



BSI Standards Publication

<http://www.china-gauges.com/>

Dimensions and tolerances of bright steel products of stainless and other special steels

National foreword

This British Standard is the UK implementation of EN 10278:2023. It supersedes BS EN 10278:1999, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/105, Steels for Heat Treatment, Alloy Steels, Free-Cutting Steels and Stainless Steels.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 18948 3

ICS 77.140.60

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2023.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

EUROPEAN STANDARD

EN 10278

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2023

ICS 77.140.60

Supersedes EN 10278:1999

English Version

Dimensions and tolerances of light steel products of stainless and other special steels

Dimensions et tolérances des produits en acier transformés à froid à partir d'acier inoxydable et autres aciers spéciaux

Maße und Grenzabmaße von Blankstahlerzeugnissen aus nichtrostenden und anderen besonderen Stählen

This European Standard was approved by CEN on 25 September 2023.

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 CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

	Page
European foreword.....	3
1 Scope.....	4
2 Normative references.....	4
3 Terms and definitions.....	4
4 Information to be supplied by the purchaser.....	5
4.1 Mandatory information.....	5
4.2 Options.....	5
4.3 Examples.....	5
5 Requirements.....	6
5.1 Shape, dimensions and tolerances.....	6
5.2 Straightness tolerance.....	6
5.3 Condition of bar ends.....	6
5.4 Disposition of tolerances.....	7
6 Visual and dimensional inspection.....	7
Annex A (normative) Methods for evaluating straightness.....	13
A.1 Scope.....	13
A.2 Recommended method.....	13
A.3 Alternative method for round bars (effective for diameters ≥ 10 mm).....	13

European foreword

This document (EN 10278:2023) has been prepared by Technical Committee CEN/TC 459/SC 5 “Steels for heat treatment, alloy steels, free-cutting steels and stainless steels”, 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 May 2024, and conflicting national standards shall be withdrawn at the latest by May 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10278:1999.

The main changes compared to the previous edition EN 10278:1999 are listed below:

- bright steels of EN 10277 are excluded from the scope of this document and its application is restricted to stainless steels and special steels which can be delivered as bright products, e.g. tool steels, roller bearing steels, etc.;
- surface condition and tolerance classes revised;
- this document can now also be used for cold heading steels both in form of bars and wire (for wire not concerning length and straightness);
- deviation from straightness revised;
- editorially revised.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document applies to bright steel products in the drawn, turned or ground condition delivered in straight lengths. This document is mainly applied to stainless steels of EN 10088-3 and other product standards, e.g. tool steels, roller bearing steels.

This document can also be used for cold heading steels in the form of bars and wire; in case of wire, the thickness and tolerances apply but not the length and the straightness.

The non-alloy and alloy steels of EN 10277 are no longer included.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10079, *Definition of steel products*

EN 10088-3, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

EN 10204, *Metallic products — Types of inspection documents*

EN ISO 9443, *Surface quality classes for hot-rolled bars and wire rod (ISO 9443)*

ISO 286-2, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts*

ISO 10474, *Steel and steel products — Inspection documents*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10079 (for drawn products) and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

thickness

nominal dimension of the product

Note 1 to entry: This means:

- a) the diameter in the case of rounds;
- b) the lateral length in the case of squares;
- c) the width over flats in the case of hexagons;
- d) the shorter lateral length in the case of flats (rectangular bars) and wide-flats.

For special sections, 'thickness' shall be specified at the time of enquiry and order.

3.2

ovality

difference between the smallest and largest dimension measured across the pairs of opposing points at a common cross-section

3.3

out-of shape

special tolerances and their deviations from the nominal section profile

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) quantity (mass, number of bars) to be delivered;
- b) shape of the product (e.g. round, hexagon, square, flat);
- c) reference to this document, i.e. EN 10278;
- d) the nominal dimensions and tolerances on dimensions and shape;
- e) reference to the material standard including the number of the part (e.g. EN 10088-3);
- f) steel name or steel number;
- g) the finished condition (see 5.1);
- h) the class of surface quality (see EN ISO 9443) where appropriate (not for EN 10088-3).

4.2 Options

Several options are specified in this document and listed below. If the purchaser does not indicate any of these options, the products will be supplied in accordance with the basic specifications (see 4.1).

- 1) Straightness (see 5.2);
- 2) Condition of bar ends (see 5.3);
- 3) Disposition of tolerances (see 5.4);
- 4) The type of inspection document in accordance with EN 10204 or ISO 10474.

4.3 Examples

EXAMPLE 1

10t rounds EN 10278 – 50 h8 x stock 3000

EN 10088-3-X5CrNi18-10+2P

EN 10204 – 3.1

or

10t rounds EN 10278 – 50 h8 x stock 3000

EN 10088-3-1.4301+2P

EN 10204 – 3.1

EXAMPLE 2

2 t rounds EN 10278 – 20 h9 x stock 6000

EN ISO 4957-32CrMoV12-28+C

EN ISO 9443 - class B

ISO 10474 – 3.1

or

2t rounds EN 10278 – 20 h9 x stock 6000

EN ISO 4957-1.2365+C

EN ISO 9443 – class B

ISO 10474 – 3.1

5 Requirements

5.1 Shape, dimensions and tolerances

The tolerance class on thickness (and width for flats) of bright steel products shall comply to the standard tolerance class in Table 1. If other than the standard tolerance class is requested by the purchaser, one of the classes written in brackets in Table 1 (e.g.) can be agreed at the time of enquiry and order. The tolerance class and the corresponding tolerances are given in Table 2 for rounds, squares and hexagons and in Table 3 for drawn flats. Where specified by the purchaser at the time of enquiry and order, the disposition tolerances specified in Table 2 shall be in accordance with 5.4.

Unless otherwise agreed at the time of enquiry and order, the length and the tolerance on length shall be as specified in Table 4.

The maximum admitted ovality shall be not more than half the specified tolerance range, in any case never above the upper limit of the tolerance. Any other requirement concerning the out of shape and its deviations from the nominal section profile (see 3.3) may be agreed at the time of enquiry and order together with the measurement method.

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 (explanation: hypothetical intersections of two surfaces), flats in widths > 150 mm within a distance of 0,5 mm, unless otherwise agreed. For widths > 150 mm, sharp corners can be ordered.

5.2 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 A and the tolerances specified in Tables 5 and 6 shall apply.

5.3 Condition of bar ends

The ends of the product (e.g. chamfering, facing) shall meet the requirements specified by the purchaser at the time of enquiry and order.

5.4 Disposition of tolerances

The dispositions of tolerances about the nominal dimensions of the product other than specified in 5.1 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.

6 Visual and dimensional inspection

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

Dimensional inspection shall be carried out as follows:

- a) for bars in manufacturing or stock length: for diameter ≤ 100 mm, not less than 150 mm from the end of the bar; for diameter > 100 mm, not less than 250 mm from the end of the bar;
- b) for bars cut to length: not less than 10 mm from the end of the bar.

Table 1 — Surface condition and tolerance class at delivery

	1	2	3	4	5	6	7	
1	Surface condition at delivery	Symbol		Tolerance class to ISO 286-2 ^a				
		Stainless steels	Other steels	Rounds and Wire	Squares	Hexagons	Drawn flanges	Special sections
2	Cold drawn or heat-treated and cold drawn	2H or 2B	+C	h10 (h9 to h12), see Table 2	h11 for $d \leq 80$ mm, h12 for 80 mm $< d \leq 100$ mm $\pm 0,7$ mm for $d > 100$ mm	h11 for $d \leq 75$ mm, h12 for $d > 75$ mm	h11, h12, see Table 3	- b
3	Cold drawn and heat treated. For stainless steels also heat treated and peeled/turned	2D	+C+QT (+C+N) (+C+SR) (+C+A)	h11 see Table 2	- b	- b	-	-
4	Peeled/turned	2H or 2B	+SH	h10 (h9 to h12) see Table 2	-	-	-	-
5	Ground	2G	+G	h9 (h6 to h10) see Table 2	-	-	-	-
6	Polished	2P	+PL	h9 (h6 to h12) see Table 2	-	-	-	-

^a Standard tolerance classes unless otherwise specified. In brackets: other possible tolerance classes according to ISO 286-2 if required at the time of enquiry and order.

^b To be agreed at the time of enquiry and order.

Table 2 — Tolerance classes for rounds, wire, squares and hexagons

Nominal thickness mm	Tolerance class to ISO 286-2 ^a						
	h6	h7	h8	h9	h10	h11	
$1 < t \leq 3$	0 - 0,006	0 - 0,010	0 - 0,014	0 - 0,025	0 - 0,040	0 - 0,060	0 - 0,100
$3 < t \leq 6$	0 - 0,008	0 - 0,012	0 - 0,018	0 - 0,030	0 - 0,048	0 - 0,075	0 - 0,120
$6 < t \leq 10$	0 - 0,009	0 - 0,015	0 - 0,022	0 - 0,036	0 - 0,058	0 - 0,090	0 - 0,150
$10 < t \leq 18$	0 - 0,011	0 - 0,018	0 - 0,027	0 - 0,043	0 - 0,070	0 - 0,110	0 - 0,180
$18 < t \leq 30$	0 - 0,013	0 - 0,021	0 - 0,033	0 - 0,052	0 - 0,084	0 - 0,130	0 - 0,210
$30 < t \leq 50$	0 - 0,016	0 - 0,025	0 - 0,039	0 - 0,062	0 - 0,100	0 - 0,160	0 - 0,250
$50 < t \leq 80$	0 - 0,019	0 - 0,030	0 - 0,046	0 - 0,074	0 - 0,120	0 - 0,190	0 - 0,300
$80 < t \leq 120$	0 - 0,022	0 - 0,035	0 - 0,054	0 - 0,087	0 - 0,140	0 - 0,220	0 - 0,350
$120 < t \leq 180$	0 - 0,025	0 - 0,040	0 - 0,063	0 - 0,100	0 - 0,160	0 - 0,250	0 - 0,400
$180 < t \leq 250$	0 - 0,029	0 - 0,046	0 - 0,072	0 - 0,115	0 - 0,185	0 - 0,290	0 - 0,460

^a The above deviation values are negatively disposed about the nominal dimension. For example, a 20 mm nominal diameter and a tolerance class h9 has tolerances on thickness of 20 mm 0/- 0,052 mm or 19,948/20,000 mm.

Table 3 — Tolerances for drawn flats

Width mm	Deviation		ISO 286-2 Class
	mm	mm	
$w \leq 18$	-	-	h11
$18 < w \leq 30$	+ 0	-0,13	h11
$30 < w \leq 50$	+ 0	-0,16	h11
$50 < w \leq 80$	+ 0	-0,19	h11
$80 < w \leq 100$	+ 0	-0,22	h11
$100 < w \leq 150$	+ 0,50	-0,50	
$150 < w \leq 200$	+ 1,00	-1,00	
$200 < w \leq 300$	+ 2,00	-2,00	
$300 < w \leq 400$	+ 2,50	-2,50	
$400 < w \leq 500$	+ 1 %	- 1 %	
Thickness ^b mm	Deviation ^a		
	mm	mm	
$3 < t \leq 6$	+ 0	-0,075	h11
$6 < t \leq 10$	+ 0	-0,090	h11
$10 < t \leq 18$	+ 0	-0,11	h11
$18 < t \leq 30$	+ 0	-0,13	h11
$30 < t \leq 50$	+ 0	-0,16	h11
$50 < t \leq 60$	+ 0	-0,19	h11
$60 < t \leq 80$	+ 0	-0,30	h12
$80 < t \leq 120$	+ 0	-0,35	h12
$120 < t \leq 140$	+ 0	-0,40	h12
<p>^a The tolerances in this table for stainless steels apply to austenitic, austenitic-ferritic and ferritic steels, but deviation may increase to 150 % of the mentioned tolerance class for martensitic steels. The tolerances in this table for non-alloy and alloy steels apply to low carbon ($C \leq 0,20$ %) steels, but deviation may increase to 150 % of the mentioned tolerance class for all other non-alloy and alloy steels.</p> <p>^b For $w > 150$ mm and $t \leq 18$ mm the tolerance of the thickness is h12.</p>			

Table 4 — Types of length and length tolerances

Type of length	Length mm	Length tolerance mm	To be stated on order
manufacturing length ^a	3 000 to 9 000	±500	length
stock length ^a	3 000 or 6 000	0, +200 0, +400	e.g. stock 6 000
cut to length	up to 9 000	corresponding to specifications with ± 5 minimum	length and tolerance

^a 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 agreed at the time of enquiry and order bright products are delivered without any short bars.

Table 5 — Deviation from straightness for rounds, squares and hexagons ^a

Product form	Steel group	Nominal dimension mm	Deviation max. mm
Rounds	Non-alloy steels < 0,25 % C, Austenitic, austenitic-ferritic and ferritic stainless steels ^b		1,0
	Non-alloy steels ≥ 0,25 % C, alloy steels, quenched and tempered steels, Martensitic stainless steels		1,5
Squares and hexagons	Non-alloy steels < 0,25 % C, Austenitic, austenitic-ferritic and ferritic stainless steels ^b	$t \leq 75$	1,0
	Non-alloy steels ≥ 0,25 % C, alloy steels, quenched and tempered steels, Martensitic stainless steels	$t \leq 75$	2,0
	Non-alloy steels < 0,25 % C, Austenitic, austenitic-ferritic and ferritic stainless steels	$t > 75$	1,5
	Non-alloy steels ≥ 0,25 % C, alloy steels, quenched and tempered steels, Martensitic stainless steels	$t > 75$	2,5

^a For the method of evaluating straightness, see Annex A.
^b For austenitic, austenitic-ferritic and ferritic stainless steels with diameter > 55 mm the deviation is max 1,5 mm.

Table 6 — Deviation from straightness for flats ^a

Product form	Steel group	Nominal dimension mm	Deviation on width and thickness max. mm	
			for w/t ≥ 10:1	for w/t < 10:1
Flats	Non-alloy steels < 0,25 % C Austenitic, austenitic-ferritic and ferritic steels	w < 120	2	1,5
		w ≥ 120	2,5	2
	Non-alloy steels ≥ 0,25 % C; alloy steels, quenched and tempered steels Martensitic steels	w < 120	2,5	2
		w ≥ 120	3	2,5
^a For the method of evaluating straightness, see Annex A.				

Annex A (normative)

Methods for evaluating straightness

A.1 Scope

This annex sets out two methods for the evaluation of the straightness of bright steel bars in case of dispute as provided for in 5.2. The method set out in A.2 is the recommended method and A.3 is an alternative method for round bars. The choice of method shall be as agreed at the time of enquiry and order.

Other methods as automatic methods for the evaluation of the straightness are available and they can be used if they are agreed at the time of enquiry and order.

A.2 Recommended method

A.2.1 The bar shall be supported on a suitable surface so as to eliminate or minimize sagging.

A.2.2 A 1 m long straight edge shall be placed on the surface of the bar at any position along its length as a chord in the arc of a circle or a straight-line segment between two points on the arms of an angle. No part of the straight edge shall be within 150 mm of the ends of the bar.

A.2.3 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 5 and Table 6.

A.3 Alternative method for round bars (effective for diameters ≥ 10 mm)

A.3.1 The round bar shall be supported on a sufficient number of centres placed 1 m apart. No centre shall be placed in between 150 mm from the bar ends.

A.3.2 Straightness shall be measured by means of a suitable dial or indicator gauge placed at any position between the supporting centres.

A.3.3 The bar shall be deemed to be straight if rotating the bar through 360° the total indicated reading (TIR) is not more than twice the deviation specified in Table 5.

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than one device provided that it is accessible by the sole named user only and that only one copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than one copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright and Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email cservices@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services

Tel: +44 345 086 9001

Email: cservices@bsigroup.com

Subscriptions

Tel: +44 345 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK