

Hardened spring steel W.-Nr. 1.1274 (C100S)**1. Application examples**

With a carbon content of more than 1%, this material is very well suited for feeler gauge tapes and shims, as well as for highly stressed springs that are not subject to corrosion requirements.

Other areas of application: Wear strips, pressure blades, valves in shock absorbers

In DIN EN 10 132-4, 1.1274 is approved as a material for springs. Compared to the materials 1.1231 (C67S), 1.1248 (C75S) and 1.1269 (C85S), which have a lower carbon content, the material 1.1274 is also suitable for high mechanical loads and has a high fatigue strength. It is the only carbon steel used for shock absorber valves and reed valves.

If there is a risk of corrosion and the highest demands on the mechanical load, we recommend the material 1.4031Mo, which is available in thicknesses of 0.10 to 2.0 mm.

2. Material codes

German Norm:	1.1274, C100S+QT (former Ck101)
AISI:	1095
ASTM:	G 10950
English Norm:	95 (B.S. 5770 Part 1)
Franz. Norm:	XC 100
Japanese Norm:	SK 4-CSP (Norm G 4802)

3. Alloy Composition *

C:	0,95-1,05%
Si:	0,15-0,35%
Mn:	0,30-0,60
P:	max. 0,025%
S:	max. 0,025%
Cr:	max. 0,40%
Ni:	max. 0,40%
Mo:	max. 0,10%

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

4. Delivery condition

Condition:	hardened and tempered (martensitic condition)
Surface:	white polished, please ask for roughness values
flatness:	mostly P2 = 0,3% of the strip width

Ultimate tensile strength: see table (depending on the thicknesses from 1600-1800 to 2000-2200 N/mm²)

Further mechanical data: see chapter 7 and 8.

5. Sizes

thicknesses: 0,02-3,0 mm

raw material width: depending on the thicknesses from 12,7 to 600 mm (see table)
standard widths: 6 – 12,7 – 25 – 50 – 100 – 150 und 305mm
(not in all thicknesses)

Edges: in widths 6 and 12.7 mm round edges in thicknesses from 0.25 to 2.0mm, all other sizes with cut edges

lengths: individual lengths from 5 to 10 000mm or as coil

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

<i>thickness in mm</i>	<i>maximum width in mm</i>	<i>Ultimate tensile strength</i>
0,02mm	12,7mm	2000-2200 N/mm ²
0,03mm	ca. 102mm	2000-2200 N/mm ²
0,04mm	ca. 102mm	2000-2200 N/mm ²
0,05mm	ca. 155mm	2000-2200 N/mm ²
0,06mm	ca. 105mm	2000-2200 N/mm ²
0,07mm	ca. 105mm	2000-2200 N/mm ²
0,08mm	ca. 170mm	2000-2200 N/mm ²
0,09mm	ca. 105mm	2000-2200 N/mm ²
0,10mm	ca. 205mm	2000-2200 N/mm ²
0,12mm	ca. 240mm	2000-2200 N/mm ²
0,15mm	ca. 240 + 500-520mm	2000-2200 N/mm ²
0,18mm	ca. 248mm	2000-2200 N/mm ²
0,20mm	ca. 305 + 500-520mm	1800-2000 N/mm ²
0,25mm	ca. 240 + 500-520mm	1800-2000 N/mm ²
0,30mm	ca. 305 + 500-520mm	1800-2000 N/mm ²
0,35mm	ca. 305mm	1800-2000 N/mm ²
0,40mm	ca. 305 + 500-520mm	1600-1900 N/mm ²
0,45mm	ca. 50mm	1600-1900 N/mm ²
0,50mm	ca. 305 + 500-520mm	1600-1900 N/mm ²
0,55mm	12,7mm	1600-1800 N/mm ²
0,60mm	ca. 305 + ca. 500-520mm	1600-1800 N/mm ²
0,65mm	12,7mm	1600-1800 N/mm ²
0,70mm	ca. 305 + ca.600mm	1600-1800 N/mm ²
0,75mm	12,7mm	1600-1800 N/mm ²
0,80mm	ca. 305 + ca. 500-520mm	1600-1800 N/mm ²
0,85mm	12,7mm	1600-1800 N/mm ²
0,90mm	ca. 305mm	1600-1800 N/mm ²
0,95mm	12,7mm	1600-1800 N/mm ²
1,00mm	ca. 305+ ca. 500-520mm	1600-1800 N/mm ²
1,20mm	400x1000mm + 400x2000mm	1600-1800 N/mm ²
1,50mm	400x1000mm + 400x2000mm	1600-1800 N/mm ²
1,80mm	400x1000mm + 400x2000mm	1600-1800 N/mm ²

<i>thickness in mm</i>	<i>maximum width in mm</i>	<i>Ultimate tensile strength</i>
2,00mm	400x1000mm + 400x2000mm	1600-1800 N/mm ²
3,00mm	400x1000mm + 400x2000mm	1600-1800 N/mm ²

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In the thicknesses from 0.60 to 5.03 mm we have the hardened tool steel 1.2003 (75Cr1) on stock.

6. Tolerances

thickness tolerance: T3
width tolerance: B2
straightness: normal
Flatness: P3 = 0,2% of the strip width

7. Further mechanical data

Yield str. Rp0,2 : approx. 90 % of the tensile strength
Elongation A 80: no data available

Fatigue strength: high fatigue strength, suitable for shock absorber valves and flapper valves

If good tumbling is done, the following values can be achieved:

Reversed bending stress (Mean stress = 0):
620-680 MPa at a failure rate of 5 %.

Fluctuating bending stress (Minimum stress = 0):
520-580 MPa at a failure rate of 5 %

As the fatigue strength depends on different factors like the corrosive conditions and the edge treatment, no definitive endurance limit values can be guaranteed.

Please ask if the requested batch meets the high demands for shock absorber valves or compressor valves.

The operation temperature should not exceed 200°C.

Please remember that the modulus of elasticity decreases at higher temperatures.

For higher operation temperatures we suggest the stainless hardened steels like the alloys 1.4031Mo (up to 2.0 mm thickness) and 1.4034 (from 1.0 to approx. 10.0 mm thickness)

8. Physical properties

Density: 7,9 g/cm³
Thermal conductivity: 49 W/(m °C) bei 20 °C
Heat capacity: 460 J/(kg °C) medium value at 50 – 100 °C
Thermal expansion:
10,5 x 10⁻⁶ (between 30 - 100 °C)
11,5 x 10⁻⁶ (between 30 - 200 °C)
12,5 x 10⁻⁶ (between 30 - 300 °C)
Electric resistance: ca. 0,20 Ohm x mm²/m (for 1.1231= C67S hardened)
Modus of elasticity: 210 000 MPa bei 20 °C

Relative permeability μ_r : maximum 400 (for 1.1231= C67S hardened)

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.

After blanking a stress relieving at a maximum temperature of 250°C for 30-60 minutes is suggested.

The pieces should then be tumbled to receive a good edge roundness.

We suggest to produce the pieces by photo etching.

10. Laser cutting

As the material melts at the edge during laser cutting, a higher hardness and therefore a lower toughness at the cutting zone is possible.

We suggest to produce critical pieces by water jet cutting.

11. Photo etching

This alloy is very easy to etch.

12. Bending

As this material is supplied in the hardened and tempered condition, the rolling direction is not important regarding the bending.

Bending radius: minimum 10 times of the strip thickness.

Spring back angle: As the spring back angle depends on several factors, bending tests are necessary. As guidance an angle of 10° at a strip thickness of 0.20 mm and an angle of 20° at a strip thickness of 0.60 mm can be expected.

13. Flat grinding

The alloy 1.1274 is magnetisable and can be fixed by magnetic clamping devices of flat grinding machines.

14. Welding

Due to the high content of carbon the alloy 1.1274 should not be welded.

15. Corrosion resistance

The alloy 1.1274 is not corrosion resistant. We supply this alloy with a light oil film.

If used at normal conditions this alloy needs to be painted or galvanized.

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.