

1.4923, X22CrMoV12-1 - Turbine Blade Steels Datasheet

1.4923, [X22CrMoV12-1](#) high temperature boiler steel - designed for for turbine blade forgings, components in steam turbines and high-temperature resistant screws. Due to the addition of vanadium it has an increased creep rupture strength. Scale oxide resistance up to approximately 600 ° C. The corrosion resistance in natural environment is limited due to the relatively low chromium content.X22CrMoV12-1 high-alloy structural steel is also classified as a heat-resistant steel - it is a martensitic-grade steel dedicated for parts, subassemblies and forgings of blades and parts of steam turbine rotors operating at temperatures up to 600 . Its application owes to its high resistance to fatigue stress. [1.4923](#) also features elements and parts of aircraft construction, components in the chemical, petrochemical and petrochemical industries, as well as parts used in the power industry.

- SIEMENS

- 0-2813-4923-00
- 1CWW000330
- TLV 9246 03
- TLV 9248 02
- TLV 9248 06
- TLV 9248 07

- ANSALDO

- 203W343
- WTLV8248.21
- WTLV8248.41
- WTLV9248.06
- WTLV9248.07

- ABB

- 23 90 95
- HZLM 00036

- ALSTOM

- ATD1231001
- ATM1230001
- 9ANA370206
- NB 00141
- STV M14105
- STV M23002

- MAN

- QSTD -51-216 /000

- SKODA

- TP 0009 M

Chemical Composition

Grade	Chemical Composition WT %											
	C	Mn	Si	P	S	Cr	Mo	Ni	V	Nb	W	N
TLV 9248 08	0.18 - 0.24	0.4 - 0.9	Max 0.5	Max 0.025	Max 0.015	11.0 - 12.5	0.8 - 1.2	0.3 - 0.8	0.25 - 0.35			
1.4923, X22C rMoV1 2-1	0.18 - 0.24	0.4 - 0.9	Max 0.5	Max 0.025	Max 0.015	11.0 - 12.5	0.8 - 1.2	0.3 - 0.8	0.25 - 0.35	-	-	-
Z20CD NbV11	0.18 - 0.25	0.3 - 0.8	0.1 - 0.5	Max 0.025	Max 0.015	10.0 - 12.0	0.5 - 1.0	Max 1.0	0.1 - 0.3	0.25 - 0.55	-	0.05 - 0.10
SN 17134	0.17 - 0.23	0.5 - 1.0	0.25 - 0.60	Max 0.035	Max 0.030	10.0 - 12.5	0.8 - 1.2	0.3 - 0.8	0.20 - 0.35	-	-	-
BS 762	0.17 - 0.23	Max 1.0	Max 0.5	Max 0.030	Max 0.030	10.0 - 12.5	0.8 - 1.2	0.3 - 0.8	0.25 - 0.35	-	-	-
1.4926, X21C rMoV1 2-1	0.20 - 0.26	0.3 - 0.8	Max 0.5	Max 0.025	Max 0.020	11.0 - 12.5	0.8 - 1.2	0.3 - 0.8	0.25 - 0.35	-	-	-

Mechanical Properties

- Tensile strength N/mm^2 MPa: 800-950
- 0.2%-proof Strength N/mm^2 : Min 600
- Elongation A %: L min 14 / L min 11
- Reduction of area Z %: L min 40 / L min 25
- Absorbed impact energy: L min 27/ T min 15
- Hardness HB30: 245-290

- Tensile strength $R_m = 900 - 1050$ MPa
- Yield point $R_e > 700$ MPa
- Elongation A > 11%
- Contraction Z > 35%
- Notch toughness KV > 20 J

- Tensile strength (Rm): 850-1050 MPa
- 0.2% Proof strength (Rp0.2): min. 700 MPa

- Elongation on 5.65 So (A): min.13%
- Reduction of area (Z): min.40%
- Notch impact strength (KV): min.20J
- Brinell hardness: 255-311 HBW

- +QT1, d 160mm,
 - $R_{p0.2}$: min.600 MPa
 - R_m : 800-950 MPa
 - A: min.14%
 - Z: min.40%
 - KV_2 : min.27J

Physical Properties

- Density (kg/dmsup³) : 7,7
- Electrical resistivity at 20 ° C (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($\mu \text{ m}/\text{mK}$) 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

Heat Treatment

Bars shall be delivered in quenched and tempered condition (QT1).

Quench hardening: 1020- 107013/air, oil, polymer* or water

with a center cooling rate comparable to oil

Tempering: 710 - 740 13 (at least 2 h)

If bars need to be straightened after the heat treatment, a stress relieving heat treatment shall be performed after completion of the entire straightening process. Stress relieving is to be carried out at

20 - 50 K below the tempering temperature with a subsequent slow cooling rate.

Process	Unit	Range
Austenitising	° C	1020 to 1070
Soaking time	Minutes	min. 30
Cooling method		Air cooled or oil quenched or equivalent or water quench to <50 ° C
Tempering	° C	700 to 720
Soaking time	h	min. 2
Stress relieving	° C	650 to 720
Soaking time	h	min. 2

Welding Properties

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.

Machining Properties

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.

Similar or Equivalent Steel Grade