Stainless Steel

Chemical Composition

CHEMICAL COMPOSITION. HEAT ANALYSIS (MASS %) EN 10270-3

STAINLESS STEEL SPRING			C	Max. Si	Max. Mn	Max. P	Max. S	Cr	Mo	Ni	Other elements
Symbolic designation	Numerical designation	AISI									
X10CrNi18-8 (NS / HS)	1.4310	302	0.05 - 0.15	2.00	2.00	0.045	0.015	16.0 - 19.0	≤ 0.80	6.0 - 9.5	N ≤ 0.11
X5CrNiMo17-12-2	1.4401	316	≤ 0.07	1.00	2.00	0.045	0.015	16.5 - 18.5	2.00 - 2.50	10.0 - 13.0	N ≤ 0.11
X7CrNiAl17-7	1.4568	631	≤ 0.09	0.70	1.00	0.040	0.015	16.0 - 18.0	-	6.5 - 7.8	Al: 0.70 - 1.50
X5CrNi18-10 (NS / HS)	1.4301	304	≤ 0.07	1.00	2.00	0.045	0.015	17.5 - 19.5	-	8.0 - 10.5	N ≤ 0.11
X1NiCrMoCu25-20-5	1.4539	904L	≤ 0.020	0.70	2.00	0.030	0.010	19.0 - 21.0	4.0 - 5.0	24.0 - 26.0	N ≤ 0.15

CHEMICAL COMPOSITION (HEAT ANALYSIS OF MARTENSITIC AND PRECIPITATION-HARDENED STAINLESS STEEL, FERRITIC STAINLESS STEEL AND AUSTENITIC STAINLESS STEEL) ACCORDING TO EN 10088-3

STAINLESS STEEL FOR GENERAL USE			mass %										
Symbolic	Numerical	AISI	C	Si max.	Mn max.	P max.	S	N max.	Cr	Cu	Mo	Ni	Ti
Martensitic Steel													
X30Cr13	1.4028	420	0.26 - 0.35	1.00	1.50	0.040	≤ 0.03	-	12.00- 14.00	-	-	-	-
Ferritic Steel													
X6Cr17	1.4016	430	≤ 0.08	1.00	1.00	0.04	≤ 0.030	-	16.00 - 18.00	-	-	≤ 0.75	-
Austenitic Steel													
X2CrNi18-9	1.4307	304L	≤ 0.03	1.00	2.00	0.045	≤ 0.030	0.11	17.50 - 19.50	-	-	8.00 - 10.00	-
X5CrNi18-10	1.4301	304	≤ 0.07	1.00	2.00	0.045	≤ 0.030	0.11	17.00 - 19.50	-	-	8.00 - 10.50	-
X8CrNiS18-9	1.4305	303	≤ 0.10	1.00	2.00	0.045	0.15 - 0.35	0.11	17.00 - 19.00	≤ 1.00	-	8.00 - 1.00	-
X2CrNiMo17-12-2	1.4401	316L	≤ 0.03	1.00	2.00	0.045	≤ 0.030	0.11	16.50 - 18.50	-	2.00 - 2.50	10.00 - 13.00	-
X2CrNiMo18-14-3	1.4435	316L	≤ 0.03	1.00	2.00	0.045	≤ 0.030	0.11	17.00 - 19.00	-	2.50 - 3.00	12.50 - 15.00	-
X5CrNiMo17-12-2	1.4401	316	≤ 0.07	1.00	2.00	0.045	≤ 0.030	0.11	16.50 - 18.50	-	2.00 - 2.50	10.00 - 13.00	-
X3CrNiMo17-13-3	1.4436	316	≤ 0.05	1.00	2.00	0.045	≤ 0.030	0.11	16.50 - 18.50	-	2.50 - 3.00	10.50 - 13.00	-
X6CrNiMoTi17-12-2	1.4571	316Ti	≤ 0.08	1.00	2.00	0.045	≤ 0.030	-	16.50 - 18.50	-	2.00 - 2.50	10.50 - 13.50	5 x C - 0.70

STAINLESS STEEL FOR GENERAL USE			mass %										
Symbolic	Numerical	AISI	C	Si max.	Mn max.	P max.	S	N max.	Cr	Cu	Mo	Ni	Ti
X3CrNiCu18-9-4	1.4567	304Cu	≤ 0.04	1.00	2.00	0.045	≤ 0.030 [3)]	0.11	17.00 - 19.00	3.00 - 4.00	-	8.50 - 10.50	-
X8CrMnCuNB17-8-3	1.4597	204Cu	≤ 0.10	≤ 2.00	6.50 - 8.50	≤ 0.040	≤ 0.015	-	16.00 - 18.00	2.00 - 3.50	≤ 1.00	≤ 2.00	-
X12CrNi23-13	1.4833	3095	≤ 0.08	≤ 0.75	≤ 2.00	≤ 0.040	≤ 0.015	-	22.00-24.00	-	-	12.00-14.00	-
X8CrNi25-21	1.4845	310S	≤ 0.08	≤ 1.50	≤ 2.00	≤ 0.040	≤ 0.015	-	24.00-26.00	-	-	19.00-22.00	-
X15CrNiSi25-21	1.4841	314	0.02	1.50-3.00	≤ 0.02	≤ 0.045	≤ 0.015	-	24.00-26.00	-	-	19.00-22.00	-

Equivalents

STAINLESS STEEL SPRING					
Symbolic designation	EUROPEA EN 10270-3	AISI	EEUU ASTM	JAPONESA JIS	CHINA
X10CrNi18-8	1.4310	302NS	AISI 302 NS	SUS 302-WPB	-
X10CrNi18-8	1.4310	302HS	AISI 302 HLS	-	-
X5CrNiMo17-12-2	1.4401	316	AISI 316	SUS 316-WPA	-
X7CrNiAl17-7	1.4568	631	AISI 631	SUS 631J1-WPC	-
X5CrNi18-10 (NS / HS)	1.4301	304	AISI 304	SUS 304-WPB	-
X1NiCrMoCu25-20-5	1.4539	904L	-	-	-

STAINLESS STEEL FOR GENERAL USE					
Symbolic	Numerical EN 10088-3	AISI	US ASTM	JAPANESE JIS	CHINESE
Martensitic steel					
X30Cr13	1.4028	420			
Ferritic steel					
X6Cr17	1.4016	430			
Austenitic steel					
X2CrNi18-9	1.4307	304L			
X5CrNi18-10	1.4301	304			
X8CrNiS18-9	1.4305	303			
X2CrNiMo17-12-2	1.4404	316L			
X2CrNiMo18-14-3	1.4435	316L			
X5CrNiMo17-12-2	1.4401	316			
X3CrNiMo17-13-3	1.4436	316			
X6CrNiMoTi17-12-2	1.4571	316Ti			
X3CrNiCu18-9-4	1.4567	304Cu			
X8CrMnCuNB17-8-3	1.4597	204Cu			
X12CrNi23-13	1.4833	3095			
X8CrNi25-21	1.4845	310S			

STAINLESS STEEL FOR GENERAL USE					
Symbolic	Numerical EN 10088-3	AISI	US ASTM	JAPANESE JIS	CHINESE
X15CrNiSi25-21	1.4841	314			

Mechanical properties

TENSILE STRENGTH OF STAINLESS STEEL DRAWN WIRE FOR SPRINGS EN 10270-3

Tensile strength (MPa) for the following types of steel													
	1.4310				1.4401		1.4568		1.4301			1.4539	
Nominal diameter mm *d*	302NS		302HS		316		631		304 NS	304 HS		904L	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	min.	max.	min.	max.
d ≤ 0.20	2200	2530	2350	2710	1725	1990	1975	2280	2000	2150	2300	1600	1840
0.20 < d ≤ 0.30	2150	2480	2300	2650	1700	1960	1950	2250	1975	2050	2280	1550	1790
0.30 < d ≤ 0.40	2100	2420	2250	2590	1675	1930	1925	2220	1925	2050	2220	1550	1790
0.40 < d ≤ 0.50	2050	2360	2200	2530	1650	1900	1900	2190	1900	1950	2190	1500	1750
0.50 < d ≤ 0.65	2000	2300	2150	2480	1625	1870	1850	2130	1850	1950	2130	1450	1670
0.65 < d ≤ 0.80	1950	2250	2100	2420	1600	1840	1825	2100	1800	1850	2070	1450	1670
0.80 < d ≤ 1.00	1900	2190	2050	2360	1575	1820	1800	2070	1775	1850	2050	1400	1610
1.00 < d ≤ 1.25	1850	2130	2000	2300	1550	1790	1750	2020	1725	1750	1990	1350	1560
1.25 < d ≤ 1.50	1800	2070	1950	2250	1500	1730	1700	1960	1675	1750	1930	1350	1560
1.50 < d ≤ 1.75	1750	2020	1900	2190	1450	1670	1650	1900	1625	1650	1870	1300	1500
1.75 < d ≤ 2.00	1700	1960	1850	2130	1400	1610	1600	1840	1575	1650	1820	1300	1500

Tensile strength (MPa) for the following types of steel													
	1.4310				1.4401		1.4568		1.4301			1.4539	
Nominal diameter mm *d*	302NS		302HS		316		631		304 NS	304 HS		904L	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	min.	max.	min.	max.
2.00 < d ≤ 2.50	1650	1900	1750	2020	1350	1560	1550	1790	1525	1550	1760	1300	1500
2.50 < d ≤ 3.00	1600	1840	1700	1960	1300	1500	1500	1730	1475	1550	1700	1300	1500
3.00 < d ≤ 3.50	1550	1790	1650	1900	1250	1440	1450	1670	1425	1450	1640	1300	1500
3.50 < d ≤ 4.25	1500	1730	1600	1840	1225	1410	1400	1610	1400	1450	1610	1250	1440
4.25 < d ≤ 5.00	1450	1670	1550	1790	1200	1380	1350	1560	1350	1350	1560	1250	1440
5.00 < d ≤ 6.00	1400	1610	1500	1730	1150	1330	1300	1500	1300	1350	1500	1250	1440
6.00 < d ≤ 7.00	1350	1560	1450	1670	1125	1300	1250	1440	1250	1300	1440	1200	1380
7.00 < d ≤ 8.50	1300	1500	1400	1610	1075	1240	1250	1440	1200	1300	1380	1150	1330
8.50 < d ≤ 10.00	1250	1440	1350	1560	1050	1210	1250	1440	1175	1250	1360	-	-

NOTE - Can be supplied with d ≥ 14mm not subject to standards, under a commercial agreement.

TENSILE STRENGTH RANGE IN EACH UNIT PACKAGE (REEL, COIL, PACKAGE) EN 10270-3

Diameter of the wire d (mm)	Maximum range
d ≤ 1.50	100
1.50 < d ≤ 10.00	70

STEEL FOR VARIOUS APPLICATIONS

Symbolic	Numerical EN 10088-3	AISI	Strength [N/mm2]	
			Annealed State	Semi-Hard State
X6Cr17	1.4016	430	≤ 640	650-900
X2CrNi18-9	1.4307	304L	≤ 640	650-900
X5CrNi18-10	1.4301	304	≤ 640	650-900
X8CrNiS18-9	1.4305	303	≤ 590	600-700
X3CrNiCu18-9-4	1.4567	304Cu	≤ 600	600-700

Finishes

SURFACE QUALITY EN 10270-3

The surface of the wire must be smooth and, insofar as is possible, free of scratches, pitting and other surface defects that may make the wire unusable. The alternating torsion test is one method that makes it possible to detect surface discontinuities.

If the wire is to be used for manufacturing springs that are used for high stresses, the special surface quality requirements and tests can be agreed on the customer's instruction when the quote is requested or the order is placed.

Surface Finishes for Wires for Springs:	
Soap S-Co	Standard coating
Special soap coating SS-Co / S-Co+	Improvement of the spring coiling
Bright	Bright surface appearance, although there is a thin layer of soap
Polished	Wet drawn
Dulll nickel plating	Dry drawn
Bright nickel plating	Wet drawn

SURFACE QUALITY EN 10088-3

Minor surface irregularities that are inherent to the manufacturing process are permitted. When necessary, it is possible to agree on more specific surface quality requirements when placing the order, based on the EN 10221 Standard.

Tolerances

DIAMETER TOLERANCES EN 10270-3

Nominal diameter *d* (mm)	Diameter tolerances (mm)	
	Reels or coils	
	T14	T15
d ≤ 0.20	± 0.005	± 0.004
0.20 < d ≤ 0.25	± 0.005	± 0.004
0.25 < d ≤ 0.40	± 0.008	± 0.005
0.40 < d ≤ 0.64	± 0.008	± 0.005
0.64 < d ≤ 0.80	± 0.010	± 0.008
0.80 < d ≤ 1.00	± 0.010	± 0.008
1.00 < d ≤ 1.60	± 0.015	± 0.010
1.60 < d ≤ 2.25	± 0.015	± 0.010
2.25 < d ≤ 3.19	± 0.020	± 0.015
3.19 < d ≤ 4.00	± 0.020	± 0.015
4.00 < d ≤ 4.50	± 0.025	± 0.020
4.50 < d ≤ 6.00	± 0.025	± 0.020
6.00 < d ≤ 6.25	± 0.025	± 0.020
6.25 < d ≤ 7.00	± 0.030	± 0.025
7.00 < d ≤ 9.00	± 0.030	± 0.025
9.00 < d ≤ 10.00	± 0.035	± 0.030

NOTE 1 - Can be supplied with d ≥ 14mm not subject to standards, under a commercial agreement.
NOTE 2 - T15 on request

The tolerances of stainless steel wires for general use must be agreed at the time of the order or quote and can be supplied with h6-h9 tolerances.

STANDARD LENGTH TOLERANCES

NOMINAL LENGTH	TOLERANCE
L < = 1000 mm.	+/- 1 mm.
1000 < L < = 4000	- 0mm. / +3 mm.