
**Steel flat products for pressure
purposes — Technical delivery
conditions —**

**Part 7:
Stainless steels**

iTeh STANDARD PREVIEW
*Produits plats en acier pour service sous pression — Conditions
techniques de livraison —
(standards.iteh.ai)
Partie 7: Aciers inoxydables*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 9328-7 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 10, *Steel for pressure purposes*.

This second edition cancels and replaces the first edition (ISO 9328-7:2004), which has been technically revised.

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ISO 9328 consists of the following parts, under the general title *Steel flat products for pressure purposes — Technical delivery conditions*:

- *Part 1: General requirements*
- *Part 2: Non-alloy and alloy steels with specified elevated temperature properties*
- *Part 3: Weldable fine grain steels, normalized*
- *Part 4: Nickel-alloy steels with specified low temperature properties*
- *Part 5: Weldable fine grain steels, thermomechanically rolled*
- *Part 6: Weldable fine grain steels, quenched and tempered*
- *Part 7: Stainless steels*

The clauses marked by two points (••) contain information relating to agreements that may be made at the time of enquiry and order.

Steel flat products for pressure purposes — Technical delivery conditions —

Part 7: Stainless steels

1 Scope

This part of ISO 9328 specifies requirements for flat products for pressure purposes made of stainless steels, including austenitic creep-resisting steels, in thicknesses as indicated in Tables 7 to 10.

Additionally the requirements of ISO 9328-1 also apply.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

ISO 643:2003, *Steels — Micrographic determination of the apparent grain size*
<https://www.iso.org/standard/52567-2710898e94cb/iso-9328-7-2011>

ISO 3651-2:1998, *Determination of resistance to intergranular corrosion of stainless steels — Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in media containing sulfuric acid*

ISO 9328-1:2011, *Steel flat products for pressure purposes — Technical delivery conditions — Part 1: General requirements*

ISO 10474:1991, *Steel and steel products — Inspection documents*

ISO 18286, *Hot-rolled stainless steel plates — Tolerances on dimensions and shape*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9328-1 and the following apply.

3.1

cryogenic temperature

temperature lower than -75 °C used in the liquefaction of gases

4 Classification and designation

See ISO 9328-1.

NOTE Information on the designation of comparable steel grades in national or regional standards is given in Annex A.

5 Information to be supplied by the purchaser

5.1 Mandatory information

See ISO 9328-1.

5.2 Options

A number of options are specified in this part of ISO 9328 and are listed below. Additionally, the relevant options of ISO 9328-1 apply. If the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the products shall be supplied in accordance with the basic specification (see ISO 9328-1):

- a) mechanical properties for increased product thicknesses (see Table 7, footnote e);
- b) higher $R_{p0,2}$ and $R_{p1,0}$ values for continuously hot rolled products (see Table 9, footnote d and Table 10, footnote b);

5.3 Example for ordering

10 plates made of a steel grade with the name X5CrNi18-10 as specified in ISO 9328-7 with nominal dimensions thickness = 8 mm, width = 2 000 mm, length = 5 000 mm and tolerances on dimensions, shape and mass as specified in ISO 18286, with "normal" flatness tolerance in process route 1D (see Table 6), and with inspection document 3.1.B as specified in ISO 10474:

10 plates ISO 18286 — 8 × 2000 × 5000 N — Steel ISO 9328-7 — X5CrNi18-10 + 1D —
Inspection document 3.1.B

6 Requirements

<https://standards.iteh.ai/catalog/standards/sist/fa65fbd3-f6c3-4ae3-b307-2710898e94cb/iso-9328-7-2011>

6.1 Steelmaking process

See ISO 9328-1.

6.2 Delivery condition

The products shall be supplied in the delivery condition specified in the order by reference to the process route given in Table 6 and, where alternatives exist, to the treatment conditions given in Tables 7 to 10. Guidelines for further treatment, including heat treatment, are given in Annex B.

6.3 Chemical composition and chemical corrosion properties

6.3.1 The chemical composition requirements given in Tables 1 to 4 apply in respect of the chemical composition according to the cast analysis.

6.3.2 The product analysis may deviate from the limiting values for the cast analysis given in Tables 1 to 4 by the values listed in Table 5.

6.3.3 Referring to resistance to intergranular corrosion as defined in ISO 3651-2, for ferritic, austenitic and austenitic-ferritic steels, the specifications in Tables 7, 9 and 10 apply.

NOTE 1 ISO 3651-2 is not applicable for testing martensitic steels.

NOTE 2 The corrosion resistance of stainless steels is very dependent on the type of environment and can therefore not always be clearly ascertained through laboratory tests. It is therefore advisable to draw on the available experience of the use of the steels.

6.4 Mechanical properties

6.4.1 The tensile properties at room temperature and the impact energy at room temperature and at low temperature, as specified in Tables 7 to 10, apply for the relevant specified heat treatment condition.

NOTE Austenitic steels are insensitive to brittle fracture in the solution annealed condition. Because they do not have a pronounced transition temperature, which is characteristic of other steels, they are also useful for application at cryogenic temperatures.

6.4.2 The values in Tables 11 to 14 apply for the 0,2 % and 1,0 % proof strength at elevated temperatures. Additionally, the values in Table 15 apply for the tensile strength at elevated temperatures of austenitic steels.

Tensile strength values at elevated temperatures for austenitic-ferritic steels are given for guidance in Annex D.

6.4.3 Annex E provides for the purchaser mean values as preliminary data on the strength for 1 % (plastic) creep strain and creep rupture. These data apply for the solution annealed condition only.

6.4.4 In Annex F, preliminary data on mechanical properties at low temperatures of austenitic steels are listed.

6.5 Surface condition

See ISO 9328-1 and Table 6.

6.6 Internal soundness

See ISO 9328-1.

6.7 Post-weld heat treatment

Guidelines for the purchaser on post-weld heat treatment are given in Annex C.

6.8 Dimensions and tolerances

See ISO 9328-1.

6.9 Calculation of mass

For density of steels, see Annex G.

6.10 Physical properties

Reference data on some physical properties are given in Annex G.

7 Inspection

7.1 Types of inspection and inspection documents

See ISO 9328-1.

7.2 Tests to be carried out

See Table 16 and ISO 9328-1.

7.3 Re-tests

See ISO 9328-1.

8 Sampling

8.1 Frequency of testing

See Table 16 and ISO 9328-1.

8.2 Selection and preparation of samples and test pieces

See ISO 9328-1.

9 Test methods

See ISO 9328-1.

10 Marking

See ISO 9328-1.

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Table 1 — Chemical composition (cast analysis)^a of ferritic steels

Steel grade	ISO number ^b	Mass fraction, %										
		C max.	Si max.	Mn max.	P max.	S max.	N max.	Cr	Mo	Nb	Ni	Ti
X2CrNi12	—	0,030	1,00	1,50	0,040	0,015	0,030	10,5 to 12,5	—	—	0,30 to 1,10	—
X6CrNiTi12	—	0,08	1,00	1,00	0,040	0,015	—	10,5 to 12,5	—	—	0,50 to 1,50	0,05 to 0,35
X2CrTi17	—	0,025	0,50	0,50	0,040	0,015	0,015	16,0 to 18,0	—	—	—	0,30 to 0,60
X3CrTi17	—	0,05	1,00	1,00	0,040	0,015	—	16,0 to 18,0	—	—	—	[4 × (C + N) + 0,15] to 0,80 ^c
X2CrMoTi17-1	—	0,025	1,00	1,00	0,040	0,015	0,030	16,0 to 18,0	0,80 to 1,40	—	—	0,30 to 0,60
X2CrMoTi18-2	—	0,025	1,00	1,00	0,040	0,015	0,030	17,0 to 20,0	1,80 to 2,50	—	—	[4 × (C + N) + 0,15] to 0,80 ^c
X6CrMoNb17-1	—	0,08	1,00	1,00	0,040	0,015	0,040	16,0 to 18,0	0,80 to 1,40	[7 × (C + N) + 0,10] to 1,00	—	—
X2CrTiNb18	4509-439-40-X	0,030	1,00	1,00	0,040	0,015	—	17,5 to 18,5	—	[3 × C + 0,30] to 1,00	—	0,10 to 0,60

^a Elements not listed in this table may not be intentionally added to the steel without agreement of the purchaser, except for finishing of 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.

^b ISO number according to ISO 15510.

^c The stabilization 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, if additional stabilizing with niobium or zirconium is used, be the following:

$$\text{Nb} = \text{Zr} = \frac{7}{4} \text{Ti}$$

Table 2 — Chemical composition (cast analysis)^a of martensitic steels

Steel grade	ISO number ^b	Mass fraction, %									
		C max.	Si max.	Mn max.	P max.	S max.	N min.	Cr	Mo	Ni	
X3CrNiMo13-4	—	0,05	0,70	0,50 to 1,00	0,040	0,015	0,020	12,0 to 14,0	0,30 to 1,00	3,5 to 4,5	
X4CrNiMo16-5-1	4418-431-77-E	0,06	0,70	1,50	0,040	0,015	0,020	15,0 to 17,0	0,80 to 1,50	4,0 to 6,0	

^a Elements not listed in this table may not be intentionally added to the steel without the agreement of the purchaser, except for finishing of 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.

^b ISO number according to ISO 15510.

Table 3 — Chemical composition (cast analysis)^a of austenitic steels

Steel grade	ISO number ^b	Mass fraction, %											Ti	Others	
		C	Si	Min max.	P max.	S max.	N	Cr	Cu	Mo	Nb	Ni			
Austenitic corrosion-resisting grades															
X2CrNiN18-7	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	0,10 to 0,20	16,5 to 18,5	—	—	—	—	6,0 to 8,0	—	—
X2CrNi18-9	4307-304-03-I	≤ 0,030	≤ 1,00	2,00	0,045	0,015	≤ 0,10	17,5 to 19,5	—	—	—	—	8,0 to 10,5	—	—
X2CrNi19-11	4306-304-03-I	≤ 0,030	≤ 1,00	2,00	0,045	0,015	≤ 0,10	18,0 to 20,0	—	—	—	—	10,0 to 12,0	—	—
X5CrNiN19-9	—	≤ 0,06	≤ 1,00	2,00	0,045	0,015	0,12 to 0,22	18,0 to 20,0	—	—	—	—	8,0 to 11,0	—	—
X2CrNiN18-10	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	0,12 to 0,22	17,5 to 19,5	—	—	—	—	8,0 to 11,5	—	—
X5CrNi18-10	4301-304-00-I	≤ 0,07	≤ 1,00	2,00	0,045	0,015	≤ 0,10	17,5 to 19,5	—	—	—	—	8,0 to 10,5	—	—
X6CrNiTi18-10	4541-321-00-I	≤ 0,08	≤ 1,00	2,00	0,045	0,015	—	17,0 to 19,0	—	—	—	—	9,0 to 12,0	5 × C to 0,70	—
X6CrNiNb18-10	4550-347-00-I	≤ 0,08	≤ 1,00	2,00	0,045	0,015	—	17,0 to 19,0	—	—	—	10 × C to 1,00	9,0 to 12,0	—	—
X1CrNi25-21	4335-310-02-I	≤ 0,020	≤ 0,25	2,00	0,025	0,010	≤ 0,10	24,0 to 26,0	—	—	≤ 0,20	—	20,0 to 22,0	—	—
X2CrNiMo17-12-2	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	≤ 0,10	16,5 to 18,5	—	—	2,00 to 2,50	—	10,0 to 13,0	—	—
X2CrNiMoN17-11-2	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	0,12 to 0,22	16,5 to 18,5	—	—	2,00 to 2,50	—	10,0 to 12,5	—	—
X5CrNiMo17-12-2	—	≤ 0,07	≤ 1,00	2,00	0,045	0,015	≤ 0,10	16,5 to 18,5	—	—	2,00 to 2,50	—	10,0 to 13,0	—	—
X1CrNiMoN25-22-2	4466-310-50-E	≤ 0,020	≤ 0,70	2,00	0,025	0,010	0,10 to 0,16	24,0 to 26,0	—	—	2,00 to 2,50	—	21,0 to 23,0	—	—
X6CrNiMoTi17-12-2	4571-316-35-I	≤ 0,08	≤ 1,00	2,00	0,045	0,015	—	16,5 to 18,5	—	—	2,00 to 2,50	—	10,5 to 13,5	5 × C to 0,70	—
X6CrNiMoNb17-12-2	4580-316-40-I	≤ 0,08	≤ 1,00	2,00	0,045	0,015	—	16,5 to 18,5	—	—	2,00 to 2,50	10 × C to 1,00	10,5 to 13,5	—	—
X2CrNiMo17-12-3	4432-316-03-I	≤ 0,030	≤ 1,00	2,00	0,045	0,015	≤ 0,10	16,5 to 18,5	—	—	2,50 to 3,00	—	10,5 to 13,0	—	—
X2CrNiMoN17-13-3	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	0,12 to 0,22	16,5 to 18,5	—	—	2,50 to 3,00	—	11,0 to 14,0	—	—
X3CrNiMo17-12-3	4436-316-00-I	≤ 0,05	≤ 1,00	2,00	0,045	0,015	≤ 0,10	16,5 to 18,5	—	—	2,50 to 3,00	—	10,5 to 13,0	—	—
X2CrNiMo18-14-3	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	≤ 0,10	17,0 to 19,0	—	—	2,50 to 3,00	—	12,5 to 15,0	—	—
X2CrNiMoN18-12-4	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	0,10 to 0,20	16,5 to 19,5	—	—	3,0 to 4,0	—	10,5 to 14,0	—	—
X2CrNiMo18-15-4	—	≤ 0,030	≤ 1,00	2,00	0,045	0,015	≤ 0,10	17,5 to 19,5	—	—	3,0 to 4,0	—	13,0 to 16,0	—	—
X2CrNiMoN17-13-5	4439-317-26-E	≤ 0,030	≤ 1,00	2,00	0,045	0,015	0,12 to 0,22	16,5 to 18,5	—	—	4,0 to 5,0	—	12,5 to 14,5	—	—
X1NiCrMoCu31-27-4	4563-080-28-I	≤ 0,020	≤ 0,70	2,00	0,030	0,010	≤ 0,10	26,0 to 28,0	0,70 to 1,50	—	3,0 to 4,0	—	30,0 to 32,0	—	—
X1NiCrMoCu25-20-5	—	≤ 0,020	≤ 0,70	2,00	0,030	0,010	≤ 0,15	19,0 to 21,0	1,20 to 2,00	—	4,0 to 5,0	—	24,0 to 26,0	—	—

Table 3 (continued)

Steel grade	ISO number ^b	Mass fraction, %											Ti	Others
		C	Si	Mn max.	P max.	S max.	N	Cr	Cu	Mo	Nb	Ni		
Austenitic corrosion-resisting grades														
X1CrNiMoCuN25-25-5	4537-310-92-E	≤ 0,020	≤ 0,70	2,00	0,030	0,010	0,17 to 0,25	24,0 to 26,0	1,00 to 2,00	4,7 to 5,7	—	24,0 to 27,0	—	—
X1CrNiMoCuN20-18-7	—	≤ 0,020	≤ 0,70	1,00	0,030	0,010	0,18 to 0,25	19,5 to 20,5	0,50 to 1,00	6,0 to 7,0	—	17,5 to 18,5	—	—
X1NiCrMoCuN25-20-7	—	≤ 0,020	≤ 0,50	2,00	0,030	0,010	0,15 to 0,25	19,0 to 21,0	0,50 to 1,50	6,0 to 7,0	—	24,0 to 26,0	—	—
X2CrMnNiN17-7-5	—	< 0,030	≤ 1,00	6,0 to 8,0	0,045	0,015	0,15 to 0,20	16,0 to 17,0	—	—	—	3,5 to 5,5	—	—
X9CrMnNiCu17-8-5-2	4618-201-76-E	≤ 0,10	≤ 1,00	5,5 to 9,5	0,070	0,010	0,15	16,5 to 18,5	1,00 to 2,50	—	—	4,5 to 5,5	—	—
Austenitic creep-resisting grades														
X3CrNiMoBN17-13-3	4910-316-77-E	≤ 0,04	≤ 0,75	2,00	0,035	0,015	0,10 to 0,18	16,0 to 18,0	—	2,00 to 3,00	—	12,0 to 14,0	—	0,0015 to 0,005 0 B
X6CrNiTiB18-10	4941-321-09-I	0,04 to 0,08	≤ 1,00	2,00	0,035	0,015	17,0 to 19,0	—	—	—	—	9,0 to 12,0	5 × C to 0,70	0,0015 to 0,0050 B
X6CrNi18-10	—	0,04 to 0,08	≤ 1,00	2,00	0,035	0,015	17,0 to 19,0	—	—	—	—	8,0 to 11,0	—	—
X6CrNi23-13	4950-309-08-E	0,04 to 0,08	≤ 0,70	2,00	0,035	0,015	0,10	22,0 to 24,0	—	—	—	12,0 to 15,0	—	—
X6CrNi25-20	—	0,04 to 0,08	≤ 0,70	2,00	0,035	0,015	24,0 to 26,0	—	—	—	—	19,0 to 22,0	—	—
X5NiCrAlTi31-20 (+RA)	—	0,03 to 0,08	≤ 0,70	1,50	0,015	0,010	0,03	19,0 to 22,0	≤ 0,50	—	—	30,0 to 32,5	0,20 to 0,50	0,20 to 0,50 Al + Ti: ≤ 0,70 ≤ 0,50 Co Ni + Co: 30,0 to 32,5
X8NiCrAlTi32-21	—	0,05 to 0,10	≤ 0,70	1,50	0,015	0,010	≤ 0,03	19,0 to 22,0	≤ 0,50	—	—	30,0 to 34,0	0,25 to 0,65	0,25 to 0,65 Al ≤ 0,50 Co Ni + Co: 30,0 to 34,0
X8CrNiNb16-13	4961-347-77-E	0,04 to 0,10	0,30 to 0,60	1,50	0,035	0,015	—	15,0 to 17,0	—	—	10 × C to 1,20	12,0 to 14,0	—	—

^a Elements not listed in this table may not be intentionally added to the steel without the agreement of the purchaser, except for finishing of 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.

^b ISO number according to ISO 15510.

Table 4 — Chemical composition (cast analysis)^a of austenitic-ferritic steels

Steel grade	ISO number ^b	Mass fraction, %										
		C max.	Si max.	Mn max.	P max.	S max.	N	Cr	Cu	Mo	Ni	W
X2CrNiN23-4	4362-323-04-1	0,030	1,00	2,00	0,035	0,015	0,05 to 0,20	22,0 to 24,0	0,10 to 0,60	0,10 to 0,60	3,5 to 5,5	—
X2CrNiN22-2	—	0,030	1,00	2,00	0,040	0,010	0,16 to 0,28	21,0 to 23,8	—	≤ 0,45	1,5 to 2,9	—
X2CrNiMoN22-5-3	—	0,030	1,00	2,00	0,035	0,015	0,10 to 0,22	21,0 to 23,0	—	2,50 to 3,5	4,5 to 6,5	—
X2CrNiMoCuN25-6-3	4507-325-20-1	0,030	0,70	2,00	0,035	0,015	0,20 to 0,30	24,0 to 26,0	1,00 to 2,50	3,0 to 4,0	6,0 to 8,0	—
X2CrNiMoN25-7-4	4410-327-50-E	0,030	1,00	2,00	0,035	0,015	0,24 to 0,35	24,0 to 26,0	—	3,0 to 4,5	6,0 to 8,0	—
X2CrNiMoCuWN25-7-4	—	0,030	1,00	1,00	0,035	0,015	0,20 to 0,30	24,0 to 26,0	0,50 to 1,00	3,0 to 4,0	6,0 to 8,0	0,50 to 1,00

^a Elements not listed in this table may not be intentionally added to the steel without the agreement of the purchaser, except for finishing of 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.

^b ISO number according to ISO 15510.

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Table 5 — Permissible product analysis tolerances on the limiting values given in Tables 1 to 4 for the cast analysis

Element	Specified value in the cast analysis in Tables 1 to 4 % by mass	Permissible deviation ^a of the product analysis % by mass
Carbon	≤ 0,030	+0,005
	> 0,030; ≤ 0,10	±0,01
Silicon	≤ 1,00	+0,05
Manganese	≤ 1,00	+0,03
	> 1,00; ≤ 2,50	+0,04
Phosphorus	≤ 0,030	+0,003
	> 0,030; ≤ 0,045	+0,005
Sulfur	≤ 0,015	+0,003
Nitrogen	≤ 0,35	±0,01
Aluminium	≤ 0,65	±0,10
Chromium	≥ 10,5; < 15,0	±0,15
	≥ 15,0; ≤ 20,0	±0,20
	> 20,0; ≤ 28,0	±0,25
Copper	≤ 1,00	±0,07
	> 1,00; ≤ 2,50	±0,10
Molybdenum	≤ 0,60	±0,03
	> 0,60; ≤ 1,75	±0,05
	≥ 1,75; < 7,0	±0,10
Niobium	≤ 1,00	±0,05
Nickel	≤ 1,00	±0,03
	> 1,00; ≤ 5,0	±0,07
	> 5,0; ≤ 10,0	±0,10
	> 10,0; ≤ 20,0	±0,15
	> 20,0; ≤ 34,0	±0,20
Cobalt	≤ 0,50	±0,05
Titanium	≤ 0,08	±0,05
Tungsten	≤ 1,00	±0,05

^a If several product analyses are carried out on one cast, and the contents of an individual element determined lie outside the permissible range of the chemical composition specified for the cast analysis, then it is only allowed to exceed the permissible maximum value or to fall short of the permissible minimum value, but not both for one cast.

Table 6 — Type of process route of sheet, plate and strip^a

	Abbreviation ^b	Type of treatment	Surface finish	Notes
Hot rolled	1C	Hot rolled, heat treated, not descaled	Covered with the rolling scale	Suitable for parts which will be descaled or machined in subsequent production or for certain heat-resisting applications.
	1E	Hot rolled, heat treated, mechanically descaled	Free of scale	The type of mechanical descaling, e.g. coarse grinding or shot blasting, depends on the steel grade and the product, and is left to the manufacturer's discretion, unless otherwise agreed
	1D	Hot rolled, heat treated, pickled	Free of scale	Usually standard for most steel types to ensure good corrosion resistance; also common finish for further processing. It is permissible for grinding marks to be present. Not as smooth as 2D or 2B.
Cold rolled	2C	Cold rolled, heat treated, not descaled	Smooth with scale from heat treatment	Suitable for parts which will be descaled or machined in subsequent production or for certain heat-resisting applications.
	2E	Cold rolled, heat treated, mechanically descaled	Rough and dull	Usually applied to steels with a scale which is very resistant to pickling solutions. May be followed by pickling.
	2D	Cold rolled, heat treated, pickled	Smooth	Finish for good ductility, but not as smooth as 2B or 2R.
	2B	Cold rolled, heat treated, pickled, skin passed	Smoothen than 2D	Most common finish for most steel types to ensure good corrosion resistance, smoothness and flatness. Also a common finish for further processing. Skin passing may be by tension levelling.
	2R	Cold rolled, bright annealed ^c	Smooth, bright, reflective	Smoothen and brighter than 2B. Also a common finish for further processing.
Special finishes	1G or 2G	Ground ^d	See footnote e.	Grade of grit or surface roughness can be specified. Unidirectional texture, not very reflective.
	1J or 2J	Brushed ^d or dull polished ^d	Smoothen than ground. See footnote e.	Grade of brush or surface roughness can be specified. Unidirectional texture, not very reflective.
	1K or 2K	Satin polished ^d	See footnote e.	Additional specific requirements to a "J" type finish, in order to achieve adequate corrosion resistance for marine and external architectural applications. Transverse $R_a < 0,5 \mu\text{m}$ with clean cut surface finish.
	1P or 2P	Bright polished ^d	See footnote e.	Mechanical polishing. Process or surface roughness can be specified. Non-directional finish, reflective with high degree of image clarity.
	2F	Cold rolled, heat treated, skin passed on roughened rolls	Uniform non-reflective matt surface	Heat treatment by bright annealing or by annealing and pickling.

^a Not all process routes and surface finishes are available for all steels.
^b First digit: 1 = hot rolled, 2 = cold rolled.
^c May be skin passed.
^d One surface only, unless otherwise agreed at the time of enquiry and order.
^e Within each finish description, the surface characteristics can vary, and more specific requirements may need to be agreed between the manufacturer and purchaser (e.g. grade of grit or surface roughness).

Table 7 — Mechanical properties at room temperature for ferritic steels in the annealed condition (see Table B.1) and resistance to intergranular corrosion

Steel grade	Product form ^a	Thickness		0,2 % proof strength		Tensile strength	Elongation after fracture		Resistance to intergranular corrosion ^d		Impact energy (ISO-V)
		mm	max.	MPa	MPa		A_{80}^b	A^c	in the delivery condition	in the welded condition	
				min. (long.)	min. (tr.)	MPa	< 3 mm thick % min. (long. + tr.)	≥ 3 mm thick % min. (long. + tr.)			KJ/J. min. (tr.)
X2CrNi12	C	8		280	320	450 to 650	20		no	no	50
	H	13,5					18				
	P	25 ^e		250	280						
X6CrNiTi12	C	8		280	320	450 to 650	23		no	no	50
	H	13,5					20				
	P	25 ^e		250	280						
X2CrTi17	C	4		180	200	380 to 530	24		yes	yes	— ^f
X3CrTi17	C	4		230	240	420 to 600	23		yes	yes	— ^f
X2CrMoTi17-1	C	4		200	220	400 to 550	23		yes	yes	— ^f
X2CrMoTi18-2	C	4		300	320	420 to 640	20		yes	—	— ^f
X6CrMoNb17-1	C	4		280	300	480 to 560	25		yes	yes	— ^f
X2CrTiNb18	C	4		230	250	430 to 630	18		yes	yes	— ^f

a C = cold-rolled strip; H = hot-rolled strip; P = hot-rolled plate.
b The values are related to test pieces with a gauge length of 80 mm and a width of 20 mm. Test pieces with a gauge length of 50 mm and a width of 12,5 mm may also be used.
c The values are related to test pieces with a gauge length of $5,65 \sqrt{S_0}$.
d When tested according to ISO 3651-2.
e ●● For thicknesses above 25 mm up to 75 mm, the mechanical properties may be agreed upon at the time of enquiry and order.
f Because of the small maximum product thickness t [the requirement to prepare impact test pieces applies for $t \geq 6$ mm, see ISO 9328-1:2011, 8.2.2.3 c)], no verifiable values can be specified.