

## HOLLOW BAR – AISI 4140

---

**AISI 4140 Chrome - Moly High Tensile Steel Hollow Bars**, generally supplied hot rolled, hardened and tempered, with a tensile strength of 860 – 1100 Mpa. They offer good strength and toughness, excellent impact properties, good machinability but limited weldability.

### Typical Applications:

Hollow shafts, hydraulic shafts, hollow parts, bushings, bearings, nuts, rings, cylinders, conveyor rolls, gears, ring gears etc.

### Typical Chemical Analysis

<b>Carbon</b>	<b>0.40%</b>
<b>Silicon</b>	<b>0.25%</b>
<b>Manganese</b>	<b>0.85%</b>
<b>Chromium</b>	<b>1.00%</b>
<b>Molybdenum</b>	<b>0.25%</b>

### Related specifications:

ASTM A519-96	4140
DIN 17200-1654	1.7225 42CrMo4
JIS G 3441	SCM 440 TK
SAE & UNS	4140 & G41400

### 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 54**.

### Mechanical Property Requirements – For 4140 type 7 hollow bars.

As supplied in the hot rolled, hardened and tempered condition.

Wall Thickness mm max	Yield Strength MPa min	Tensile Strength MPa min	Elongation % min	Hardness HRC min – max
50.8	758	862	14	28 – 36

### Typical Mechanical Properties – Hot rolled, hardened and tempered.

Wall Thickness mm	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness HRC
50.8 max	900	1000	16	33

Typical mechanical properties are for guidance only

**Welding:**

Readily welded annealed but avoid when hardened and tempered if at all possible, due to the effect on the mechanical properties. Welding if nitrided, flame or induction hardened 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 until uniform  
Minimum forging temperature 850°C  
Cool slowly in ashes or sand etc.

**Flame and Induction Hardening:**

Heat quickly to the required case depth at 860°C – 890°C and quench immediately in water or oil.

**Annealing:**

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

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

**Normalising:**

Heat to 870°C – 900°C  
Cool in still air

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

**Stress Relieving:**

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

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

**Hardening:**

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

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

**Tempering:**

Heat to 450°C – 700°C cool in still air  
**NB.** Tempering within the range 200°C – 420°C will result in temper brittleness and should be avoided

Heat treatment details for guidance only.