SMS DEMAG

Dimensions and tolerances of bright steel products

English version of DIN EN 10278

DIN EN 10278

ICS 77.140.60

Maße und Grenzabmaße von Blankstahlerzeugnissen

Supersedes DIN 174, June 1969 edition, DIN 175, October 1981 edition, DIN 176, February 1972 edition, DIN 178, June 1969 edition, DIN 668 to DIN 671, and DIN 59360 and DIN 59361, October 1981 editions.

European Standard EN 10278 : 1999 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been prepared by ECISS/TC 23.

The responsible German body involved in its preparation was the *Normenausschuss Eisen und Stahl* (Steel and Iron Standards Committee).

Amendments

DIN 174, June 1969 edition, DIN 175, October 1981 edition, DIN 176, February 1972 edition, DIN 178, June 1969 edition, DIN 668 to DIN 671, and DIN 59360 and DIN 59361, October 1981 editions, have been superseded by the specifications of DIN EN 10287.

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EUROPEAN STANDARD
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EN 10278

October 1999

ICS 77.140.60

English version

Dimensions and tolerances of bright steel products

Dimensions et tolérances des produits en acier transformé à froid

Maße und Grenzabmaße von Blankstahlerzeugnissen

This European Standard was approved by CEN on 1999-09-03.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 10278 : 1999 E

Contents

Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 23 "Steels for heat treatment, alloy steels and free-cutting steels - Qualities and dimensions", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by April 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. This European Standard is considered to be a supporting standard to those application and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard applies to bright steel products in the drawn, turned or ground condition delivered in straight lengths.

It does not cover cold rolled products and cut lengths produced from strip or sheet by cutting.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10079	Definition of steel products
EN 10088-3	Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes
EN 10204	Metallic products - Types of inspection documents
EN 10277-1	Bright steel products - Technical delivery conditions - Part 1: General
EN 10277-3	Bright steel products - Technical delivery conditions - Part 3: Free-cutting steels
ISO 286-2	ISO system of limits and fits - Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts

3 Definitions

For the purpose of this European Standard the following definition applies in addition to the definitions in EN 10079 for drawn products.

3.1 Out of round: The difference between the least and greatest dimension measured across the pairs of opposing points at a common cross section.

4 Information to be supplied by the purchaser

4.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) the quantity (mass, number of bars) to be delivered;

b) the shape of the product (e. g. round, hexagon, square, flat);

c) the number of this European Standard (EN 10278);

d) the dimensions and tolerances on dimensions and shape;

e) reference to the material standard including the number of the part (e. g. EN 10277-3);

f) steel name or steel number;

g) the finished condition (see 5.1);

h) the class of surface quality (see EN 10277-1) where appropriate;

EXAMPLE 1:

2t rounds EN 10278 - 20 h9 x stock 6000
EN 10277-3-38SMn28+C - class 3
or
2t rounds EN 10278 - 20 h9 x stock 6000
EN 10277-3-1.0760+C - class 3

EXAMPLE 2:

10t rounds EN 10278 - 50 h8 x stock 3000
EN 10088-3-X5CrNi18-10+2P - class 2
or
10t rounds EN 10278 - 50 h8 x stock 3000
EN 10088-3-1.4301+2P - class 2

4.2 Supplementary information

The following supplementary information may be supplied by the purchaser and as agreed with the manufacturer:

a) disposition of tolerances (see A.1);
b) end condition (see A.2);
c) straightness (see 6.4);
d) if required, the type of inspection document in accordance with EN 10204.

5 Condition of delivery

5.1 Finished condition

The steel product shall be delivered in one or combination of the following finished conditions with or without heat treatment:

a) drawn, symbol +C;
b) turned, symbol +SH;
c) ground, symbol +SL;
d) polished, symbol +PL.

5.2 End condition

Unless otherwise agreed at the time of enquiry and order, the method of cutting shall be left at the discretion of the manufacturer.

Where specified at the time of enquiry and order, end conditions may be specified in accordance with A.2.

6 Tolerances on dimensions and shape

6.1 Tolerances on dimensions (diameter, thickness, width)

6.1.1 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.

6.1.2 Unless otherwise specified at the time of enquiry and order (see 6.3) tolerances on dimensions shall be as follows:

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

b) for hexagon and square drawn bars: h11 for dimensions ≤ 80 mm, h12 for dimensions > 80 mm 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.

6.1.3 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.

6.2 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.

6.3 Out of round

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

6.4 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.

6.5 Edges of non-round bars

Non-round bars (i. e. square, hexagon and flat) in widths ≤ 150 mm may have an undefined profile within a distance of 0,2 mm of the hypothetical edge, flats in widths > 150 mm within a distance of 0,5 mm, unless otherwise agreed. For widths > 150 mm the corner profile may be undefined within a distance of 0,5 mm of the hypothetical edge, unless sharp corners have specifically been ordered.

7 Inspection and testing

A sufficient number of samples shall be inspected for dimensional compliance.

Dimensional inspection shall be carried out as follows:

a) for round bars: not less than 150 mm from the end of the bar;

b) for round bars cut to length: not less than 10 mm from the end of the bar;

c) for shapes other than round: not less than 25 mm from the end of the bar.

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: Tolerance 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 20 mm nominal diameter having a tolerance class h9 is 20 mm + 0, - 0,052 mm or 19,948/20,000 mm							

Table 3: Tolerance for drawn flats

Width mm	Deviation		ISO 286-2 Class
	mm	mm	
≤ 18	+ 0	-0,11	h11
> 18 ≤ 30	+ 0	-0,13	h11
> 30 ≤ 50	+ 0	-0,16	h11
> 50 ≤ 80	+ 0	-0,19	h11
> 80 ≤ 100	+ 0	-0,22	h11
> 100 ≤ 150	+ 0,50	-0,50	
> 150 ≤ 200	+ 1,00	-1,00	
> 200 ≤ 300	+ 2,00	-2,00	
> 300 ≤ 400	+ 2,50	-2,50	
Thickness	Deviation[1)2)]		
mm	mm		
> 3 ≤ 6	-0,075		h11
> 6 ≤ 10	-0,090		h11
> 10 ≤ 18	-0,11		h11
> 18 ≤ 30	-0,13		h11
> 30 ≤ 50	-0,16		h11
> 50 ≤ 60	-0,19		h11
> 60 ≤ 80	-0,30		h12
> 80 ≤ 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 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 ≤ 75 mm	1,0
	≥ 0,25 % C, alloy steels, quenched and tempered steels	d ≤ 75 mm	2,0
	stainless steels, ball and roller bearing steels, tool steels	d ≤ 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
		w ≥ 120 mm w/t < 10:1	on width:
	< 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
		w ≥ 120 mm w/t < 10:1	on thickness:
	< 0,25 % C		2,0
	≥ 0,25 % C, alloy steels, quenched and tempered steels		2,5
	stainless steels, ball and roller bearing steels, tool steels		2,5
		w ≥ 120 mm w/t ≥ 10:1	on width:
	< 0,25 % C		2,0
	≥ 0,25 % C, alloy steels, quenched and tempered steels		2,5
	stainless steels, ball and roller bearing steels, tool steels		2,5
		w ≥ 120 mm w/t ≥ 10:1	on thickness:
	< 0,25 % C		2,5
	≥ 0,25 % C, alloy steels, quenched and tempered steels		3,0
	stainless steels, ball and roller bearing steels, tool steels		3,0

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

Table 5: Types of length and length tolerances

Type of length	Length mm	Length tolerance mm	To be stated on order
manufacturing length	3000 to 9000[1)]	± 500	length[1)]
stock length	3000[1)] or 6000[1)]	0, +200 0, + 200	e. g. stock 6000
cut to length	up to 9000	corresponding to specifications with ± 5 minimum	length and tolerance

[1)] Short bars: each bundle may contain a percentage of short bars.

- Dimensions ≤ 25 mm: the percentage is 5% maximum, the length of these short bars being at the minimum two thirds the nominal length ordered.
- Dimensions > 25 mm: 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.

Annex A
(normative)

Supplementary or special requirements

NOTE: One or more of the following supplementary or special requirements may be agreed upon at the time of enquiry and order (see 4.2). The details of these requirements may be agreed upon between the manufacturer and the purchaser at the time of enquiry and order if necessary.

A.1 Disposition of tolerances

The disposition of tolerances about the nominal dimension of the product other than specified in 6.1.1 shall be one of the following as specified by the purchaser at the time of enquiry and order:

a) values all positive, i. e. + and lower tolerances all zero, i. e. -0

b) values equally disposed about the nominal dimension.

A.2 End condition

The ends of the product shall be as specified by the purchaser at the time of enquiry and order, e. g. chamferring, facing.

Annex B
(normative)

Methods for evaluating straightness

B.0 Scope

This annex sets out two methods for the evaluation of the straightness of bright steel bars as provided for in 6.4. The method set out in B.1 is the preferred method and B.2 is an alternative method. The choice of method shall be as agreed at the time of enquiry and order.

B.1 Preferred method

B.1.1 The bar shall be supported on a suitable surface so as to eliminate or minimise sagging.

B.1.2 A 1 m long straight edge shall be placed on the surface of the bar at any position along its length. No part of the straight edge shall be within 150 mm of the ends of the bar.

B.1.3 Straightness shall be determined by measuring the maximum gap between the bar and the straight edge by suitable means, e. g. feeler gauge. The bar shall be deemed straight where the maximum gap does not exceed the values specified in table 4.

B.2 Alternative method for round bars

B.2.1 The round bar shall be supported on a sufficient number of centres placed 1 m apart.

B.2.2 Straightness shall be measured by means of a suitable dial or indicator gauge place at any position between the supporting centres.

B.2.3 The bar shall be deemed to be straight when rotating the bar through 360° the indicated reading (TIR) is not greater than twice the deviation specified in table 4.