

Material Grade: **4140mod (30-36HRc)**
 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

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**

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		110	130	16	40	30 (286)	42	27
		Max		140	160			36 (336)		

3. INSPECTION

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