

Material Grade: **4340mod**
 Material Condition(s): **Untreated / Annealed / Quench and tempered (with optional Normalising)**
 Surface Finish: **As rolled / As forged / Bright turned**

Associated Standard: **ASTM A29**
ASTM A322

Description:

A through hardening steel which in the quenched and tempering condition is capable of high strengths. It's hardenability is excellent, allowing large section sizes to be heat treated with maintained through hardness. Whilst 4340 is normally oil quenched, due to the high hardenability small sections may be air hardened. 4340 has good ductility allowing for hot forming operations to be carried out in the annealed condition. This grade is not considered weldable by standard methods but it can be welded by more sophisticated methods such as EBW. Pre-heating and post-weld heat treatment is desirable to prevent cracking and compromised mechanical properties. 4340 is also suitable for nitriding which will result in improved fatigue strength.

Typical applications: **Mandrel hanger bodies, connectors, drilling riser bolting, nuts, inserts, tools**

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	0.60			0.70	1.65	0.20	0.38	0.15	0.60	
Max	0.43	0.35	0.80	0.025	0.025	0.90	2.00	0.30	0.43	0.35	0.80	0.025

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	-29°C	-59°C
Variation Examples	Unit	KSI	KSI	KSI	%	%	HB	J	J
4340 + QT to lower strength	Min		85	105	18	35	217	42	42
	Max						300		
4340 + QT to high strength	Min		115	130	15	35	275	42	27
	Max						327		

3. INSPECTION

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