

AISI4140 - 1% Cr - Mo Steel

Related Specifications

SAE 4140

UNS G41400

AISI 4140 is a 1% Cr-Mo through hardening steel, used particularly where strength and impact toughness is required. It is generally supplied in the Hardened and Tempered condition, especially in the Oil and Gas sector to achieve Ultimate Tensile strengths in excess of 100KSI (690 MPa), moderate impact toughness (>42J) is maintained at temperatures as low as -46°C.

This alloy is used in most industry sectors for a wide variety of applications. Typical uses include Drive shafts, couplings, bolts and gears, together with many surface and sub-surface components in the oil and gas industries. AISI4140 can be further surface hardened by either flame or induction hardening methods, giving case hardnesses in excess of 50 HRc.

Typical Chemical composition

Carbon	0.38 - 0.43%
Silicon	0.20 - 0.35%
Manganese	0.75 - 1.00%
Phosphorous	<0.025%
Sulphur	<0.025%
Chromium	0.80 - 1.00%
Molybdenum	0.15 - 0.25%

Mechanical Property Requirements - BS970 Part 3 1991

Ruling Section	Tensile Strength Mpa	Yield (0.2%) MpA	Elongation %	Reduction of Area %	Charpy J -46°C	Hardness HB
< 254mm (10")	690 (100Ksi)	552 (80KSi)	>20	>40	>42	217-235
<127mm (5")	862 (125KSi)	758 (110KSi)	>13	>40	>27	285-341

Forging

Forging Temperature for this material should be 900 - 1150°C
Soak times should be kept to a minimum to avoid heavy scaling, but sufficient time should be given to allow centre to achieve furnace temperature.
After forging pieces should be allowed to cool in still air.

Heat Treatment

Hardening - Heat to 860 - 890°C for a time commensurate with ruling section and quench in Oil, Water or Polymer.
Note: If water quench is to be used, although not recommended, care must be taken to ensure that all sharp corners are removed prior to heat treatment.

Tempering should be done immediately whilst the material is still hand warm

Tempering - Re-heat to 650°C Minimum as required, dependent on final required properties. Hold for a time commensurate with the ruling section and cool in still in air.

Machining

AISI 4140 has good to very good machinability, dependent on condition, and operations such as sawing, turning, broaching, milling etc can be accomplished satisfactorily using standard machine tool manufacturers recommended speeds and feeds.

Welding

Welding of AISI4140 in the hardened and tempered condition can be readily achieved, however the relatively high carbon content mandates the use of carefully controlled pre and post weld heat treatment.