

Hardened knife steel 1.4021
Hardened knife steel W.-Nr. 1.4034/W.-Nr. 1.2083
Hardened knife steel 1.4037

1. Application examples

Due to the 13% chromium alloy, these martensitic chromium steels are corrosion-resistant in humid air, steam and water, but not sufficiently resistant to chloride ions and acids. Compared to the material 1.4310, these materials have a lower corrosion resistance. The advantages of these steels are their good wear resistance and very good flatness due to minimal internal stresses.

Depending on the application, three different alloys are available, which differ only in terms of carbon content and hardness:

Material 1.4021 = X20Cr13

With a hardness of only 43-47 HRC, this material can still be easily milled and folded.

Material 1.4034 = X46Cr13

With a Rockwell hardness of 49-53 HRC, the material 1.4034 is ideal for gauges, tools and machine knives in the food industry, as well as scalpels. The grades 1.4034 and 1.2083 differ only minimally in the carbon content.

Material 1.4037 = X65 Cr13

Due to the very high tensile strength of over 1900 N/mm², this material is ideal for wear-resistant parts, machine knives, scalpels and razor blades.

Other areas of application: Saws in the food industry, textile knives Wear strips, pressure squeegees, brake discs

If there are high demands on hardness and wear resistance, grade 1.2379 should be used, and grade 1.4112 in a corrosive environment.

The stainless hardened special steel is in the thickness range from 0.076 to 2.00 mm W. no. 1.4031Mo available, which has a slightly better corrosion resistance due to the molybdenum content of approx. 1%.

2. Material codes

German Norm:	W.-Nr. 1.4021 (X20Cr13)
	W.-Nr. 1.4034 (X46Cr13)
	W.-Nr. 1.4037 (X65Cr13)
AISI:	420
ASTM:	S42000
English Norm:	
French Norm:	Z 44C14 CI (1.4034)
Japanese Norm:	SUS 420 J2 (1.4034)

3. Alloy Composition *

C: 0,16-0,70% depending on the alloy

Si: max. 1,00%

Mn: max. 1,00%

P: max. 0,04%

S: max. 0,03%

Cr: 12,5-14,5%

Mo: no content

* 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

Surface: polished (alloy 1.4037), grinded (alloys 1.4021 + 1.4034)

Hardness: 1.4021: 43-47 HRC

1.4034: 50-54 HRC (approx. 1700 bis 1860 N/mm²)

1.4037: 1900-2200 N/mm²

Further mechanical data: see chapter 7 and 8.

5. Sizes

thicknesses: 1.4021: 0,50 - 2,00 mm

1.4034: 1,00 - 3,00 mm

1.4037: 0,25 - 1,0mm

Widths: see table

edges: cut

Lengths: 1000 mm and 2000 mm

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

thickness:	Alloy 1.4021	Alloy 1.4034	Alloy 1.4037
0,25			ca. 125mm
0,40			ca. 170mm
0,50	380x1000+380x2000		ca. 250mm
0,80	380x1000+380x2000		
1,00	380x1000+380x2000	360x1000 + 360x2000	ca. 250mm
1,10		360x1000 + 360x2000	
1,20		360x1000 + 360x2000	
1,30		360x1000 + 360x2000	
1,40		360x1000 + 360x2000	
1,50	380x1000+380x2000	360x1000 + 360x2000	
1,60		360x1000 + 360x2000	
1,70		360x1000 + 360x2000	
1,80		360x1000 + 360x2000	
1,90		360x1000 + 360x2000	
1,975		320x2160	
2,00	380x1000+380x2000	360x1000 + 360x2000	
2,50		360x1000 + 360x2000	
2,97		360x2000	
3,00		360x1000 + 360x2000	

without obligation, Issue: July 2023

Piece hardened sheets in the size 650x1000 mm available in thicknesses between 4,5 – 10,50mm. Due to the poor thickness tolerance due to hot rolling and the loss of Carbon during hardening and a scaled surface due to hardening these pieces need to be ground after cutting.

6. Tolerances

thickness tolerance: T3 (width range 250-400mm, up to a thickness 3,0 mm),
EN 9445 for alloy 1.4037
width tolerance: B1
straightness: normal
flatness: 2 µm per mm strip width (up to a thickness of 3,0 mm)

7. Further mechanical data

Yield strength Rp0,2 : depending of the alloy
Elongation A80: no data available

The operation temperature should not exceed 350 °C. Please remember that the modulus of elasticity decreases at higher temperatures.

The stainless hardened steels have a much higher maximum operation temperature than the hardened carbon steels and the austenitic stainless steels.

8. Physical properties

Density: 7,7 g/cm³
Thermal conductivity: 30 W/(m °C) bei 20 °C
Heat capacity: 460 J/(kg °C) medium value bei 50 – 100 °C
Thermal expansion: 10,5 x 10⁻⁶ (between 30 - 100 °C)
11,0 x 10⁻⁶ (between 30 - 200 °C)
11,5 x 10⁻⁶ (between 30 - 300 °C)

Electric resistance: 0,55 Ohm x mm²/m

Modus of elasticity: 215 000 MPa bei 20 °C

Relative Permeability: ca. 97 (for 1.4031Mo hardened)

9. Blanking

Due to the high hardness and thickness this material should not be blanked.

We suggest to produce pieces by laser cutting or water jet cutting.

10. Laser cutting

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

As alternative we recommend water jet cutting.

11. Photo etching

Due to the thickness of more than 1 mm it is not economical to produce parts by photo etching.

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 12 times of the strip thickness
Spring back angle: As the spring back 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.

We suggest not to bend this steel in the hardened condition.

The following values can be used as a guide for Alloy 1.4021:

Bending parallel and at right angle (90°) to the rolling direction:

thickness	Alloy 1.4021
Up to 0,25 mm	1,0 x t
0,25-0,50 mm	1,0 x t
0,50-0,75 mm	2,0 x t
0,75-1,00 mm	2,5 x t

t = strip thickness

We suggest the alloy 1.4021 only for bent parts.

With hardened materials, the direction of rolling does not have to be taken into account.

13. Flat grinding

These alloys are magnetic and can be fixed by magnetic clamping devices of flat grinding machines.

14. Welding

Due to the high content of carbon these alloys are difficult to weld.

15. Corrosion resistance

These alloys are in the group 1 in the Nirosta-table of corrosion resistance of stainless steels (see www.nirosta.de/Publikationen). This alloy are less resistant than the alloys 1.4310 (in group 4) and 1.4404 (in group 5).

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Please check there and by tests if the alloys 1.4021/1.4034/1.4037 are resistant enough for your application.

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.