

## HIGH TENSILE STEEL – AISI 4340

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**AISI 4340 Nickel – Chrome - Moly High Tensile Steel**, generally supplied hardened and tempered to condition “U” in sections up to 100mm, with a tensile strength of 930 – 1080 MPa and aiming for this strength range in larger sections. It offers a very good balance of strength, toughness and wear-resistance.

### Typical Applications:

Heavy-duty axles, shafts, heavy-duty gears, spindles, pins, studs, collets, bolts, couplings, sprockets, pinions, torsion bars, connecting rods, crow bars, conveyor parts etc.

### Typical Chemical Analysis

<b>Carbon</b>	<b>0.40%</b>
<b>Silicon</b>	<b>0.25%</b>
<b>Manganese</b>	<b>0.70%</b>
<b>Nickel</b>	<b>1.85%</b>
<b>Chromium</b>	<b>0.80%</b>
<b>Molybdenum</b>	<b>0.25%</b>

### Related specifications:

AS 1444-1996	4340
BS EN10083-1-1991	817M40
BS 970-1955	EN 24
JIS G 4103	SNCM 439
SAE & UNS	4340 & G43400
Werkstoff 1.6565	40NiCrMo6

### Surface Treatment:

Will **Nitride** with a typical surface hardness up to **HRC 60**.

Will **Flame or Induction** harden with a typical surface hardness up to **HRC 58**.

### Mechanical Property Requirements in Condition “U” - to AS 1444-1996

Section mm	0.2% Proof Stress MPa	Tensile Strength MPa	Elongation On $5.65\sqrt{S_0}$ %	Impact		Hardness HB
				Izod J	Charpy J	
*up to 63	755 min	930 – 1080	9 min	-	-	269 – 331
up to 100	740 min	930 – 1080	12 min	47 min	42 min	269 – 331

\*Applies only to bars bright drawn after hardening and tempering

### Typical Mechanical Properties – Hardened and tempered in section size listed.

Section in mm	Yield Strength MPa	Tensile Strength MPa	Elongation %	Izod J	Hardness HB
50	880	1000	17	85	295
100	850	980	17	80	290
200	730	930	17	75	275

Typical properties for guidance only

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### **Welding:**

Readily welded in the annealed condition but avoid when possible if hardened and tempered due to the effect on the mechanical properties. Welding in the nitrided, flame or induction hardened condition is not recommended.

### **Welding procedure:**

Low hydrogen electrodes are recommended. Pre-heat at 200°C – 300°C and maintain during welding. Cool slowly in ashes or sand etc and stress relieve if this is possible.

Welding details for guidance only

## **HEAT TREATMENT:**

### **Forging:**

Heat to 1150°C      Hold till uniform  
Minimum forging temperature 850°C  
Cool slowly in ashes or sand etc.

### **Annealing:**

Heat to 830°C – 850°C  
Cool in furnace

### **Stress Relieving:**

Annealed: Heat to 600°C – 650°C  
Hardened: Heat to 500°C – 550°C  
Cool in still air

### **Hardening:**

Heat to 830°C – 880°C  
Quench in oil or polymer

### **Tempering:**

Heat to 450°C – 660°C cool in still air  
**NB.** Tempering within the range 250°C – 450°C will result in temper brittleness and should be avoided

### **Flame and Induction Hardening:**

Heat quickly to the required case depth at 850°C – 870°C and quench immediately in water or oil.

Tempering at 150°C – 200°C will reduce stresses in the case with minimal effect on its hardness.

All de-carburised surface material must first be removed to ensure best results.

### **Nitriding:**

Heat to 500°C – 530°C and hold for sufficient time to develop the depth of case required

Parts should be pre-hardened and tempered as required and also pre-machined leaving a small grinding allowance only.

Heat treatment details for guidance only.