



E STEEL SDN BHD (891338-A)

NO 3, Lorong Sungai Puloh 7/KU 6,
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Tel : 03-3292 8686 / 32928666 / 32928777
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4340 High Tensile Steel, 6582, ASSAB 705, SNCM439, EN24

4340 is a 1.8% nickel - chromium - molybdenum high hardenability high tensile steel - generally supplied hardened and tempered in the tensile range of 930 - 1080 Mpa (condition U) - (Rc 28 - 36)..

Characterised by high strength and toughness in relatively large sections.

Pre hardened and tempered 4340 can be further surface hardened by flame or induction hardening and by nitriding.

1.6582 is used in most industry sectors for applications requiring higher tensile/yield strength than 1.7225 can provide.

Typical applications are: Heavy Duty Shafts, Gears, Axles, Spindles, Couplings, Pins etc.

DIN	AISI	JIS	Chemical Composition											
			C	Si	Mn	P	S	Co	Cr	Mo	Ni	V	W	Cu
40NiCr4Mo6	4340H	SCM 439H	0.37 to 0.44	0.15 to 0.35	0.55 to 0.90	≤ 0.04	≤ 0.03	-	0.65 to 0.95	0.20 to 0.30	1.55 to 2.00	-	-	≤ 0.35

AISI 4340 Steel Specification and Relevant Standards

Country	USA	Britain	Britain	Japan
Standard	ASTM A29	EN 10250	BS 970	JIS G4103
Grades	4340	36CrNiMo4/ 1.6511	EN24/817M40	SNCM 439/SNCM8

AISI Alloy 4340 Steel Mechanical Properties

Mechanical Properties (Heat Treated Condition)	Condition	Ruling section mm	Tensile Strength MPa	Yield Strength MPa	Elong. %	Izod Impact J	Brinell Hardness
	T	250	850-1000	635	13	40	248-302
	T	150	850-1000	665	13	54	248-302
	U	100	930-1080	740	12	47	269-331
	V	63	1000-1150	835	12	47	293-352
	W	30	1080-1230	925	11	41	311-375
	X	30	1150-1300	1005	10	34	341-401
	Y	30	1230-1380	1080	10	24	363-429
Z	30	1555-	1125	5	10	444-	

Forging

Heat to 1150 °C - 1200 °C maximum, hold until temperature is uniform throughout the section.
Do not forge below 850 °C.
Following forging operation the work piece should be cooled as slowly as possible in sand or dry lime etc.



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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

4340 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 (830 °C - 860 °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.

Hardening

Heat to 830 °C - 860 °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

4340 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.

N.B. Nickel is inert to the action of nitrogen and in general resists its diffusion into steel. This can result in lower case hardness or longer nitriding cycle times for steels containing nickel such as 4340.

Stress Relieving

Heat to 600 °C - 650 °C, hold until temperature is uniform throughout the section, soak for 1 hour per 25 mm of section, and cool in still air.

Tempering

Re-heat to 450 °C - 660 °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.

N.B. Tempering should be avoided if possible within the range 250 °C - 450 °C due to temper brittleness.

Notes on Heat Treatment

Heating temperatures, rate of heating, cooling 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

4340 in the hardened and tempered as supplied condition is still regarded as being readily machinable and operations such as turning and drilling etc. can be carried out satisfactorily using machine manufacturers, recommendations for suitable tool type - feeds and speeds.



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Welding

Welding of 4340 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 4340 while in the annealed condition, and that the work piece, immediately on cooling to hand warm, is then stress relieved at 640 °C - 660 °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).