Material Data sheet Issue: July 2023

Cold-rolled spring steel W.-Nr. 1.4310

1. Application examples

Due to the alloy with 17% chromium and 7% nickel, this material has good corrosion resistance. With this material, high strength is achieved by cold rolling. Compared to the material 1.4301, a significantly higher tensile strength of over 2000 N/mm² can be achieved. Therefore, the material 1.4310 is very well suited for rstainless precision gauge tapes and shims as well as for stainless springs and parts with higher strength.

Further application examples:
welded endless belts, conveyor belts and covers in machine tools

The material 1.4310 is approved as a spring material in the DIN EN 10 151 standard. If there are high demands on hardness and wear resistance, grades 1.4031Mo (up to 2.00 mm thick) or 1.4034 (from 1.0 to 3.0 mm thick) should be used. with high demands on corrosion resistance, the materials 1.4404 or 1.4529 in hard-rolled condition.

At high temperatures up to approx. 650° Celsius, the material 2.4668 (Alloy 718) should be used in a precipitation-hardened condition.

2. Material codes

German Norm:	1.4310, X 10CrNi 17-7
AISI:	301
ASTM:	S 30100
English Norm:	301S21
Franz. Norm:	Z 12 CN18-09
Japanese Norm:	SUS 301

3. Alloy Composition *

C: 0,05-0,15%
Si: max. 2,0%
Mn: max. 2,0%
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

thicknesses: 0,003-3,00 mm
raw material width: depending on the thicknesses von 50 bis ca. 1250 mm in different tensile ranges
standard widths: 10,0 – 12,7 – 25 – 50 – 100 – 150 – 305 mm in tensile range 15-1700 N/mm²
edges: cut
Lengths: variable lengths from 5 to 10 000 mm or as Coil

The following sizes are available from stock (without obligation):

thickness	***Tensile range 1100-1300***	***Tensile range 1300-1500***	***Tensile range 1500-1700***	***Tensile range 1900-2200***	***Annotation***
0,003					ca. 50 mm hart
0,005					ca. 100 mm hart
0,008					ca. 100 mm hart
0,01			200-205		
0,015			100		
0,02			200-205		
0,025			200-205		
0,03		ca. 305	100		
0,035			100		
0,04		ca. 305	100		
0,045			100		
0,05		ca. 610	305		
0,055			100		
0,06			305		
0,065			305		
0,07			305		
0,075			305		
0,08			305		
0,085			305		
0,09			305		
0,095			305		
0,10	ca. 300	ca.300	305+610+1000	ca. 300	
0,11			305		
0,12			305+610		
0,13			305		
0,14			305		
0,15	ca .300	305+610+1250	305+610+1250		
0,16			305		
0,17			305		
0,18			305+610		
0,19			305+610		
0,20	305+610+1250	305+610+1250	305+610+1250	ca. 300	
0,21			305		

thickness	*Tensile range 1100-1300*	*Tensile range 1300-1500*	*Tensile range 1500-1700*	*Tensile range 1900-2200*	*Annotation*
0,22			305		
0,23			305		
0,24			305		
0,25	305+610+1250	305+610+1250	305+610+1250	ca. 305	
0,26			305		
0,27			305+610		
0,28			305		
0,29			305+610		
0,30	305+610+1250	305+610+1250	305+610+1250	ca. 300	
0,325			nur 12,7		
0,35			305+610		
0,38			ca. 400		
0,40	305+610+1250	305+610+1250	305+610+1250	ca. 300	
0,45			305+610		
0,47			ca. 300		
0,50	305+610+1250	305+610+1250	305+610+1250	ca. 305	
0,55			305+610		
0,60	ca. 300	305+610+1250	305+610+1250		
0,65			305+610		
0,70	ca. 300		305+610		
0,75			305		
0,80	ca. 300	305+610+1250	305+610+1250		
0,85			305		
0,90			305+610		
0,95			305		
1,00	ca. 300	305+620+1250	305+610		
1,10			100x500		
1,20	300x2000		100/150x500		
1,30		100x500			
1,40		100x500			
1,50	300x2000	300x2000	610x1000		
1,60		100x500			
1,70		100x500			
1,80	300x2000	100/150x500			
1,90		100x500			
2,00	300x2000	300x2000			
2,50	300x2000				
3,00	300x2000				

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6. Tolerances

thickness tolerace: DIN EN 9445 Tabelle 1 bzw. T3 (for tensile range 15-1700 N/mm²)
width tolerance: according to DIN EN 9445
straightness: normal
flatness: wave height max. 1,0 mm

7. Further mechanical data

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
Heat capacity:	500 J/(kg °C) medium value at 50 – 100 °C
Thermal expansion:	15,5 x 10 -6 (between 30 - 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 bei 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 etches, but not as easily as the alloys 1.4404 with a lower carbon content.

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 N/mm²	13-1500 N/mm²	15-1700 N/mm²	>1900 N/mm²
Up to 0,25 mm	0,5 x t	1,50 x t	2,0 x t	3,0 x t
0,25-0,50 mm	1,0 x t	2,0 x t	2,5 x t	3,5 x t
0,50-0,75 mm	2,0 x t	2,5 x t	3,0 x t	Not recommended
0,75-1,00 mm	2,5 x t	3,0 x t	3,5 x t	Not recommended

t = strip thickness

Bending parallel to the rolling direction:

	11-1300 N/mm²	13-1500 N/mm²	15-1700 N/mm²	>1900 N/mm²
Up to 0,25 mm	2,5 x t	3,0 x t	4,5 x t	12,0 x t
0,25-0,50 mm	3,0 x t	4,0 x t	5,0 x t	13,0 x t
0,50-0,75 mm	4,0 x t	5,0 x t	7,0 x t	Not recommended
0,75-1,00 mm	5,0 x t	7,0 x t	9,5 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 non magnetic. 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).

For springs in a magnetic environment, we recommend the stainless steel spring strip 1.4529, which is almost non-magnetizable due to its high austenite stability even in the hard-rolled state (in thicknesses of 0.05-0.50mm in stock).

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 very 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 between 0,01 and 2,00 mm.

In addition, a seawater resistant stainless steel alloy 1.4529 (alloy 926) is available also in the temper rolled condition in thicknesses between 0,05-0,50mm for very corrosive environments.

At our sister company Schwab Metallfolien GmbH&Co.KG, the age hardenable nickel alloy 718 (German Werkstoff number 2.4668) is available in thicknesses between 0,10-0,50mm.

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.