



E STEEL SDN BHD (891338-A)

NO 3, Lorong Sungai Puloh 7/KU 6,
Kawasan Perindustrian Sungai Puloh, 42100 Selangor D.E
Tel : 03-3292 8686 / 32928666 / 32928777
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4140 High Tensile Steel, SCM440, 42CrMo4, ASSAB 709, 7225, EN19, SCM4

4140 is a 1% chromium - molybdenum medium hardenability general purpose high tensile steel - generally supplied hardened and tempered in the tensile range of 850 - 1000 Mpa (condition T).

AISI 4140 is now available with improved machinability, which greatly increases feeds and/or speeds, while also extending tool life without adversely affecting mechanical properties.

Pre hardened and tempered 4140 can be further surface hardened by flame or induction hardening and by nitriding.

1.7225 is used extensively in most industry sectors for a wide range of applications such as: Adapters, Arbors, Axle Shafts, Bolts, Crankshafts, Connection Rods, Chuck Bodies, Collets, Conveyor Pins & Rolls, Ejector Pins, Forks, Gears, Guide Rods, Hydraulic Shafts & Parts, Lathe Spindles, Logging Parts, Milling Spindles, Motor Shafts, Nuts, Pinch Bars, Pins Various, Pinions, Pump Shafts, Rams, Sockets, Spindles, Sprockets, Studs, Tool Holders, Torsion Bars, Worms etc..

DIN	AISI	JIS	Chemical Composition											
			C	Si	Mn	P	S	Co	Cr	Mo	Ni	V	W	Cu
42CrMo4	4140H	SCM440H	0.37 to 0.44	0.15 to 0.35	0.65 to 1.10	≤ 0.04	≤ 0.03	-	0.75 to 1.20	0.15 to 1.25	≤ 0.25	-	-	≤ 0.35

Common 4140 Steel Specifications

Country	USA	German	British	Japan	China	Australia
Standard	ASTM A29	DIN 17200	BS 970	JIS G4105	GB/T 3077	AS 1444
Grades	4140	1.7225/ 42crmo4	42CrMo4	SCM440	42CrMo	4140

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 Charpy J	Hardness HB
*up to 63	680 n	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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Heat Treatment

Annealing

Heat to 800 °C - 850 °C, hold until temperature is uniform throughout the section and cool in furnace.

Flame or Induction Hardening

7225 hardened and tempered bar can be further surface hardened by either the flame or induction hardening methods resulting in a case hardness in excess of Rc 50.

Parts should be heated as quickly as possible to the austenitic temperature range (840 C - 870 C) and "required case depth followed by an immediate oil or water quench, depending upon hardness required, workpiece" size/shape and quenching arrangements.

"Following quenching to hand warm, most components should be tempered between 150 C - 200 C to remove" quenching stresses in the case. This will have little effect on case hardness and will reduce the risk of grinding cracks.

Hardening

Heat to 840 °C - 875 °C, hold until temperature is uniform throughout the section, soak for 10 - 15 minutes per 25 mm section, and quench in oil, water, or polymer as required.

*Temper immediately while still hand warm.

Nitriding

EN19 hardened and tempered bar can also be successfully nitrided, giving a surface hardness of up to Rc 60. Nitriding is carried out at 490 °C - 530 °C, followed by slow cooling (no quench) reducing the problem of distortion. Parts can therefore be machined to near final size, leaving a grinding allowance only. The tensile strength of the core is usually not affected since the nitriding temperature range is generally below the original tempering temperature employed.

Normalizing

Heat to 870 °C - 900 °C, hold until temperature is uniform throughout the section, soak for 10 - 15 minutes and cool in still air.

Stress Relieving

Heat to 680 °C - 700 °C, hold until temperature is uniform throughout the section, soak for 1 hour per 25 mm section, and cool in still air.

Tempering

Re-heat to 550 °C - 700 °C as required, hold until temperature is uniform throughout the section, soak for 1 hour per 25 mm of section, and cool in still air.



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Notes on Heat Treatment

Heating temperatures, rate of heating and soaking times will vary due to factors such as work piece size/shape also furnace type employed, quenching medium and work piece transfer facilities etc.. Please consult your heat treater for best results.

Machining

42CrMo4 in the hardened and tempered as supplied condition has good to very good machinability and operations such as sawing, turning, drilling, broaching, hobbing, milling and tapping can be carried out satisfactorily using machine manufacturers recommendations for suitable tool type - feeds and speeds.

Welding

Welding of AISI4140 in the hardened and tempered condition (as normally supplied), is not recommended and should be avoided if at all possible, as the mechanical properties will be altered within the weld heat affected zone. It is preferred that welding be carried out on 4140 while in the annealed condition, and that the work piece, immediately on cooling to hand warm, is then stress relieved at 595 °C - 620 °C prior to hardening and tempering.
If welding in the hardened and tempered condition is really necessary, then the work piece, immediately on cooling to hand warm, should be if possible stress relieved at 15 °C below the original tempering temperature (if known).