SÜDWESTFALEN
Edelstahlwerke Südwestfalen GmbH

C: **0,18 - 0,24**
Cr: **11,0 - 12,5**
Ni: **0,30 - 0,80**
Mo: **0,80 - 1,20**
V: **max. 0,30**

1.4923
X22CrMoV 12-1

1.4923

High temperature resistant stainless steel with molybdenum addition

Relevant current and obsolete standards:
- EN : 1.4923 X22CrMo 12-1
- AISI :
- DIN 17240 : 1.4923
- SIS : -
- VD TÜV Blatt 110

General properties
- corrosion resistance : average
- mechanical properties : good
- forgeability : good
- weldability : good
- machinability : average

Special properties
- resistant to scaling up to around 600 °C
- maximum hardness approximately 590 Hv

Physical properties
- density (kg/dm^3) : 7,7
- electrical resistivity at 20°C (Ω mm^2/m) : 0,60
- magnetisable : yes
- thermal conductivity
  at 20°C (W/m K) : 24
  at 650°C (W/m K) : 29
- specific heat capacity
  at 20°C (J/kg K) : 460
  at 800°C (J/kg K) : 540
- thermal expansion (μm/mK) between
  20 and 100°C : 10,5
  20 and 200°C : 11,0
  20 and 300°C : 11,5
  20 and 400°C : 12,0
  20 and 500°C : 12,3
  20 and 600°C : 12,5

Typical applications
- pressure vessels and boilers
- aviation and aerospace
- reactor manufacture
- turbine components

Hint: - available from stock
- WL 1.4934/82 can be used as an alternative material.

Processing
- automated machining : not common
- machinable : yes
- hammer and die forging : yes
- cold forming : limited
- cold heading : limited

Finished product forms and conditions
- wire rod
- peeled bars ∅ 20 - 75
- bright bar h9, ∅ 5 - 75
- bright coils h9, ∅ 5 - 20
- solution annealed and quenched
- quenched and tempered
- pickled
- drawn
- straightened
- peeled
- ground

Demand tendency ↗

1.4923, is the standard material of construction for components such as steam turbines and heat resistant screws etc. The vanadium addition serves to improve the creep and high temperature strength properties of this steel.

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Properties, applications and processing

Corrosion resistance (PRE = 13,64 to 16,46)

Due to its relatively low chromium content, the corrosion resistance of **1.4923**, is somewhat limited, but sufficient to resist corrosion in rural and urban atmospheres, provided no chlorides or salts are present. **1.4923** is resistant to steam.

Heat treatment / mechanical properties

Optimal mechanical properties may be attained by quenching and tempering, in which the steel is first hardened by holding the steel at a temperature between 1020 and 1070°C followed by quenching in air, oil or polymer. The tempering temperature is dependent on the desired strength. In most cases a tempering treatment in the temperature range 640 to 740°C followed by air cooling produces the required properties. In this condition, the following mechanical properties can be expected:

Property	**Spec QT800**	**Typical**
- yield strength (N/mm^2)	$R_{p0,2}$: ≥ 600	675
- tensile strength (N/mm^2)	R_m : 800 – 900	880
- tensile elongation (%)	A_5 : ≥ 14	17
- impact energy (J) @ 25°C	ISO-V : ≥ 52	

Property	**Spec QT900**	
- yield strength (N/mm^2)	$R_{p0,2}$: ≥ 700	800
- tensile strength (N/mm^2)	R_m : 900 – 1050	960
- tensile elongation (%)	A_5 : ≥ 11	15

NOTE: In order to reduce the possibility of cracking, the component must be tempered as soon as possible after the hardening treatment. Stress relieving treatments are usually performed within the temperature range 600 to 680°C.

Welding

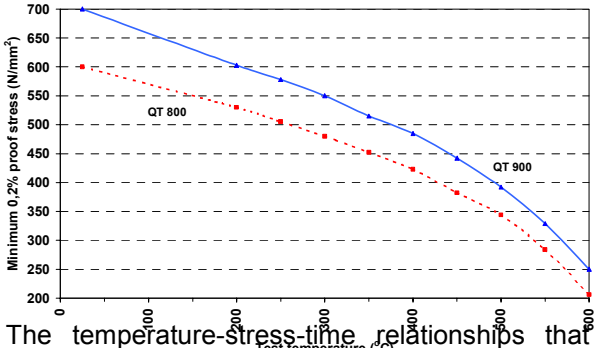
1.4923, may only be welded once special precautions have been taken. For example, the work piece must be pre-heated to a temperature between 400 and 450°C, depending on the geometry of the component. During welding, an interpass temperature of between 400 and 500°C must be maintained. After welding, the component can be immediately annealed or tempered. If a tempering treatment is performed, then the weldment must be slowly cooled to a temperature between 100 and 150°C. After complete transformation to martensite, the component must be tempered at a temperature between 740 and 780°C for a period of at least 4 hours. Tempering is to be followed by slow cooling.

Forging

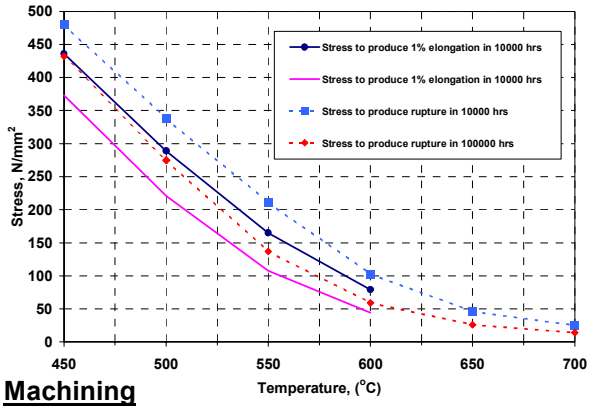
Gradual heating to a temperature of about 850°C is recommended prior to more rapid heating to a temperature of between 1150 and 1180°C. Forging then takes place between 950 - 1180°C followed by slow cooling is an oven or in dry ash or similar material to promote slow cooling. After forging, the forged components are heat treated to attain the required properties.

Elevated temperature properties

The following minimum tensile properties at various temperatures are what can be typically expected of this grade of steel.



The temperature-stress-time relationships that are important for **1.4923** from a creep point of view are presented in the graph below:



Machining

The machinability of this heat resistant stainless steel is directly related to its hardness and is generally considered to machine similarly to carbon steels of the same hardness. Although it must be realised that the machining parameters will vary depending on the structure/hardness of the steel, the following parameters can be used as a guideline when using coated hardmetal cutting tools:

tensile strengths R_m in N/mm^2	depth of cut (mm) feed (mm/rev)		
	6 mm 0,5 mm/r	3 mm 0,4 mm/r	1 mm 0,2 mm/r
annealed (700 - 800)	100 m/min	130 m/min	165 m/min