

**AISI 4140, 140 KSI (965 MPa), FORGING/BARSTOCK, NON H2S
SERVICE, CP SERVICE RESTRICTED**

Rev	Reason of Change	Date	Made By	Reviewed By	Approved By	Status
0	Initial release	11-07-2018	MN	AS	KKD	Released
1	Quenching media temperature requirements amended & retention period added in clause 6.0 added as per API 6A 21st edition	03-10-2019	MN	USR	AS	Released

Summary:

This specification covers AISI 4140 forgings, forged or rolled bar stock with minimum yield strength of 140 ksi (965 MPa). This material is not to be used for sour (H₂S) service or in service where cathodic protection is active on component without approval from Materials Engineering. This material is not intended for use in any welded application.

1.0 SCOPE

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2.0 Reference Specifications

Documents	Descriptions
AISI 4140	American Iron and Steel Institute Chemistry

3.0 Chemistry Requirements

The chemistry shall meet the requirements of Table 1.

Table 1: Required Chemistry. All are maximums unless otherwise noted.

Elements	Wt. Percentage (%)
Carbon	0.38 - 0.43
Manganese	0.75 - 1.00
Chromium	0.80 - 1.10
Molybdenum	0.15 - 0.25
Phosphorus	0.035
Sulfur	0.040
Silicon	0.15 - 0.35

4.0 Mechanical Properties

Test location, orientation and permitted QTC configurations are specified within an additional specification SES 26-590, SES 26-740 & SES 26-744. The material shall meet the mechanical requirements of the table 2

Table 2: Mechanical Properties. (All values are minimums unless otherwise noted.)

Tensile strength	150,000 psi (1,035 MPa)
Yield strength	140,000 psi (965 MPa)
Elongation in 2" or 4D	10%
Reduction in area	20%
Brinell Hardness (raw)	321-352 HBW
Brinell Hardness (finished part)	311-352 HBW

5.0 Heat Treatment

PROCESS	ATMOSPHERE/MEDIA	TEMPERATURE	TIME AT TEMPERATURE
Normalized	Air	1600 °F – 1700 °F (870 °C – 925 °C)	30 Minutes / Inch of T, Minimum Time is 30 Minutes.
Still air cool to below 400 degrees F (204 degrees C) before further processing			
Austenitize	Air	1550 °F - 1650 °F (840 °C – 900 °C)	30 Minutes / Inch of T, Minimum Time is 30 Minutes.
Quench	Oil, Polymer	104 °F (40 °C) - 158 °F (70 °C)	
	Water	The temperature of quenching medium shall not exceed 100 °F (38 °C) at the start of the quench nor exceed 49°C (120°F) at any time during the quench cycle.	
Temper	Air	900 °F – 1200 °F (480 °C – 650 °C)	1 hour per inch of maximum through thickness. One-hour Minimum.

Note: Maximum holding time shall not exceed Five times (5X) the maximum holding time. In all case, holding time shall not start until parts or materials have reached specified heat treatment temperature. The 5X rule does not apply to the separate QTC (e.g. ER 5").

6.0 Workmanship

Material shall be inspected in accordance with part report (DBI). Material shall be free of injurious defects that are detrimental to the integrity of the final product, such as laps, scabs, cracks and exogenous inclusions.

Suppliers shall retain heat treat charts in a secure area for a period of no less than 10 years (e.g. electronic or paper).