

SANDVIK 12R11 STRIP STEEL

DATASHEET

Sandvik 12R11 is an austenitic stainless, general purpose steel with good spring properties that in most cases fulfill demands regarding corrosion resistance, mechanical strength, fatigue and relaxation properties.

Service temperature: up to 250°C (480°F)

STANDARDS

ASTM: (301)

EN Number: 1.4310

EN Name: X 10 CrNi 18-8

- SS: 2331

CHEMICAL COMPOSITION (NOMINAL) %

Chemical composition (nominal) %

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FORMS OF SUPPLY

Sandvik 12R11 is supplied, as standard, in the cold rolled condition. Strip steel can be supplied in coils, bundles, on plastic spools or in lengths. The edges can be either slit, deburred or smoothly rounded. Contact us for more information.

Dimensions

The following range of thicknesses and widths can be supplied as standard. Please contact Sandvik if other dimensions are required.

Thickness, mm	Width, mm	Thickness, in.	Width, in.	Gr. G
0.015 - 3.00*	2 - 345	0.0006 - 0.118	.079 - 13.6	definance d

^{*} Depending on requested tensile strength.

Tolerances

The thickness and width tolerances are +/- tolerances to the nominal size. The normal tolerance classes for most of our strip products are T2 and B1. Tighter tolerances as well as other tolerance limits can be offered upon request.

Stock standard

The following combinations of tensile strength and thickness are available from stock. Other combinations can be supplied on request.

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Condition*	Tensile strength, Rm	Thickness		
Stephen Stephen Stephen Stephen	MPa ksi	/ mm / / / / / / / / / / / / / / / / /		
C C C C C C C C C C C C C C C C C C C	1300 189	0.20/0.30/0.40/0.50/0.60/0.80/0.90/1.00		
The Carlot State of S	1500 218	0.10/0.15/0.20/0.25/0.30/0.40/0.50/0.60/0.70/ 0.80/1.00/1.5/2.0		
C de la company	1700 247	0.10/0.15/0.20/0.30/0.40/0.50/0.60/0.90/1.00		

^{*} C = Cold rolled

MECHANICAL PROPERTIES

Static strength

Nominal values at 20°C (68°F)

Condition ¹⁾	Tensile strength	, Rm	Proof strer Rp0,2a)	ngth,	Elongatio A11,3	n, or standing
ANT STATE STATES	MPa	ksi	MPa	ksi	%	Tropy Tropy Stry
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CT grand grand grand	1350	196			Articles Stationers	Station Station Station
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Current States States States	1900	276	1825	265	Bearing Bearing States	Stelling Stelling Stelling
CT & S	2000	290	Start Start	a program	Street - Street Street	Stelling Stelling Stelling

¹⁾ A = Annealed, C = Cold rolled, CT = Cold rolled and tempered, 350°C (662°F)/3 h. See further under section 'Heat treatment'.

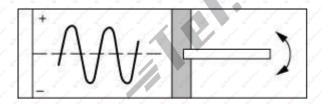
Fatigue strength

Nominal values at 20°C (68°F) in a normal dry atmosphere. The fatigue limit is defined as the stress at which 50% of the specimens withstand a minimum of 2 million load cycles.

Reversed bending stress

Average stress = 0

Bending transversal to rolling direction.



Comparison made for different thicknesses and tensile strength levels.

Tensile strength, Rm	Fatigue strength	Tensile strength, Rm	Fatigue strength
gen Surfer States States States States States	Thickness, mm	and the state of t	Thickness, in.
Article Statem Statem Statem Statem Statem Statem	0.50 0.75	State	0.020 0.030
MPa	MPa MPa	ksi da	ksi ksi s

a) Rp0.2 corresponds to 0.2% offset yield strength. 1 MPa = 1 N/mm²

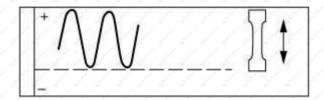
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Tensile strength, Rm	Fatigue s	trength	Tensile strength, Rm Fatigue str		trength	
The state of the s	Thicknes	ss, mm		Thickness, in.		
	0.50	0.75		0.020	0.030	
MPa	MPa	MPa	ksi	ksi	ksi	
1500	± 555	± 525	218	± 80.5	± 76.2	
1700	± 560	± 545	247	± 81.3	± 79.1	
1900	± 570	± 560	276	± 82.7	± 81.3	
2000	± 600	± 580	290	± 87.1	± 84.2	

Fluctuating tensile stress

Minimum stress = 0

Specimens parallel to rolling direction.



Comparison made for different thicknesses and tensile strength levels.

Tensile strength, Rm	Fatigue strength		Tensile strength, Rm	Fatigue stren	Fatigue strength	
Statistics Statistics Statistics Statistics Statistics	Thickness, mm			Thickness, in.		
Branch Statement Statement Statement Statement	0.25	0.50	and grant grant grant	0.010	0.020	
MPa 🍼 🦸 🖑 🐇	MPa	MPa	ksi	ksi	ksi	
1500	420 ± 420	405 ±405	218	60.9 ± 60.9	58.8 ± 58.8	
1700	460 ± 460	425 ±425	247	66.8 ± 66.8	61.7 ± 61.7	
1900	475 ± 475	445 ±445	276	68.9 ± 68.9	64.6 ± 64.6	
2000	480 ± 480	460 ± 460	290	69.7 ± 69.7	66.8 ± 66.8	

PHYSICAL PROPERTIES

The physical properties of a steel relate to a number of factors, including alloying elements, heat treatment and manufacturing route, but the following data can generally be used for rough calculations. These values refer to cold rolled material, at a temperature of 20°C (68°F) unless otherwise stated.

Density 7.9 g/cm3 (0.29 lb/in)

Resistivity 0.8 $\mu\Omega$ m (31.5 $\mu\Omega$ in.)

Modulus of elasticity

'as delivered': approx 185 000 MPa (26 825 ksi) tempered: approx 190 000 MPa (27 550 ksi)

Shear modulus

'as delivered': approx 70 000 MPa (10 150 ksi)

Specific heat capacity 500 J/kg°C (in the temperature range 50-100°C (120- 210 oF)

Thermal expansion mean values in temperature ranges (x10-6)

	Temperature, ℃	per °C	Temperature, °F	per ℉
STA.	20 - 100℃	15.5	68 - 200	8.5
STATE THOUSE	20 - 200℃	16	68 - 400	9 m 3 m 3 m 3 m 3 m 3 m 3 m 3 m 3 m 3 m
Ziferi Lafterier	20 - 300℃	16.5	68 - 550	9 9

Thermal conductivity

Temperature, °C	W/m °C	Temperature, ℉	Btu/ft h°F	
20,000 000 0000 0000 0000 0000 0000	15,	68,000	8.5	
100	16/	200	9	
300 / / / / /	19	600	11 jede gjede gjede gjede gjede gjede	

CORROSION RESISTANCE

It is very important to avoid corrosion in spring applications so as not to impair spring properties. Sandvik 12R11 is an austenitic stainless steel and has sufficient corrosion resistance in most spring applications. The corrosion resistance is almost the same as ASTM 304 and, compared to other low alloyed spring steels, Sandvik 12R11 has superior performance. However, all austenitic steels of this type are susceptible to stress corrosion cracking (SCC) when in contact with chloride solutions at elevated temperatures.

HEAT TREATMENT

The strength of cold rolled Sandvik 12R11 can be increased by a tempering operation at 350°C (662°F) for 3 hours. An increase in tensile strength up to approx. 150 MPa (22 ksi) can be expected, depending on the initial cold rolled tensile strength. Further information on the nominal tempering effect can be seen under the "Mechanical properties" section. This heat treatment is also beneficial for relaxation and fatigue resistance.

Tempering is normally carried out by the customer after forming. To avoid discolouration, parts should be carefully cleaned before heat treatment. Tempering in open air furnaces gives a harmless brownish oxide on the surface.

WELDING

Sandvik 12R11, like most austenitic stainless steels, has a good weldability. Welding, however, introduces excess heat into the material closest to the weld that breaks down the structure formed by cold working. As a consequence, this will decrease the mechanical properties of the welded area. The lowest practical heat input, <1.0 kJ/mm, and interpass temperature for multipass welding, <100°C (210 oF), is recommended.

In most cases, the TIG (GTAW) method is preferable. It can be used either autogenously (without filler metal) or with filler metal. In both cases, pure argon (99.99%) should be used as the shielding gas.

When filler metal is used, Sandvik 19.9.L or Sandvik 19.9.LSi is recommended.

Due to the high carbon content of Sandvik 12R11, there is also a risk of carbide precipitation at the grain boundaries of the material in the heat affected zone (HAZ), which may decrease the corrosion resistance of the material in certain environments.

BENDING

The values given below have been obtained by bending according to Swedish standard SS 11 26 26 method 3 (in a 90° V-block with a 25 mm die opening, a sample of 35 mm width, turned so that the burrs of the blanked edges face into the bend). They can be used as guidance for the smallest recommended bending radius.

Sifee ¹	Nominal tensile strength, Rm	Thickness (t)	Min. bending radius as function of thickness*
Gifeet.	MPa	mm , st. , st. , st.	<u>, i, i,</u>

Nominal tensile strength, Rm	Thickness (t)	Min. bending radius as function of thickness*	
MPa	mm		
1300	0.25	0.5 t	* * * * * * * * * *
1300	0.50	0.5 t	2.5 t
1300	0.75	The state of the s	3 t
1300	1.0	1 t	3.5 t
1500	0.25	grand 1, the standard standard standard	3.5 t
1500	0.50	grand 1 t grand grand grand	5t
1500	0.75	1.5 t	5.5 t
1500	garden garden garden gard 1.0 million	And 2 t grand grand grand	6 1 / / / / / / / / / / / / / / / / / /
1700 % 5 5 5 5 5	0.25	1.5 t	6.5 t
1700	0.50	2 t 3 d 3 d	9 t
1700	0.75	2.5 t	9.5 t
1700	1.0	3 t	9.5 t
1900	0.25	2 t	10 t
1900	0.50	3.5 t	111
1900	0.75	5 t	12 t

^{*)} \bot Bend transverse to the rolling direction

APPLICATIONS

Sandvik 12R11 is suitable for springs and other high strength components in the mechanical, electronics and computer industries. It is a very good spring material that in most cases fulfils demands regarding corrosion resistance, mechanical strength, fatigue and relaxation properties.

Disclaimer: Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Sandvik materials.





^{//} Bend parallel to the rolling direction