

Grade: AISI 4140 (UNS G41400, ASTM A29)

Type: Cr-Mo Steel usually supplied in the hardened, quenched and tempered condition.

Nominal Composition	
Element	Weight %
Carbon	0.28 – 0.33
Silicon	0.15 – 0.35
Manganese	0.40 – 0.60
Phosphorus	0.025 max *
Sulphur	0.025 max *
Molybdenum	0.15 – 0.25
Chromium	0.8 – 1.1
Nickel	0.5 max

Mechanical Properties Condition

Hardened followed by water, oil or polymer quenching and tempering

Typical tempering range is 620 – 680o C, depending on properties required

Property	Values (65K Variant)	Values (75K Variant)
Ultimate Tensile Strength	85 min Ksi (586 Mpa)	95 min Ksi (655 Mpa)
0.2 % Yield Strength	60 min Ksi (420 Mpa)	75 min Ksi (517 Mpa)
Elongation	17% min	17%/
Reduction of Area	35 % min	35 % min
Hardness	197 – 237 BHN	197 – 237 BHN

Notes

Various other hybrid analysis available in order to enhance hardenability and mechanical properties.

* S and P values conform with API 6A, PSL 3 requirements. Higher values may be permitted if delivered to alternative specifications



Notes

Low alloy steel typically containing 0.3% Carbon and alloyed with 1% Chromium and 0.2% Molybdenum to give enhanced mechanical properties.

The grade has poor through hardenability with a typical ruling section of around 4 inches (at 75 Ksi) depending on the chemical composition, and it is critical that the hardenability of the grade must be taken into account when designing and selecting it for specific equipment.

Impact toughness is generally good to temperatures as low as -46 Deg C with typically 27J average and 20J single achieved, this is limited though dependent on a number of factors such as ruling section, chemical composition and heat treatment condition, with impact toughness achieved decreasing with higher strength, increased ruling section and at lower test temperatures due to the materials Ductile / Brittle transition temperature.

Minimum hardness is based on API 6A requirements. Maximum hardness shown is based on compliance with NACE MR0175 / ISO 15156

Very good weldability, and so may be readily welded to itself or weld inlayed. However there have been recent concerns on using the grade for buttered connections. The grade does require a post weld heat treatment at 620o C min in order to meet sour service (NACE MR0175/ ISO 15156) requirements.