



SLOVENSKI STANDARD

SIST EN 10088-1:1997

01-december-1997

Nerjavna jekla - 1. del: Seznam nerjavnih jekel

Stainless steels - Part 1: List of stainless steels

Nichtrostende Stähle - Teil 1: Verzeichnis der nichtrostenden Stähle

Aciers inoxydables - Partie 1: Liste des aciers inoxydables

Ta slovenski standard je istoveten z: **EN 10088-1:1995**

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EUROPEAN STANDARD

EN 10088-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 1995

ICS 77.140.20

Descriptors: stainless steels, austenitic steels, ferritic steels, martensitic steels, lists, designation, chemical composition, grades : quality, rolled products, physical properties, data

English version

Stainless steels - Part 1: List of stainless steels

Aciers inoxydables - Partie 1: Liste des aciers
inoxydables

Nichtrostende Stähle - Teil 1: Verzeichnis der
nichtrostenden Stähle

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European Committee for Standardization
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Foreword

This European Standard has been prepared by SC 1 "Stainless steels" of Technical Committee ECISS/TC 23 "Steels for treatment, alloy steels and free-cutting steels - Qualities" of which the secretariat 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of an identical text or by endorsement, at the latest by October 1995, and conflicting national standards shall be withdrawn at the latest by October 1995.

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

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1 Scope

This European Standard lists

- the chemical composition of stainless steels (see tables 1 to 4)
- reference data on some physical properties (see tables A.1 to A.4)

NOTE: A CEN Report covering information on the forms of wrought products in which the grades are standardized and the application of the grades is identified, is in course of preparation.

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. <https://standards.iteh.ai/catalog/standards/sist/a80e676a-b265-420b-8967-f995a2fab960/sist-en-10088-1-1997>

EN 10079 Definition of steel products

3 Definitions

3.1 Stainless steels

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

NOTE: It is intended to include into this standard at a later stage also creep resisting and heat resisting steel grades.

3.2 Product forms

For the form of products the definitions in EN 10079 apply.

4 Chemical composition

The chemical composition is given

- in Table 1 for ferritic steels,
- in Table 2 for martensitic and precipitation-hardening steels,
- in Table 3 for austenitic steels,
- in Table 4 for austenitic-ferritic steels.

They apply for all product forms including ingots and semi-finished material.

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Table 1: Chemical composition (cast analysis)¹⁾ of ferritic stainless steels

Steel designation		% by mass											Others
name	number	C max.	Si max.	Mn max.	P max.	S	N max.	Cr	Mo	Nb	Ni	Ti	
X2CrNi12	1.4003	0,030	1,00	1,50	0,040	≤ 0,015	0,030	10,50 to 12,50			0,30 to 1,00		
X2CrTi12	1.4512	0,030	1,00	1,00	0,040	≤ 0,015		10,50 to 12,50				6 x (C+N) to 0,65 0,05 to 0,35	
X6CrNiTi12	1.4516	0,08	0,70	1,50	0,040	≤ 0,015		10,50 to 12,50			0,50 to 1,50		
X6Cr13	1.4000	0,08	1,00	1,00	0,040	≤ 0,015 ²⁾		12,00 to 14,00					
X6CrAl13	1.4002	0,08	1,00	1,00	0,040	≤ 0,015 ²⁾		12,00 to 14,00					
X2CrTi17	1.4520	0,025	0,50	0,50	0,040	≤ 0,015	0,015	16,00 to 18,00					Al: 0,10 to 0,30
X6Cr17	1.4016	0,08	1,00	1,00	0,040	≤ 0,015 ²⁾		16,00 to 18,00					
X3CrTi17	1.4510	0,05	1,00	1,00	0,040	≤ 0,015 ²⁾		16,00 to 18,00					
X3CrNb17	1.4511	0,05	1,00	1,00	0,040	≤ 0,015 ²⁾		16,00 to 18,00					
X6CrMo17-1	1.4113	0,08	1,00	1,00	0,040	≤ 0,015 ²⁾		16,00 to 18,00		12 x C to 1,00			
X6CrMoS17	1.4105	0,08	1,50	1,50	0,040	0,15 to 0,35		0,90 to 1,40 0,20 to 0,60					
X2CrMoTi17-1	1.4513	0,025	1,00	1,00	0,040	≤ 0,015	0,015	16,00 to 18,00					
X2CrMoTi18-2	1.4521	0,025	1,00	1,00	0,040	≤ 0,015	0,030	17,00 to 20,00					
X2CrMoTiS18-2 ³⁾	1.4523 ⁴⁾	0,030	1,00	0,50	0,040	≤ 0,015		1,80 to 2,50 2,00 to 2,50					
X6CrNi17-1 ⁵⁾	1.4017 ⁶⁾	0,08	1,00	1,00	0,040	≤ 0,015		17,50 to 19,00					(C+N) ≤ 0,040
X6CrMoNb17-1	1.4526	0,08	1,00	1,00	0,040	≤ 0,015	0,040	16,00 to 18,00			1,20 to 1,60		
X2CrNbZr17 ⁷⁾	1.4590 ⁸⁾	0,030	1,00	1,00	0,040	≤ 0,015		16,00 to 17,50	7x(C+N)+0,10 to 1,00 0,35 to 0,55				
X2CrAlTi18-2	1.4605	0,030	1,00	1,00	0,040	≤ 0,015		17,00 to 18,00					Zr ≥ 7x(C+N)+0,15 Al: 1,70 to 2,10
X2CrTiNb18	1.4509	0,030	1,00	1,00	0,040	≤ 0,015		17,50 to 18,50					
X2CrMoTi29-4	1.4592	0,025	1,00	1,00	0,030	≤ 0,010	0,045	28,00 to 30,00					

¹⁾ Elements not listed in this table may not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate precautions are to be taken to avoid the addition of such elements from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

²⁾ For bars, rods, sections and the relevant semi-finished products, a maximum content of 0,030 % S applies.
For any product to be machined a controlled sulfur content of 0,015 to 0,030 % is recommended and permitted.

³⁾ The stabilisation may be made by use of titanium or niobium or zirconium. According to the atomic number of these elements and the content of carbon and nitrogen, the equivalence shall be the following:

$$Ti \cong \frac{7}{4} Nb \cong \frac{7}{4} Zr.$$

⁴⁾ Patented steel grade.

Table 2. Chemical composition (cast analysis)¹⁾ of martensitic and precipitation hardening stainless steels

Steel designation		% by mass											Others
name	number	C ²⁾	Si max.	Mn max.	P max.	S	Cr	Cu	Mo	Nb	Ni		
X12Cr13	1.4006	0,08 to 0,15	1,00	1,50	0,040	≤ 0,015 ³⁾	11,50 to 13,50		≤ 0,60		≤ 0,75		
X12CrS13	1.4005	0,08 to 0,15	1,00	1,50	0,040	0,15 to 0,35	12,00 to 14,00						
X20Cr13	1.4021	0,16 to 0,25	1,00	1,50	0,040	≤ 0,015 ³⁾	12,00 to 14,00						
X30Cr13	1.4028	0,26 to 0,35	1,00	1,50	0,040	≤ 0,015 ³⁾	12,00 to 14,00						
X29CrS13	1.4029	0,25 to 0,32	1,00	1,50	0,040	0,15 to 0,25	12,00 to 13,50						
X39Cr13	1.4031	0,36 to 0,42	1,00	1,00	0,040	≤ 0,015 ³⁾	12,50 to 14,50						
X46Cr13	1.4034	0,43 to 0,50	1,00	1,00	0,040	≤ 0,015 ³⁾	12,50 to 14,50					V: 0,10 to 0,20	
X50CrMoV15	1.4116	0,45 to 0,55	1,00	1,00	0,040	≤ 0,015 ³⁾	14,00 to 15,00		0,50 to 0,80				
X70CrMo15	1.4109	0,65 to 0,75	0,70	1,00	0,040	≤ 0,015 ³⁾	14,00 to 16,00		0,40 to 0,80				
X14CrMoS17	1.4104	0,10 to 0,17	1,00	1,50	0,040	0,15 to 0,35	15,50 to 17,50		0,20 to 0,60				
X39CrMo17-1	1.4122	0,33 to 0,45	1,00	1,50	0,040	≤ 0,015 ³⁾	15,50 to 17,50		0,80 to 1,30		≤ 1,00		
X105CrMo17	1.4125	0,95 to 1,20	1,00	1,00	0,040	≤ 0,015 ³⁾	16,00 to 18,00		0,40 to 0,80				
X90CrMoV18	1.4112	0,85 to 0,95	1,00	1,00	0,040	≤ 0,015 ³⁾	17,00 to 19,00		0,90 to 1,30			V: 0,07 to 0,12	
X17CrNi16-2	1.4057	0,12 to 0,22	1,00	1,50	0,040	≤ 0,015 ³⁾	15,00 to 17,00				1,50 to 2,50		
X3CrNiMo13-4	1.4313	≤ 0,05	0,70	1,50	0,040	≤ 0,015	12,00 to 14,00		0,30 to 0,70		3,50 to 4,50	Ni: ≥ 0,020	
X4CrNiMo16-5-1	1.4418	≤ 0,06	0,70	1,50	0,040	≤ 0,015 ³⁾	15,00 to 17,00		0,80 to 1,50		4,00 to 6,00	Ni: ≥ 0,020	
X5CrNiCuNb16-4	1.4542	≤ 0,07	0,70	1,50	0,040	≤ 0,015 ³⁾	15,00 to 17,00	3,00 to 5,00		5xC to 0,45	3,00 to 5,00	Al: 0,70 to 1,50	
X7CrNiAl17-7	1.4568	≤ 0,09	0,70	1,00	0,040	≤ 0,015	16,00 to 18,00		≤ 0,60		6,50 to 7,80 ⁴⁾	Al: 0,70 to 1,50	
X8CrNiMoAl15-7-2	1.4532	≤ 0,10	0,70	1,20	0,040	≤ 0,015	14,00 to 16,00		2,00 to 3,00		6,50 to 7,80		
X5CrNiMoCuNb14-5	1.4594	≤ 0,07	0,70	1,00	0,040	≤ 0,015	13,00 to 15,00	1,20 to 2,00	1,20 to 2,00	0,15 to 0,60	5,00 to 6,00		

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

2) Tighter carbon ranges may be agreed at the time of enquiry and order.

3) For bars, rods, sections and the relevant semi-finished products, a maximum content of 0,030 % S applies. For any product to be machined a controlled sulfur content of 0,015 to 0,030 % is recommended and permitted.

4) For better cold deformability, the upper limit may be increased to 8,30 %.

Table 3: Chemical composition (cast analysis)¹⁾ of austenitic stainless steels

Steel designation		% by mass												
name	number	C	Si	Mn	P max.	S	N	Cr	Cu	Mo	Nb	Ni	Ti	
X10CrNi18-8	1.4310	0,05 to 0,15	≤ 2,00	≤ 2,00	0,045	≤ 0,015	≤ 0,11	16,00 to 19,00		≤ 0,80		6,00 to 9,50		
X2CrNi18-7	1.4318	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	0,10 to 0,20	16,50 to 18,50				6,00 to 8,00		
X2CrNi18-9	1.4307	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,50 to 19,50				8,00 to 10,00		
X2CrNi19-11	1.4308	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	18,00 to 20,00				10,00 to 12,00 ³⁾		
X2CrNi18-10	1.4311	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	0,12 to 0,22	17,00 to 19,50				8,50 to 11,50		
X5CrNi18-10	1.4301	≤ 0,07	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,50	≤ 1,00			8,00 to 10,50		
X6CrNi18-9	1.4305	≤ 0,10	≤ 1,00	≤ 2,00	0,045	0,15 to 0,35	≤ 0,11	17,00 to 19,00				8,00 to 10,00	5xC to 0,70	
X6CrNi18-10	1.4541	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,00				9,00 to 12,00 ³⁾		
X6CrNi18-10	1.4550	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,00			10xC to 1,00	9,00 to 12,00 ³⁾		
X4CrNi18-12	1.4303	≤ 0,06	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,00				11,00 to 13,00		
X1CrNi25-21	1.4335	≤ 0,020	≤ 0,25	≤ 2,00	0,025	≤ 0,010	≤ 0,11	24,00 to 26,00		≤ 0,20		20,00 to 22,00		
X2CrNiMo17-12-2	1.4404	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	16,50 to 18,50		2,00 to 2,50		10,00 to 13,00 ³⁾		
X2CrNiMo17-12-2	1.4406	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	0,12 to 0,22	16,50 to 18,50		2,00 to 2,50		10,00 to 12,00 ³⁾		
X1CrNiMoN25-22-2	1.4401	≤ 0,07	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	16,50 to 18,50		2,00 to 2,50		10,00 to 13,00		
X6CrNiMoTi17-12-2	1.4468	≤ 0,020	≤ 0,70	≤ 2,00	0,025	≤ 0,010 ²⁾	0,10 to 0,18	24,00 to 26,00		2,00 to 2,50	10xC to 1,00	10,50 to 13,50	5xC to 0,70	
X6CrNiMoNb17-12-2	1.4571	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	16,50 to 18,50		2,00 to 2,50		10,50 to 13,50		
X2CrNiMo17-12-3	1.4432	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	16,50 to 18,50		2,50 to 3,00		10,50 to 13,50		
X2CrNiMoN17-13-3	1.4429	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	16,50 to 18,50		2,50 to 3,00		11,00 to 14,00 ³⁾		
X3CrNiMo17-13-3	1.4438	≤ 0,05	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	16,50 to 18,50		2,50 to 3,00		10,50 to 13,00 ³⁾		
X2CrNiMo18-14-3	1.4435	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,00		2,50 to 3,00		12,50 to 15,00		
X2CrNiMo18-12-4	1.4434	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,00		3,00 to 4,00		10,50 to 14,00 ³⁾		
X2CrNiMo18-15-4	1.4438	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,50 to 19,50		3,00 to 4,00		13,00 to 16,00 ³⁾		
X2CrNiMoN17-13-5	1.4439	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,50 to 19,50		4,00 to 5,00		12,50 to 14,50		
X1CrNiSi18-15-4	1.4381	≤ 0,015	3,70 to 4,50	≤ 2,00	0,025	≤ 0,010	≤ 0,11	18,50 to 18,50		≤ 0,20		14,00 to 16,00		
X12CrMnNi17-7-5	1.4372	≤ 0,15	≤ 1,00	5,50 to 7,50	0,045	≤ 0,010	≤ 0,11	16,00 to 18,00				3,50 to 5,50		
X2CrMnNi17-7-5	1.4371	≤ 0,030	≤ 1,00	6,00 to 8,00	0,045	≤ 0,015	0,05 to 0,25	16,00 to 18,00				3,50 to 5,50		
X12CrMnNi18-9-5	1.4373	≤ 0,15	≤ 1,00	7,50 to 10,50	0,045	≤ 0,015	0,15 to 0,20	16,00 to 17,00				3,50 to 5,50		
X3CrNiCu19-9-2	1.4560	≤ 0,035	≤ 1,00	1,50 to 2,00	0,045	≤ 0,015	0,05 to 0,25	17,00 to 19,00				8,00 to 9,00		
X6CrNiCu18-9-2	1.4570	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,015	≤ 0,11	18,00 to 19,00	1,50 to 2,00			8,00 to 10,00		
X3CrNiCu18-9-4	1.4567	≤ 0,04	≤ 1,00	≤ 2,00	0,045	≤ 0,015 ²⁾	≤ 0,11	17,00 to 19,00	1,40 to 1,80			8,50 to 10,50		
X3CrNiCuMo17-11-3-2	1.4578	≤ 0,04	≤ 1,00	≤ 2,00	0,045	≤ 0,015	≤ 0,11	17,00 to 19,00	3,00 to 4,00			10,00 to 11,00		
X1NiCrMoCu31-27-4	1.4563	≤ 0,020	≤ 0,70	≤ 2,00	0,030	≤ 0,010	≤ 0,11	16,50 to 17,50	3,00 to 3,50	2,00 to 2,50		30,00 to 32,00		
X1NiCrMoCu25-20-5	1.4539	≤ 0,020	≤ 0,70	≤ 2,00	0,030	≤ 0,010	≤ 0,15	26,00 to 28,00	0,70 to 1,50	3,00 to 4,00		24,00 to 26,00		
X1CrNiMoCuN25-25-5	1.4537	≤ 0,020	≤ 0,70	≤ 2,00	0,030	≤ 0,010	0,17 to 0,25	19,00 to 21,00	1,20 to 2,00	4,00 to 5,00		24,00 to 27,00		
X1CrNiMoCuN20-18-7*)	1.4547	≤ 0,020	≤ 0,70	≤ 1,00	0,030	≤ 0,010	0,18 to 0,25	24,00 to 26,00	1,00 to 2,00	6,00 to 7,00		17,50 to 18,50		
X1NiCrMoCuN25-20-7	1.4529	≤ 0,020	≤ 0,50	≤ 1,00	0,030	≤ 0,010	0,15 to 0,25	19,00 to 21,00	0,50 to 1,00	6,00 to 7,00		24,00 to 26,00		

1) Elements not quoted in this table may not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate precautions are to be taken to avoid the addition of such elements from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.
 2) For bars, rods, sections and the relevant semi-finished products a maximum content of 0,030 % S applies.
 For any product to be machined a controlled sulfur content of 0,015 to 0,030 % is recommended and permitted.
 3) Where for special reasons, e. g. hot workability for the fabrication of seamless tubes where it is necessary to minimize the delta-ferrite content, or with the aim of low permeability, the maximum Ni content may be increased by the following amounts:
 0,50 % (m/m): 1.4571.
 1,00 % (m/m): 1.4308, 1.4406, 1.4429, 1.4434, 1.4438, 1.4438, 1.4541, 1.4550.
 1,50 % (m/m): 1.4404
 *) Patented steel grade

Table 4. Chemical composition (cast analysis)¹⁾ of austenitic-ferritic stainless steels

Steel designation		% by mass										
name	number	C max.	Si max.	Mn max.	P max.	S max.	N	Cr	Cu	Mo	Ni	W
X2CrNiN23-4 ^{*)}	1.4362 ^{*)}	0,030	1,00	2,00	0,035	0,015	0,05 to 0,20	22,00 to 24,00	0,10 to 0,60	0,10 to 0,60	3,50 to 5,50	
X3CrNiMoN27-5-2	1.4460	0,05	1,00	2,00	0,035	0,015 ²⁾	0,05 to 0,20	25,00 to 28,00		1,30 to 2,00	4,50 to 6,50	
X2CrNiMoN22-5-3	1.4462	0,030	1,00	2,00	0,035	0,015	0,10 to 0,22	21,00 to 23,00		2,50 to 3,50	4,50 to 6,50	
X2CrNiMoCuN25-6-3	1.4507	0,030	0,70	2,00	0,035	0,015	0,15 to 0,30	24,00 to 26,00	1,00 to 2,50	2,70 to 4,00	5,50 to 7,50	
X2CrNiMoN25-7-4 ^{*)}	1.4410 ^{*)}	0,030	1,00	2,00	0,035	0,015	0,20 to 0,35	24,00 to 26,00		3,00 to 4,50	6,00 to 8,00	
X2CrNiMoCuWN25-7-4	1.4501	0,030	1,00	1,00	0,035	0,015	0,20 to 0,30	24,00 to 26,00	0,50 to 1,00	3,00 to 4,00	6,00 to 8,00	0,50 to 1,00

¹⁾ Elements not listed in this table may not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate precautions are to be taken to avoid the addition of such elements from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.

²⁾ For bars, rods, sections and the relevant semi-finished products, a maximum content of 0,030 % S applies. For any product to be machined a controlled sulfur content of 0,015 % to 0,030 % is recommended and permitted.

^{*)} Patented steel grade