

Steel rod, bars and wire for cold heading and cold extrusion —

Part 5: Technical delivery conditions for stainless steels

The European Standard EN 10263-5:2001 has the status of a
British Standard

ICS 77.140.60; 77.140.65

National foreword

This British Standard is the official English language version of EN 10263-5:2001. Together with BS EN 10263-1:2001 it supersedes BS 3111-2:1979 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/71, Steel rods for wire drawing, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

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This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 August 2001

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 11 and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
13453 Corrigendum No. 1	13 September 2001	Addition of supersession details

© BSI 13 September 2001

ISBN 0 580 37624 9

EUROPEAN STANDARD

EN 10263-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2001

ICS 77.140.60; 77.140.65

English version

Steel rod, bars and steel wire for cold heading and cold extrusion — Part 5: Technical delivery conditions for stainless steels

Barres, fil machine et fils en acier pour transformation à froid et extrusion à froid — Partie 5: Conditions techniques de livraison des aciers inoxydables

Walzdraht, Stäbe und Draht aus Kaltstauch- und Kaltfließpreßstählen — Teil 5: Technische Lieferbedingungen für nichtrostende Stähle

This European Standard was approved by CEN on 19 April 2001.

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 15, Wire-rod — Qualities, dimensions, tolerances and specific tests, the Secretariat of which is held by UNI.

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 December 2001, and conflicting national standards shall be withdrawn at the latest by December 2001.

This European Standard EN 10263 is subdivided as follows:

- *Part 1: General technical delivery conditions;*
- *Part 2: Technical delivery conditions for steels not intended for heat treatment after cold working;*
- *Part 3: Technical delivery conditions for case hardening steels;*
- *Part 4: Technical delivery conditions for steels for quenching and tempering;*
- *Part 5: Technical delivery conditions for stainless steels.*

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1 Scope

1.1 This part of EN 10263 is applicable to round rod, round bars and wire made of stainless steels intended for cold heading and cold extrusion having a diameter up to and including:

- 25 mm for ferritic and austenitic-ferritic steels;
- 50 mm for austenitic steels;
- 100 mm for martensitic steels.

1.2 This part of EN 10263 is complemented by EN 10263-1.

2 Normative references

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

EN 10020, *Definitions and classification of grades of steel*.

EN 10088-1, *Stainless steels — Part 1: List of stainless steels*.

EN 10263-1, *Steel rod, bars and wire for cold heading and cold extrusion — Part 1: General technical delivery conditions*.

3 Terms and definitions

For the purposes of this standard the definitions in EN 10263-1:2001 and the following apply.

3.1

stainless steels

steels with at least 10,5 % of Cr and max. 1,2 % C are considered as stainless steels if their resistance to corrosion is of primary importance

4 Classification and designation

4.1 Classification

All steels covered by this part of EN 10263 standard are special alloy steel according to EN 10020.

From a practical viewpoint these steels are also classified on the basis of their structure, see also annex B of EN 10088-1:1995.

4.2 Designation

See EN 10263-1:2001.

5 Production Process

See EN 10263-1:2001.

6 Requirements

6.1 Delivery conditions

The delivery conditions in which the products covered by this part of EN 10263 are normally supplied, the product forms and the applicable requirements are given in Table 1.

6.2 Chemical composition

6.2.1 Heat analysis

The chemical composition shall be in accordance with the values specified in Table 2 for the heat analysis.

6.2.2 Product analysis

In cases where a product analysis is requested, the admissible deviations from the values specified for the heat analysis are indicated in Table 3.

6.3 Mechanical properties

The mechanical properties of the products, to be determined by the tensile test, shall be in accordance with the prescriptions given in Tables 4, 5, 6 and 7.

6.4 Surface quality

6.4.1 Rod is normally supplied in the pickled condition. Mechanical descaling (sandblasting) can also be used, in which case a subsequent treatment in a pickling solution shall be carried out unless otherwise agreed. Particular processes such as peeling can also be applied, subject to specific agreement at the time of enquiry and order.

6.4.2 Minor surface imperfections that may occur under normal manufacturing conditions, such as scores originating from rolled-in scale, shall not be regarded as defects.

6.4.3 Any particular surface requirements may be agreed at the time of enquiry and order.

6.5 Supplementary or special requirements

6.5.1 Aptitude to cold forming

A test for the verification of the aptitude of products to cold forming may be carried out if agreed at the time of enquiry and order.

If for the verification of the aptitude to cold forming the upsetting test is applied, it shall be carried out as follows:

- a test piece with an initial length (height) equal to $1,5 d$, where d is the product diameter, is submitted to axial heading by means of a press until its length is reduced to $1/3$ of the initial value.

The above test shall be carried out at ambient temperature and limited to the products with a max. diameter of 15 mm.

The criteria for the assessment of test results shall be agreed at the time of ordering bearing in mind the end use for which the products are intended.

6.5.2 Depth of surface defects

The max. admissible depth of surface defects is indicated in Table 8. The depth of a defect is considered as being the distance between the surface of the product and the bottom of the defect, to be measured in a direction perpendicular to the surface along a radius. In case of dispute the determination of the depth of surface defects shall be carried out by metallographic means with a magnification of X 100, on a straight cross-section of the product in the delivery condition concerned.

Table 1 — Summary of delivery conditions, product forms and applicable requirements

Delivery condition	Symbols	Product forms ^a			Steels			Applicable requirements
		Rod	Bar	Wire	Ferritic	Martensitic	Austenitic and Austenitic-Ferritic	
Soft annealed	+cold drawn +soft annealed	—	X	X	X	X	—	Chemical composition as specified in Tables 2 and 3 Mechanical properties as specified in Tables 4, 5, 6 or 7 Supplementary or special requirements as specified in annex B of EN 10263-1:2001 ^b
	+cold drawn +soft annealed +skin passed	—	X	X	X	X	—	
	as treated or +peeled	+A or +A+PE	X	—	—	X	—	
Solution annealed	+skin passed	—	X	X	X	X	—	
	as treated or +peeled	+A+LC	X	—	—	—	X	
	+cold drawn	+AT or +AT+PE	X	—	—	—	X	
	+cold drawn +solution annealed	+AT+C	—	X	X	—	X	
Solution annealed	+cold drawn +solution annealed	+AT+C+AT	—	X	—	—	X	
	+cold drawn +solution annealed	+AT+C+AT	—	X	—	—	X	
	+cold drawn +solution annealed +skin passed	+AT+C+AT+LC	—	X	X	—	X	
Other	Other delivery conditions can be agreed at the time of ordering							

a X = applicable
— = not applicable
b If agreed at the time of ordering

Table 2 — Steel grades and chemical composition (heat analysis), % by mass^a

Steel grade	Steel name	Steel number	C	Si max.	Mn	P max.	S max.	Cr	Cu	Mo	Ni	Others
Ferritic steels												
X6Cr17		1.401 6	≤ 0,08 ^b	1,00	≤ 1,00	0,040	0,030	16,00/18,00				
X6CrMo17-1		1.411 3	≤ 0,08	1,00	≤ 1,00	0,040	0,030	16,00/18,00		0,90/1,40		
Martensitic steel												
X12Cr13		1.400 6	0,08/0,15	1,00	≤ 1,50	0,040	0,030	11,50/13,50			≤ 0,75	
Austenitic-ferritic steel												
X2CrNiMoN22-5-3		1.4462	≤ 0,030	1,00	≤ 2,00	0,035	0,015	21,00/23,00		2,50/3,50	4,50/6,50	N=0,10/0,22 ^e
Austenitic steels												
X10CrNi18-8		1.431 0	0,05/0,15	2,00	≤ 2,00	0,045	0,015	16,00/19,00	≤ 1,00	≤ 0,80	6,00/9,50	N ≤ 0,11
X2CrNi18-9		1.430 7	≤ 0,030	1,00	≤ 2,00	0,045	0,030	17,50/19,50	≤ 1,00		8,00/10,00	N ≤ 0,11
X2CrNi19-11		1.430 6	≤ 0,030	1,00	≤ 2,00	0,045	0,030	18,00/20,00	≤ 1,00		10,00/12,00	N ≤ 0,11
X5CrNi18-10		1.430 1	≤ 0,07	1,00	≤ 2,00	0,045	0,030	17,00/19,50	≤ 1,00		8,00/10,50	N ≤ 0,11
X6CrNiTi18-10		1.454 1	≤ 0,08	1,00	≤ 2,00	0,045	0,030	17,00/19,00	≤ 1,00		9,00/12,00	Ti = 5xC to 0,70
X4CrNi18-12		1.430 3	≤ 0,06	1,00	≤ 2,00	0,045	0,030	17,00/19,00	—		11,00/13,00	N ≤ 0,11
X2CrNiMo 17-12-2		1.440 4	≤ 0,030	1,00	≤ 2,00	0,045	0,030	16,50/18,50	≤ 1,00	2,00/2,50	10,00/13,00	N ≤ 0,11
X2CrNiMo17-12-3		1.443 2	≤ 0,030	1,00	≤ 2,00	0,045	0,015	16,50/18,50	≤ 1,00	2,50/3,00	10,50/13,00	N ≤ 0,11
X5CrNiMo17-12-2		1.440 1	≤ 0,07	1,00	≤ 2,00	0,045	0,030	16,50/18,50	≤ 1,00	2,00/2,50	10,00/13,00	N ≤ 0,11
X6CrNiMoTi17-12-2		1.457 1	≤ 0,08	1,00	≤ 2,00	0,045	0,030	16,50/18,50	≤ 1,00	2,00/2,50	10,50/13,50	Ti = 5xC to 0,70
X2CrNiMoN17-13-3		1.442 9	≤ 0,030	1,00	≤ 2,00	0,045	0,015	16,50/18,50	≤ 1,00	2,50/3,00	11,00/14,00	N = 0,12/0,22
X3CrNiMo17-13-3		1.443 6	≤ 0,05	1,00	≤ 2,00	0,045	0,015	16,50/18,50	—	2,50/3,00	10,50/13,00	N ≤ 0,11
X3CrNiCu18-9-4		1.456 7	≤ 0,04	1,00	≤ 2,00	0,045	0,030	17,00/19,00	3,00/4,00	—	8,50/10,50 ^e	N ≤ 0,11
X3CrNiCu19-9-2		1.456 0	≤ 0,035	1,00	1,50/2,00	0,045	0,015	18,00/19,00	1,50/2,00	—	8,00/9,00	N ≤ 0,11
X3CrNiCuMo17-11-3-2		1.457 8	≤ 0,04	1,00	≤ 1,00 ^d	0,045	0,015	16,50/17,50	3,00/3,50	2,00/2,50	10,00/11,00	N ≤ 0,11

a Elements not quoted in this table may not be intentionally added to the steel without the agreement of the purchaser except for finishing the heat. All appropriate precautions are to be taken to avoid the addition of such elements from scrap and other materials used in production that would impair mechanical properties and the suitability of the steel.

b In order to improve the cold formability, a carbon content of max. 0,04 % is recommended and may be agreed at the time of enquiry and order.

c At the time of the enquiry and order a min. content of N of 0,06 % may be agreed.

d A max. content of Mn of 2,00 % is permitted unless otherwise agreed at the time of the enquiry and order.

e A min. content of 8 % of Ni is permitted, unless otherwise agreed at the time of enquiry and order.

Table 3 — Permissible deviations between product analysis and the limiting values specified in Table 2 for the heat analysis

Elements	Limiting values of the cast (heat) analysis % by mass	Permissible deviation for the product analysis % by mass^a
C	≤ 0,030 > 0,030 ≤ 0,15	+ 0,005 ± 0,01
Si	≤ 1,00 > 1,00 ≤ 2,00	+ 0,05 + 0,10
Mn	≤ 1,00 > 1,00 ≤ 2,00	+ 0,03 ± 0,04
P	≤ 0,045	+ 0,005
S	≤ 0,015 > 0,015 ≤ 0,030	+ 0,003 + 0,005
N	≤ 0,22	± 0,01
Cr	≥ 11,50 < 15,00 ≥ 15,00 ≤ 20,00 > 20,00 ≤ 23,00	± 0,15 ± 0,20 ± 0,25
Cu	≤ 1,00 > 1,00 ≤ 4,00	+ 0,07 ± 0,10
Mo	< 1,75 ≥ 1,75 ≤ 3,50	± 0,05 ± 0,10
Ni	≤ 1,00 > 1,00 ≤ 5,00 > 5,00 ≤ 10,00 > 10,00 ≤ 14,00	+ 0,03 ± 0,07 ± 0,10 ± 0,15
Ti	≤ 0,70	± 0,05

a ± means that in one heat the deviation of the product analysis for a given element may occur over the upper value or under the lower value of the specified range in Table 2, but not both at the same time.

Table 4 — Mechanical properties for Ferritic Stainless steels in the specified delivery condition

Steel grade		Diameter		Delivery condition							
				+A or +A+PE		+A+ LC		+A+C+A		+A+C+A+LC	
Steel name	Steel number	above mm	up to mm	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %
X6Cr17	1.4016	2	5	—	—	—	—	560	63	620	61
		5	10	560	63	660	60	560	63	600	61
		10	25	560	63	640	60	560	63	—	—
X6CrMo 17-1	1.4113	2	5	—	—	—	—	600	60	660	58
		5	10	600	60	710	57	600	60	640	58
		10	25	600	60	690	57	600	60	—	—

1 Mpa = 1N/mm²

Table 5 — Mechanical properties for Martensitic Stainless steels in the specified delivery condition

Steel grade		Diameter		Delivery condition							
				+A or +A+PE		+A+ LC		+A+C+A		+A+C+A+LC	
Steel name	Steel number	above mm	up to mm	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %
X12Cr13	1.4006	2	5	—	—	—	—	600	60	660	58
		5	10	600	60	720	57	600	60	640	58
		10	25	600	60	700	57	600	60	—	—
		25	100	600	60	—	—	—	—	—	—

1 MPa = 1N/mm²

Table 6 — Mechanical properties for Austenitic-Ferritic Stainless steels in the specified delivery condition

Steel grade		Diameter		Delivery condition							
				+AT or +AT+PE		+AT+C		+AT+C+AT		+AT+C+AT+ LC	
Steel name	Steel number	above mm	up to mm	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %
X2CrNi MoN22-5-3	1.4462	2	5	880	55	—	—	950	55	1 010	50
		5	10	880	55	1 020	—	900	55	970	50
		10	25	880	55	1 000	—	880	55	—	—

1 MPa = 1N/mm²

Table 7 — Mechanical properties for Austenitic Stainless steels in the specified delivery condition

Steel grade		Delivery condition									
		Diameter		+AT or +AT+PE		+AT+C		+AT+C+AT		+AT+C+AT+L C	
Steel name	Steel number	above mm	up to mm	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %
X10CrNi 18-8	1.4310	2	5	—	—	—	—	720	65	760	60
		5	10	660	65	890	—	680	65	730	60
		10	25	660	65	850	—	660	65	—	—
		25	50	660	65	—	—	—	—	—	—
X2CrNi1 8-9	1.4307	2	5	—	—	—	—	680	68	730	63
		5	10	630	68	800	—	630	68	680	63
		10	25	630	68	760	—	630	68	—	—
		25	50	630	68	740	—	630	68	—	—
X2CrNi1 9-11	1.4306	2	5	—	—	—	—	680	68	730	63
		5	10	630	68	780	—	630	68	680	63
		10	25	630	68	740	—	630	68	—	—
		25	50	630	68	—	—	—	—	—	—
X5CrNi1 8-10	1.4301	2	5	—	—	—	—	700	60	750	60
		5	10	650	65	820	—	650	65	700	60
		10	25	650	65	780	—	650	65	—	—
		25	50	650	65	—	—	—	—	—	—
X6CrNi Ti18-10	1.4541	2	5	—	—	—	—	720	65	770	60
		5	10	680	65	850	—	680	65	730	60
		10	25	680	65	810	—	680	65	—	—
		25	50	680	65	—	—	—	—	—	—
X4CrNi1 8-12	1.4303	2	5	—	—	—	—	670	65	720	60
		5	10	650	65	800	—	650	65	700	60
		10	25	650	65	770	—	650	65	—	—
		25	50	650	65	—	—	—	—	—	—
X2CrNi Mo17-12-2	1.4404	2	5	—	—	—	—	670	68	720	63
		5	10	650	68	780	—	650	68	700	63
		10	25	650	68	750	—	650	68	—	—
		25	50	650	68	—	—	—	—	—	—
X2CrNi Mo17-12-3	1.4432	2	5	—	—	—	—	670	68	720	63
		5	10	650	68	780	—	650	68	700	63
		10	25	650	68	750	—	650	68	—	—
		25	50	650	68	—	—	—	—	—	—
X5CrNi Mo17-12-2	1.4401	2	5	—	—	—	—	690	65	740	60
		5	10	660	65	830	—	670	65	720	60
		10	25	660	65	790	—	660	65	—	—
		25	50	660	65	—	—	—	—	—	—
X6CrNi MoTi17-12-2	1.4571	2	5	—	—	—	—	720	65	770	60
		5	10	680	65	850	—	680	65	730	60
		10	25	680	65	810	—	680	65	—	—
		25	50	680	65	—	—	—	—	—	—
X2CrNi MoN17-13-3	1.4429	2	5	—	—	—	—	820	60	870	55
		5	10	780	60	940	—	800	60	850	55
		10	25	780	60	910	—	780	60	—	—
		25	50	780	60	—	—	—	—	—	—
X3CrNi Mo17-13-3	1.4436	2	5	—	—	—	—	690	65	740	60
		5	10	660	65	830	—	670	65	720	60
		10	25	660	65	790	—	660	65	—	—
		25	50	660	65	—	—	—	—	—	—

1 MPa = 1N/mm²

(continued)

Table 7 — Mechanical properties for Austenitic Stainless steels in the specified delivery condition (concluded)

Steel grade		Diameter		Delivery condition							
				+AT or +AT+PE		+AT+C		+AT+C+AT		+AT+C+AT+L C	
Steel name	Steel number	above mm	up to mm	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %	R_m max. MPa	Z min. %
X3CrNiCu18-9-4	1.4567	2	5	—	—	—	—	600	68	650	63
		5	10	590	68	740	—	590	68	640	63
		10	25	590	68	700	—	590	68	—	—
		25	50	590	68	—	—	—	—	—	—
X3CrNiCu19-9-2	1.4560	2	5	—	—	—	—	630	68	680	63
		5	10	610	68	790	—	610	68	660	63
		10	25	610	68	750	—	610	68	—	—
		25	50	610	68	—	—	—	—	—	—
X3CrNiCuMo17-11-3-2	1.4578	2	5	—	—	—	—	630	68	680	63
		5	10	610	68	760	—	610	68	660	63
		10	25	610	68	720	—	610	68	—	—
		25	50	610	68	—	—	—	—	—	—

1 MPa = 1N/mm²

Table 8 — Depth of surface defects

Diameter in the delivery condition ^a mm	Max. admissible depth of defect ^b mm
≤ 10	0,10
> 10	1 % of the diameter

a For diameter less than 5 mm, the permissible depth of surface defects shall be reduced in proportion of the reduction of the diameter during cold drawing.

b For ferritic, martensitic and austenitic-ferritic steels, higher values may be agreed at the time of enquiry and order.

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