

Unless otherwise agreed at the time of enquiry and order, the length and the tolerance on length shall be as specified in Table 13.

Table 13 — Types of length and length tolerances			
Type of length	Length mm	Length tolerance mm	To be stated on order
manufacturing length ^a	3000 to 9000	±500	length
stock length ^a	3000 or 6000	0, +200 0, +200	e.g. stock 6000
cut to length	up to 9000	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.			



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

9.4 Verification of dimensions

The out-of-roundness test has to be carried out by the two-point measuring method. Other methods have to be agreed at the time of enquiry and order.



Maximum deviation from 'out of roundness' shall be not more than half the specified tolerance range in any case never above the upper limit of the 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 D and the tolerances specified in Table 14 shall apply.

Table 14 — Deviation from straightness^a

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
Squares and hexagons	< 0,25 % C	$t \leq 75 \text{ mm}$	1,0
	≥ 0,25 % C, alloy steels, quenched and tempered steels	$t \leq 75 \text{ mm}$	2,0
	< 0,25 % C	$t > 75 \text{ mm}$	1,5
	≥ 0,25 % C, alloy steels, quenched and tempered steels	$t > 75 \text{ mm}$	2,5
Flats		$w < 120 \text{ mm}$	on width:
	< 0,25 % C		1,5
	≥ 0,25 % C, alloy steels, quenched and tempered steels		1,5
		$w < 120 \text{ mm}$	on thickness
	< 0,25 % C		1,5
	≥ 0,25 % C, alloy steels, quenched and tempered steels		2,0
		$w \geq 120 \text{ mm}$ $w/t < 10: 1$	on width
	< 0,25 % C		1,5
	≥ 0,25 % C, alloy steels, quenched and tempered steels		2,0
		$w \geq 120 \text{ mm}$ $w/t < 10: 1$	on thickness:
	< 0,25 % C		2,0
	≥ 0,25 % C, alloy steels, quenched and tempered steels		2,5
		$w \geq 120 \text{ mm}$ $w/t \geq 10: 1$	on width:
	< 0,25 % C		2,0
	≥ 0,25 % C, alloy steels, quenched and tempered steels		2,5
		$w \geq 120 \text{ mm}$ $w/t \geq 10: 1$	on thickness:
	< 0,25 % C		2,5
	≥ 0,25 % C, alloy steels, quenched and tempered steels		3,0

^a For the method of evaluating straightness see Annex D.

Methods for evaluating straightness

D.1 Scope

This annex sets out two methods for the evaluation of the straightness of bright steel bars as provided for in 7.7. The method set out in D.2 is the recommended method and D.3 is an alternative method for round bars. The choice of method shall be as agreed at the time of enquiry and order.

D.2 Recommended method

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

D.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.

D.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 14.

D.3 Alternative method for round bars

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

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

D.3.3 The bar shall be deemed to be straight when rotating the bar through 360° the total indicated reading (TIR) is not greater than twice the deviation specified in Table 14.

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.

7.8 Surface quality

Bright products shall have a smooth, scale free surface. Bright products in the final heat treated condition shall be free from loose surface scale; their surface might be discoloured or darker. For hexagons, squares, flats and profiles with special cross-sections, one cannot achieve – for manufacturing reasons – the same quality of surface finish as for round cross-sections.

7.7 Surface condition

Drawn products shall have a smooth, scale free surface. Products in the final heat treated condition shall be free from loose surface scale; their surface might be discoloured or darker. For hexagons, squares, flats and profiles with special cross sections one cannot achieve – for manufacturing reasons – the same quality of surface finish as for round cross sections.

Since surface discontinuities (cracks, overlapping, scale, isolated pores, pits, grooves, etc.) cannot be completely avoided during manufacturing (hot and cold forming, heat treatments, handling and storage) and since they are retained when drawing, agreements shall be made regarding surface quality. The surface quality of the products shall be one of the classes according to Table 3. Cold drawn bars and ground/polished bars (+C, +C+QT, +C+G, +C+PL) are delivered in class 1, while peeled/turned bars as well as ground/polished bars produced from peeled/turned bars (+SH, +SH+G, +SH+PL) are delivered in class 3. Different classes may be agreed at the time of enquiry and order.

For flats, squares in sizes greater than 20 mm and hexagons in sizes greater than 50 mm, the maximum possible depth of surface discontinuities shall be agreed at the time of enquiry and order.

NOTE Where automatic testing of the surface is applied, 50 mm of each end of the bar is not normally covered.

Surface defects cannot be eliminated without removal of material. Products in the 'technically crack free by manufacture' condition are only available in the peeled/turned and/or ground conditions.

Since surface discontinuities (cracks, overlapping, scale, isolated pores, pits, grooves, etc.) can not be completely avoided during manufacturing (hot and cold formation, heat treatments, handling and storage) and since they are retained when drawing, agreements shall be made regarding surface quality. The surface quality of the products shall be one of the classes according to Table 1. Cold drawn products are normally delivered in class 1, while turned and peeled bars as well as ground bars are delivered in class 3. Different classes may be agreed at the time of enquiry and order.

For flats, squares in sizes greater than 20 mm and hexagons in sizes greater than 50 mm, the maximum possible depth of surface discontinuities shall be agreed at the time of enquiry and order.

NOTE Where automatic testing of the surface is applied, 50 mm of each end of the bar is not normally covered.

Surface defects cannot be eliminated without removal of material. Products in the 'technically crack free by manufacture' condition are only available in the turned and peeled and/or ground conditions.

Table 3 — Surface quality classes



Condition	Class			
	1	2	3	4
Permissible depth of discontinuities	max. 0,3 mm for $t \leq 15$ mm; max. 0,02t for $15 < t \leq 100$ mm	max. 0,3 mm for $t \leq 15$ mm; max. 0,02t for $15 < t \leq 75$ mm; max. 1,5 mm for $t > 75$ mm	max. 0,2 mm for $t \leq 20$ mm; max. 0,01t for $20 < t \leq 75$ mm; max. 0,75 mm for $t > 75$ mm	technically crack free by manufacture ^e
Maximum percentage of delivered weight with discontinuities in excess of specified level	4 %	1 %	1 %	0,2 %

Table 1 — Surface quality classes

Condition	Class			
	1	2	3	4
Permissible depth of discontinuities	max. 0,3 mm for $d \leq 15$ mm; max. 0,02 · d for $15 < d \leq 100$ mm	max. 0,3 mm for $d \leq 15$ mm; max. 0,02 · d for $15 < d \leq 75$ mm; max. 1,5 mm for $d > 75$ mm	max. 0,2 mm for $d \leq 20$ mm; max. 0,01 · d for $20 < d \leq 75$ mm; max. 0,75 mm for $d > 75$ mm	technically crack free by manufacture ^e
Maximum percentage of delivered weight with discontinuities in excess of specified level	4 %	1 %	1 %	0,2 %



Product form ^a				
Rounds	+	+	+	+
Squares	+	+ (for $t \leq 20$ mm) ^c	-	-
Hexagons	+	+ (for $t \leq 50$ mm) ^c	-	-
Flats	+ ^b	-	-	-
Special sections	+ ^d	-	-	-
NOTE t = nominal thickness that means diameter of bars and distance across flats of squares and hexagons.				
^a + indicates available in these classes, - indicates not available in these classes. ^b Maximum depth of discontinuities refers to respective section (width or thickness). ^c Crack detection with eddy current device not possible for $t > 20$ mm or $t > 50$ mm as indicated. ^d Reference dimensions to be agreed at the time of enquiry and order ^e The surface quality class shall be better than class 3. The requirements and the kind of verification are to be agreed at the time of enquiry and order.				

Product form ^a				
Rounds	+	+	+	+
Squares	+	+ (for $d \leq 20$ mm) ^c	-	-
Hexagons	+	+ (for $d \leq 50$ mm) ^c	-	-
Flats	+ ^b	-	-	-
Special sections	+ ^d	-	-	-
NOTE d = nominal diameter of bar and distance across flats of squares and hexagons.				
^a + indicates available in these classes, - indicates not available in these classes. ^b Maximum depth of discontinuities refers to respective section (width or thickness). ^c Crack detection with eddy current device not possible for $d > 20$ mm or $d > 50$ mm as indicated. ^d Reference dimensions to be agreed at the time of enquiry and order ^e The surface quality class shall be better than class 3. The requirements and the kind of verification are to be agreed at the time of enquiry and order.				

8 Inspection

8.1 Testing procedures and types of documents

8.1.1 Products complying with this standard shall be ordered and delivered with one of the inspection documents specified in EN 10204. The type of document shall be agreed upon at the time of enquiry and order. If the order does not contain any specification of this type, a test report 2.2 shall be issued.

8.1.2 If, in accordance with the agreements made at the time of enquiry and order, a test report 2.2 is to be provided, this shall cover the following information:

- a) confirmation that the material complies with the requirements of the order;
- b) results of the cast analysis for all elements specified in Tables A.1 to A.4 for the steel grade concerned.

8 Inspection and testing

8.1 Types and contents of inspection documents

8.1.1 When specifically requested by the purchaser, an inspection document according to EN 10204 shall be supplied. The purchaser shall indicate the type of inspection document required.

8.1.2 If, in accordance with the agreements made at the time of enquiry and order, a test report 2.2 is to be issued, it shall contain the following information:

- a) confirmation that the material complies with the requirements of the order;
- b) results of the cast analysis for all the elements specified for the steel grade concerned.

8.1.3 If in accordance with the agreements in the order an inspection certificate 3.1 or 3.2 to EN 10204 is to be provided, the specific inspections and tests described in 8.3 and 9 shall be carried out and the results shall be confirmed in the inspection certificate.

In addition, the inspection certificate shall cover:

- a) confirmation that the material complies with the requirements of the order;
- b) results of the cast analysis for all elements specified in Table A.1 to A.4 for the steel grade concerned;
- c) the result of all inspections and tests ordered by supplementary requirements (see Annex C),
- d) the symbol letters or numbers relating the inspection certificate, test pieces and products to each other.

8.1.3 If, in accordance with the agreements made at the time of enquiry and order, an inspection certificate 3.1 or 3.2 is to be issued, the specific tests described in 8.2 shall be carried out and the results shall be confirmed in the inspection certificate.

In addition, the inspection certificate shall include the following information:

- a) manufacturer's results for the cast analysis of all elements specified for the steel grade concerned;
- b) results of inspections and tests ordered as a result of supplementary requirements (see Annex B);
- c) symbol letters or numbers relating the inspection documents, test pieces and products to each other.

8.2 Frequency of testing

The amount of testing, the sampling conditions and the test methods to be applied for the verification of the requirements shall be in accordance with the prescriptions of Table 15.

Table 15 — Test conditions for the verification of the requirements given in Tables 4 to 10

No.	Requirements	Test unit ^a	Amount of testing		Sampling and sample preparation	Test method to be used
			samples per test unit	tests per sample		
1	Chemical composition	C	The cast analysis is given by the manufacturer (m); for product analysis see C.7 (o)		EN ISO 14284	CEN/TR 10261 ^c
2	Mechanical properties				EN ISO 377	Tensile test ^d ISO 6892-1 Impact test ISO 148-1
2.1	As-rolled and peeled	C+D	1	1 tensile (m)		
2.2	Cold drawn	C+D	1	1 tensile (m)		
2.3	Quenched and tempered and peeled and Cold drawn and quenched and tempered	C+D+T	1	1 tensile (m) and 3 CVN (m)		
2.4	Quenched and tempered and cold drawn	C+D+T	1	1 tensile (m)		
3	Hardness ^e				EN ISO 6506-1	Brinell hardness test EN ISO 6506-1
3.1	As-rolled and peeled	C+D	1	1 (m)		
3.2	Heat-treated and peeled	C+D+T	1	1 (m)		
3.3	Heat-treated and cold drawn	C+D+T	1	1 (m)		

NOTE Verification of the requirements is only necessary if an inspection certificate is ordered.

^a The tests shall be carried out separately for each cast as indicated by 'C', each dimension as indicated by 'D', and each heat-treatment batch as indicated by 'T'. Products with different thickness may be grouped if the differences in thickness do not affect the properties.

^b Tests marked with an "m" (mandatory) shall be carried out as specific tests. In all cases, those marked with an "o" (optional) shall be carried out as specific tests only if agreed at ordering.

^c For routine testing also other methods are available (e.g. spectrographic).

^d In cases of dispute, the tensile test shall be carried out on proportional test pieces having a gauge length of $L_0 = 5,65 \sqrt{S_0}$, where S_0 is the original cross-section area.

Unless otherwise agreed at the order the manufacturer decides whether to use the tensile test or hardness test. In the case of dispute the tensile test shall be done.

8.2.4 Where appropriate, retesting shall be in accordance with EN 10021.

No.	Requirements	Test unit ^a	Amount of testing		Sampling and sample preparation	Test method to be used
			samples per test unit	tests per sample		
1	Chemical composition	C	The cast analysis is given by the manufacturer; for product analysis see B.7		EN ISO 14284	prCEN/TR 10261 ^b
2	Mechanical properties				EN ISO 377	Tensile test ^c EN 10002-1
2.1	As rolled and turned	C+D	1	1		
2.2	Cold drawn	C+D	1	1		
2.3	Quenched and tempered, either before or after cold working	C+D+T	1	1		
3	Hardness				EN ISO 6506-1	Brinell hardness test EN ISO 6506-1 ^d
3.1	As rolled and turned	C+D	1	1		
3.2	Heat-treated and turned	C+D+T	1	1		
3.3	Heat-treated and cold drawn	C+D+T	1	1		

^a The tests shall be carried out separately for each cast as indicated by 'C', each dimension as indicated by 'D', and each heat treatment batch as indicated by 'T'.
Products with different thickness may be grouped if the differences in thickness do not affect the properties.

^b For routine testing also other methods are available (e. g. spectrographic).

^c In cases of dispute, the tensile test shall be carried out on proportional test pieces having a gauge length of $L_0 = 5,65 \sqrt{S_0}$, where S_0 is the original cross section area.

^d In cases of dispute, hardness tests shall be performed on the cross section at the same point as specified for the centre line of the tensile test piece.

In cases of dispute, hardness tests shall be performed on the cross section at the same point as specified for the centre line of the tensile test piece.



8.3 Specific inspection and testing

8.3.1 Verification of the hardenability, hardness and mechanical properties

For steels ordered in one of the treatment condition in Table 1, the hardness requirements or mechanical properties, shall, with the following exception, be verified. The requirements given in Table 1, footnote d (mechanical properties of reference test pieces), is only to be verified if supplementary requirement specified in C.2 is ordered.

C.2 Mechanical properties of reference test pieces in the quenched and tempered condition

For deliveries in a condition other than quenched and tempered, the requirements for the mechanical properties in the quenched and tempered condition shall be verified on a reference test piece.

In the case of bars, the sample to be quenched and tempered shall, unless otherwise agreed, have the cross-section of the product. In all other cases the dimensions and the manufacture of the sample shall be agreed at the time of enquiry and order, where appropriate, while taking into consideration the indications for the determination of the diameter of the ruling section given in Annex B. The samples shall be quenched and tempered in accordance with the conditions given in the table for the heat-treatment conditions or as agreed at the time of enquiry and order. The details of the heat treatment shall be given in the inspection document. Unless otherwise agreed, the test pieces shall be taken in accordance with Figure 1 for bars.

B.1 Mechanical properties of reference test pieces in the quenched and tempered condition

For products delivered in other than the quenched and tempered condition the requirements for their mechanical properties in the quenched and tempered condition shall be verified on a reference test piece.

For bars the quenched and tempered sample shall have the same cross section as the product under consideration. For other product forms the dimensions and preparation of the sample shall be agreed at the time of enquiry and order taking into consideration, where appropriate, the method for determining the diameter of the ruling section in accordance with Annex A.

The samples shall be quenched and tempered as agreed at the time of the enquiry or order. Details of the heat treatment shall be reported in the inspection document (see 8.1).

Samples for the production of test pieces shall be taken from the product in accordance with EN ISO 377.

For steels being ordered with the symbol +H, +HH or +HL in the designation, unless otherwise agreed, only the hardenability requirements according to EN ISO 683-1, EN ISO 683-2 and EN ISO 683-3 are to be verified.

8.3 Verification of hardenability

See EN 10084, 8.2.1.1.

8.3 Verification of hardenability

See 10.3.2 of EN 10083-2 and EN 10083-3.

8.3.2 Visual and dimensional inspection

A sufficient number of products are to be inspected to ensure the compliance with the specification.

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.

9.2.1 Tensile test

The tensile test shall be carried out in accordance with EN ISO 6892-1.

For the specified yield strength in the tables on mechanical properties in this standard, the upper yield strength (R_{eH}) shall be determined.

If a yield phenomenon is not present, the 0,2 % proof strength ($R_{p0,2}$) shall be determined.

9.2.2 Impact test

The Charpy-V-notch (CVN) impact test shall be carried out in accordance with EN ISO 148-1. For cold drawn bars (+C, +C+G, +C+PL), requirements on impact tests can normally not be fulfilled, impact tests can only be performed if mentioned in the tables for mechanical properties.

At the time of enquiry and order additional requirements concerning the impact energy and the verification at temperatures other than room temperature (0 °C, -20 °C and -40 °C) can be agreed.

The average values of a set of three test pieces shall be equal to or greater than the specified value. One individual value may be below the specified value, provided that it is not less than 70 % of that value.

If these conditions are not satisfied additional tests can be done according to EN 10021:2006, 8.3.4.2.

10 Marking

The manufacturer shall mark the products or the bundles or boxes containing the products in a suitable way, so that the identification of the cast, the steel type and the origin of the delivery is possible (see C.10).

C.10 Special agreements for marking

The products shall be marked in a way that is specially agreed at the time of enquiry and order.

9 Marking

The steel product or its packaging shall be marked in such a way as to ensure traceability to the manufacturer, steel grade and cast.

Where specified by the purchaser at the time of enquiry and order, special marking of the steel product shall be in accordance with B.8.

NOTE It is recommended that subsequent processes maintain traceability.

B.8 Special marking

Products shall have special markings as agreed at the time of enquiry and order, e.g. by bar coding according to EN 606.

Table 4 — Mechanical properties of bright steels for general engineering use



Steel grade		Thickness ^a <i>t</i> mm	Mechanical properties ^a				
Steel name	Steel number		As-rolled + peeled (+SH)		Cold drawn (+C)		
			Hardness ^b HBW	<i>R_m</i> MPa	<i>R_{p0,2}</i> ^c MPa min.	<i>R_m</i> ^c MPa	<i>A</i> min.

Acciai presenti	
S235JRC	1.0122
S355J2C	1.0579
C25	
C30	
C35	1.0501
C40	1.0511
C45	1.0503
C50	
C60	1.0605

Acciai presenti	
S235JRC	1.0122
E295GC	1.0533
E335GC	1.0543
S355J2C	1.0579
C10	1.0301
C15	1.0401
C16	1.0407
C35	1.0501
C40	1.0511
C45	1.0503
C55	1.0535
C60	1.0601



Steel grade		Thickness ^a <i>t</i> mm	Mechanical properties	
Steel name	Steel number		As-rolled + peeled (+SH) Hardness ^b HBW	<i>R_m</i> MPa
S235JRC	1.0122	$5 \leq t \leq 10$	-	-
		$10 < t \leq 16$	-	-
		$16 < t \leq 40$	107 to 152	360 to 510
		$40 < t \leq 63$	107 to 152	360 to 510
		$63 < t \leq 100$	107 to 152	360 to 510

Table 3 — Mechanical properties				
Designation		Thickness ^a	Mechanical properties	
Steel name	Steel number	mm	As rolled + turned (+SH) ^b Hardness ^c HBW	<i>R_m</i> MPa
S235JRC	1.0122	$\geq 5 \leq 10$	-	-
		$> 10 \leq 16$	-	-
		$> 16 \leq 40$	102 to 140	360 to 510
		$> 40 \leq 63$	102 to 140	360 to 510
		$> 63 \leq 100$	102 to 140	360 to 510

^b In case of dispute, the tensile strength values are the decisive factor.

**Table 5 — Mechanical properties of free-cutting bright steels
(except steels for quenching and tempering)**



Steel grade		Thickness ^a <i>t</i> mm	Mechanical properties				
Steel name	Steel number		As-rolled + peeled (+SH)		Cold drawn (+C)		
			Hardness ^b HBW max.	<i>R_m</i> MPa	<i>R_{p0,2}</i> ^c MPa min.	<i>R_m</i> ^c MPa	<i>A</i> min.

Acciai presenti	
9S20	
11SMn30	1.0715
11SMnPb30	1.0718
11SMn37	1.0736
11SMnPb37	1.0737
10S20	1.0721
10SPb20	1.0722
15SMn13	1.0725
17SMN20	

Acciai presenti	
11SMn30	1.0715
11SMnPb30	1.0718
11SMn37	1.0736
11SMnPb37	1.0737
10S20	1.0721
10SPb20	1.0722
15SMn13	1.0725



**Table 5 — Mechanical properties of free-cutting bright steels
(except steels for quenching and tempering)**

Steel grade		Thickness ^a <i>t</i> mm	Mechanical properties				
Steel name	Steel number		As-rolled + peeled (+SH)	Cold drawn (+C)			
			Hardness ^b HBW max.	<i>R_m</i> MPa	<i>R_{p0,2}</i> ^c MPa min.	<i>R_m</i> ^c MPa	<i>A</i> min.
11SMn30 11SMnPb30 11SMn37 11SMnPb37	1.0715	5 ≤ <i>t</i> ≤ 10	–	–	440	510 to 810	6
		10 < <i>t</i> ≤ 16	–	–	410	490 to 760	7
	1.0718	16 < <i>t</i> ≤ 40	169	380 to 570	375	460 to 710	8
	1.0736	40 < <i>t</i> ≤ 63	169	370 to 570	305	400 to 650	9
	1.0737	63 < <i>t</i> ≤ 100	154	360 to 520	245	360 to 630	9

Table 3 — Mechanical properties of free-cutting steels not intended for heat treatment

Designation		Thickness ^a mm	Mechanical properties ^a				
Steel name	Steel number		As rolled and turned (+SH)	Cold drawn (+C)			
			Hardness ^b HBW	<i>R_m</i> MPa	<i>R_{p0,2}</i> ^c MPa min.	<i>R_m</i> ^c MPa	<i>A</i> % min.
11SMn30	1.0715	≥ 5 ≤ 10	–	–	440	510 to 810	6
11SMnPb30	1.0718	> 10 ≤ 16	–	–	410	490 to 760	7
11SMn37	1.0736	> 16 ≤ 40	112 to 169	380 to 570	375	460 to 710	8
11SMnPb37	1.0737	> 40 ≤ 63	112 to 169	370 to 570	305	400 to 650	9
		> 63 ≤ 100	107 to 154	360 to 520	245	360 to 630	9

Table 6 — Mechanical properties of free-cutting bright steels for quenching and tempering

Steel grade		Thickness ^a , b t mm	Mechanical properties										
			As-rolled + peeled (+SH)		Cold drawn (+C)			Quenched and tempered and peeled ^c (+QT+SH)			Quenched and tempered + cold drawn (+QT +C)		
Steel name	Steel number		Hardness ^d HBW max.	R _m MPa	R _{p0,2} MPa min.	R _m MPa	A % min.	R _{p0,2} MPa min.	R _m MPa	A % min.	R _{p0,2} ^e MPa min.	R _m ^e MPa	A % min.

Acciai presenti

35S20	1.0726
35SPb20	1.0756
36SMn14	1.0764
36SMnPb14	1.0765
35SMn20	
35SMnPb20	
38SMn28	1.0760
38SMnPb28	1.0761
44SMn28	1.0762
44SMnPb28	1.0763
46S20	1.0727
46SPb20	1.0757

Acciai presenti

35S20	1.0726
35SPb20	1.0756
36SMn14	1.0764
36SMnPb14	1.0765
38SMn28	1.0760
38SMnPb28	1.0761
44SMn28	1.0762
44SMnPb28	1.0763
46S20	1.0727
46SPb20	1.0757

Table 6 — Mechanical properties of free-cutting bright steels for quenching and tempering



Steel grade		Thickness ^a , b <i>t</i> mm	Mechanical properties										
Steel name	Steel number		As-rolled + peeled (+SH)		Cold drawn (+C)			Quenched and tempered and peeled ^c (+QT+SH)			Quenched and tempered + cold drawn (+QT +C)		
			Hardness ^d HBW max.	<i>R</i> _m MPa	<i>R</i> _{p0,2} MPa min.	<i>R</i> _m MPa	<i>A</i> % min.	<i>R</i> _{p0,2} MPa min.	<i>R</i> _m MPa	<i>A</i> % min.	<i>R</i> _{p0,2} ^e MPa min.	<i>R</i> _m ^e MPa	<i>A</i> % min.
35S20 35SPb20	1.0726 1.0756	5 ≤ <i>t</i> ≤ 10	–	–	480	640 to 880	6	430	630 to 780	–	490	700 to 900	9
		10 < <i>t</i> ≤ 16	–	–	400	590 to 830	7	430	630 to 780	–	490	700 to 900	11
		16 < <i>t</i> ≤ 40	198	520 to 680	360	560 to 800	8	380	600 to 750	16	455	650 to 850	12
		40 < <i>t</i> ≤ 63	196	520 to 670	340	530 to 760	9	320	550 to 700	17	400	570 to 770	13
		63 < <i>t</i> ≤ 100	190	500 to 650	300	510 to 680	9	320	550 to 700	17	385	550 to 750	14

Steel grade													
Steel name	Steel number	Thickness ^a , b <i>t</i> mm	As-rolled + peeled (+SH)		Cold drawn (+C)			Quenched and tempered and peeled ^c (+QT+SH)			Quenched and tempered + cold drawn (+QT +C)		
			Hardness ^d HBW max.	<i>R_m</i> MPa	<i>R_{p0,2}</i> MPa min.	<i>R_m</i> MPa	<i>A</i> % min.	<i>R_{p0,2}</i> MPa min.	<i>R_m</i> MPa	<i>A</i> % min.	<i>R_{p0,2}</i> ^e MPa min.	<i>R_m</i> ^e MPa	<i>A</i> % min.
35S20 35SPb20	1.0726 1.0756	$5 \leq t \leq 10$	—	—	480	640 to 880	6	430	630 to 780	—	490	700 to 900	9
		$10 < t \leq 16$	—	—	400	590 to 830	7	430	630 to 780	—	490	700 to 900	11
		$16 < t \leq 40$	198	520 to 680	360	560 to 800	8	380	600 to 750	16	455	650 to 850	12
		$40 < t \leq 63$	196	520 to 670	340	530 to 760	9	320	550 to 700	17	400	570 to 770	13
		$63 < t \leq 100$	190	500 to 650	300	510 to 680	9	320	550 to 700	17	385	550 to 750	14

Table 7 — Mechanical properties of non-alloy bright steels for case hardening

Steel grade		Thickness ^a <i>t</i> mm	Mechanical properties						
Steel name	Steel number		As-rolled + peeled (+SH)		Cold drawn (+C)			+A + peeled (+A +SH)	+A + cold drawn (+A +C)
			Hardness ^c HBW	<i>R_m</i> MPa	<i>R_{p0.2}</i> ^b MPa min.	<i>R_m</i> ^b MPa	<i>A</i> % min.	Hardness HBW max.	Hardness ^d HBW max.

Acciai presenti

C10E	1.1121
C10R	1.1207
C15E	1.1141
C15R	1.1140
C16E	1.1148
C16R	1.1208

Acciai presenti

C10R	1.1207
C15R	1.1140
C16R	1.1208

Table 8 — Mechanical properties of alloy bright steels for case hardening



Steel grade		Thickness ^a <i>t</i> mm	Mechanical properties			
Steel name	Steel number		+A+ peeled (+A+SH)	+A+cold drawn (+A+C)	+FP+ peeled (+FP+SH)	+FP+cold drawn (+FP+C)
			Hardness HBW max.	Hardness ^b HBW max.	Hardness HBW	Hardness ^b HBW

Acciai presenti	
20Cr4	
20CrS4	
16MnCr5	1.7131
16MnCrS5	1.7139
20MnCr5	1.7147
20MnCrS5	1.7149
24CrMn4	
24CrMoS4	
20NiCrMo2-2	1.6523
20NiCrMoS2-2	1.6526
18CrNiMo7-6	1.6587

Acciai presenti	
16MnCrS5	1.7139
16MnCrB5	1.7160
20MnCrS5	1.7149
16NiCrS4	1,5715
15NiCr13	1.5752
20NiCrMoS2-2	1.6526
17NiCrMoS6-4	1.6959

Table 9 — Mechanical properties of non-alloy bright steels for quenching and tempering



Steel grade		Thickness a, b <i>t</i> mm	Mechanical properties											
Steel name	Steel number		As-rolled + peeled (+SH)		Cold drawn (+C)			Quenched and tempered and peeled ^c (+QT+SH)				Quenched and tempered + cold drawn (+QT +C)		
			Hardness d HBW	<i>R</i> _m MPa	<i>R</i> _{p0,2} MPa min.	<i>R</i> _m MPa	<i>A</i> % min .	<i>R</i> _{p0,2} MPa min.	<i>R</i> _m MPa	<i>A</i> % min.	KV ₂ J min.	<i>R</i> _{p0,2} ^e MPa min.	<i>R</i> _m ^e MPa	<i>A</i> % min.

Acciai presenti		Acciai presenti	
C25E	1.1151	C45E	1.1191
C25R	1.1149	C45R	1.1201
C30E		C50E	1.1206
C30R		C50R	1.1241
C35E	1.1181	C60E	1.1221
C35R	1.1180	C60R	1.1223
C40E	1.1186	28Mn6	1.1170
C40R	1.118	26Mn6	

Acciai presenti	
C35E	1.1181
C35R	1.1180
C40E	1.1186
C40R	1.1180
C45E	1.1191
C45R	1.1201
C50E	1.1206
C50R	1.1241
C60E	1.1221
C60R	1.1223

Table 10 — Mechanical properties of bright alloy steels for quenching and tempering



Steel grade		Thickness ^a , b <i>t</i> mm	Mechanical properties								
Steel name	Steel number		S.annealed + peeled (+A +SH)	S.annealed + Cold drawn (+A +C)	Quenched and tempered and peeled ^c (+QT+SH)				Quenched and tempered + cold drawn (+QT +C)		
			Hardness HBW max.	Hardness HBW max.	<i>R</i> _{p0,2} MPa min.	<i>R</i> _m MPa	<i>A</i> % min.	KV ₂ J min.	<i>R</i> _{p0,2} MPa min.	<i>R</i> _m ^d MPa	<i>A</i> % min.

Acciai presenti		Acciai presenti	
34Cr4	1.7033	34CrMo4	1.7220
34CrS4	1.7037	34CrMoS4	1.7226
37Cr4	1.7034	42CrMo4	1.7225
37CrS4	1.7038	42CrMoS4	1.7227
41Cr4	1.7035	50CrMo4	1.7228
41CrS4	1.7039	51CrV4	1.8159
25CrMo4	1.7218	36CrNiMo4	
25CrMoS4	1.7213	34CrNiMo6	1.6582
		30CrNiMo8	1.6580

Acciai presenti	
34CrS4	1.7037
41CrS4	1.7039
25CrMoS4	1.7213
42CrMoS4	1.7227
34CrNiMo6	1.6582
39NiCrMo3	1.6510
51CrV4	1.8159

Table 10 — Mechanical properties of bright alloy steels for quenching and tempering

Steel grade		Thickness ^a , b <i>t</i> mm	S.annealed + peeled (+A +SH) Hardness HBW max.	S.annealed + Cold drawn (+A +C) Hardness HBW max.	Mechanical properties				Quenched and tempered + cold drawn (+QT +C)		
Steel name	Steel number				Quenched and tempered and peeled ^c (+QT+SH)						
					<i>R</i> _{p0,2} MPa min.	<i>R</i> _m MPa	<i>A</i> % min.	KV ₂ J min.			
34Cr4 34CrS4	1.7033 1.7037	5 ≤ <i>t</i> ≤ 10	-	285	-	-	-	-	700	900 to 1 100	8
		10 < <i>t</i> ≤ 16	-	275	-	-	-	-	700	900 to 1 100	9
		16 < <i>t</i> ≤ 40	223	270	590	800 to 950	14	40	580	800 to 1 000	9
		40 < <i>t</i> ≤ 63	223	265	460	700 to 850	15	40	510	700 to 900	10
		63 < <i>t</i> ≤ 100	223	265	460	700 to 850	15	40	480	700 to 900	11

[illegible]

Annex A

(informative)

Steel grades and chemical composition according to EN 10025-2, EN ISO 683-1, EN ISO 683-2, EN ISO 683-3 and EN ISO 683-4

The chemical composition here is listed only for information. The chemical composition is according to the European Standards EN 10025-2, EN ISO 683-1, EN ISO 683-2, EN ISO 683-3 and EN ISO 683-4.

Table A.1 — Steel grades and chemical composition (cast analysis) of general engineering bright steels (for information only – chemical composition as listed in EN 10025-2, EN ISO 683-1)



Table A.4 — Steel grades and chemical composition (cast analysis) of bright steels for quenching and tempering (for information only – chemical composition as listed in EN ISO 683-1 and EN ISO 683-2)

Steel grade		%, mass fraction ^{a, b}									
Steel name	Steel number	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	Cr+Mo+Ni
Non-alloy steels for quenching and tempering											
37Cr4	1.7034	0,34 to 0,41	0,10 to 0,40 ^c	0,60 to 0,90	0,025	0,035	0,90 to 1,20	–	–	0,40	–
37CrS4	1.7038					0,020 to 0,040					
41Cr4	1.7035	0,38 to 0,45	0,10 to 0,40 ^c	0,60 to 0,90	0,025	0,035	0,90 to 1,20	–	–	0,40	–
41CrS4	1.7039					0,020 to 0,040					
25CrMo4	1.7218	0,22 to 0,29	0,10 to 0,40 ^c	0,60 to 0,90	0,025	0,035	0,90 to 1,20	0,15 to 0,30	–	0,40	–
25CrMoS4	1.7213					0,020 to 0,040					
34CrMo4	1.7220	0,30 to 0,37	0,10 to 0,40 ^c	0,60 to 0,90	0,025	0,035	0,90 to 1,20	0,15 to 0,30	–	0,40	–
34CrMoS4	1.7226					0,020 to 0,040					
42CrMo4	1.7225	0,38 to 0,45	0,10 to 0,40 ^c	0,60 to 0,90	0,025	0,035	0,90 to 1,20	0,15 to 0,30	–	0,40	–
42CrMoS4	1.7227					0,020 to 0,040					
50CrMo4	1.7228	0,46 to 0,54	0,10 to 0,40 ^c	0,50 to 0,80	0,025	0,035	0,90 to 1,20	0,15 to 0,30	–	0,40	–
51CrV4	1.8159	0,47 to 0,55	0,10 to 0,40 ^c	0,60 to 1,00	0,025	0,025	0,80 to 1,10	–	–	0,40	V: 0,10 to 0,25

Annex C

(normative)

Supplementary or special requirements

C.1 Introduction

One or more of the following supplementary or special requirements shall be applied but only when specified in the enquiry and order. Details of these requirements shall, when necessary, be agreed upon by the manufacturer and purchaser at the time of enquiry and order.

C.3 Fine grain steel

When tested in accordance with EN ISO 643, the steel shall have an austenite grain size of 5 or finer. If specific testing is ordered, the grain size requirement is to be verified by determining the aluminium content or micrographically. In the case of determining the grain size by the aluminium content for case hardening steels Al min is 0,018 % and for steels for quenching and tempering Al min is 0,007 %. The Al-content shall be given in the inspection document. For micrographical test according to EN ISO 643 for case hardening steels see EN ISO 683-3, and for steels for quenching and tempering see EN ISO 683-1 and EN ISO 683-2.

B.2 Fine grain steels

B.2.1 Fine grain steel shall have an austenite grain size of five or finer. If specific testing is ordered (see 7.4), the grain size requirement is to be verified by determining the aluminium content or micrographically. If the grain size requirements are verified micrographically sampling and sample preparation shall be as specified in EN ISO 643 and one test piece per cast shall be inspected.

B.2.2 For free-cutting steels when tested in accordance with one of the methods described in EN ISO 643, the grain structure shall be considered satisfactory if 70 % of the area is within the specified size limits.

For case hardening steels the fine grain structure is normally achieved, when the total aluminium content is min. 0,018 %. In such case the micrographic investigation is not necessary. The aluminium content shall be given in the inspection document. Otherwise the steel shall be tested in accordance with Mc-Quaid-Ehn method described in EN ISO 643 and the grain structure shall be considered satisfactory if 70 % of the area is within the specified size limits, for further details see EN 10084.

Steels for quenching and tempering shall be tested by determination of the aluminium content or micrographically. In the first case, the aluminium content shall be agreed. In the second case the steels shall be tested in accordance with one of the methods described in EN ISO 643, for further details see EN 10083-2, A.3 for non alloy steels for quenching and tempering and EN 10083-3, A.2 for alloy steels for quenching and tempering.

C.7 Product analysis

One product analysis shall be carried out per cast for the determination of all elements for which values are specified for the cast analysis of the steel type concerned.

The conditions for sampling shall be in accordance with EN ISO 14284. In cases of dispute, the analysis shall be carried out, if possible, in accordance with a reference method taken from one of the standards in CEN/TR 10261.

B.7 Product analysis

One product analysis shall be carried out for each cast for the determination of the chemical composition of the product as specified for the cast analysis in Table 1 of EN 10277-2 to EN 10277-5.

Preparation of samples shall be in accordance with EN ISO 14284. In cases of dispute about the analytical method, the chemical composition shall be determined in accordance with a reference method taken from one of the European Standards in prCEN/TR 10261.

Annex E (informative)



Designation of steels given in this standard and of comparable grades covered in various designation systems

Table E.1 — Designation of steels given in this standard and of comparable grades covered in various designation systems

Steel names according to ^a										
ISO-steel grade (ISO 683-18)	ISO- numb er	ASTM/SAE/UNS ^b		EN 10025-2, EN 10083, EN 10084, EN 10087 ^c		JIS ^d		GB/ISC ^e		
			i/n/ w ^f		i/n/ w ^f		i/n/ w ^f		i/n/w f	
General engineering steels										
S235B	–	–	–	S235JRC	1.0122	i	–	–	Q235 B	n
S355D	–	–	–	S355J2C	1.0579	i	–	–	Q345 D	w
C25	–	–	–	–	–	–	S25C	w	25	w
C30	–	–	–	–	–	–	S30C	w	30	w
C35	–	–	–	C35	1.0501	n	S35C	w	35	w
C40	–	–	–	C40	1.0511	n	S40C	w	40	w
C45	–	–	–	C45	1.0503	n	S45C	w	45	w
C50	–	–	–	–	–	–	S50C	n	50	w
C60	–	–	–	C60	1.0601	n	S58C	w	60	w
Free-cutting steels										
9S20	–	–	–	–	–	–	SUM21	n	Y08	n
11SMn30	–	SAE 1215	n	11SMn30	1.0715	i	SUM22	n	Y15	n
11SMnPb30	–	SAE 12L15	n	11SMnPb 30	1.0718	i	SUM22 L	n	–	–
11SMn37	–	–	–	11SMn37	1.0736	i			–	–
11SMnPb37	–	–	–	11SMnPb 37	1.0737	i	–	–	–	–
10S20	–	–	–	10S20	1.0721	i	–	–	Y12	n
10SPb20	–	–	–	10SPb20	1.0722	i	–	–	–	–
15SMn13	–	–	–	15SMn13	1.0725	i	–	–	–	–
17SMn20	–	–	–	–	–	–	–	–	–	–
35S20	–	–	–	35S20	1.0726	i	–	–	Y30	n
35SPb20	–	–	–	35SPb20	1.0756	i	–	–	–	–
36SMn14	–	SAE 1137	n	36SMn14	1.0764	i	SUM41	n	–	–

^a See sources in the Bibliography.
^b US steel listed in ASTM A959 and in UNS – if the steel number is given in brackets then the steel has only a UNS-number.
^c European steel listed in EN 10025-2, EN 10083, EN 10084, EN 10087 and EN 10088-3 and in the “Stahl-Eisen-Liste” – if the steel number is given in brackets then the steel is only listed in the “Stahl-Eisen-Liste”.
^d Japanese Industrial Standard.
^e Chinese National Standard.
^f I = identical steel to ISO-steel grade, n = steel grade with closer match of composition, but not identical, w = wider match.

Primi commenti

- La prEN 10277 comprende tutti i requisiti dimensionali e quindi sostituisce anche la EN 10278
- Se la EN 10278 viene ritirata, gli acciai inox rimangono senza norma dimensionale
- A meno di non specificare nella prEN 10277 che la parte dimensionale vale anche per gli inox (mi sembra una soluzione che possa creare confusione)

Primi commenti

- La ISO 9443 – in fase di preparazione – relativa alla qualità superficiale dei prodotti laminati sostituirà la EN 10221
- Non comprenderà tuttavia i finiti a freddo contrariamente a quanto si era pensato in un primo momento (decisione di ISO TC17 SC4 del 8/11/16)

Primi commenti

- Attenzione ad utilizzare materiale con lega di piombo:

WARNING Due to hazardous effects to health and environmental problems of Pb, it is recommended to use instead steels only with sulphur and other innocuous free-cutting element additions.

- Corretta la dicitura
- Le varie direttive europee per ora ammettono nella lega una percentuale max in peso di 0,35%
- Si discute da molto tempo del bando del piombo nell'acciaio, ma per ora è a discrezione del cliente utilizzarlo o meno
- I clienti chiedono se un giorno il piombo verrà bandito

DECISIONE DELLA COMMISSIONE

del 27 giugno 2002

che modifica l'allegato II della direttiva 2000/53/CE del Parlamento europeo e del Consiglio relativa ai veicoli fuori uso

[notificata con il numero C(2002) 2238]

(Testo rilevante ai fini del SEE)

(2002/525/CE)

Articolo 1

L'allegato II della direttiva 2000/53/CE è sostituito dal testo contenuto nell'allegato della presente decisione.

ALLEGATO

«ALLEGATO II

Materiali e componenti cui non si applica l'articolo 4, paragrafo 2, lettera a)

Materiali e componenti	Ambito di applicazione e termine di scadenza dell'esenzione	Da etichettare o rendere identificabili in base all'articolo 4, paragrafo 2, lettera b), punto iv)
<i>Piombo come elemento di lega</i>		
1. Acciaio destinato a lavorazione meccanica e acciaio zincato contenente, in peso, lo 0,35 % o meno di piombo		



DIRETTIVA 2002/95/CE DEL PARLAMENTO EUROPEO E DEL CONSIGLIO

del 27 gennaio 2003

sulla restrizione dell'uso di determinate sostanze pericolose nelle apparecchiature elettriche ed elettroniche

(GU L 37 del 13.2.2003, pag. 19)

Articolo 4

Prevenzione

1. A partire dal 1° luglio 2006 gli Stati membri provvedono affinché le apparecchiature elettriche ed elettroniche nuove immesse sul mercato non contengano piombo, mercurio, cadmio, cromo esavalente, bifenili polibromurati (PBB) o eteri di difenile polibromurato (PBDE). Fino al 1° luglio 2006 è possibile mantenere le misure nazionali volte a limitare o vietare l'uso di dette sostanze nelle apparecchiature elettriche ed elettroniche adottate per ottemperare alla normativa comunitaria prima dell'adozione della presente direttiva.
2. Il paragrafo 1 non si applica alle applicazioni elencate nell'allegato.
3. Sulla base di una proposta della Commissione, non appena disponibili le prove scientifiche, il Parlamento europeo e il Consiglio decidono, conformemente ai principi della politica in materia di sostanze chimiche stabiliti nel 6° programma d'azione in materia ambientale, sul divieto di altre sostanze pericolose e sulla loro sostituzione con sostanze alternative più rispettose dell'ambiente, che assicurino almeno lo stesso livello di protezione dei consumatori.

ALLEGATO

Applicazioni di piombo, mercurio, cadmio, cromo esavalente, bifenili polibromurati (PBB) o eteri di difenile polibromurato (PBDE) esentate dai requisiti di cui all'articolo 4, paragrafo 1

1. Mercurio in lampade fluorescenti compatte, sino ad un massimo di 5 mg per lampada.
2. Mercurio in tubi fluorescenti, per usi generici sino ad un massimo di:

— alofosfato	10 mg
— trifosfato con tempo di vita normale	5 mg
— trifosfato con tempo di vita lungo	8 mg
3. Mercurio in tubi fluorescenti per usi speciali.
4. Mercurio in altre lampade non espressamente menzionate nel presente allegato.
5. Piombo nel vetro dei tubi a raggi catodici, componenti elettronici e tubi fluorescenti.
6. Piombo come elemento di lega nell'acciaio contenente fino allo 0,35 % di piombo in peso, alluminio contenente fino allo 0,4 % di piombo in peso e leghe di rame contenenti fino al 4 % di piombo in peso.

Primi commenti

7.8 Surface quality

NOTE Where automatic testing of the surface is applied, 50 mm of each end of the bar is not normally covered.

- Per questa nota sono d'accordo solo se le barre vengono controllate singolarmente fuori linea.
- Andrebbe inserito che per avere almeno una estremità della barra controllata, o la si intesta per 5 centimetri tagliando l'estremità non controllata, oppure si potrebbe ottenere segnando a metà una barra con lunghezza doppia a quanto richiesto dal cliente.
- Es: controllo a correnti indotte di una singola barra con lunghezza mm 6.100, segata a metà, otteniamo 2 barre con lunghezza mm 3.050 e una estremità per barra è controllata.

Primi commenti

Table 1 — Combinations of usual treatment conditions at delivery and requirements

^b For rounds with diameters over 80 mm, it is more usual to apply peeling/turning instead of drawing.

- Non sono d'accordo, non riesco a capire la differenza fra un tondo mm 75 e uno da mm 85 allo stato trafilato +C, non viene spiegato come mai il tondo da mm 85 dovrebbe essere allo stato pelato.
- Poi è vero che è il cliente che decide, ma francamente ritengo l'annotazione non corretta.
- Si trafilano tranquillamente tondi da mm. 100 in toll h9.
- Magari per questa nota, sarebbe più corretto inserire le qualità che andrebbero pelate sopra mm. 80, perché non tutte si riescono a trafilare con facilità.

Primi commenti

Table 3 — Surface quality classes

Product form ^a		
Rounds	+	+
Squares	+	+ (for $t \leq 20$ mm) ^c
Hexagons	+	+ (for $t \leq 50$ mm) ^c

- Una precisazione sugli esagoni:
- la classe 2 standard si potrebbe ottenere solo su esagoni in chiave fino a mm. 50, per quale motivo?
- Ci sono in commercio bobine esagonali per controllare chiavi ben superiori a mm. 50.....

Primi commenti

- Una nota importante, sempre su argomento esagoni
- Non viene menzionata l'impossibilità di intercettare discontinuità longitudinali.
- La nostra pressione sulle case costruttrici di strumenti a correnti indotte è continua, ma per ora senza nessuna soluzione a riguardo.
- Per evitare controversie con i clienti, sarebbe opportuno inserire il commento che ho elencato sopra.
- Magari non sono aggiornato su eventuali nuove tecnologie.....

Primi commenti

- Ho notato che per acciai per impieghi generali, si fa riferimento ancora alla EN 10025
- Le qualità E335GC E295GC C10 C15 C16 mancano nell'elenco

Primi commenti

- Bene l'inserimento della norma sulla preparazione dei provini e per le prove di trazione.
- Manca un riferimento alla svergolatura dei piatti / esagoni / quadri.

6.11. Svergolatura

Distorsione a spirale (od elicoidale) nel senso dell'asse longitudinale (torsione intorno all'asse) del prodotto. Per i quadri, gli esagoni, i piatti, i larghi piatti ed i profili speciali è ammessa una svergolatura minore di 4° per metro.

9.2.4. Svergolatura

L'errore di svergolatura α deve essere rilevato come indicato in fig. 5. Esso può anche essere calcolato trigonometricamente mediante la misurazione della quota h .

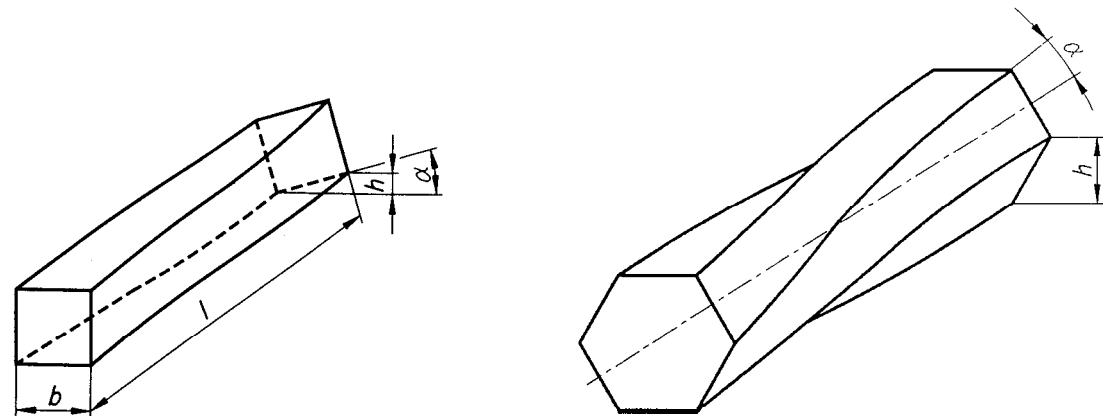


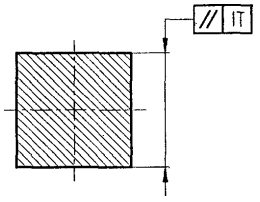
Fig. 5 — Errore di svergolatura



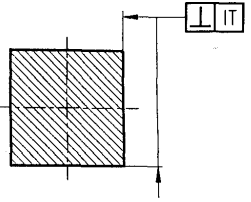
6.4. , Sul quadri è ammessa una tolleranza di parallelismo ed una tolleranza di perpendicolarità pari a IT come indicato in fig. 2.

Rappresentazione grafica

Parallelismo

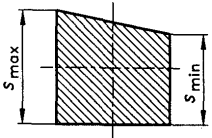


Perpendicolarità



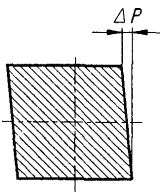
Probabili errori di forma

Parallelismo



$$(s_{\max} - s_{\min}) \leq IT$$

Perpendicolarità

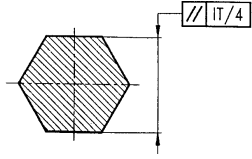


$$\Delta P \leq IT$$

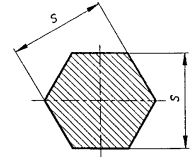
6.6. Per gli esagoni è ammessa una tolleranza di parallelismo e una differenza fra le larghezze di poligono (larghezza in chiave s) pari a IT/2 come indicato in fig. 3.

Rappresentazione grafica

Parallelismo

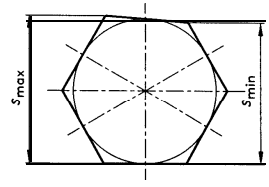


Larghezza in chiave



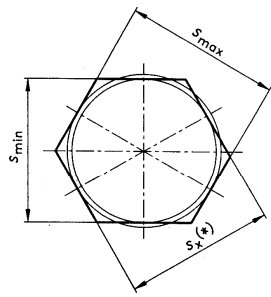
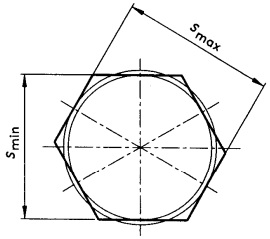
Probabile errore di forma

Parallelismo



$$(s_{\max} - s_{\min}) \leq \frac{IT}{2}$$

Larghezza in chiave



$$(s_{\max} - s_{\min}) \leq \frac{IT}{2}$$

(*) s_x = dimensione compresa tra $s_{\max}$ e $s_{\min}$

Primi commenti

- Manca l'obbligo di inserimento sul certificato tutti gli elementi secondari riferiti all'analisi chimica

8 Inspection

8.1 Testing procedures and types of documents

8.1.1 Products complying with this standard shall be ordered and delivered with one of the inspection documents specified in EN 10204. The type of document shall be agreed upon at the time of enquiry and order. If the order does not contain any specification of this type, a test report 2.2 shall be issued.

8.1.2 If, in accordance with the agreements made at the time of enquiry and order, a test report 2.2 is to be provided, this shall cover the following information:

a) confirmation that the material complies with the requirements of the order;

b) results of the cast analysis for all elements specified in Tables A.1 to A.4 for the steel grade concerned.

- Andrebbe rivisto anche il metodo di invio certificati da parte dei nostri fornitori:
 - oltre al formato PDF sarebbe utile anche il formato Excel CSV o testo.
 - con questi formati o magari diversi, si evita l'inserimento manuale dell'analisi chimica.
 - forse questa richiesta andrebbe in riferimento alla EN 10204...

Primi commenti

Annex D (normative)

Methods for evaluating straightness

D.3 Alternative method for round bars

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

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

D.3.3 The bar shall be deemed to be straight when rotating the bar through 360° the total indicated reading (TIR) is not greater than twice the deviation specified in Table 14.

- Manca la dimensione del diametro che si può controllare con il metodo D3. Es. da mm. 12 a salire
- Far ruotare un tondo mm. 8 tra due rulli distanti 1 metro fra loro non è fattibile perché centralmente la barra potrebbe flettere
- Tutti noi sappiamo che la rettilineità viene misurata alle estremità della barra, perché il punto critico è lì

Primi commenti

Esempio di un controllo della rettilineità mediante strumento a quadrante sulle estremità.

- Ruotare leggermente la barra avendo cura di tenere la mano oltre l'appoggio (cuscinetto) onde evitare vibrazioni dannose alla rilevazione.
- Leggere l'escursione massima della lancetta dopo aver effettuato almeno una rotazione completa di 360° della barra.
- Il valore registrato è riferito alla deformazione massima riscontrata sul diametro (misurata nella parte terminale delle barre dove un eventuale difetto risulta maggiormente evidente).
- Per tale motivo, per conoscere il valore reale della deformazione sul raggio bisognerebbe dividere il valore per due ma considerato il fatto che la rilevazione viene effettuata su di un tratto di barra di 500 mm e non di 1000 mm bisogna considerare il valore intero rilevato.

Primi commenti

Tolleranze larghi piatti :

I clienti non accettano

- +/- 1 mm fra 150 e 200 mm
- Proposta: +/- 0,8 mm
- +/- 2 mm fra 220 e 300 mm
- Proposta: +/- 1,5 mm
- +/- 2,5 mm fra 350 e 400 mm
- Proposta: +/- 1,5 mm
- 1 % sulle dimensioni oltre 400 (quindi fra 4 e 5 mm) mi sembra assurda.
- Proposta: 1,5 mm

Table 12 — 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 %	

Primi commenti

Tolleranze quadri:

La precedente norma prevedeva h11 fino all'80 mm e h12 per le superiori .

- Proporrei di lasciare le tolleranze attuali fino al 100 compreso, mentre oltre al 100 prevedere $\pm 0,7$ mm.

The tolerance class on thickness (and width for flats) shall comply with the requirements agreed at the time of enquiry and order and shall be in accordance with Table 2. If there is no agreement on the tolerance class the bright products are delivered with the standard tolerance class given in Table 2. The tolerance class and the corresponding tolerances are given in Table 11 for rounds, squares and hexagons and in Table 12 for drawn flats. Where specified by the purchaser at the time of enquiry and order the disposition tolerances specified in Table 11 shall be in accordance with C.5.

- Ci sarebbero anche da fare parecchie considerazioni sull'opportunità di tenere sempre tolleranze negative: per quadri e piatti molti clienti sarebbero felici di avere materiale con tolleranza centrata (esempio $\pm 0,10$ mm anziché $+0/-0,20$). Mi rendo conto che sarebbe una rivoluzione, va valutata con gli utilizzatori con attenzione

C.5 Disposition of tolerances

The disposition of tolerances about the nominal dimension of the product other than specified in 7.7 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.

Primi commenti

Tolleranze esagoni:

- Confermerei la previsione della norma precedente (h11 fino a 75 e h12 oltre), come prevista nel progetto.

Tolleranze tondi:

- Confermerei la previsione della norma precedente (h10), come prevista nel progetto.

Primi commenti

Tolleranze tondi rettificati:

- Il progetto prevede h9, ma mi sembra inaccettabile per i clienti
- Proporrei h8 (anche se lo standard è h7, h6 in Germania ...)
- Sarebbe forse opportuno inserire una previsione di tolleranze più elevate per i tondi bonificati

Table 2 — Surface condition and tolerance class at delivery

5	Ground	+G	h9 (h6 to h12) see Table 11	–	–	–	–	Obtained e.g. from conditions Table 1, lines 2 to 7 and 9
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Primi commenti



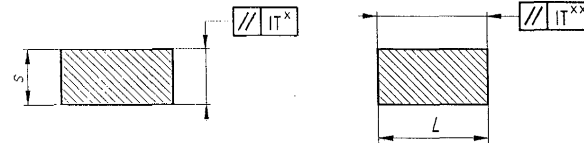
Errori di forma

- Sarebbe opportuno precisare meglio i possibili errori di forma che si possono trovare sui piatti, ad esempio fuori squadra, svuotamenti o bombature sui piani, errori di parallelismo
- Erano specificati molto chiaramente nella UNI 10233.
- Tale estensione potrebbe trovare posto al punto 3.6 che tratta gli errori di rotondità, estendendolo anche agli errori di forma, e precisando che essi si vanno a sommare alla tolleranza concordata .

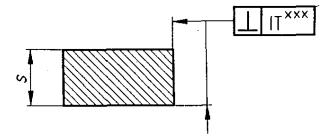
6.6. Per i piatti ed i larghi piatti è ammessa una tolleranza di parallelismo tra i lati maggiori e tra i lati minori pari a IT ed una tolleranza di perpendicolarità del lato minore riferito al lato maggiore pari a IT come indicato in fig. 4.

Rappresentazione grafica

Parallelismo



Perpendicolarità



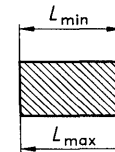
x Valore di IT riferito alla dimensione s
xx Valore di IT riferito alla dimensione L
xxx Valore di IT riferito alla dimensione s

Probabile errore di forma

Parallelismo

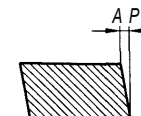


$$s_{\max} - s_{\min} \leq IT$$



$$L_{\max} - L_{\min} \leq IT$$

Perpendicolarità



$$AP \leq IT$$

Primi commenti

Rettilinearità

- La norma precedente ha unificato i parametri della rettilinearità (sciabolatura) e della svergolatura (torsione), utilizzando quello di planarità. Sommando i due errori si devono richiedere tolleranze piuttosto elevate a prima vista (si arriva a 3 mm/mt per un 150x10 in C45 o 2,5 mm/mt per la stessa misura in S235, valore inaccettabile per i clienti...)
- Inoltre spesso i clienti utilizzano i due concetti in maniera separata e chiedono tolleranze ben diverse (quasi sempre pretendono 1 mm/mt come standard).
- Il problema è come spiegare ad un cliente che una barra di 6 metri possa avere una freccia di circa 7/9 mm e possa essere considerata dritta dalla norma
- La precedente norma italiana UNI 10233 era molto più realista al proposito. Differenziava rettilinearità localizzate e su tutta la lunghezza proponendo misurazioni a 600 mm, 1000 mm e su tutta la lunghezza della barra, non considerando il tipo di acciaio e la differenza tra spessore e larghezza.
- Non volendo stravolgere la tabella attuale , che comunque non si può dire sia un esempio di chiarezza, si potrebbero prevedere dei valori per l'errore di rettilinearità su tutta la lunghezza (pari ad esempio al valore su 1 mt moltiplicato per la lunghezza e diviso per 2-1,5)

Primi commenti

- Un'altra questione è l'opportunità di estendere la previsione di un aumento della rettilineità per le misure inferiori a 120 con rapporto $w/t > 10:1$
- Sappiamo quanto sia complicato raddrizzare adeguatamente un 60x5 che secondo la norma deve essere 1,5 mm/mt
- Lo stesso valore sarebbe previsto per un 40x20, che al contrario è semplicissimo da raddrizzare.
- Graficamente sarebbe opportuno fare una sola tabella per i piatti

Primi commenti

Lunghezze a magazzino

- Le lunghezze a stock hanno una tolleranza di 200 mm
- Ma sarebbe opportuno avere $-0/+500$ come è l'abitudine del mercato

Primi commenti

Acciai mancanti

- 18NiCrMo5 (=17NiCrMo6-4)
 - non è previsto nella nuova norma
 - le alternative sono 20NiCrMo2-2 (meno legato) e 18CrNiMo7-6 (più legato)
 - sono entrambi acciai non reperibili facilmente sul mercato .
- 39NiCrMo3
 - era stato inserito nella 10083-2006, ma su questa revisione della 10277 non è previsto
 - potrebbe essere sostituito facilmente dal 42CrMo4, che è facilmente reperibile sul mercato e meno costoso
 - in Italia è ancora molto richiesto .

Primi commenti

Parametri non menzionati

- In diversi casi si prevede la possibilità di definire alcuni parametri in fase di ordine, senza specificare quale sia il valore applicabile nel caso non sia specificato nulla
- Sarebbe sempre opportuno segnalare un valore valido nel caso non sia specificato nulla nell'ordine

Primi commenti

Grafica

- Sarebbe opportuno, per una più efficace consultazione, inserire le tabelle vicino al testo dove viene trattato l'argomento.
- Ad esempio:
 - la spiegazione delle tolleranze avviene alla pagina 10, e rimanda alla tabella 2 (pagina 16) e tabelle 11 e 12 (pagina 37 e 38)
 - le condizioni della superficie sono trattate a pagina 10/11 e la tabella è a pagina 17

Vi ringrazio per l'attenzione

Dr. Ing. Mario Cusolito



La norma EN 10088-1 :2014

EN 10088

- Norma in 5 parti valida per prodotti laminati e trafilati
 - parte 1: Lista degli acciai inossidabili
 - parte 3: Condizioni tecniche di fornitura per prodotti semilavorati, barre, vergelle, fili, profili e prodotti finiti a freddo in acciaio resistente alla corrosione per uso generale
 - parte 5: Condizioni tecniche di fornitura per barre, vergelle, fili, profili e prodotti finiti a freddo in acciaio resistente alla corrosione per utilizzo nelle costruzioni

EN 10088-3 :2014

EUROPEAN STANDARD

EN 10088-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2014

ICS 77.140.20; 77.140.50; 77.140.65

Supersedes EN 10088-3:2005

English Version

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

Aciers inoxydables - Partie 3: Conditions techniques de livraison pour les demi-produits, barres, fils tréfilés, profils et produits transformés à froid en acier résistant à la corrosion pour usage général

Nichtrostende Stähle - Teil 3: Technische Lieferbedingungen für Halbzeug, Stäbe, Walzdraht, gezogenen Draht, Profile und Blankstahlerzeugnisse aus korrosionsbeständigen Stählen für allgemeine Verwendung

EN 10088 :2014 parte 3

Scopo

- Scopo: la norma specifica le condizioni tecniche di fornitura per semilavorati, barre finite a caldo, vergelle, fili, profili e barre finite a freddo di acciai inossidabili resistenti alla corrosione per usi generali, compresi quelli a contatto con gli alimenti.

1 Scope

This European Standard specifies the technical delivery conditions for semi-finished products, hot or cold formed bars, rods, wire, sections and bright products of standard grades and special grades of corrosion resisting stainless steels for general purposes.

NOTE General purposes include the use of stainless steels in contact with foodstuffs.

The general technical delivery conditions specified in EN 10021 apply in addition to the specifications of this European Standard, unless otherwise specified in this European Standard.

This European Standard does not apply to components manufactured by further processing of the product forms listed above with quality characteristics altered as a result of such further processing.

EN 10088 :2014 parte 3

Le finiture

- Sono elencate nella tabella 7:

Simb.	prodotto	tolleranza	condizione	difettosità	ciclo
2H	barre fili	IT8 – IT11 T3, T4	Liscio, ludo o opaco.	Non esente	Laminato + lavorato a freddo. Eventualmente ricoperto
2D	barre fili	IT8 – IT11 T3, T4	Liscio, lucido o opaco.	Non esente	Come 2H + trattato. Eventualmente skinpassato e/o ricoperto
2B	barre	IT8 – IT11	Liscio, uniforme e lucido.	Esente	Laminato + lavorato a freddo + lucidato meccanicamente
2G	barre	IT ≤ 9	Liscio, uniforme e lucido.	Esente	2H, 2B, 2D + rettifica. Tolleranze ristrette; Ra≤1,2
2P	barre	IT < 11	Più liscio e lucido del 2B o 2G	Esente	Aspetto superficiale bello. Rugosità da definire

- Non ci sono distinzioni tra trafilato e pelato

EN 10088 :2014 parte 3

Le finiture

Table 7 — Type of surface finish and process route of semi-finished products, rods and wires, bars and sections^a

	Product forms				Tolerances on dimensions ^b nominal ^c	Condition			Recommended use and observations
	Semi-finished products	Rods	Wires	Bars, sections		Symbol	Surface finish	Type of process route	
Cold processed	-	-	x	x	Bars: IT 8 to 11 ^d /EN 10278 Wire: T3 or T4 /EN 10218-2	2H	Smooth and matt or bright. Not necessarily polished. Not free of surface imperfections ⁱ .	Finishes 1E, 1D or 1X, cold processed ^j , coated (optional).	In products formed by cold drawing without subsequent heat treatment, the tensile strength is substantially increased, particularly in austenitic materials, depending on the degree of cold processing. The surface hardness may be higher than the centre hardness.
	-	-	x	x	Bars: IT 8 to 11 ^d /EN 10278 Wire: T3 or T4 /EN 10218-2	2D	Smooth and matt or bright. Not free of surface imperfections ⁱ .	Finish 2H, heat treated ^e , pickled and skin-passed (optional), coated (optional).	This finish allows the restoration of the mechanical properties after cold processing. Products with good ductility (extrusion) and specific magnetic properties.
Cold processed	-	-	-	x	Bars: IT 8 to 11 ^d /EN 10278	2B	Smooth, uniform and bright. Free of surface imperfections.	Finishes 1E, 1D or 1X, cold processed ^j , mechanically smoothed ^k .	Products used in their present condition or intended for better finishing. In products formed by cold drawing without subsequent heat treatment, the tensile strength is substantially increased, particularly in austenitic materials, depending on the degree of cold processing. The surface hardness may be higher than the centre hardness.
	-	-	-	x	IT $\square$ 9 ^d /EN 10278	2G	Smooth, uniform and bright. Free of surface defects.	Finishes 2H, 2D or 2B, centreless ground, mechanically smoothed (optional) ^l .	Finish for close tolerances. Unless otherwise agreed the surface roughness shall be Ra $\square$ 1,2.
	-	-	-	x	IT < 11 ^d /EN 10278	2P	Smother and brighter than finish 2B or 2G. Free of surface defects.	Finishes 2H, 2D, 2B or 2G, specular polishing ^l .	Products showing a well groomed surface appearance. Surface roughness shall be specified at the time of enquiry and order.

EN 10088 :2014 parte 3

La qualità superficiale

- Come per la EN 10277-1, sono previste classi diverse.

Simb.	profilo	Max discontin.	Max peso con discontinuità eccedenti	Rif. EN 10277
2H, 2D	tondi	0,2 mm fino a 20 mm 1% da 20 a 75 mm 0,75 mm oltre i 75 mm	1%	Come classe 3
	esagoni	0,3 mm fino a 15 mm 2% da 15 a 63 mm	2%	Come classe 2
	altri	0,3 mm fino a 15 mm 2% da 15 a 63 mm	4%	Come classe 1
2B, 2G, 2P	tondi	Tecnicamente esente da difetti di fabbricazione	0,2%	Come classe 4

EN 10088 :2014 parte 3

La qualità superficiale

Table 1 — Maximum depth of acceptable discontinuities for bars, rods and sections

Conditions	Product forms	Permissible depth of discontinuities ^a	Max. % of delivered weight in excess of permissible depth of discontinuities
1U, 1C, 1E, 1D	Sections	To be agreed upon at the time of enquiry and order on the basis of EN 10163–3.	
1U, 1C, 1E, 1D	Rounds and rod	Unless not specified otherwise at the time of enquiry and order: EN 10221 class A za2.	
1X ^b , 2H ^b , 2D ^b	Rounds	- max. 0,2 mm for $d \leq 20$ mm - max. 0,01 d for $20 < d \leq 75$ mm - max. 0,75 mm for $d > 75$ mm	1 %
	Hexagons	- max. 0,3 mm for $d \leq 15$ mm - max. 0,02 d for $15 < d \leq 63$ mm	2 %
	Other bars	- max. 0,3 mm for $d \leq 15$ mm - max. 0,02 d for $15 < d \leq 63$ mm	4 %
1G, 2B, 2G, 2P	Rounds	Technically defect free by manufacture.	0,2 %

EN 10088 :2014 parte 3

Le caratteristiche meccaniche

- Sono elencate nelle tabelle da 13 a 17
 - Per i vari gruppi di acciaio in funzione delle finiture ammesse
 - Non distinguono tra trafilato e pelato

Table 13 — Mechanical properties for bright bars ^a at room temperature of solution annealed ^b (see Table A.1) austenitic steels in conditions 2H, 2B, 2G or 2P

- In tabella 18 e 19 ci sono le caratteristiche dei fili:

Table 18 — Tensile strength of wire in diameters of 0,05 mm and above in 2H condition

Table 19 — Mechanical properties at room temperature of annealed wire in 2D condition

- In tabella 25 ci sono le caratteristiche delle barre incrudite:

Table 25 — Mechanical properties for bars at room temperature of steels in the cold work hardened (2H) condition

- Nell'allegato B quelle dei fili incruditi