4140 High tensile

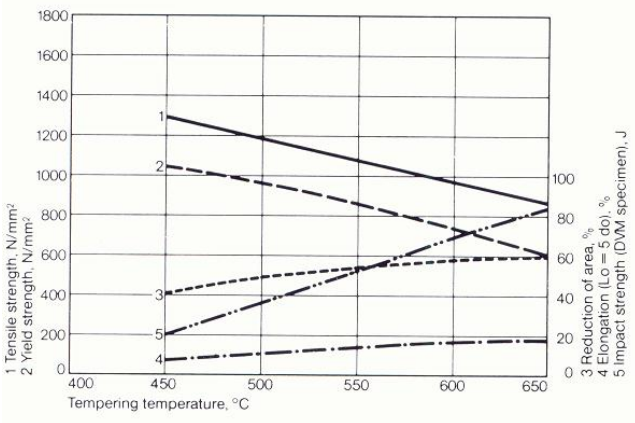
Typical Analysis (Ave. values %)	C	Si	Mn	Ni	Cr	Mo	S	P	
	0.4	0.2	0.8	-	1.0	0.2	0.025	0.025	

NEAREST STANDARD	AS	DIN	BS	AISI
	4140	1.7225 41CrMo4	~En19A ~708 M 40	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

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.

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	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 300-400ºC. Temper after welding to about 35-50ºC 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.

MECANICAL PROPERTIES Heat Treated Condition		10 – 100 mm dia	101 – 250 mm dia	251 above **Aim**
	Yield strength (Rp 0.2)	Min 740 N/mm²	Min 665 N/mm²	665 N/mm²
	Tensile (Rm)	930 - 1080 N/mm²	850 - 1000 N/mm²	850 - 1000 N/mm²
	Elongation (A5) %	Min 12	Min 13	**To be recorded**
	Charpy Impact J	Min 42	Min 50	**To be recorded**
	Hardness HB	269 – 331 HB	248 – 302 HB	**To be recorded**
	Z% RA	**To be recorded**	**To be recorded**	**To be recorded**
	Note Test piece to be taken 12.5 mm from the surface			

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

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"High Performance Metals"

Round Ground h9										
SIZE RANGE	12	19.05	25.4	34.93	41.27	50	57.15	69.85	80	90
	12.7	20	28.58	35	44.45	50.8	60	70	82.55	100
	15.88	22.23	30	38.1	45	53.97	63.5	75	85	101.6
	16	25	31.75	40	47.63	55	65	76.2	88.9	110

Round Peeled & Polished h10/h 11										
SIZE RANGE		20	30	38.1	45	57.15	65	76.2	90	
		25	31.75	40	50	60	70	80	100	
		25.4	35	44.45	50.8	63.5	75	82.55		

Round Machined k12										
SIZE RANGE	10	35	65	97	130	162	205	285	410	590
	12.7	36	70	100	133	165	210	290	420	647
	13	38	75	102	136	170	220	300	425	700
	20	40	78	105	140	175	230	310	440	
	22	42	80	106	145	180	250	320	450	
	24	45	82	110	146	182	260	340	460	
	25	47	85	116	150	185	265	350	518	
	28	50	87	120	152	190	270	360	520	
	30	51	90	125	155	195	275	385	550	
	32	60	92	127	160	200	280	400	560	

Round Black										
SIZE RANGE	13	25	35	48	65	95	120	150	180	215
	16	26	36	50	70	97	125	155	185	220
	19	28	39	55	75	100	130	160	190	230
	20	30	40	56	80	105	135	165	195	240
	22	32	42	60	85	110	140	170	200	250
	24	33	45	63	90	115	145	175	205	305

Hollow Bar Black					
SIZE RANGE	50x25	85x45	100x63	125x71	160x90
	50x32	85x67	100x71	125x80	160x112
	56x36	90x40	100x80	125x100	160x132
	63x32	90x50	106x56	132x71	170x100
	63x40	90x63	106x63	132x80	170x118
	71x36	95x50	106x71	132x90	180x125
	71x56	95x59	112x63	132x106	200x140
	75x40	95x60	112x80	140x80	224x132
	75x50	95x63	118x63	140x90	
	80x40	95x75	118x80	140x100	
	80x50	100x56	118x90	150x80	

Hexagonal Black										
SIZE RANGE	20	25	25.4	31.5	36	38.4	44.5	47	51	57
										65
	Hexagonal Drawn									
	19.1	25.4	31.8	38.1	50.8	57.2	65			
Flat Black										
SIZE RANGE	76.2 x 38.1									
Square Black										
SIZE RANGE	28	28.6	31.8	38.1	50	65	75	100	127	

Sizes normally stocked in Australia. Some branches may not hold the entire range.
Other sizes available on request.

Notes