BS EN 10278 : 1999
Dimensions and tolerances of bright steel products

Tolerances on dimensions and shape

Tolerances on dimensions (diameter, thickness, width)

Tolerances on dimensions shall be as specified by the purchaser at the time of enquiry and order and shall be in accordance with ISO 286-2 as set out in table 1.

Unless otherwise specified at the time of enquiry and order tolerances on dimensions shall be as follows:

a) for drawn round bars, other than those under e), or turned bars : h10 according to table 2;

b) for hexagon and square drawn bars: h11 for dimensions ≤ 80mm, h12 for dimensions >80mm, according to tables 1 and 2;

c) for drawn flats: in accordance with table 3;

d) for ground products: h9 in accordance with tables 1 and 2;

e) for drawn round bars in the final quenched and tempered condition: h11, according to tables 1 to 3.

Where specified by the purchaser at the time of enquiry and order, the disposition tolerances specified in table 2 shall be in accordance with A.1.

Types of length and length tolerances

Unless otherwise agreed at the time of enquiry and order, the length and the tolerance on length shall be as specified in table 5.

Out of round

Maximum deviation from "Out of round" shall be not more than half the specified tolerance and in any case never above the upper limit of the tolerance.

Straightness tolerance

Where specified at the time of enquiry and order and in cases of dispute, an agreed number of bars shall be evaluated for straightness in accordance with one of the methods specified in annex B and the tolerances specified in table 4 shall apply.

Edges of non-round bars

Non-round bars (i.e. square, hexagon and flat) in widths ≤150mm may have an undefined profile within a distance of 0.2mm of the hypothetical edge, flats in widths >150mm within a distance of 0.5mm, unless otherwise agreed. For widths >150mm the corner profile may be undefined within a distance of 0.5mm of the hypothetical edge, unless sharp corners have specifically been ordered.

Table 1. Tolerance class according to finished condition

Finished condition	Tolerance class to ISO 286-2						
	h6	h7	h8	h9	h10	h11	h12
Drawn				R	R	R,S,H	R,S,H
Turned				R	R	R	R
Ground	R	R	R	R	R	R	R
Polished	R	R	R	R	R	R	R

R=round, S=square, H=hexagon

Table 2. Tolerances classes

Nominal dimension mm	Tolerance class to ISO 286-2 (1)						
	h6	h7	h8	h9	h10	h11	h12
>1 to <3	0.006	0.010	0.014	0.025	0.040	0.060	0.100
>3 to <6	0.008	0.012	0.018	0.030	0.048	0.075	0.120
>6 to <10	0.009	0.015	0.022	0.036	0.058	0.090	0.150
>10 to <18	0.011	0.018	0.027	0.043	0.070	0.110	0.180
>18 to <30	0.013	0.021	0.033	0.052	0.084	0.130	0.210
>30 to <50	0.016	0.025	0.039	0.062	0.100	0.160	0.250
>50 to <80	0.019	0.030	0.046	0.074	0.120	0.190	0.300
>80 to <120	0.022	0.035	0.054	0.087	0.140	0.220	0.350
>120 to <180	0.025	0.040	0.063	0.100	0.160	0.250	0.400
>180 to <200	0.029	0.046	0.072	0.115	0.185	0.290	0.460

(1) The above deviation values are negatively disposed about the nominal dimension. For example a 20mm nominal diameter having a tolerance class h9 is 20mm + 0, -0,052mm or 19,948/20,000mm

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Table 3. Tolerances for drawn flats

Width mm	Deviation mm	mm	ISO 286-2 class
≤18	+0	-0.11	h11
>18 to ≤30	+0	-0.13	h11
>30 to ≤50	+0	-0.16	h11
>50 to ≤80	+0	-0.19	h11
>80 to ≤100	+0	-0.22	h11
>100 to ≤150	+0.50	-0.50	
>150 to ≤200	+1.00	-1.00	
>200 to ≤300	+2.00	-2.00	
>300 to ≤400	+2.50	-2.50	

Thickness mm	Deviation (1) (2) mm	ISO 286-2 class
>3 to ≤6	-0.075	h11
>6 to ≤10	-0.090	h11
>10 to ≤18	-0.11	h11
>18 to ≤30	-0.13	h11
>30 to ≤50	-0.16	h11
>50 to ≤60	-0.19	h11
>60 to ≤80	-0.30	h12
>80 to ≤100	-0.35	h12

(1) All deviations are +0. (2) The tolerances in the table apply to low carbon (C≤0.20%) and low carbon free-cutting steels only. For all other steels, deviation is increased by 50%

Table 5. Types of length and length tolerances

Type of length	Length mm	Length tolerance mm	To be stated on order
Manufacturing length	3 000 to 9 000 (1)	±500	Length (1)
Stock length	3 000 (1) or 6 000	0. +200 0. +200	e.g. stock 6 000
Cut to length	Up to 9 000	Corresponding to specifications with ± 5 minimum	Length and tolerance

(1) Short bars each bundle may contain a percentage of short bars.
- Dimensions ≤25mm: the percentage is 5% maximum, the length of these short bars being at the minimum two thirds the nominal length ordered.
- Dimensions >25mm: the percentage is 10% maximum, with the same restriction on the minimum length.

If specially stated at the time of enquiry and order, the bundles are delivered without any short bars.

Table 4. Deviation from straightness (1)

Product form	Steel group	Nominal dimension	Deviation max.mm
Rounds	<0.25%C		1.0
	≥0.25%C, alloy steels, quenched and tempered steels		1.5
	Stainless steels, ball and roller bearing steels, tool steels		1.0
Squares and hexagons	<0.25%C	$d \leq 75$mm	1.0
	≥0.25%C, alloy steels, quenched and tempered steels	$d \leq 75$mm	2.0
	Stainless steels, ball and roller bearing steels, tool steels	$d \leq 75$mm	1.0
	<0.25%C	$d > 75$mm	1.5
	≥0.25%C, alloy steels, quenched and tempered steels	$d > 75$mm	2.5
	Stainless steels, ball and roller bearing steels, tool steels	$d > 75$mm	1.5
Flats		$w < 120$mm	on width:
	<0.25%C		1.5
	≥0.25%C, alloy steels, quenched and tempered steels		1.5
	Stainless steels, ball and roller bearing steels, tool steels		1.5
		$w < 120$mm	on thickness:
	<0.25%C		1.5
	≥0.25%C, alloy steels, quenched and tempered steels		2.0
	Stainless steels, ball and roller bearing steels, tool steels		2.0
	<0.25%C		1.5
	≥0.25%C, alloy steels, quenched and tempered steels	w/t<10:1	2.0
	Stainless steels, ball and roller bearing steels, tool steels		2.0
		$w \geq 120$mm	on thickness:
	<0.25%C		
	≥0.25%C, alloy steels, quenched and tempered steels	w/t<10:1	2.5
	Stainless steels, ball and roller bearing steels, tool steels		2.5
		$W \geq 120$mm	on width:
	<0.25%C		2.0
	≥0.25%C, alloy steels, quenched and tempered steels	w/t≥10:1	2.5
	Stainless steels, ball and roller bearing steels, tool steels		2.5
		$W \geq 120$mm	on thickness:
	<0.25%C		2.5
	≥0.25%C, alloy steels, quenched and tempered steels	w/t≥10:1	3.0
	Stainless steels, ball and roller bearing steels, tool steels		3.0

(1) For the method of evaluating straightness see annex B.