

Table 2 — Chemical composition (cast analysis) of ferritic corrosion resisting steels

Steel designation		% by mass										
Name	Number	C max.	Si max.	Mn max.	P max.	S	N max.	Cr	Mo	Ni	Ti	Others
Standard grades												
X2CrNi12	1.4003	0,030	1,00	1,50	0,040	≤ 0,030 ^a	0,030	10,5 to 12,5	-	0,30 to 1,00	-	-
X6Cr17	1.4016	0,08	1,00	1,00	0,040	≤ 0,030 ^a	-	16,0 to 18,0	-	-	-	-
Special grade												
X2CrMoTiS18-2	1.4523	0,030	1,00	0,50	0,040	0,15 to 0,35	-	17,5 to 19,0	2,00 to 2,50	-	0,30 to 0,80	(C + N) ≤ 0,040
All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.												
^a Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.												

Table 3 — Chemical composition (cast analysis) of martensitic and precipitation hardening corrosion resisting steels

Steel designation		% by mass									
Name	Number	C	Si max.	Mn max.	P max.	S max.	Cr	Cu	Mo	Ni	Others
Standard grades (Martensitic steels)											
X12Cr13	1.4006	0,08 to 0,15	1,00	1,50	0,040	0,030 ^a	11,5 to 13,5	-	-	≤ 0,75	-
X20Cr13	1.4021	0,16 to 0,25	1,00	1,50	0,040	0,030 ^a	12,0 to 14,0	-	-	-	-
X17CrNi16-2	1.4057	0,12 to 0,22	1,00	1,50	0,040	0,030 ^a	15,0 to 17,0	-	-	1,50 to 2,50	-
X4CrNiMo16-5-1	1.4418	≤ 0,06	0,70	1,50	0,040	0,030 ^a	15,0 to 17,0	-	0,80 to 1,50	4,0 to 6,0	N: ≥ 0,020
Standard grades (Precipitation hardening steels)											
X5CrNiCuNb16-4	1.4542	≤ 0,07	0,70	1,50	0,040	0,030 ^a	15,0 to 17,0	3,0 to 5,0	≤ 0,60	3,0 to 5,0	Nb: 5xC to 0,45
X7CrNiAl17-7	1.4568	≤ 0,09	0,70	1,00	0,040	0,015	16,0 to 18,0	-	-	6,5 to 7,8 ^b	Al: 0,70 to 1,50
All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.											
^a Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.											
^b For better cold deformability, the upper limit may be increased to 8,3 %.											

EN 10088-5:2009 (E)

Table 4 — Chemical composition (cast analysis) of austenitic corrosion resisting steels

Steel designation		% by mass											
Name	Number	C	Si	Mn	P max.	S	N	Cr	Cu	Mo	Nb	Ni	Others
Standard grades													
X2CrNi18-9	1.4307	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	17,5 to 19,5	-	-	-	8,0 to 10,5	-
X2CrNi19-11	1.4306	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	18,0 to 20,0	-	-	-	10,0 to 12,0 ^b	-
X2CrNi18-10	1.4311	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	0,12 to 0,22	17,5 to 19,5	-	-	-	8,5 to 11,5	-
X5CrNi18-10	1.4301	≤ 0,07	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	17,5 to 19,5	-	-	-	8,0 to 10,5	-
X8CrNiS18-9	1.4305	≤ 0,10	≤ 1,00	≤ 2,00	0,045	0,15 to 0,35	≤ 0,10	17,0 to 19,0	≤ 1,00	-	-	8,0 to 10,0	-
X6CrNiTi18-10	1.4541	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	-	17,0 to 19,0	-	-	-	9,0 to 12,0 ^b	Ti: 5 x C to 0,70
X2CrNiMo17-12-2	1.4404	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	16,5 to 18,5	-	2,00 to 2,50	-	10,0 to 13,0 ^b	-
X2CrNiMoN17-11-2	1.4406	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	0,12 to 0,22	16,5 to 18,5	-	2,00 to 2,50	-	10,0 to 12,5 ^b	-
X5CrNiMo17-12-2	1.4401	≤ 0,07	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	16,5 to 18,5	-	2,00 to 2,50	-	10,0 to 13,0	-
X6CrNiMoTi17-12-2	1.4571	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	-	16,5 to 18,5	-	2,00 to 2,50	-	10,5 to 13,5 ^b	Ti: 5 x C to 0,70
X2CrNiMo17-12-3	1.4432	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	16,5 to 18,5	-	2,50 to 3,00	-	10,5 to 13,0	-
X2CrNiMoN17-13-3	1.4429	≤ 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 ^b	-
X3CrNiMo17-13-3	1.4436	≤ 0,05	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	16,5 to 18,5	-	2,50 to 3,00	-	10,5 to 13,0	-
X2CrNiMo18-14-3	1.4435	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	17,0 to 19,0	-	2,50 to 3,00	-	12,5 to 15,0	-
X2CrNiMoN17-13-5	1.4439	≤ 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	-
X3CrNiCu18-9-4	1.4567	≤ 0,04	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	17,0 to 19,0	3,0 to 4,0	-	-	8,5 to 10,5	-
X1NiCrMoCu25-20-5	1.4539	≤ 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	-
Special grades													
X6CrNiNb18-10	1.4550	≤ 0,08	≤ 1,00	≤ 2,00	0,045	≤ 0,015	-	17,0 to 19,0	-	-	10 x C to 1,00	9,0 to 12,0 ^b	-
X1CrNiMoN25-22-2	1.4466	≤ 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	-
X2CrNiMo18-15-4	1.4438	≤ 0,030	≤ 1,00	≤ 2,00	0,045	≤ 0,030 ^a	≤ 0,10	17,5 to 19,5	-	3,0 to 4,0	-	13,0 to 16,0 ^b	-
X12CrMnNiN17-7-5	1.4372	≤ 0,15	≤ 1,00	5,5 to 7,5	0,045	≤ 0,015	0,05 to 0,25	16,0 to 18,0	-	-	-	3,5 to 5,5	-
X3CrNiCuMo17-11-3-2	1.4578	≤ 0,04	≤ 1,00	≤ 1,00	0,045	≤ 0,015	≤ 0,10	16,5 to 17,5	3,0 to 3,5	2,00 to 2,50	-	10,0 to 11,0	-
X1NiCrMoCu31-27-4	1.4563	≤ 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	-
X1CrNiMoCuN20-18-7	1.4547	≤ 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	1.4529	≤ 0,020	≤ 0,50	≤ 1,00	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	-
X2CrNiMnMoN25-18-6-5	1.4565	≤ 0,030	≤ 1,00	5,0 to 7,0	0,030	≤ 0,015	0,30 to 0,60	24,0 to 26,0	-	4,0 to 5,0	≤ 0,15	16,0 to 19,0	-
All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.													

^a Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.

^b 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 magnetic permeability, the maximum Ni content may be increased by the following amounts:

0,50 % (by mass): 1.4571

1,00 % (by mass): 1.4306, 1.4406, 1.4429, 1.4438, 1.4541, 1.4550

1,50 % (by mass): 1.4404.



EN 10088-5:2009 (E)

Table 5 — Chemical composition (cast analysis) of austenitic-ferritic corrosion resisting steels

Steel designation		% by mass									
Name	Number	C max.	Si max.	Mn	P max.	S max.	N	Cr	Cu	Mo	Ni
Standard grades											
X3CrNiMoN27-5-2	1.4460	0,05	1,00	≤ 2,00	0,035	0,030 ^a	0,05 to 0,20	25,0 to 28,0	-	1,30 to 2,00	4,5 to 6,5
X2CrNiMoN22-5-3 ^b	1.4462 ^b	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
Special grades											
X2CrNiN23-4	1.4362	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
X2CrNiMoN29-7-2 ^{*)}	1.4477 ^{*)}	0,030	0,50	0,80 to 1,50	0,030	0,015	0,30 to 0,40	28,0 to 30,0	≤ 0,80	1,50 to 2,60	5,8 to 7,5
X2CrNiMoN25-7-4	1.4410	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
X2CrNiMoSi18-5-3	1.4424	0,030	1,40 to 2,00	1,20 to 2,00	0,035	0,015	0,05 to 0,10	18,0 to 19,0	-	2,50 to 3,0	4,5 to 5,2
X2CrMnNiN21-5-1 ^{*)}	1.4162 ^{*)}	0,040	1,00	4,0 to 6,0	0,040	0,015	0,20 to 0,25	21,0 to 22,0	0,10 to 0,80	0,10 to 0,80	1,35 to 1,70
All precautions shall be taken to avoid the addition of such elements not quoted in the table from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.											
^a Particular ranges of sulphur content can provide improvement of particular properties. For machinability a controlled sulphur content of 0,015 % to 0,030 % is recommended. For weldability, a controlled sulphur content of 0,008 % to 0,015 % is recommended. For polishability, a controlled sulphur content of 0,015 % max. is recommended.											
^b By agreement, this grade can be delivered with a Pitting Resistance Equivalent Number (PRE = Cr +3,3Mo + 16N, compare Table C.1 of EN 10088-1:2005) greater than 34.											
^{*)} Patented steel grade.											

**Table 6 — Permissible product analysis tolerances on the limiting values given in Tables 2 to 5
for the cast analysis**

Element	Specified limits, cast analysis % by mass		Permissible tolerance ^a % by mass
Carbon		≤ 0,030	+ 0,005
	> 0,030	≤ 0,20	± 0,01
	> 0,20	≤ 0,25	± 0,02
Silicon		≤ 1,00	+ 0,05
	> 1,00	≤ 2,00	± 0,10
Manganese		≤ 1,00	+ 0,03
	> 1,00	≤ 2,00	± 0,04
	> 2,00	≤ 7,5	± 0,10
Phosphorus		≤ 0,045	+ 0,005
Sulphur		≤ 0,015	+ 0,003
	> 0,015	≤ 0,030	± 0,005
	≥ 0,15	≤ 0,35	± 0,02
Nitrogen		≤ 0,10	± 0,01
	> 0,10	≤ 0,60	± 0,02
Chromium	10,5	≤ 15,0	± 0,15
	> 15,0	≤ 20,0	± 0,20
	> 20,0	≤ 30,0	± 0,25
Copper		≤ 1,00	± 0,07
	> 1,00	≤ 5,0	± 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	≤ 32,0	± 0,20
Aluminium	> 0,70	≤ 1,50	± 0,10
Titanium		≤ 0,80	± 0,05

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

EN 10088-5:2009 (E)

Table 7 — Type of surface finish and process route of rods and wires, bars and sections

	Product forms			Tolerances on nominal dimensions ^a	Condition			Recommended use and observations
	Rods	Wires	Bars, sections		Symbol ^b	Surface finish	Type of process route	
Hot formed	x	-	x	EN 10017, EN 10058, EN 10059, EN 10060, EN 10061	1U	Covered with scale (spot ground if necessary). Not free of surface defects.	Hot formed, not heat treated, not descaled.	Suitable for products to be further hot formed.
	x	-	x		1C		Hot formed, heat treated ^c , not descaled.	Suitable for products to be further processed (hot or cold).
	-	-	x	≥ IT 14 ^g /ISO 286-1	1E	Largely free of scale (but some black spots may remain). Not free of surface defects.	Hot formed, heat treated ^c , mechanically descaled ^d .	
	x	-	x	EN 10017, EN 10058, EN 10059, EN 10060, EN 10061	1D	Free of scale (spot ground if necessary). Not free of surface defects.	Hot formed, heat treated ^c , pickled, coated (optional).	Products used in their present condition or to be further processed (hot or cold).
	-	-	x	≥ IT 12 ^g /ISO 286-1	1X	Free of scale (but some marks left from machining may remain). Not free of surface defects.	Hot formed, heat treated ^c , rough machined ^e .	
	x	-	x		1G	Appearance bright, but not uniform, Free of surface defects.	Hot formed, heat treated ^c , descaled, rough machined ^e or shaved in the case of rod. Finishing by removal of material ^f .	Suitable for severe applications (extrusion and/or cold or hot heading). Surface roughness can be specified.
Cold processed	-	x	x	Bars: IT 8 to 11 ^g /EN 10278 Wire: T3 or T4 /EN 10218-2	2H	Smooth and matt or bright. Not necessarily polished. Not free of surface defects ^h .	Finishes 1C, 1D or 1X, cold processed ⁱ , 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 ^g /EN 10278 Wire: T3 or T4 /EN 10218-2	2D	Smooth and matt or bright. Not free of surface defects ^h .	Finish 2H, heat treated ^c , 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.
	-	-	x	Bars: IT 8 to 11 ^g /EN 10278	2B	Smooth, uniform and bright. Free of surface defects.	Finishes 1C, 1D or 1X, cold processed ⁱ , mechanically smoothed ^j .	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.

Table 7 (continued)

	Product forms			Tolerances on nominal dimensions ^a	Condition			Recommended use and observations
	Rods	Wires	Bars, sections		Symbol ^b	Surface finish	Type of process route	
	-	-	x	IT ≤ 9 ^g /EN 10278	2G	Smooth, uniform and bright. Free of surface defects.	Finishes 2H, 2D or 2B, centreless ground, mechanically smoothed (optional) ^k .	Finish for close tolerances. Unless otherwise agreed the surface roughness shall be Ra ≤ 1,2.
	-	-	x	IT < 11 ^g /EN 10278	2P	Smoother and brighter than finish 2B or 2G. Free of surface defects.	Finishes 2H, 2D, 2B or 2G, specular polishing ^k .	Products showing a well groomed surface appearance. Surface roughness shall be specified at the time of enquiry and order.

NOTE Not all surface finishes and process routes are available for all steels.

- ^a For sections, the following standards are used, in practice, for tolerances on dimensions and shape: EN 10024, EN 10034, EN 10055, EN 10056-2 and EN 10279. See footnote to Annex B.
- ^b First digit 1 = Hot formed; 2 = Cold processed.
- ^c On ferritic, austenitic and austenitic-ferritic grades, the heat treatment may be omitted if the conditions for hot forming and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion are obtained.
- ^d The type of mechanical descaling (shot blasting, grinding, peeling) is left to the manufacturer's discretion unless otherwise agreed.
- ^e The type of rough machining (grinding, peeling) is left to the manufacturer's discretion unless otherwise agreed.
- ^f The type of finish is left to the manufacturer's discretion unless otherwise agreed.
- ^g Specific tolerance within this range shall be agreed upon at the time of enquiry and order.
- ^h Unless otherwise agreed at the time of order.
- ⁱ The type of cold processing (cold drawing, turning, grinding, abrading ...) is left to the manufacturer's discretion unless otherwise agreed.
- ^j The type of mechanical polishing (burnishing, abrading) is left to the manufacturer's discretion unless otherwise agreed.
- ^k The type of specular polishing (electro-polishing, felting, buffing ...) is left to the manufacturer's discretion unless otherwise agreed.

Table 8 — Mechanical properties at room temperature of ferritic steels in the annealed condition (see Table A.1) and resistance to intergranular corrosion in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness <i>t</i> or diameter ^a <i>d</i>	Hardness	0,2%-proof strength	Tensile Strength	Elongation after fracture ^c	Resistance to intergranular corrosion ^d	
Name	Number	mm	<i>HB</i> ^b	<i>R_{p0,2}</i> ^c MPa ^{*)}	<i>R_m</i> ^c MPa ^{*)}	<i>A</i> % min. (long.)	in the delivery condition	in the welded condition
Standard grades								
X2CrNi12	1.4003	100	200	260	450 to 600	20	no	no
X6Cr17	1.4016	100	200	240	400 to 630	20	yes	no
Special grade								
X2CrMoTiS18-2	1.4523	100	200	280	430 to 600	15	yes	no
The annealing treatment may be omitted, if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.								
^a Width across flats for hexagons. ^b Only for guidance. ^c For rods, only the tensile strength values apply. ^d When tested according to EN ISO 3651-2. ^{*)} 1MPa = 1 N/mm ² .								

Table 9 — Mechanical properties at room temperature of martensitic steels in the heat-treated condition (see Table A.2) in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness <i>t</i> or diameter ^a <i>d</i>	Heat-treatment condition ^b	Hardness	0,2 %-proof strength	Tensile strength	Elongation after fracture		Impact energy (ISO-V)	
Name	Number	mm		HB ^c max.	R _{p0,2} ^d MPa ^{*)} min.	R _m ^d MPa ^{*)}	A ^d % min. (long.)	(tr.)	KV J min. (long.)	(tr.)
Standard grades										
X12Cr13	1.4006	-	+A	220	-	max. 730	-	-	-	-
		≤ 160	+QT650	-	450	650 to 850	15	-	25	-
X20Cr13	1.4021	-	+A	230	-	max. 760	-	-	-	-
		≤ 160	+QT700	-	500	700 to 850	13	-	25	-
			+QT800	-	600	800 to 950	12	-	20	-
X17CrNi16-2	1.4057	-	+A	295	-	max. 950	-	-	-	-
		≤ 60	+QT800	-	600	800 to 950	14	-	25	-
		60 < <i>t</i> ≤ 160					12	-	20	-
		≤ 60	+QT900	-	700	900 to 1050	12	-	20	-
		60 < <i>t</i> ≤ 160					10	-	15	-
X4CrNiMo16-5-1	1.4418	-	+A	320	-	max. 1100	-	-	-	-
		≤ 160	+QT760	-	550	760 to 960	16	-	90	-
		160 < <i>t</i> ≤ 250					-	14	-	70
		≤ 160	+QT900	-	700	900 to 1100	16	-	80	-
		160 < <i>t</i> ≤ 250					-	14	-	60
^a Width across flats for hexagons. ^b +A = annealed, +QT = quenched and tempered. ^c Only for guidance. ^d For rods, only the tensile strength values apply. ^{*)} 1 MPa = 1 N/mm ² .										

Table 10 — Mechanical properties at room temperature of precipitation hardening steels in the heat-treated condition (see Table A.3) in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness <i>t</i> or diameter ^a <i>d</i>	Heat treatment condition ^b	Hard- ness ^c	0,2 %-proof strength	Tensile strength	Elongation after fracture	Impact energy (ISO- V)
Name	Number	mm max.		<i>HB</i> max.	<i>R_{p0,2}</i> MPa ^{*)} min.	<i>R_m</i> MPa ^{*)}	<i>A</i> % min. (long.)	<i>KV</i> J min. (long.)
Standard grades								
X5CrNiCuNb16-4	1.4542	100	+AT	360	-	max. 1200	-	-
			+P800	-	520	800 to 950	18	75
			+P930	-	720	930 to 1100	16	40
			+P960	-	790	960 to 1160	12	-
			+P1070	-	1000	1070 to 1270	10	-
X7CrNiAl17-7	1.4568	30	+AT	255	-	max. 850	-	-
^a Width across flats for hexagons. ^b +AT = solution annealed, +P = precipitation hardened. ^c Only for guidance. ^{*)} 1 MPa = 1 N/mm ² .								

Table 11 — Mechanical properties at room temperature of austenitic steels in the solution annealed condition (see Table A.4) and resistance to intergranular corrosion in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness <i>t</i> or diameter ^a <i>d</i>	Hard- ness ^{b,c}	0,2%- proof strength	1%- proof strength	Tensile strength ^{c,d}	Elongation after fracture ^{c,d}		Impact energy (ISO-V)		Resistance to intergranular corrosion ^e	
Name	Number	mm	HB max.	<i>R</i> _{p0,2} ^d MPa ^{a,j} min.	<i>R</i> _{p1,0} ^{b,d} MPa ^{a,j} min.	<i>R</i> _m MPa ^{a,j}	<i>A</i> % min. (long.)	(tr.)	KV J min (long.)	(tr.)	in the delivery condition	In the sensi- tized con- dition ^f
Standard grades												
X2CrNi18-9	1.4307	≤ 160	215	175	210	500 to 700	45	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	35	-	60		
X2CrNi19-11	1.4306	≤ 160	215	180	215	460 to 680	45	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	35	-	60		
X2CrNiN18-10	1.4311	≤ 160	230	270	305	550 to 760	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X5CrNi18-10	1.4301	≤ 160	215	190	225	500 to 700	45	-	100	-	yes	no ^g
		160 < <i>t</i> ≤ 250					-	35	-	60		
X8CrNiS18-9	1.4305	≤ 160	230	190	225	500 to 750	35	-	-	-	no	No
X6CrNiTi18-10	1.4541	≤ 160	215	190	225	500 to 700	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X2CrNiMo17-12-2	1.4404	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X2CrNiMoN17-11-2	1.4406	≤ 160	250	280	315	580 to 800	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X5CrNiMo17-12-2	1.4401	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	no ^g
		160 < <i>t</i> ≤ 250					-	30	-	60		
X6CrNiMoTi17-12-2	1.4571	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X2CrNiMo17-12-3	1.4432	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X2CrNiMoN17-13-3	1.4429	≤ 160	250	280	315	580 to 800	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X3CrNiMo17-13-3	1.4436	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	no ^g
		160 < <i>t</i> ≤ 250					-	30	-	60		
X2CrNiMo18-14-3	1.4435	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X2CrNiMoN17-13-5	1.4439	≤ 160	250	280	315	580 to 800	35	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X3CrNiCu18-9-4	1.4567	≤ 160	215	175	210	450 to 650	45	-	-	-	yes	yes
X1NiCrMoCu25-20-5	1.4539	≤ 160	230	230	260	530 to 730	35	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		

Table 11 (continued)

Steel designation		Thickness <i>t</i> or diameter ^a <i>d</i>	Hard- ness ^{b,c}	0,2%- proof strength	1%- proof strength	Tensile strength ^{c,d}	Elongation after fracture ^{c,d}		Impact energy (ISO-V)		Resistance to intergranular corrosion ^e	
Name	Number	mm	HB max.	<i>R_{p0,2}</i> ^d MPa ^{*)} min.	<i>R_{p1,0}</i> ^{b, d} MPa ^{*)} min.	<i>R_m</i> MPa ^{*)}	<i>A</i> % min.		KV J min		in the delivery condition	in the sensitized condition ^f
							(long.)	(tr.)	(long.)	(tr.)		
Special grades												
X6CrNiNb18-10	1.4550	≤ 160	230	205	240	510 to 740	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X1CrNiMoN25-22-2	1.4466	≤ 160	240	250	290	540 to 740	35	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250	240	250	290	540 to 740	-	30	-	60		
X2CrNiMo18-15-4	1.4438	≤ 160	215	200	235	500 to 700	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X12CrMnNiN17-7-5	1.4372	≤ 160	260	230	370	750 to 950	40	-	100	-	yes	no
		160 < <i>t</i> ≤ 250	260	230	370	750 to 950	-	35	-	60		
X3CrNiCuMo17-11-3-2	1.4578	≤ 160	215	175	-	450 to 650	45	-	-	-	yes	yes
X1NiCrMoCu31-27-4	1.4563	≤ 160	230	220	250	500 to 750	35	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X1CrNiMoCuN20-18-7	1.4547	≤ 160	260	300	340	650 to 850	35	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	30	-	60		
X1NiCrMoCuN25-20-7	1.4529	≤ 160	250	300	340	650 to 850	40	-	100	-	yes	yes
		160 < <i>t</i> ≤ 250					-	35	-	60		
X2CrNiMnMoN25-18-6-5	1.4565	≤ 160	-	420	460	800 to 950	35	-	100	-	yes	yes
The solution treatment may be omitted if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to Intergranular corrosion as defined in EN ISO 3651-2 are obtained.												
^a Width across flats for hexagons. ^b Only for guidance. ^c The maximum HB-values may be raised by 100 HB or the tensile strength value may be raised by 200 MPa and the minimum elongation value may be lowered to 20 % for sections and bars of ≤ 35 mm thickness having a final cold deformation and for hot formed sections and bars of ≤ 8 mm thickness. ^d For rods, only the tensile strength values apply. ^e When tested according to EN ISO 3651-2. ^f See NOTE to 6.4. ^g Sensitization treatment of 15 min at 700°C followed by cooling in air. ^{*)} 1 MPa = 1 N/mm ² .												

Table 12 — Mechanical properties at room temperature of austenitic-ferritic steels in the solution annealed condition (see Table A.5) and resistance to intergranular corrosion in conditions 1C, 1E, 1D, 1X, 1G and 2D

Steel designation		Thickness <i>t</i> or diameter ^a <i>d</i>	Hardness ^b	0,2 %- proof strength	Tensile strength	Elongation after fracture	Impact energy (ISO-V)	Resistance to intergranular corrosion ^d	
Name	Number	mm	<i>HB</i> max.	<i>R_{p0.2}</i> ^c MPa ^e min.	<i>R_m</i> ^c MPa ^e	<i>A</i> ^c % min. (long.)	<i>KV</i> J min. (long.)	in the delivery conditio n	in the sensitized condition ^e
Standard grades									
X3CrNiMoN27-5-2	1.4460	≤ 160	260	450	620 to 880	20	85	yes	yes
X2CrNiMoN22-5-3	1.4462	≤ 160	270	450	650 to 880	25	100	yes	yes
Special grades									
X2CrNiN23-4	1.4362	≤ 160	260	400	600 to 830	25	100	yes	yes
X2CrNiMoN29-7-2	1.4477	≤ 10	310	650	800 to 1050	25	100	yes	yes
		10 < <i>t</i> ≤ 160	310	550	750 to 1000	25	100	yes	yes
X2CrNiMoN25-7-4	1.4410	≤ 160	290	530	730 to 930	25	100	yes	yes
X2CrNiMoSi18-5-3	1.4424	≤ 50	260	450	700 to 900	25	100	yes	yes
		50 < <i>t</i> ≤ 160	260	400	680 to 900	25	100	yes	yes
X2CrMnNiN21-5-1	1.4162	≤ 160	-	450	650 to 850	30	60	yes	yes
The solution treatment may be omitted if the conditions for hot working and subsequent cooling are such that the requirement for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.									
^a Width across flats for hexagons. ^b Only for guidance. ^c For rods, only the tensile strength values apply. ^d When tested according to EN ISO 3651-2. ^e See NOTE to 6.4. ^f 1 MPa = 1N/mm ² .									

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

Steel designation		Thickness <i>t</i> or diameter ^b <i>d</i>	0,2 %-proof strength	Tensile strength	Elongation after fracture
Name	Number	mm	<i>R</i> _{p0,2} MPa ^{a)} min.	<i>R</i> _m MPa ^{a)}	<i>A</i> ₅ ^c % min.
Standard grade					
X6Cr17	1.4016	≤ 10 ^d	320	500 to 750	8
		10 < <i>t</i> ≤ 16	300	480 to 750	8
		16 < <i>t</i> ≤ 40	240	400 to 700	15
		40 < <i>t</i> ≤ 63	240	400 to 700	15
		63 < <i>t</i> ≤ 100	240	400 to 630	20
The initial annealing treatment may be omitted if the conditions for previous hot working and subsequent cooling have been such that the requirements for the final mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.					
^a Including cut lengths from wire.					
^b Width across flats for hexagons.					
^c Elongation <i>A</i> ₅ is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.					
^d In the range 1 mm ≤ <i>d</i> < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.					
^{a)} 1MPa = 1N/mm ² .					

Table 14 — Mechanical properties for bright bars ^a at room temperature of heat-treated (see Table A.2) martensitic steels in conditions 2H, 2B, 2G or 2P

Steel designation		Thickness <i>t</i> or diameter ^b <i>d</i> mm	Annealed		Heat treatment condition	Quenched + tempered					
Name	Number		<i>R_m</i> MPa ^{a)} max.	<i>HB</i> ^c max.		<i>R_{p0,2}</i> MPa ^{a)} min.	<i>R_m</i> MPa ^{a)}	<i>A₅</i> ^d % min. (long.) (tr.)	<i>KV</i> J min. (long.) (tr.)		
Standard grades											
X12Cr13	1.4006	≤ 10 ^e	880	280	+QT650	550	700 to 1000	9	-	-	-
		10 < <i>t</i> ≤ 16	880	280		500	700 to 1000	9	-	-	-
		16 < <i>t</i> ≤ 40	800	250		450	650 to 930	10	-	25	-
		40 < <i>t</i> ≤ 63	760	230		450	650 to 880	10	-	25	-
		63 < <i>t</i> ≤ 160	730	220		450	650 to 850	15	-	25	-
X20Cr13	1.4021	≤ 10 ^e	910	290	+QT700	600	750 to 1000	8	-	-	-
		10 < <i>t</i> ≤ 16	910	290		550	750 to 1000	8	-	-	-
		16 < <i>t</i> ≤ 40	850	260		500	700 to 950	10	-	25	-
		40 < <i>t</i> ≤ 63	800	250		500	700 to 900	12	-	25	-
		63 < <i>t</i> ≤ 160	760	230		500	700 to 850	13	-	25	-
X17CrNi16-2	1.4057	≤ 10 ^e	1050	330	+QT800	750	850 to 1100	7	-	-	-
		10 < <i>t</i> ≤ 16	1050	330		700	850 to 1100	7	-	-	-
		16 < <i>t</i> ≤ 40	1000	310		650	800 to 1050	9	-	25	-
		40 < <i>t</i> ≤ 63	950	295		650	800 to 1000	12	-	25	-
		63 < <i>t</i> ≤ 160	950	295		650	800 to 950	12	-	20	-
X4CrNiMo16-5-1	1.4418	≤ 10 ^e	1150	380	+QT900	750	900 to 1150	10	-	-	-
		10 < <i>t</i> ≤ 16	1150	380		750	900 to 1150	10	-	-	-
		16 < <i>t</i> ≤ 40	1100	320		700	900 to 1100	12	-	80	-
		40 < <i>t</i> ≤ 63	1100	320		700	900 to 1100	16	-	80	-
		63 < <i>t</i> ≤ 160	1100	320		700	900 to 1100	16	-	80	-
		160 < <i>t</i> ≤ 250	1100	320		700	900 to 1100	-	14	-	60
^a Including cut lengths from wire. ^b Width across flats for hexagons. ^c For information only. ^d Elongation <i>A₅</i> is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order. ^e In the range 1 mm ≤ <i>d</i> < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order. ^{a)} 1MPa = 1N/mm ² .											

Table 15 — Mechanical properties for bright bars ^a at room temperature of heat-treated (see Table A.3) precipitation hardening steels in conditions 2H, 2B, 2G or 2P

Steel designation Name	Number	Thickness <i>t</i> or diameter ^b <i>d</i> mm	Annealed		Heat treatment condition	Precipitation hardened			
			<i>R_m</i> MPa ^{a)} max.	<i>HB</i> ^c max.		<i>R_{p0.2}</i> MPa ^{a)} min.	<i>R_m</i> MPa ^{a)}	<i>A₅</i> ^d % min. (long.)	<i>KV</i> J min. (long.)
Standard grade									
X5CrNiCuNb16-4	1.4542	≤ 10 ^a	1200	360	+P800	600	900 to 1100	10	-
		10 < <i>t</i> ≤ 16	1200	360		600	900 to 1100	10	-
		16 < <i>t</i> ≤ 40	1200	360		520	800 to 1050	12	75
		40 < <i>t</i> ≤ 63	1200	360		520	800 to 1000	18	75
		63 < <i>t</i> ≤ 160	1200	360		520	800 to 950	18	75
		≤ 100	-	-	+P930	720	930 to 1100	12	40
		≤ 100	-	-	+P960	790	960 to 1160	10	-
		≤ 100	-	-	+P1070	1000	1070 to 1270	10	-

^a Including cut lengths from wire.

^b Width across flats for hexagons.

^c For information only.

^d Elongation *A*₅ is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.

^e In the range 1 mm ≤ *d* < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.

^{a)} 1MPa = 1N/mm².

Table 16 — Mechanical properties for bright bars ^a at room temperature of solution annealed (see Table A.4) austenitic steels in conditions 2H, 2B, 2G or 2P

Steel designation Name	Number	Thickness <i>t</i> or diameter ^b <i>d</i> mm	<i>R</i> _{p0.2} MPa ^{a1} min.	Solution annealed		<i>A</i> _s ^c % min.		<i>KV</i> J min.	
				<i>R</i> _m MPa ^{a1}		(long.)	(tr.)	(long.)	(tr.)
Standard grades									
X2CrNi18-9	1.4307	≤ 10 ^d	400	600 to 930	25	-	-	-	
		10 < <i>t</i> ≤ 16	380	600 to 930	25	-	-	-	
		16 < <i>t</i> ≤ 40	175	500 to 830	30	-	100	-	
		40 < <i>t</i> ≤ 63	175	500 to 830	30	-	100	-	
		63 < <i>t</i> ≤ 160	175	500 to 700	45	-	100	-	
		160 < <i>t</i> ≤ 250	175	500 to 700	-	35	-	60	
X2CrNi19-11	1.4306	≤ 10 ^e	400	600 to 930	25	-	-	-	
		10 < <i>t</i> ≤ 16	380	600 to 930	25	-	-	-	
		16 < <i>t</i> ≤ 40	180	460 to 830	30	-	100	-	
		40 < <i>t</i> ≤ 63	180	460 to 830	30	-	100	-	
		63 < <i>t</i> ≤ 160	180	460 to 680	45	-	100	-	
		160 < <i>t</i> ≤ 250	180	460 to 680	-	35	-	60	
X5CrNi18-10	1.4301	≤ 10 ^d	400	600 to 950	25	-	-	-	
		10 < <i>t</i> ≤ 16	400	600 to 950	25	-	-	-	
		16 < <i>t</i> ≤ 40	190	600 to 850	30	-	100	-	
		40 < <i>t</i> ≤ 63	190	580 to 850	30	-	100	-	
		63 < <i>t</i> ≤ 160	190	500 to 700	45	-	100	-	
		160 < <i>t</i> ≤ 250	190	500 to 700	-	35	-	60	
X8CrNiS18-9	1.4305	≤ 10 ^e	400	600 to 950	15	-	-	-	
		10 < <i>t</i> ≤ 16	400	600 to 950	15	-	-	-	
		16 < <i>t</i> ≤ 40	190	500 to 850	20	-	100	-	
		40 < <i>t</i> ≤ 63	190	500 to 850	20	-	100	-	
		63 < <i>t</i> ≤ 160	190	500 to 750	35	-	100	-	
X2CrNiMo17-12-2	1.4404	≤ 10 ^d	400	600 to 930	25	-	-	-	
		10 < <i>t</i> ≤ 16	380	580 to 930	25	-	-	-	
		16 < <i>t</i> ≤ 40	200	500 to 830	30	-	100	-	
		40 < <i>t</i> ≤ 63	200	500 to 830	30	-	100	-	
		63 < <i>t</i> ≤ 160	200	500 to 700	40	-	100	-	
		160 < <i>t</i> ≤ 250	200	500 to 700	-	30	-	60	
X5CrNiMo17-12-2	1.4401	≤ 10 ^d	400	600 to 950	25	-	-	-	
		10 < <i>t</i> ≤ 16	380	580 to 950	25	-	-	-	
		16 < <i>t</i> ≤ 40	200	500 to 850	30	-	100	-	
		40 < <i>t</i> ≤ 63	200	500 to 850	30	-	100	-	
		63 < <i>t</i> ≤ 160	200	500 to 700	40	-	100	-	
		160 < <i>t</i> ≤ 250	200	500 to 700	-	30	-	60	
X6CrNiMoTi17-12-2	1.4571	≤ 10 ^d	400	600 to 950	25	-	-	-	
		10 < <i>t</i> ≤ 16	380	580 to 950	25	-	-	-	
		16 < <i>t</i> ≤ 40	200	500 to 850	30	-	100	-	
		40 < <i>t</i> ≤ 63	200	500 to 850	30	-	100	-	
		63 < <i>t</i> ≤ 160	200	500 to 700	40	-	100	-	
		160 < <i>t</i> ≤ 250	200	500 to 700	-	30	-	60	
X2CrNiMo17-12-3	1.4432	≤ 10 ^d	400	600 to 930	25	-	-	-	
		10 < <i>t</i> ≤ 16	380	600 to 880	25	-	-	-	
		16 < <i>t</i> ≤ 40	200	500 to 850	30	-	100	-	
		40 < <i>t</i> ≤ 63	200	500 to 850	30	-	100	-	
		63 < <i>t</i> ≤ 160	200	500 to 700	40	-	100	-	
		160 < <i>t</i> ≤ 250	200	500 to 700	-	30	-	60	

Table 16 (continued)

Steel designation Name	Number	Thickness <i>t</i> or diameter ^b <i>d</i> mm	<i>R</i> _{p0.2} MPa ^{a)} min.	<i>R</i> _m MPa ^{a)}	Solution annealed		<i>KV</i> J min. (long.)	<i>KV</i> J min. (tr.)
					<i>A</i> ₅ ^c % min. (long.)	(tr.)		
Standard grades (continued)								
X3CrNiMo17-13-3	1.4436	≤ 10 ^d	400	600 to 950	25	-	-	-
		10 < <i>t</i> ≤ 16	400	600 to 950	25	-	-	-
		16 < <i>t</i> ≤ 40	200	500 to 850	30	-	100	-
		40 < <i>t</i> ≤ 63	190	500 to 850	30	-	100	-
		63 < <i>t</i> ≤ 160	200	500 to 700	40	-	100	-
		160 < <i>t</i> ≤ 250	200	500 to 700	-	30	-	60
X2CrNiMo18-14-3	1.4435	≤ 10 ^d	400	600 to 950	25	-	-	-
		10 < <i>t</i> ≤ 16	400	600 to 950	25	-	-	-
		16 < <i>t</i> ≤ 40	235	500 to 850	30	-	100	-
		40 < <i>t</i> ≤ 63	235	500 to 850	30	-	100	-
		63 < <i>t</i> ≤ 160	235	500 to 700	40	-	100	-
		160 < <i>t</i> ≤ 250	235	500 to 700	-	30	-	60
X3CrNiCu18-9-4	1.4567	≤ 10 ^d	400	600 to 850	25	-	-	-
		10 < <i>t</i> ≤ 16	340	600 to 850	25	-	-	-
		16 < <i>t</i> ≤ 40	175	450 to 800	30	-	100	-
		40 < <i>t</i> ≤ 63	175	450 to 800	30	-	100	-
		63 < <i>t</i> ≤ 160	175	450 to 650	40	-	100	-
X1NiCrMoCu25-20-5	1.4539	≤ 10 ^d	400	600 to 930	20	-	-	-
		10 < <i>t</i> ≤ 16	400	600 to 930	20	-	-	-
		16 < <i>t</i> ≤ 40	230	530 to 880	25	-	100	-
		40 < <i>t</i> ≤ 63	230	530 to 880	25	-	100	-
		63 < <i>t</i> ≤ 160	230	530 to 730	35	-	100	-
		160 < <i>t</i> ≤ 250	230	530 to 730	-	30	-	60
Special grade								
X3CrNiCuMo17-11-3-2	1.4578	≤ 10 ^d	400	600 to 850	20	-	-	-
		10 < <i>t</i> ≤ 16	340	600 to 850	20	-	-	-
		16 < <i>t</i> ≤ 40	175	450 to 800	30	-	-	-
		40 < <i>t</i> ≤ 63	175	450 to 800	30	-	-	-
		63 < <i>t</i> ≤ 160	175	450 to 650	45	-	-	-
The initial solution treatment may be omitted if the conditions for previous hot-working and subsequent cooling have been such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.								
^a Including cut lengths from wire.								
^b Width across flats for hexagons.								
^c Elongation is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.								
^d In the range 1 mm ≤ <i>d</i> < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.								
^{e)} 1MPa = 1N/mm ² .								

Table 17 — Mechanical properties for bright bars ^a at room temperature of solution annealed (see Table A.5) austenitic-ferritic steels in conditions 2H, 2B, 2G or 2P

Steel designation Name	Number	Thickness <i>t</i> or diameter ^b <i>d</i> mm	<i>R</i> _{p0.2} MPa ^{s)} min.	Solution annealed <i>R</i> _m MPa ^{s)}	<i>A</i> ₅ ^c % min. (long.)	KV J min. (long.)
Standard grades						
X3CrNiMoN27-5-2	1.4460	≤ 10 ^d	610	770 to 1030	12	-
		10 < <i>t</i> ≤ 16	560	770 to 1030	12	-
		16 < <i>t</i> ≤ 40	460	620 to 950	15	85
		40 < <i>t</i> ≤ 63	460	620 to 950	15	85
		63 < <i>t</i> ≤ 160	460	620 to 880	20	85
X2CrNiMoN22-5-3	1.4462	≤ 10 ^d	650	850 to 1150	12	-
		10 < <i>t</i> ≤ 16	650	850 to 1100	12	-
		16 < <i>t</i> ≤ 40	450	650 to 1000	15	100
		40 < <i>t</i> ≤ 63	450	650 to 1000	15	100
		63 < <i>t</i> ≤ 160	450	650 to 880	25	100
The initial solution treatment may be omitted if the conditions for previous hot-working and subsequent cooling have been such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.						
^a Including cut lengths from wire.						
^b Width across flats for hexagons.						
^c Elongation is valid only for dimensions of 5 mm and above. For smaller diameters, the minimum elongation has to be agreed upon at the time of enquiry and order.						
^d In the range 1 mm ≤ <i>d</i> < 5 mm valid only for rounds. The mechanical properties of non round bars with thicknesses < 5 mm have to be agreed at the time of enquiry and order.						
^{s)} 1MPa = 1N/mm ² .						

Table 18 — Mechanical properties at room temperature of annealed wire in 2D condition

Steel designation Name	Number	Nominal dimension <i>d</i> mm	Tensile strength MPa ^{*)} max.	Elongation % min.
Ferritic steels (+A) ^a				
X6Cr17	1.4016	1,00 < <i>d</i> ≤ 3,00	800	15
		3,00 < <i>d</i> ≤ 5,00	750	15
		5,00 < <i>d</i> ≤ 16,00	700	20
Martensitic (+A) and precipitation hardening (+AT) steels ^a				
X12Cr13	1.4006	1,00 < <i>d</i> ≤ 3,00	1050	10
X20Cr13	1.4021	3,00 < <i>d</i> ≤ 5,00	1000	10
X17CrNi16-2	1.4057	5,00 < <i>d</i> ≤ 16,00	950	15
X7CrNiAl17-7	1.4568			
Austenitic steels (+AT) ^a				
X2CrNi18-9,	1.4307,	1,00 < <i>d</i> ≤ 3,00	900	30
X2CrNi19-11	1.4306,	3,00 < <i>d</i> ≤ 5,00	850	35
X5CrNi18-10,	1.4301,	5,00 < <i>d</i> ≤ 16,00	800	35
X8CrNiS18-9	1.4305			
X6CrNiTi18-10	1.4541,			
X2CrNiMo17-12-2,	1.4404,			
X5CrNiMo17-12-2,	1.4401,			
X6CrNiMoTi17-12-2,	1.4571,			
X2CrNiMo17-12-3,	1.4432,			
X3CrNiMo17-13-3,	1.4436			
X2CrNiMo18-14-3,	1.4435,			
X1CrNiMoN25-22-2	1.4466,			
X1NiCrMoCu31-27-4,	1.4563,			
X1CrNiMoCuN20-18-7,	1.4547,			
X1NiCrMoCuN25-20-7	1.4529			
Austenitic-ferritic steels (+AT) ^a				
X2CrNiMoN22-5-3	1.4462	1,00 < <i>d</i> ≤ 3,00	1000	20
X2CrNiN23-4	1.4362	3,00 < <i>d</i> ≤ 5,00	950	25
X2CrNiMoN25-7-4	1.4410	5,00 < <i>d</i> ≤ 16,00	900	25
NOTE 1 If skin passed (i. e. less than 5 % reduction in cross section), the maximum tensile strength might be increased by up to 50 MPa.				
NOTE 2 For cold heading, see EN 10263-5.				
^a +A = annealed, +AT = solution annealed.				
^{*)} 1 MPa = 1 N/mm ²				

Table 19 — Minimum values for the 0,2 %- and 1 %-proof strength of austenitic steels at elevated temperatures

Steel designation		Heat treatment condition ^a	Minimum 0,2 % proof strength (MPa ^h)										Minimum 1 % proof strength (MPa ^h)									
Name	Number		at a temperature (in °C) of																			
			100	150	200	250	300	350	400	450	500	550	100	150	200	250	300	350	400	450	500	550
Standard grades																						
X2CrNi18-9	1.4307	+AT	145	130	118	108	100	94	89	85	81	80	180	160	145	135	127	121	116	112	109	108
X2CrNi19-11	1.4306	+AT	145	130	118	108	100	94	89	85	81	80	180	160	145	135	127	121	116	112	109	108
X2CrNiN18-10	1.4311	+AT	205	175	157	145	136	130	125	121	119	118	240	210	187	175	167	160	156	152	149	147
X5CrNi18-10	1.4301	+AT	155	140	127	118	110	104	98	95	92	90	190	170	155	145	135	129	125	122	120	120
X6CrNiTi18-10	1.4541	+AT	175	165	155	145	136	130	125	121	119	118	205	195	185	175	167	161	156	152	149	147
X2CrNiMoN17-11-2	1.4406	+AT	215	195	175	165	155	150	145	140	138	136	245	225	205	195	185	180	175	170	168	166
X5CrNiMo17-12-2	1.4401	+AT	175	158	145	135	127	120	115	112	110	108	210	190	175	165	155	150	145	141	139	137
X6CrNiMoTi17-12-2	1.4571	+AT	185	175	165	155	145	140	135	131	129	127	215	205	192	183	175	169	164	160	158	157
X2CrNiMo17-12-3	1.4432	+AT	165	150	137	127	119	113	108	103	100	98	200	180	165	153	145	139	135	130	128	127
X2CrNiMoN17-13-3	1.4429	+AT	215	195	175	165	155	150	145	140	138	136	245	225	205	195	185	180	175	170	168	166
X3CrNiMo17-13-3	1.4436	+AT	175	158	145	135	127	120	115	112	110	108	210	190	175	165	155	150	145	141	139	137
X2CrNiMo18-14-3	1.4435	+AT	165	150	137	127	119	113	108	103	100	98	200	180	165	153	145	139	135	130	128	127
X2CrNiMoN17-13-5	1.4439	+AT	225	200	185	175	165	155	150	-	-	-	255	230	210	200	190	180	175	-	-	-
X1NiCrMoCu25-20-5	1.4539	+AT	205	190	175	160	145	135	125	115	110	105	235	220	205	190	175	165	155	145	140	135
Special grades																						
X6CrNiNb18-10	1.4550	+AT	175	165	155	145	136	130	125	121	119	118	210	195	185	175	167	161	156	152	149	147
X1CrNiMoN25-22-2	1.4466	+AT	195	170	160	150	140	135	-	-	-	-	225	205	190	180	170	165	-	-	-	-
X2CrNiMo18-15-4	1.4438	+AT	172	157	147	137	127	120	115	112	110	108	206	186	177	167	157	150	144	140	138	136
X12CrMnNiN17-7-5	1.4372	+AT	295	260	230	220	205	185	-	-	-	-	325	295	265	250	230	205	-	-	-	-
X1NiCrMoCu31-27-4	1.4563	+AT	190	175	160	155	150	145	135	125	120	115	220	205	190	185	180	175	165	155	150	145
X1CrNiMoCuN20-18-7	1.4547	+AT	230	205	190	180	170	165	160	153	148	-	270	245	225	212	200	195	190	184	180	-
X1NiCrMoCuN25-20-7	1.4529	+AT	230	210	190	180	170	165	160	-	-	-	270	245	225	215	205	195	190	-	-	-
X2CrNiMnMoN25-18-6-5	1.4565	+AT	350	310	270	255	240	225	210	210	210	200	400	355	310	290	270	255	240	240	240	230
^a +AT = solution annealed.																						
*) 1 MPa = 1 N/mm ² .																						

Table 20 — Mechanical properties for bars at room temperature of steels in the cold work hardened (2H) condition

Steel designation		Tensile strength level	0,2 % proof strength	Tensile strength	Elongation after fracture
Name	Number		$R_{p0,2}$ MPa ^{a)} min.	R_m MPa ^{a)}	A % min.
Standard grades (Austenitic steels)					
X2CrNi18-9	1.4307	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X2CrNi19-11	1.4306	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X5CrNi18-10	1.4301	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X8CrNiS18-9	1.4305	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X6CrNiTi18-10	1.4541	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X2CrNiMo17-12-2	1.4404	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X5CrNiMo17-12-2	1.4401	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
X6CrNiMoTi17-12-2	1.4571	+C700 ^b	350	700 to 850	20
		+C800 ^a	500	800 to 1000	12
^a The maximum diameter for this tensile strength level shall be agreed at the time of enquiry and order; it shall not be greater than 25 mm.					
^b The maximum diameter for this tensile strength level shall be agreed at the time of enquiry and order; it shall not be greater than 35 mm.					
^{*)} 1 MPa = 1 N/mm ² .					

Table 21 — Tests to be carried out, test units and extent of testing in specific testing

Test	^a	Test unit	Product form	Number of test pieces per sample
			Rods, bars and sections	
Chemical analysis	m	Cast	The cast analysis is given by the manufacturer ^b	—
Tensile test at ambient temperature	m	Batch ^c	1 sample per 25 t; maximum of 2 per test unit	1
Tensile test at elevated temperature	o	—	To be agreed at the time of ordering (see Table 19)	1
Impact test at ambient temperature	o	—	To be agreed at the time of ordering (see Tables 9 to 12)	3
Resistance to intergranular corrosion	o	—	To be agreed at the time of ordering if intergranular corrosion is a hazard (see Tables 8, 11 and 12)	1
^a Tests marked with an “m” 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 the time of ordering.				
^b A product analysis may be agreed at the time of ordering; the extent of testing shall be specified at the same time.				
^c Each batch consists of products coming from the same cast. The products shall have been subject to the same heat treatment cycle in the same furnace. In the case of a continuous furnace or in process annealing a batch is the lot heat treated without intermission with the same process parameters. The shape and size of the cross sectional area of products in a single batch may be different providing that the ratio of the largest to the smallest cross sectional areas shall be equal or less than three.				

Table 22 – Minimum frequency of testing for product testing and evaluation as part of FPC

Property	Clause, indicating the relevant test method (if any)	Threshold value (if any) and tolerances	Minimum number of samples	Minimum frequency of tests
Tolerances on dimension and shape	Annex B	yes	1 per product form and nominal dimension	1 per sample
Elongation	7.4.2	yes	1 per cast, product form, dimensional range (tables for mechanical properties), heat treatment batch	1 per sample
Tensile strength	7.4.2			
Yield strength	7.4.2			
Impact strength	7.4.2	yes	1 per cast, product form, dimensional range (tables for mechanical properties), heat treatment batch	3 per sample
Weldability [covered by chemical composition]	7.4.1	yes	1 per cast	1 per cast
Durability [covered by chemical composition]	7.4.1	yes	1 per cast	1 per cast

Table 23 — Marking of the products

Marking of	Products with specific testing ^a
Manufacturer's name, trade mark or logo	+
Steel number or name	+
Cast number	+
Identification number ^b	+
Inspector's mark	(+)
^a The symbols in the table mean: + = the marking shall be applied; (+) = the marking shall be applied if so agreed, or at the manufacturer's discretion. ^b The numbers or letters used for identification shall allow the product(s) to be related to the relevant inspection certificate.	

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Annex A
(informative)

Guidelines for further treatment (including heat treatment) in fabrication

- A.1** The guidelines given in Tables A.1 to A.5 are intended for hot forming and heat treatment.
- A.2** Flame cutting can adversely affect edge areas; where necessary, they should be machined.
- A.3** As the corrosion resistance of stainless steels is only ensured with a metallically clean surface, layers of scale and annealing colours produced during hot forming, heat treatment or welding should be removed as far as possible before use. Finished parts made of steels with approximately 13 % Cr also require the best surface condition (e. g. polished) in order to achieve maximum resistance to corrosion.

Table A.1 — Guidelines on the temperatures for hot forming and heat treatment of ferritic corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Annealing	
Name	Number	Temperature °C	Type of cooling		Temperature ^a °C	Type of cooling
Standard grades						
X2CrNi12	1.4003	1100 to 800	air	+A	680 to 740	air
X6Cr17	1.4016				750 to 850	
Special grade						
X2CrMoTiS18-2	1.4523	1100 to 800	air	+A	1000 to 1050	air
NOTE The temperature of annealing should be agreed for simulated heat-treated test pieces.						
^a If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.						

Table A.2 — Guidelines on the temperatures for hot forming and heat treatment of martensitic corrosion resisting steels

Steel designaton		Hot forming		Heat treatment symbol	Annealing		Quenching		Tempering
Name	Number	Temperature °C	Type of cooling		Temperature ^a °C	Type of cooling	Temperature ^a °C	Type of cooling	Temperature °C
Standard grades									
X12Cr13	1.4006	1100 to 800	air	+A	745 to 825	air	-	-	-
				+QT650	-	-	950 to 1000	oil, air	680 to 780
X20Cr13	1.4021		slow cooling	+A	745 to 825	air	-	-	-
				+QT700	-	-	950 to 1050	oil, air	650 to 750
				+QT800	-	-	950 to 1050	oil, air	600 to 700
X17CrNi16-2	1.4057			+A ^b	680 to 800	furn.,air	-	-	-
			+QT800 ^c	-	-	950 to 1050	oil, air	750 to 800 + 650 to 700 ^c	
			+QT900	-	-	950 to 1050	oil, air	600 to 650	
X4CrNiMo16-5-1	1.4418	1150 to 900	air	+A ^d	600 to 650	furn., air	-	-	-
				+QT760	-	-	950 to 1050	oil, air	590 to 620 ^e
				+QT900	-	-	950 to 1050	oil, air	550 to 620
NOTE The temperatures of annealing, quenching and tempering should be agreed for simulated heat-treated test pieces									
^a If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.									
^b Double annealing might be advisable.									
^c In the case that the nickel is at the lower side of the range specified in Table 3, a single tempering at 620 to 720°C may be sufficient.									
^d Tempering after martensitic transformation.									
^e Either 2 x 4 h or 1 x 8 h as a minimum time.									

Table A.3 — Guidelines on the temperatures for hot forming and heat treatment of precipitation hardening corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Solution annealing		Precipitation hardening
Name	Number	Temperature °C	Type of cooling		Temperature* °C	Type of cooling	Temperature °C
Standard grades							
X5CrNiCuNb16-4	1.4542	1150 to 900	furnace, air	+AT ^b	1030 to 1050	oil, air	-
				+P800	1030 to 1050		2 h 760 °C/air + 4 h 620 °C/air
				+P930	1030 to 1050		4 h 620 °C/air
				+P960	1030 to 1050		4 h 590 °C/air
				+P1070	1030 to 1050		4 h 550 °C/air
X7CrNiAl17-7	1.4568		air	+AT	1060 to 1080	water, air	-
NOTE The temperatures of solution annealing should be agreed for simulated heat-treated test pieces.							
^a If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.							
^b Not suitable for direct application, prompt precipitation hardening after solution annealing is recommended to avoid cracking.							

Table A.4 — Guidelines on the temperatures for hot forming and heat treatment of austenitic corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Solution annealing ^a	
Name	Number	Temperature °C	Type of cooling		Temperature ^{b, c} °C	Type of cooling
Standard grades						
X2CrNi18-9	1.4307	1200 to 900	air	+AT	1000 to 1100	water,air ^d
X2CrNi19-11	1.4306				1000 to 1100	
X2CrNiN18-10	1.4311				1000 to 1100	
X5CrNi18-10	1.4301				1000 to 1100	
X8CrNiS18-9	1.4305				1000 to 1100	
X6CrNiTi18-10	1.4541				1020 to 1120	
X2CrNiMo17-12-2	1.4404				1020 to 1120	
X2CrNiMoN17-11-2	1.4406				1020 to 1120	
X5CrNiMo17-12-2	1.4401				1020 to 1120	
X6CrNiMoTi17-12-2	1.4571				1020 to 1120	
X2CrNiMo17-12-3	1.4432				1020 to 1120	
X2CrNiMoN17-13-3	1.4429				1020 to 1120	
X3CrNiMo17-13-3	1.4436				1020 to 1120	
X2CrNiMo18-14-3	1.4435				1020 to 1120	
X2CrNiMoN17-13-5	1.4439				1020 to 1120	
X3CrNiCu18-9-4	1.4567				1000 to 1100	
X1NiCrMoCu25-20-5	1.4539	1050 to 1150				
Special grades						
X6CrNiNb18-10	1.4550	1150 to 850	air	+AT	1020 to 1120	water,air ^d
X1CrNiMoN25-22-2	1.4466	1150 to 850			1070 to 1150	
X2CrNiMo18-15-4	1.4438	1150 to 850			1020 to 1120	
X12CrMnNiN17-7-5	1.4372	1150 to 850			1000 to 1100	
X3CrNiCuMo17-11-3-2	1.4578	1150 to 900			1000 to 1100	
X1NiCrMoCu31-27-4	1.4563	1150 to 850			1050 to 1150	
X1CrNiMoCuN20-18-7	1.4547	1200 to 1000			1140 to 1200	
X1NiCrMoCuN25-20-7	1.4529	1200 to 950			1120 to 1180	
X2CrNiMnMoN25-18-6-5	1.4565	1200 to 950			1120 to 1170	
NOTE The temperatures of solution annealing should be agreed for simulated heat-treated test pieces.						
^a If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.						
^b The solution annealing may be omitted, if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.						
^c The lower end of the range specified for solution annealing should be aimed at the heat treatment as part of further processing, because otherwise the mechanical properties might be affected. If the temperature of hot forming does not drop below the lower temperature for solution annealing, a temperature of 980°C is adequate as lower limit for Mo-free steels, a temperature of 1000 °C for steels with Mo contents up to 3 % and a temperature of 1020°C for steels with Mo contents exceeding 3 %.						
^d Cooling sufficiently rapidly in order to avoid the occurrence of intergranular corrosion as defined in EN ISO 3651-2.						

Table A.5 — Guidelines on the temperatures for hot forming and heat treatment of austenitic-ferritic corrosion resisting steels

Steel designation		Hot forming		Heat treatment symbol	Solution annealing ^a	
Name	Number	Temperature °C	Type of cooling		Temperature ^b °C	Type of cooling
Standard grades						
X3CrNiMoN27-5-2	1.4460	1200 to 950	air	+AT	1020 to 1100	water, air ^c
X2CrNiMoN22-5-3	1.4462				1020 to 1100	water, air ^c
Special grades						
X2CrNiN23-4	1.4362	1200 to 1000	air	+AT	950 to 1050	water, air
X2CrNiMoN29-7-2	1.4477				1040 to 1120	water
X2CrNiMoN25-7-4	1.4410				1040 to 1120	water
X2CrNiMoSi18-5-3	1.4424				1000 to 1100	water, air ^c
X2CrMnNiN21-5-1	1.4162	1100 to 900			1020 to 1080	water, air
NOTE The temperature of solution annealing should be agreed for simulated heat-treated test pieces.						
^a If heat treatment is carried out in a continuous furnace, the upper part of the range specified should usually be preferred, or even exceeded.						
^b The solution annealing may be omitted, if the conditions for hot working and subsequent cooling are such that the requirements for the mechanical properties of the product and the resistance to intergranular corrosion as defined in EN ISO 3651-2 are obtained.						
^c Cooling sufficiently rapidly in order to avoid precipitation.						