

Material Grade: **4140mod (18-22HRc)**  
 Material Condition(s): **Untreated / Annealed / Quench and tempered (optionally also Stress Relieved)**  
 Surface Finish: **As rolled / As forged / Bright turned**

Associated Standard: **ASTM A29**  
**ASTM A322**  
**NACE MR0175 / ISO15156**

Description:

A Chromium-molybdenum steel used widely for downhole applications for drilling and completion parts. It is a higher carbon version of 4130 resulting in greater strength and ruling sections. This grade can easily achieve yield strengths of 110KSI, however it should not be used in sour service environments above 22HRc (approx 80KSI Yield Strength). 4140 has poor weldability due to the risk of weld cracking, however machinability is fair and forgeability is very good.

Typical applications: **Tool joints in drill stem assemblies, Oil & Gas applications for sour service**

**1. STEELMAKING**

Method/ Refining: **Electric Arc Furnace / Basic Oxygen Furnace followed by VDG**  
 Grain Size: **5-8**  
 Min. reduction ratio: **4:1 min (typically 3:1 on sections > 300mm)**

	<u>C</u>	<u>Si</u>	<u>Mn</u>	<u>S</u>	<u>P</u>	<u>Cr</u>	<u>Ni</u>	<u>Mo*</u>	<u>V</u>	<u>Al</u>	<u>Cu</u>	<u>Sn</u>
Min	0.38	0.15	0.8			0.9		0.20		0.01		
Max	0.43	0.30	1.00	0.025	0.015	1.1	0.25	0.25	0.03	0.04	0.30	0.035

\* Mo content is often modified to 0.30-0.35 to ensure greater hardenability

**2. TYPICAL MECHANICAL PROPERTIES**

Test type			Tensile and hardness test (at room temperature)					Impact test (KV)		
			Yield (Re)	0.2 % proof	UTS (Rm)	Elong (A)	R of A (Z)	Hardness	-32°C	-42°C
Variation	Sample dia	Unit	KSI	KSI	KSI	%	%	HRc (HB)	J	J
4140 + QT	200mm	Min		80	100	20	45	18 (217)	42	42
		Max		110	130			22 (235)		

**3. INSPECTION**

NDT procedure: **ASTM A388/A388M**  
 Acceptance Standard **API 6A PSL Level 3**