

STEEL



LIBERTY

AISI 4140

A low alloy chromium molybdenum (CrMo) steel

AISI 4140 has higher yield and fatigue strength, better through hardening and superior impact properties compared to plain carbon steels like 1045.

Typical applications include connection rods, collets, conveyor pins, gears, stem assemblies, pump shafts and tool holders.

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Scope

The specification defines the requirements for AISI 4140 hot rolled CrMo bars hardened and tempered to meet 80ksi minimum yield, 22HRC maximum, in line with NACE MR0175/ISO 15156 or 110 ski minimum yield, 36 HRC maximum.

Certification

A material test report will be provided, documenting the following: Chemical Analysis; Heat Treatment Processing Parameters; Mechanical Properties; Surface hardness; Grain Size; reduction Ratio; NDE Test Method/ Criteria.

Steel manufacture

Steel is manufactured via Electric Arc Furnace, followed by Ladle Refining and Vacuum Degassing and is either cast into bottom-poured wide end up ingots, or Continually Cast.

Chemical analysis

C	Si	Mn	P	S	Cr	Mo	Ni	Al
0.38	0.15	0.75	-	-	0.8	0.15	-	0.015
0.43	0.35	1	0.035	0.04	1.1	0.25	0.25	0.03

Mechanical properties

	80ksi Variant 1-8" (mid radial) 1-12" (1" below)			110ksi variant 1-7" (mid radial)	
	Minimum	Maximum		Minimum	Maximum
0.2% Proof stress (ksi)	80			110	
UTS (ksi)	100			125	
% Elongation	20			13	
% reduction of area	45			40	
Hardness HRC	18	22		30	36
Hardness HBW	217	237		285	341
	Average	Min. Single		Average	Min. Single
CVN @ 23°C (J)	80		CVN @23°C (J)	60	
CVN @ -32°C (J)	42	30	CVN @ -10 °C (J)	42	30
CVN @ -46°C (J)	40	30	CVN @ -32 °C (J)	30	20

Tensile Strength as per ASTM A370, Charpy as per ASTM E23, HRC as per ASTM E18, HBW as per ASTM E10

Reduction ratio

Reduction ratio will meet 4:1 as a minimum.

Structure

Grain size will be ASTM 5 or finer.

Heat treatment

Furnaces surveyed and calibrated per AMS 2750.

Austenitised and liquid quenched.

Tempered to meet selected strength variant.

Supplied either stress free or stress relieved.

API 6A

Each bar length will be 100% ultrasonically tested per ASTM A388, with acceptance criteria in accordance with API 6A PSL 3&4

Note: Above a rolled size 10.5" the central 20% of the bar will be excluded from ultrasonic testing.

Machining tolerances

For 'Machining Quality Bar' to ASTM A29 Tolerances the minimum machining allowance should be as follows:

Ordered Surface condition	Minimum stock removal
Peeled/Smooth Turned	1 % per side
Black	1.6 % per side

General delivery conditions

- Applicable bar diameters: 1 -10".
- Surface conditions: Black/Peeled/Smooth Turned.
- Straightness: 1mm in 500mm, 1/8" in 5'.
- Enhanced straightness may be available on request.

Technical Support

We have a comprehensive technical support team available to advise on grade selection and product range to achieve the maximum benefit. Customer Technical Support provide specialist advice and help with day-to-day problem solving.

Works based metallurgists and the full resources of our Steel Research and Development Laboratories are available to assist with longer-term developments.

For further information, enquiries or any technical guidance on our range of Oil & Gas products please contact the Commercial Department at the address below.

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