Material Datasheet Issue: October 2015

Temper rolled Spring Steel W.-Nr. 1.4310

1. Applications:

The alloy 1.4310 (AISI 301) has a good corrosion resistance due to a content of 17% Chromium and 7% Nickel. A high tensile strength is obtained by cold rolling. Compared to alloy 1.4301 (AISI 304) a much higher tensile strength of more than 2000 N/mm² can be reached. Because of this, the alloy 1.4310 is suitable for stainless feeler gage stock, precision foils, stainless springs and parts of higher strength. This alloy is little magnetic and can not be hold by magnetic tables of grinding machines. Available in more than 60 thicknesses between 0.003 and 3.0 mm and in different tensile strengths.

Further applications:
welded steel belts, transport belts

The alloy 1.4310 is suitable for spring according to DIN 17 224 (new: DIN EN 10 151).

At high demands for hardness and wear resistance we suggest the alloys 1.4031Mo (up to 0.80 mm thickness) and 1.4034 (1.0 to approx. 8.0 mm thickness).

2. Material codes:

German Norm:	1.4310, X10CrNi 17-7
AISI:	301
ASTM:	S 30100
Engl. Norm:	301S21
French Norm:	Z 12 CN18-09
Japan. Norm:	SUS 301

3. Chemical composition (nominal): *

C:	0.05-0.15 %
Si:	max. 2.00 %
Mn:	max. 2.00 %
P:	max. 0.045 %
S:	max. 0.015 %
Cr:	16-19 %
Ni:	6-9.5 %
Mo:	max. 0.80 %

* the exact composition of each batch can be documented by a test certificate 2.2 or 3.1 according to DIN 10 204

4. Delivery condition:

Condition:	temper rolled (austenitic and partially martensitic), not hardenable
Surface:	2H, Ra maximal 0,3 µm (depending of the roughness of the working roll)
Tensile strength:	1100 up to more than 2000 N/mm²

The tensile strength can be increased by annealing at 330-370°C (approx. 4 hours) for 100-300 N/mm² (depending on the primary tensile strength of the material).

Further mechanical data: see chapter 7 and 8.

5. Sizes:

Thickness:	0,003-3,00 mm
Raw material width:	depending on thickness 50 up to approx. 1000 mm in several tensile strengths
Standard widths:	10,0 – 12,7 – 25 – 50 – 100 – 150 mm in tensile strength 15-1700
Edges:	cut
Lengths:	variable lengths from 5 to 10 000 mm or as Coil

The following maximum widths are available from stock:
(without obligation, Issue: November 2014)

Thick-ness	***UTS 1100-1300***	***UTS 1300-1500***	***UTS 1500-1700***	***UTS 1900-2100***	***Annotations***
0,003					ca. 50 mm temper rolled
0,005					ca. 100 mm temper rolled
0,008					ca. 100 mm temper rolled
0,01			205		
0,015			100		
0,02			100		
0,025			300		
0,03		ca. 300	100		
0,035			100		
0,04		ca. 300	100		
0,045			100		
0,05		ca. 300	305		
0,055			100		
0,06			305		
0,07			305		
0,075			305		
0,08			305		
0,09			305		
0,10	ca. 300	ca.300+1000	305+610	ca. 300	
0,11			305		
0,12			305		
0,13			305		
0,14			305		
0,15	ca .300	300+1000	305+610		
0,16			305		
0,17			305		
0,18			305		
0,19			305		
0,20	ca. 300+600	300+1000	305+610	ca. 300	
0,21			305		
0,22			305		
0,23			ca. 205		
0,24			305		
0,25	ca .300	300+1000	305+610		
0,26			305		
0,27			305		
0,28			305		

Thick-ness	*UTS 1100-1300*	*UTS 1300-1500*	*UTS 1500-1700*	*UTS 1900-2100*	*Annotations*
0,29			305		
0,30	ca.300+600	300+1000	305+610	ca. 300	+ 620x1000 F13-1500
0,325			only 12,7		
0,35			305		
0,40	ca. 300	300+1000	305+610		+ 620x1000 F13-1500
0,45			305		
0,47			ca. 300		
0,50	ca. 300	300+1000	305+610		+ 630x1000 F13-1500
0,55			305		
0,60	ca .300		305+610		
0,65			305		
0,70			305+610		
0,75			250x1000		
0,80	ca. 300		305		+ 600x1000 F11-1300/15-1700
0,85			305		
0,90			305		
0,95			305		
1,00	ca. 300		305		+ 600x1000 F11-1300/15-1700
1,10			100x500		
1,20	300x2000		100/150x500		
1,30		100x500			
1,40		100x500			
1,50	300x2000	100/150x500			
1,60		100x500			
1,70		100x500			
1,80		100/150x500			+ 250x1000 F 13-1500
1,90		100x500			
2,00	300x2000	100/150x500			
2,50	300x2000				
3,00	300x2000				

6. Tolerances:

Thickness tolerance: DIN EN 9445 Table 1 or T3 (for U.T.S. 15-1700 N/mm²)
Width tolerance: according to DIN EN 9445
Straightness: normal
Flatness: wave height max. 1,0 mm

7. Further mechanical properties

Yield Str. Rp0,2 : depending on tensile strength
Elongation A 80: depending on tensile strength

If good tumbling is done, the following values can be achieved:
Reversed bending stress (Mean stress = 0):
550 MPa (50 % of the tested samples survive 2 million cycles at normal environment), if bending direction is at a 90° angle to the rolling direction

Fluctuating bending stress (Minimum stress = 0):
420 MPa (50 % of the tested samples survive 2 million cycles at normal environment), if bending direction is at a 90° angle to the rolling direction

As the fatigue strength depends on different factors like the corrosive conditions and the edge treatment, no definitive endurance limit values can be guaranteed.
At high forces or bending not in the right angle to the rolling direction hardened steels like the alloy 1.4031Mo are strictly recommended.

The operation temperature should not exceed 120-250°C (compare to DIN 17224 – stainless strip steel for springs). Please remember that the modus of elasticity decreases at higher temperatures.

8. Physical properties:

Density:	7,9 g/cm³
Thermal conductivity:	15-19 W/(m °C) depending on the temperature
Spec. heat capacity:	500 J/(kg °C) mean value at 50 – 100 °C
Thermal expansion:	15,5 x 10 -6 (between30 - 100 °C)
	16,0 x 10 -6 (between 30 - 200 °C)
	16,5 x 10 -6 (between 30 - 300 °C)
Electric resistance:	0,73 Ohm x mm²/m
Modus of elasticity:	185 000 MPa at 20 °C
Relative Permeability μr:	maximal 24 (further data: see chapter 13)

9. Blanking
We recommend a punch-to-die clearance of 4-10 % of the strip thickness.
The corner radius should be at least 0.25 mm and the punching die should be at least twice the strip thickness.
The pieces should then be tumbled to receive a good edge roundness.

10. Laser cutting
This alloy can be laser cut without problems.

11. Photo etching
The alloy 1.4310 can be etched easily.

12. Bending
As the high hardness of 1.4310 is obtained by temper rolling, the rolling direction has a big influence on the bending.
The suggested minimum bending radius also depends on the tensile strength.
Bending at right angle (90°) to the rolling direction:

	11-1300	13-1500	15-1700	>1700 N/mm²
Up to 0,25 mm	1,0 x t	1,50 x t	2,0 x t	2,5 x t
0,25-0,50 mm	1,0 x t	2,0 x t	2,5 x t	3,0 x t
0,50-0,75 mm	2,0 x t	2,5 x t	3,0 x t	3,5 x t
0,75-1,00 mm	2,5 x t	3,0 x t	4,0 x t	Not recommended

t = Strip thickness

Bending parallel to the rolling direction:

	11-1300	13-1500	15-1700	>1700 N/mm²
Up to 0,25 mm	2,5 x t	3,0 x t	6,5 x t	9,0 x t
0,25-0,50 mm	3,0 x t	4,0 x t	9,0 x t	9,5 x t
0,50-0,75 mm	4,0 x t	5,0 x t	9,5 x t	11,0 x t
0,75-1,00 mm	5,0 x t	7,0 x t	10,0 x t	Not recommended

t = strip thickness

We suggest the tensile strength of 11-1300 N/mm² for bended pieces

13. Flat grinding
In the temper rolled condition this alloy is only little magnetic and can not be holy by magnetic clamping devices of flat grinding machines.

The alloy 1.4310 has an austenitic structure in the annealed condition and is therefore nearly unmagnetic. The temper rolling leads to a change in the structure from austenitic to martensitic which causes an increase of magnetizability.

As this depends on several factors like the deformation degree, the material temperature during rolling and the chemical composition of the alloy, no specific data can be given.

At a deformation degree of 50%, the relative permeability should be not more than 10 to 18, and at a deformation degree of 70% the relative permeability should be not more than 15 to 24 (at 200H).

14. Welding
The alloy 1.4310 can be welded easily. At the weldseam a change in the structure occurs due to the welding heat which decreases the strength.
Due to a content of approx. 0.10% of Carbon local corrosion at the weldseam is possible.
For critical applications the alloy 1.4404 (AISI 316L) with a verly low content of Carbon of less than 0.03% is recommended.

15. Corrosion resistance
This alloy is in the group 4 in the Nirosta-table of corrosion resistance of stainless steels (see www.nirosta.de/Publikationen). This alloy is less resistant than the alloys 1.4404 (in group 5), but better resistant than the grades 1.4031Mo and 1.4034 (both in group 1).

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Please check there and by tests if the alloy 1.4310 is resistant enough for your application.
As alternative, the alloy 1.4404 (AISI 316L) is available in the strength 11-1300 N/mm² in the thicknesses 0,01-0,02-0,05-0,10-0,15-0,20-0,25-0,30-0,40 and 0,50 mm.

Important Annotation
The specifications which are given in this technical information sheet about the condition and application of the alloys are only for reference and are no confirmation about certain performances and characteristics.
The information correspond to our own experiences and experiences of our suppliers.
We can not guarantee for the results during processing and utilisation.