

HIGH TENSILE STEEL – AISI 4140

AISI 4140 Chrome - Moly High Tensile Steel, generally supplied hardened and tempered to Condition “T” in sections up to 100mm, with a tensile strength of 850 – 1000 MPa and aiming for this strength range in larger sections. It offers a very good balance of strength, toughness and wear-resistance.

TYPICAL APPLICATIONS:

Axles, conveyor parts, crow bars, gears, logging parts, spindles, shafts, sprockets, studs, pinions, pump shafts, rams, ring gears etc.

CHEMICAL ANALYSIS

Carbon	0.40%
Silicon	0.25%
Manganese	0.85%
Chromium	1.00%
Molybdenum	0.25%

RELATED SPECIFICATIONS:

AS 1444-1996	4140
BS 970-3-1991	708M40 or 709M40
BS 970-1955	EN 19A
EN10083-1-1991	1.7225 42CrMo4
JIS G 4105	SCM 440
SAE & UNS	4140 & G41400

Good through hardening properties with excellent toughness due to the low carbon and high alloy content, also suitable for Nitriding.

MECHANICAL PROPERTY REQUIREMENTS IN CONDITION “T” – to AS 1444-1996

Section mm	0.2% Proof Stress MPa	Tensile Strength MPa	Elongation on 5.65√So %	Impact Izod J	Charpy J	Hardness HB
*up to 63	680n	850 - 1000	14	-	-	248 - 302
*up to 100	665 min	850 - 1000	15	54min	50min	248 - 302

*Applies only to bars bright drawn after hardening and tempering

TYPICAL MECHANICAL PROPERTIES – Hardened and tempered in section size listed

Section mm	Yield Strength MPa	Tensile Strength MPa	Elongation %	Impact Izod J	Hardness HB
50	770	930	17	90	275
100	710	920	15	70	270
200	570	850	14	60	250

Typical Mechanical Properties for guidance only

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HIGH TENSILE STEEL – AISI 4140 - continued

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.

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

Normalising:

Heat to 870°C – 900°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
Cool in Oil or Polymer

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

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

Flame and Induction Hardening:

Heat quickly to the required case depth at 860°C – 890°C and quench immediately in water or oil
Carburise at 900°C – 950°C

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