub>w</sub>	±1.0			6.3 ≤ t < 10	±0.7
					10 ≤ t < 16	±0.8
<b>Flange thick-ness</b> <b>t<sub>f</sub> (mm)</b>	t <sub>f</sub> ≤ 10	±0.5			t ≥ 16	±1.0
	10 < t <sub>f</sub> ≤ 15	±1			<b>h ≥ 130</b>	
	15 < t <sub>f</sub>	±1.5			t < 6.3	±0.7
					6.3 ≤ t < 10	±0.8
<b>Heel radius</b> <b>r<sub>3</sub> (mm)</b>		≤ 0.3t <sub>f</sub>			10 ≤ t < 16	±1.0
					16 ≤ t < 25	±1.2
					t ≥ 25	±1.5
<b>Out-of-square</b> <b>k (k') (mm) [in.]</b>	b ≤ 100	k + k' ≤ 2		k + k' ≤ 0.03 b		≤ 0.025 b
	b > 100	k + k' ≤ 0.025 b		[k + k' ≤ 1/32 b]		
<b>Web deforma-tion</b> <b>f (mm)</b>	h ≤ 100	±0.5				
	100 < h ≤ 200	±1				
	200 < h ≤ 400	±1.5				
	400 < h	±1.5				
<b>Straightness</b> <b>q<sub>yy</sub>/q<sub>zz</sub> (mm) [in.]</b>	<b>q<sub>zz</sub></b>			<b>q<sub>yy</sub> ≤ 0.002 L</b>		≤ 0.030 L
	h ≤ 150	±0.0030 L		[q <sub>yy</sub> ≤ 1/8 x L(ft)/5]		
	150 < h ≤ 300	±0.0020 L				
	300 < h	±0.0015 L				
	<b>q<sub>yy</sub></b>					
	h ≤ 150	±0.0050 L				
150 < h ≤ 300	±0.0030 L					
300 < h	±0.0020 L					
<b>Length</b> <b>L (mm) [in.]</b>	-0/+ 100			-0/+ 100	L ≤ 7m	+40/-0
	±50			[-0/+4]	L > 7m	+(40+0.005 x (L-7))/-0
<b>Mass</b> <b>G (%)</b>	h ≤ 125	±6		±2.5	t <sub>f</sub> < 10	±5
	h > 125	±4			t <sub>f</sub> ≥ 10	±4



# Rolling Tolerances for Angles

Profile	L		L		JIS	
Standard	EN 10056-2:1993		ASTM A6/A6M		JIS G3192:2014	
<b>Width</b> <b>h, b (mm) [in.]</b> 	Equal legs: h,b≤50 50<h,b≤100 100<h,b≤150 150<h,b≤200 h,b>200	±1 ±2 ±3 ±4 +6 / -4	h,b≤25 25<h,b≤51 51<h,b≤64 64<h,b≤102 102<h,b≤152 152<h,b≤203 203<h,b≤254 h,b>254	+1/-1 +1/-1 +2/-2 +3/-2 +3/-3 +5/-3 +6/-6 +6/-10	h,b<50 50≤h,b<100 100≤h,b<200 ≥200	±1.5 ±2 ±3 ±4
	Unequal legs: h≤50 50<h≤100 100<h≤150 150<h≤200 h>200	±1 ±2 ±3 ±4 +6 / -4	[h,b≤1] [1<h,b≤2] [2<h,b≤2,5] [2,5<h,b≤4] [4<h,b≤6] [6<h,b≤8] [8<h,b≤10] [h,b>10]	[+1/32 / -1/32] [+3/64 / -3/64] [+1/16 / -1/16] [+1/8 / -3/32] [+1/8 / -1/8] [+3/16 / -1/8] [+1/4 / -1/4] [+1/4 / -3/8]		
<b>Thickness</b> <b>t (mm)</b>	≤5 5<t≤10 10<t≤15 t>15	±0.5 ±0.75 ±1.0 ±1.2	h,b≤25 25<h,b≤51 51<h,b≤64 [h,b≤1] [1<h,b≤2] [2<h,b≤2.5]	t≤10;±0.2 t≤10;±0.2; t>10;±0.3 t≤5;±0.3; t>5;±0.4 [t≤3/16; ±0.008; 3/16<t≤3/8;±0.010] [t≤3/8; ±0.010; t>3/8;±0.012] [t≤3/16; ±0.012; t>3/16;±0.015]	h<130 t<6.3 6.3≤t<10 10≤t<16 t≥16 h≥130 t<6.3 6.3≤t<10 10≤t<16 16≤t<25 t≥25	±0.6 ±0.7 ±0.8 ±1.0 ±0.7 ±0.8 ±1.0 ±1.2 ±1.5
	Out-of-square <b>k (mm) [in.]</b> 	h≤100 100<h≤150 150<h≤200 h>200	1 1.5 2 3		0.026 h [3/128 h]	≤0.025 b
<b>Straightness</b> <b>q<sub>yy</sub>/q<sub>zz</sub> (mm) [in.]</b> 	h≤150 150<h≤200 h>200	0.004 L 0.002 L 0.001 L	h<75 [h<3] h≥75	q <sub>yy</sub> ≤0,004 L [q <sub>yy</sub> ≤1/4 inch per any 5ft or 1/4 x L (ft)/5] q <sub>yy</sub> ≤0,002 L	≤0.030 L	
	<b>Length</b> <b>L (mm) [in.]</b>	-0/+ 100 ±50			-0/+ 100 [-0/+4]	L≤7m L>7m +40/-0 +(40+0.005 x (L-7))/-0
<b>Mass</b> <b>G (%)</b>	t≤4 t>4	±6 ±4	h≥75 [h≥3]	G<100lbs/ft : +3.0/-2.5 G≥100lbs/ft : +2.5/-2.5	t <sub>c</sub> <10 t <sub>c</sub> ≥10	±5 ±4

# Rolling Tolerances for Merchant Bars

Profile		Flat					
Standard		EN 10058:2003		ASTM A6/A6M		JIS G3194:1998	
<b>Width</b> <b>b (mm) [in.]</b>		10 ≤ b ≤ 40	±0.75	≤ 25	±0.5	b < 50	±0.8
		40 < b ≤ 80	±1	25 < b ≤ 50	±1.0	b ≥ 50	±1.6% (max. 3.5mm)
		80 < b ≤ 100	±1.5	50 < b ≤ 100	+1.5/-1.0		
		100 < b ≤ 120	±2	100 < b ≤ 150	+2.5/-1.5		
		120 < b ≤ 150	±2.5	150 < b ≤ 200	+3.0/-2.5		
				[≤ 1]	[±1/64]		
				[1 < b ≤ 2]	[±1/32]		
				[2 < b ≤ 4]	[+1/16/ -1/32]		
				[4 < b ≤ 6]	[+3/32/ -1/16]		
				[6 < b ≤ 8]	[+1/8/ -3/32]		
<b>Thickness/ Diameter</b> <b>a, d (mm) [in.]</b>		a ≤ 20	±0.5			t < 6	±0.3
		20 < a ≤ 40	±1			6 ≤ t < 12	±0.4
		40 < a ≤ 80	±1.5			12 ≤ t < 15	±0.5
						15 ≤ t < 20	±0.6
						20 ≤ t < 25	±0.8
						25 ≤ t < 40	±1.0
<b>Heel radius</b> <b>r<sub>3</sub> (mm)</b>							
<b>Out-of-square</b> <b>u (mm) [in.]</b>		10 ≤ a ≤ 25	±0.5				
		25 < a ≤ 40	±1				
		40 < a ≤ 80	±1.5				
<b>Straightness</b> <b>q (mm) [in.]</b>		bxa < 1000mm <sup>2</sup>	q ≤ 0.0040L			0.003 L	
		bxa ≥ 1000mm <sup>2</sup>	q ≤ 0.0025L			(max. 10mm)	
<b>Flatness</b> <b>q (mm)</b>						b ≥ 150,	0.003 b
						d ≤ 50	
<b>Length</b> <b>L (mm) [in.]</b>		±100		-0/+100		+100/-0	
				[-0/+4]			
<b>Mass</b> <b>G (%)</b>							

# Rolling Tolerances for Merchant Bars

Square		Round		Square and Round			
EN 10059:2003		EN 10060:2003		JIS G3191:2012		ASTM A6/A6M	
35<a≤50	±0.8						
50<a≤90	±1.0						
90<a≤100	±1.3						
100<a≤120	±1.5						
120<a≤150	±1.8						
		10≤d≤15	±0.4	d<16	±0.4	d≤7	±0.13
		15<d≤25	±0.5	16≤d<28	±0.5	7<d≤11	±0.15
		25<d≤35	±0.6	d≥28	±1.8%	11<d≤15	±0.18
		35<d≤50	±0.8			15<d≤19	±0.20
		50<d≤80	±1.0			19<d≤250	±1%
		80<d≤100	±1.3				
		100<d≤120	±1.5				
30<a≤50	≤2.5						
50<a≤100	≤3						
a>100	≤4						
a≤50	±1.5			Not more than 70% of tolerance range of diameter		d≤7	±0.20
50<a≤75	±2.25					7<d≤11	±0.22
75<a≤100	±3.0					11<d≤15	±0.27
100<a≤150	±4.5					15<d≤19	±0.30
						19<d≤250	±1.5%
25<a≤80	0.0040 L	25<d≤80	q≤0.0040L				
80<a	0.0025 L	80<d≤250	q≤0.0025L				
		±100		L≤7m	+40/-0	-0/+100	
				L>7m	+(40+0.005 x (L-7))/-0	[-0/+4]	
				t<10	±7		
				10≤t<16	±5		
				16≤t<28	±4		
				b≥28	±3.5		
±4							




# Rolling Tolerances for Plates

Standard	EN 10029:2010					
<b>Thickness</b> t (mm) [in.]		$3 \leq t < 5$ $5 \leq t < 8$ $8 \leq t < 15$ $15 \leq t < 25$ $25 \leq t < 40$ $40 \leq t < 80$ $80 \leq t < 150$ $150 \leq t < 250$	<b>Class A</b> +0.8/ -0.4 +1.1/ -0.4 +1.2/ -0.5 +1.3/ -0.6 +1.4/ -0.8 +1.8/ -1.0 +2.2/ -1.0 +2.4/ -1.2	<b>Class B</b> +0.9/ -0.3 +1.2/ -0.3 +1.4/ -0.3 +1.6/ -0.3 +1.9/ -0.3 +2.5/ -0.3 +2.9/ -0.3 +3.3/ -0.3	<b>Class C</b> +1.2/ -0 +1.5/ -0 +1.7/ -0 +1.9/ -0 +2.2/ -0 +2.8/ -0 +3.2/ -0 +3.6/ -0	<b>Class D</b> ±0.6 ±0.75 ±0.85 ±0.92 ±1.1 ±1.4 ±1.6 ±1.8
<b>Width</b> b (mm) [in.]		$600 \leq b < 2000$ $2000 \leq b < 3000$ $b \geq 3000$		+20/ -0 +25/ -0 +30/ -0		
<b>Out-of-square</b> u (mm) [in.]			$L - [(A-B)/2] \geq L$			
<b>Straightness</b> q (mm) [in.]			$q \leq 0.0025 L$ $q \leq 0.004 L$ for cut lengths			
<b>Flatness (Class N, Type L)</b> q (mm)		$3 \leq t < 5$ $5 \leq t < 8$ $8 \leq t < 15$ $15 \leq t < 25$ $25 \leq t < 40$ $40 \leq t < 250$ $40 \leq t < 80$	<b>1000</b> 9 8 7 7 6 5	<b>2000</b> 14 12 11 10 9 8		
<b>Length</b> L (mm) [in.]		$L < 4000$ $4000 \leq L < 6000$ $6000 \leq L < 8000$ $8000 \leq L < 10000$ $10000 \leq L < 15000$ $15000 \leq L \leq 20000$		+20/ -0 +30/ -0 +40/ -0 +50/ -0 +75/ -0 +100/ -0		
<b>Mass</b> G (%)						

# Rolling Tolerances for Plates

Standard	ASTM A6/A6M											
<b>Thickness</b> t (mm) [in.]		<b>b</b>	<b>1200≥b</b>	<b>1500≥b</b>	<b>1800≥b</b>	<b>2100≥b</b>	<b>2400≥b</b>	<b>2700≥b</b>	<b>3000≥b</b>	<b>3300≥b</b>	<b>3600≥b</b>	<b>b</b>
		<1200	<1500	<1800	<2100	<2400	<2700	<3000	<3300	<3600	<4200	≥4200
t<6		+0.8	+0.8	+0.8	+0.8	+0.8	+0.8	+0.9	+1.0	+1.1		
6≤t<8		+0.8	+0.8	+0.8	+0.8	+0.8	+0.8	+0.9	+1.0	+1.2	+1.4	
8≤t<10		+0.8	+0.8	+0.8	+0.8	+0.8	+0.8	+1.0	+1.0	+1.3	+1.5	+1.7
10≤t<12		+0.8	+0.8	+0.8	+0.8	+0.8	+0.9	+1.0	+1.0	+1.3	+1.5	+1.8
12≤t<16		+0.8	+0.8	+0.8	+0.8	+0.9	+0.9	+1.0	+1.1	+1.3	+1.5	+1.8
16≤t<20		+0.8	+0.8	+0.8	+0.8	+0.9	+1.0	+1.2	+1.2	+1.4	+1.6	+2.0
20≤t<25		+0.9	+0.9	+1.0	+1.0	+1.0	+1.2	+1.3	+1.5	+1.5	+1.8	+2.2
25≤t<50		+1.8	+1.8	+1.8	+2.0	+2.0	+2.3	+2.5	+3.0	+3.0	+3.3	+3.8
50≤t<100		+3.3	+3.3	+3.3	+3.3	+3.5	+3.8	+3.8	+3.8	+3.8	+4.4	+4.4
100≤t<150		+4.5	+4.5	+4.5	+4.5	+4.5	+4.5	+4.5	+4.5	+4.5	+5.6	+5.6
150≤t<250		+5.8	+5.8	+6.0	+6.0	+6.0	+6.0	+6.0	+6.0	+6.0	+7.0	+7.0
Permitted variation under specified thickness: <b>-0.3mm</b>												
<b>Width</b> b (mm) [in.]		<b>t&lt;10.5</b>	<b>t&lt;16</b>	<b>t&lt;25</b>	<b>t≤50</b>							
b<1500		+14/ -6	+19/ -6	+22/ -6	+25/ -6							
1500≤b<2100		+19/ -6	+22/ -6	+25/ -6	+29/ -6							
2100≤b<2700		+19/ -6	+22/ -6	+25/ -6	+32/ -6							
b≥2700		+25/ -6	+29/ -6	+32/ -6	+35/ -6							
<b>Out-of-square</b> u (mm) [in.]												
<b>Straightness</b> q (mm) [in.]	b≤750	q≤0.0033 L										
750<b≤1500	q≤0.004 L											
<b>Flatness</b> q (mm)		<b>b</b>	<b>900≥b</b>	<b>1200≥b</b>	<b>1500≥b</b>	<b>1800≥b</b>	<b>2100≥b</b>	<b>2400≥b</b>	<b>2700≥b</b>	<b>3000≥b</b>	<b>3600≥b</b>	<b>b</b>
		<900	<1200	<1500	<1800	<2100	<2400	<2700	<3000	<3600	<4200	≥4200
t<6		14	19	24	32	35	38	41	44	48		
6≤t<10		13	16	19	24	29	32	35	38	41		
10≤t<12		13	14	16	16	19	22	25	29	32	48	54
12≤t<20		11	13	14	16	16	19	25	25	29	38	51
20≤t<25		11	13	14	16	16	16	19	22	25	35	44
25≤t<50		10	13	13	14	14	16	22	16	18	29	38
50≤t<100		8	10	11	13	13	13	24	14	16	22	29
100≤t<150		10	11	13	13	14	14	25	19	22	22	25
150≤t<200		11	13	11	16	19	19	25	22	25	25	25
<b>Length</b> L (mm) [in.]		<b>t&lt;10.5</b>	<b>t&lt;16</b>	<b>t&lt;25</b>	<b>t≤50</b>							
L<3000		+22/ -6	+25/ -6	+29/ -6	+32/ -6							
3000≤L<6000		+25/ -6	+29/ -6	+32/ -6	+35/ -6							
6000≤L<9000		+29/ -6	+32/ -6	+35/ -6	+44/ -6							
9000≤L<12000		+35/ -6	+38/ -6	+41/ -6	+48/ -6							
12000≤L<15000		+38/ -6	+41/ -6	+44/ -6	+48/ -6							
15000≤L<18000		+44/ -6	+51/ -6	+57/ -6	+64/ -6							
L≥18000		+51/	+60/ -6	+64/ -6	+76/ -6							
<b>Mass</b> G (%)												

# Rolling Tolerances for Plates

Standard		JIS G3193:2005					
Thickness t (mm) [in.]		b	1600≥b	2000≥b	2500≥b	3150≥b	4000≥b
		<1600	<2000	<2500	<3150	<4000	<5000
t<1.25		±0.16					
1.25≤t<1.60		±0.18					
1.60≤t<2.00		±0.19	±0.23				
2.00≤t<2.50		±0.20	±0.25				
2.50≤t<3.15		±0.22	±0.29	±0.29			
3.15≤t<4.00		±0.24	±0.34	±0.34			
4.00≤t<5.00		±0.45	±0.55	±0.55	±0.65		
5.00≤t<6.30		±0.50	±0.60	±0.60	±0.75	±0.75	±0.85
6.30≤t<10.0		±0.55	±0.65	±0.65	±0.80	±0.80	±0.90
10.0≤t<16.0		±0.55	±0.65	±0.65	±0.80	±0.80	±1.00
16.0≤t<25.0		±0.65	±0.75	±0.75	±0.95	±0.95	±1.10
25.0≤t<40.0		±0.70	±0.80	±0.80	±1.00	±1.00	±1.20
40.0≤t<63.0		±0.80	±0.95	±0.95	±1.10	±1.10	±1.30
63.0≤t<100		±0.90	±1.10	±1.10	±1.30	±1.30	±1.50
100≤t<160		±1.30	±1.50	±1.50	±1.70	±1.70	±1.90
160≤t<200		±1.60	±1.80	±1.80	±1.90	±1.90	±2.10
200≤t<250		±1.80	±1.90	±1.90	±2.00	±2.00	±2.20

Width b (mm) [in.]		Mill Edge		Cut Edge		
		As rolled	Coil or sheet	A (Normal)	B (Re-heard)	C (Slit)
b<160	t<3.15			+5/-0	+2.0/-0	±0.3
	3.15≤t<6.00			+5/-0	+3.0/-0	±0.5
	6.00≤t<20.0		±2	+10/-0	+4.0/-0	
	t≥20.0			+10/-0		
160≤b<250	t<3.15			+5/-0	+2.0/-0	±0.4
	3.15≤t<6.00			+5/-0	+3.0/-0	±0.5
	6.00≤t<20.0		±2	+10/-0	+4.0/-0	
	t≥20.0			+15/-0		
250≤b<400	t<3.15			+5/-0	+2.0/-0	±0.5
	3.15≤t<6.00			+5/-0	+3.0/-0	±0.5
	6.00≤t<20.0	+Not specified/-0	±5	+10/-0	+4.0/-0	
	t≥20.0			+15/-0		
400≤b<630	t<3.15			+10/-0	+3.0/-0	±0.5
	3.15≤t<6.00	+Not specified/-0		+10/-0	+3.0/-0	±0.5
	6.00≤t<20.0		+20/-0	+10/-0	+5.0/-0	
	t≥20.0			+15/-0		
630≤b<1000	t<3.15			+10/-0	+4.0/-0	
	3.15≤t<6.00	+Not specified/-0		+10/-0	+4.0/-0	
	6.00≤t<20.0		+25/-0	+10/-0	+6.0/-0	
	t≥20.0			+15/-0		

# Rolling Tolerances for Plates

Standard		JIS G3193:2005					
<b>Width</b> <b>b (mm) [in.]</b>	1000 ≤ b < 1250	t < 3.15 3.15 ≤ t < 6.00 6.00 ≤ t < 20.0 t ≥ 20.0	+Not specified/ -0	+30/ -0	+10/ -0 +10/ -0 +15/ -0 +15/ -0	+4.0/ -0 +4.0/ -0 +6.0/ -0	
	1250 ≤ b < 1600	t < 3.15 3.15 ≤ t < 6.00 6.00 ≤ t < 20.0 t ≥ 20.0	+Not specified/ -0	+35/ -0	+10/ -0 +10/ -0 +15/ -0 +15/ -0	+4.0/ -0 +4.0/ -0 +6.0/ -0	
	1600 ≤ b < 2000	t < 3.15 3.15 ≤ t < 6.00 6.00 ≤ t < 20.0 t ≥ 20.0	+Not specified/ -0	+40/ -0	+10/ -0 +10/ -0 +20/ -0 +20/ -0	+4.0/ -0 +4.0/ -0 +6.0/ -0	
	2000 ≤ b < 3000	t < 3.15 3.15 ≤ t < 6.00 6.00 ≤ t < 20.0 t ≥ 20.0	+Not specified/ -0	+40/ -0	+10/ -0 +10/ -0 +20/ -0 +20/ -0	+4.0/ -0 +4.0/ -0 +6.0/ -0	
	3000 ≤ b	t < 3.15 3.15 ≤ t < 6.00 6.00 ≤ t < 20.0 t ≥ 20.0	+Not specified/ -0	+40/ -0	+10/ -0 +10/ -0 +25/ -0 +25/ -0	+4.0/ -0 +4.0/ -0 +6.0/ -0	
<b>Straightness</b> <b>q (mm) [in.]</b>			q ≤ 0.002 L				
<b>Length</b> <b>L (mm) [in.]</b>							
	600 ≤ L < 4000				+20/ -0		
	4000 ≤ L < 6000				+30/ -0		
	6000 ≤ L < 8000				+40/ -0		
	8000 ≤ L < 10000				+50/ -0		
	10000 ≤ L < 15000				+75/ -0		
	15000 ≤ L < 20000				+100/ -0		
	L ≥ 20000				+0.5%/ -0		

# Rolling Tolerances for Hollow Sections

Profile	Circular		Square and Rectangular		Circular		Square and Rectangular	
Standard	EN 10219:2006				ASTM A500			
<b>Outside Diameter</b> D, B, H (mm) [in.]	±1% (min. ±0.5 mm; max. ±1.0 mm)		H, B < 100  100 ≤ H, B ≤ 200 H, B > 200	±1% (min. ±0.5)  ±0.8%  ±0.6%	D ≤ 48.3 [1.9] D ≥ 50.8 [2.0]	±0.5%  ±0.75%	B, H ≤ 63.5 63.5 < B, H ≤ 88.9 88.9 < B, H ≤ 139.7 B, H ≥ 139.7 [B, H ≤ 2 1/2] [2 1/2 < B, H ≤ 3 1/2] [3 1/2 < B, H ≤ 5 1/2] [B, H ≥ 5 1/2]	±0.51 ±0.64 ±0.76 ±0.01H [0.020] [0.025] [0.030] [0.01H]
<b>Thickness</b> T (mm)	D ≤ 406.4  D > 406.4	T ≤ 5; ±10% T > 5; ±0.5 ±10% (max. ±2 mm)	T ≤ 5; ±10% T > 5; ±0.5		±10%			
<b>Out-of-round</b> O (mm) [in.]	2% for diameter to thickness ratio ≤ 100							
<b>Concavity/convexity</b> x <sub>1</sub> , x <sub>2</sub> (mm)					Max. 0.8% (min. 0.5mm)			
<b>Squareness of side</b> U					90° ± 1°		90° ± 2°	
<b>External corner profile</b> C1, C2, R (mm)					T ≤ 6 6 < T ≤ 10 T > 10	1.6T - 2.4T 2.0T - 3.0T 2.4T - 3.6T	≤ 3T	
<b>Twist</b> V (mm)					2.0 + 0.5/m		H ≤ 38.1 38.1 < H ≤ 63.5 63.5 < H ≤ 101.6 101.6 < H ≤ 152.4 152.4 < H ≤ 203.2 H > 203.2	1.39/m 1.72/m 2.09/m 2.42/m 2.78/m 3.11/m
<b>Straightness</b> e (mm) [in.]	0.002 L L > 1m: 3		0.0015 L L > 1m: 3		10.4 L (m) [1/8 L (ft)]			
<b>Length</b> L (mm) [in.]	L < 6000 6000 ≤ L ≤ 10000 L > 10000		+5/ -0 +15/ -0 +5/ -0 +1/m		L ≤ 6700 L > 6700 [L ≤ 22 ft] [L > 22 ft]		+12.7/ -6.4 +19.0/ -6.4 [+1/2/ -1/4] [+3/4/ -1/4]	
<b>Mass</b> G (%)					±6			

# Rolling Tolerances for Pipes

Profile	EN 10255:2004		ASTM A53		ASTM A106		API 5L	
<b>Standard</b>	EN 10255:2004		ASTM A53		ASTM A106		API 5L	
<b>Outside Diameter</b> D, B, H (mm) [in.]	As per specified range in standard		D ≤ 48.3 D ≥ 60.33	±0.4 ±1%	10.29 ≤ D ≤ 48.26 48.26 < D ≤ 114.3 114.3 < D ≤ 219.0 219.0 < D ≤ 457.2 457.2 < D ≤ 660.4	±0.40 ±0.79 +1.59/ -0.79 +2.38/ -0.79 +3.18/ -0.79	D ≤ 273.05 273.05 < D ≤ 508 508 < D ≤ 1066.8 D > 1066.8	+1.59/ -0.40 +2.38/ -0.79 +2.38/ -0.79 +2.38/ -0.79
<b>Thickness</b> T (mm)	M, H, L L1, L2 Seamless	±10% ±8% ±12.5%	±12.5%		±12.5%		D ≤ 73.03 73.03 < D < 508 D ≥ 508 (Welded) D ≥ 508 (Seamless)	+20/ -12.5 +15/ -12.5 +17.5/ -12.5 +15/ -12.5
<b>Out-of-round</b> O (mm) [in.]	Included in diameter tolerance						D > 508	±1%
<b>Straightness</b> e (mm) [in.]	D ≥ 33.7	0.002 L						
<b>Length</b> L (mm) [in.]	L < 6m 6m ≤ L ≤ 12m L > 12m	+10/ -0 +15/ -0 to order						
<b>Mass</b> G (%)	M, H, L L1, L2	±7.5 +10/ -8	±10		+10/ -3.5		+10/ -3.5	