

Material Grade: **4330Vmod**
 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 through hardening steel capable of very high strengths in large sections from hardening and tempering treatments due to its high hardenability. It is typically used for drilling parts where longer tool life and higher strength is required than conventional 4145. However, it does not meet the approval of NACE MR0175 due to its high nickel content.

The relatively low carbon making this grade useful for applications involving shock loading or stress concentrations, and where good fracture toughness is required. It can be welded, however preheating and post-weld heat treatment are desirable to prevent cracking. Good forgability is also demonstrated but preheating and furnace cooling are recommended due to its high hardenability.

Typical applications: **Subs, crossovers, reamers, drill shoes, drill jars, 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	0.30	0.15	0.75			0.8	1.7	0.40	0.05	0.01		
Max	0.33	0.35	1.00	0.010	0.015	1.0	2.0	0.65	0.10	0.04	0.35	0.035

* Ni content is often modified to 1.7-3.0 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	RT	-20°C
Variation	Sample dia	Unit	KSI	KSI	KSI	%	%	HB	J	J
4330V + QT	150mm	Min		150	165	15	50	341	54	40
		Max						372		
4330V + QT	320mm	Min		150	160	13	35	319	54	
		Max						390		

3. INSPECTION

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