

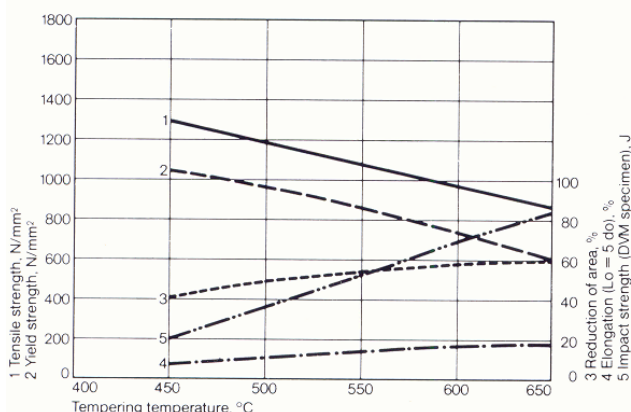
4140 High tensile

Typical Analysis (Ave. values %)	C	Si	Mn	Ni	Cr	Mo	S	P	
	0.4	0.2	0.8	-	1.0	0.2	0.025	0.025	
NEAREST STANDARD	AS		DIN		BS		AISI		
	4140		1.7225 41CrMo4		EN19A		4140		

DESCRIPTION	Chromium, Molybdenum steel for applications requiring high tensile strength and toughness values, in particular in medium and large cross sections in the quenched and tempered condition. The Molybdenum additions prevent the steel from being susceptible to temper brittleness. Surface hardenable
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APPLICATIONS	4140 is the most commonly used of the high tensile steels with a wide range of applications in automotive, Gear and Engine construction, Crankshafts, Steering knuckles, Connecting rods, Spindles, Intermediate gears, Pump and Gear shafts, Axles, Nuts and Bolts.
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HEAT TREATMENT	Forge	850-1050°C. Cool in furnace.
	Normalize	840-880°C. Air cool.
	Anneal	680-720°C. Cool slowly in controlled furnace.
	Stress relieve	In the quenched and tempered condition, about 30-50°C below the tempering temperature. Air cool. In the annealed condition, 600-650°C. Air cool.
	Harden	830-860°C Oil quench.
	Temper	540-680°C hold for 1 hour min. at temperature, air cool. (see tempering chart)
	Nitride	Suitable for both liquid and gas nitriding.



Hardening temperature: 840°C
Quenched and tempered
Specimen size: 60 mm diameter

WELDING	<p>Parts should be welded in the hardened and tempered condition. Strength properties of the joint will not be the same as the base metal. Preheat 300-400°C. Temper after welding to about 35-50°C below the recommended tempering temperature. Filler metal: - FOX CM2-KB electrodes or CM2-IGwire. For advice in connection with difficult welding, please consult our engineers.</p>
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MECHANICAL PROPERTIES Heat Treated Condition	Condition	Ruling section mm	Tensile Strength MPa	Yield Strength MPa	Elong. %	Izod Impact J	Brinell Hardness	
	R	250	780-850	480	15	34	201-255	
	S	250	770-930	540	13	27	223-277	
	S	150	770-930	570	15	54	223-277	

	T	100	850-1000	665	13	54	248-302	
	U	63	930-1080	740	12	47	269-331	
	V	30	1000-1150	835	12	47	293-352	

	W	20	1080-1230	925	12	40	311-375	

HIGH TEMPERATURE STRENGTH	For quenched and tempered heavy forgings.								
	Diameter		Yield strength MPa						
	Over	Up to	20°C	100°C	200°C	250°C	300°C	350°C	400°C
		250	510	486	461	441	422	392	363
	250	500	460	431	412	402	382	353	324
500	750	390	333	333	324	304	275	245	

PHYSICAL PROPERTIES	Density (kg/dm ³)	7.85				
	Modulus of elasticity 10 ³ N/mm ²	210				
	Thermal conductivity W/(m.K)	42				
	Electric resistivity Ohm.mm ² /m	0.19				
	Specific heat capacity J/(kg.K)	460				
	Modulus of elasticity 10 ³ N/mm ²	100°C	200°C	300°C	400°C	500°C
		205	195	185	175	165
	Thermal expansion 10 ⁶ m/(m.K)	100°C	200°C	300°C	400°C	500°C
11.1		12.1	12.9	13.5	13.9	

SIZE RANGE	Round	10 to 650 mm
	Hollow	45/28 to 200/140 mm
	Hexagon	19 to 75 mm A/F
	Square	28 to 127 mm
	Flat	76.2 x 38.1 mm
	Chrome Bar	19.05 to 101.6 mm Dia.
	Ground	12.7 to 110 mm Dia. (H9 Tolerance)
	Peeled & polished	19.05 to 101.6 mm Dia. (H11 Tolerance)

LOCATIONS				
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