

# Database of Steel and Alloy (Marochnik)

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## Characteristics for grade 40KH13 ( 40X13 ).

|                    |                                            |
|--------------------|--------------------------------------------|
| Grade :            | 40KH13 ( 40X13 ) ( 4X13 )                  |
| Substitute:        | 30X13                                      |
| Classification :   | Corrosion-resistant high-temperature steel |
| Equivalent grades: | <a href="#">Go here</a>                    |

## Chemical composition in % for grade 40KH13 ( 40X13 )

| C           | Si      | Mn      | Ni      | S         | P        | Cr      |
|-------------|---------|---------|---------|-----------|----------|---------|
| 0.35 - 0.44 | max 0.6 | max 0.6 | max 0.6 | max 0.025 | max 0.03 | 12 - 14 |

## Temperature of critical points for grade 40KH13 ( 40X13 ).

|                                 |
|---------------------------------|
| $A_{c1} = 800$ , $A_{r1} = 780$ |
|---------------------------------|

## Mechanical properties under T=20°C for grade 40KH13 ( 40X13 )

| Assortment          | Dimension | Direct. | $\sigma_B$ | $\sigma_T$ | $\delta_5$ | $\psi$ | KCU                 | Heat treatment         |
|---------------------|-----------|---------|------------|------------|------------|--------|---------------------|------------------------|
| -                   | mm        | -       | MPa        | MPa        | %          | %      | kJ / m <sup>2</sup> | -                      |
| Sheet, GOST 5582-75 |           |         | 550        |            | 15         |        |                     | Annealing 740 - 800°C, |
| Bar, GOST 18907-73  |           |         | 590-810    |            | 10         |        |                     |                        |
| Wire, GOST 18143-72 |           |         | 640-880    |            | 10-14      |        |                     |                        |

|                                                                      |                                     |
|----------------------------------------------------------------------|-------------------------------------|
| Brinell hardness for 40KH13 ( 40X13 ) (quenching, tempering) ,       | HB 10 <sup>-1</sup> = 460 - 550 MPa |
| Brinell hardness for 40KH13 ( 40X13 ) (annealing) , Bar GOST 5949-75 | HB 10 <sup>-1</sup> = 143 - 229 MPa |

## Technological properties for grade 40KH13 ( 40X13 )

|              |              |
|--------------|--------------|
| Weldability: | is not used. |
|--------------|--------------|

## Physical properties for grade 40KH13 ( 40X13 )

| T     | E 10 <sup>-5</sup> | $\alpha$ 10 <sup>6</sup> | $\lambda$      | $\rho$            | C            | R 10 <sup>9</sup> |
|-------|--------------------|--------------------------|----------------|-------------------|--------------|-------------------|
| Grade | MPa                | 1/Grade                  | Watt/(m·Grade) | kg/m <sup>3</sup> | J/(kg·Grade) | Ohm·m             |
| 20    | 2.18               |                          | 25             | 7650              | 461          | 590               |
| 100   | 2.14               | 10.8                     | 26             | 7630              | 482          | 650               |
| 200   | 2.06               | 11.9                     | 27.2           | 7600              | 523          | 710               |
| 300   | 1.98               | 12.3                     | 28.3           | 7570              | 565          | 790               |
| 400   | 1.88               | 13                       | 29.1           | 7540              | 607          | 860               |
| 500   | 1.76               | 13.6                     | 29.1           | 7510              | 674          | 940               |

|     |                   |                     |           |        |     |                |
|-----|-------------------|---------------------|-----------|--------|-----|----------------|
| 600 | 1.63              | 13.5                | 29.1      | 7480   | 775 | 1000           |
| 700 | 1.48              | 13.8                | 28.3      | 7450   | 988 | 1120           |
| 800 | 1.4               | 14.6                | 27.9      | 7420   | 825 | 1180           |
| 900 |                   |                     | 28.5      |        | 691 | 1160           |
| T   | $E \cdot 10^{-5}$ | $\alpha \cdot 10^6$ | $\lambda$ | $\rho$ | C   | $R \cdot 10^9$ |

**Equivalent steels for grade 40KH13 ( 40X13 )**

Warning! Indicated both exact and nearest equivalents.

| USA | Germany                                                                            | Japan    | France                                                               | England           | European                                          | Italy                           | Spain                                  | China | Sweden       | Poland | Czechia        |
|-----|------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------|-------------------|---------------------------------------------------|---------------------------------|----------------------------------------|-------|--------------|--------|----------------|
| -   | DIN, WNr                                                                           | JIS      | AFNOR                                                                | BS                | EN                                                | UNI                             | UNE                                    | GB    | SS           | PN     | CSN            |
| 420 | 1.4031<br>1.4034<br>X38Cr13<br>X39Cr13<br>X40Cr13<br>X42Cr13<br>X46Cr13<br>X46Cr13 | SUS420J2 | X40Cr14<br>Z33C13<br>Z38C13M<br>Z40C13<br>Z40C14<br>Z44C14<br>Z50C14 | 420S45<br>X39Cr13 | 1.4031<br>1.4034<br>X39Cr13<br>X40Cr13<br>X41Cr13 | X40Cr14<br>X41Cr13KU<br>X46Cr13 | F.3404<br>F.3405<br>X40Cr13<br>X45Cr13 | 4C13  | 2304<br>2314 | 4H13   | 17024<br>19435 |

**Specification :****Mechanical properties :**

- $\sigma_B$  - Tensile strength , [MPa]  
 $\sigma_T$  - Yield stress , [MPa]  
 $\delta_5$  - Specific elongation at fracture , [ % ]  
 $\psi$  - Reduction of area , [ % ]  
**KCU** - Impact strength , [ kJ / m<sup>2</sup> ]  
**HB** - Brinell hardness , [MPa]

**Physical properties :**

- T** - Test temperature , [Grade]  
**E** - Young modulus , [MPa]  
 $\alpha$  - Coefficient of linear expansion (range 20° - T) , [1/Grade]  
 $\lambda$  - Thermal (heat) condition coefficient , [Watt/(m·Grade)]  
 $\rho$  - Density , [kg/m<sup>3</sup>]  
**C** - Specific heat ( range 20° - T ) , [J/(kg·Grade)]  
**R** - Electrical resistance , [Ohm·m]

**Weldability :**

- without limitations** - welding is done without heating and subsequent heat treating  
**limited weldability** - welding is possible under heating up to 100-120 grade and subsequent heat treating  
**hard weldability** - obtaining the quality welding needs the additional operations: heating up to 200-300 grade; the heat treating is annealing

Database of steels and alloys (Marochnik) contains information about chemical composition and properties more than 2500 steels and alloys (stainless steel, alloy steel, carbon steel, structural steel, tool steel, cast iron, aluminum alloy, titanium alloy, copper alloy, nickel alloy, magnesium alloy and others).  
 Helpfull for specialists in grade technology, structural engineer, mechanical engineer, metallurgy and metal trader

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