Download a pdf version of this data sheet for printing and future reference. (right click and select save to disk)

8620 Case Hardening Steel

8620 is a low nickel - chromium - molybdenum medium hardenability, case hardening (carburizing) steel, generally supplied in the as rolled condition with a maximum brinell hardness of 280 (Rc30).

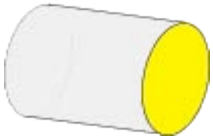
Characterised by good core strength and toughness in small to medium sections with case hardness up to Rc62 when carburized, hardened and tempered.

8620 can also be used (uncarburised) as a high tensile steel, which when suitably hardened and tempered can be utilized for various applications requiring good tensile strength and reasonable toughness.

Pre hardened and tempered (uncarburized) 8620 can be further surface hardened by nitriding but will not respond satisfactorily to flame or induction hardening due to its low carbon content.

8620 (carburized) is used extensively by all industry sectors for light to medium stressed components and shafts requiring high surface wear resistance with reasonable core strength and impact properties.

Typical uses are: Arbors, Bearings, Bushings, Cam Shafts, Differential Pinions, Guide Pins, King Pins, Pistons Pins, Splined Shafts, Ratchets, Sleeves etc..

Colour Code			
 Yellow (Bar end)	Stocked Sizes	Rounds	10mm to 260 mm Diameter
	Bar Finish	Peeled, Turned or Hot Rolled	

Related Specifications	
Australia	AS 1444-1996-8620/8620H
Germany	W.Nr 1.6523 DIN 21NiCrMo2
Great Britain	BS970: PART 3: 1991 805 M20 BS970: 1955 - EN362
Japan	JISG 4052 SNCM 220H
U.S.A.	SAE 8620 AISI 8620 ASTM A29/A29M 1991 8620 UNS G86200

Chemical Composition	Min. %	Max. %
Carbon	0.17	0.23
Silicon	0.10	0.40
Manganese	0.60	0.95
Nickel	0.35	0.75
Chromium	0.35	0.75
Molybdenum	0.15	0.25
Phosphorous	0	0.04
Sulphur	0	0.04

Typical Mechanical Properties For Core - Carburised and Oil Quenched at 840 °C.

Section Size mm	Tensile Strength Mpa		Yield Strength Mpa	Elongation on $5.65\sqrt{S_o}$ * %	Charpy Impact J	Hardness			
						HB		Rc	
	Min	Max	Min	Min	Min	Min	Max	Min	Max
11	980	1270	785	9	41	290	375	31	41
30	780	1080	590	10	41	235	320	23	35
63	690	930	490	11		205	275	16	29

Typical Mechanical Properties - As Rolled

Tensile Strength Mpa	Yield Strength Mpa	Elongation on $5.65\sqrt{S_o}$* %	Hardness	
			HB	Rc
820	590	22	240	24

Typical Mechanical Properties - Water Quenched at 830 °C and Tempered as Indicated *

Tempering Temperature °C	Tensile Strength Mpa	Yield Strength Mpa	Elongation on $5.65\sqrt{S_o}$* %	Izod Impact J	Hardness	
					HB	Rc
205	1050	765	18	80	311	34
425	930	800	20	110	275	29
650	700	556	30	140	207	16

*Section Size 25 mm

Can be used in the Hardened and Tempered (uncarburised) condition for shock resisting shafts and parts with tensile strengths up to 800 Mpa, plus reasonable toughness possible in sections up to 100 mm.

8620 is however generally used in the carburised condition with heat treatment details as follows.

Forging

Heat to 1150 °C and hold until temperature is uniform throughout the section. Soaking time at forging temperature should be as short as possible to avoid heavy scaling and excessive grain growth. This will vary depending on furnace conditions but 15 minutes per 25 mm of section may be used as a guide.

Do not forge below 850 °C.

Following completion of forging operation, work piece should be cooled as slowly as possible in sand or dry lime etc.

Note: Case hardening steels due to their low carbon content are less susceptible to cracking than medium or high carbon steels, and may therefore be heated and cooled more rapidly.

Heat Treatment

Annealing

Heat to 820 °C - 850 °C, hold until temperature is uniform throughout the section and cool in furnace.

Carburizing

Pack, salt or gas carburize at 900 °C - 925 °C, holding for sufficient time to develop the required case depth and carbon content, followed by a suitable hardening and tempering cycle to optimise case and core properties.

Hardening

Refer Refining & Hardening.

Nitriding

8620 suitably hardened and tempered (uncarburised) will respond to nitriding giving a surface hardness up to Rc 60.

Nitriding is carried out at 490 °C - 530 °C followed by slow cooling (no quench), reducing the problem of distortion.

During the initial heat treatment the tempering temperature employed should be higher than the nitriding temperature.

N.B. The relatively low nickel content in 8620 should not greatly influence the nitriding cycle.

Normalizing

Heat to 900 °C - 925 °C, hold until temperature is uniform throughout the section. Soak for 10 - 15 minutes and cool in still air.

Refining & Hardening

Core Refine

Slow cool from carburizing temperature and re-heat to 840 °C - 870 °C, hold until temperature is uniform throughout the section, quench as required in water, oil or air cool.

Case Hardening

Following core refining, re-heat to 780 °C - 820 °C, hold until temperature is uniform throughout the section, and quench in oil.

Temper immediately while still hand warm.

Single Refine*

Direct Quench: Cool from carburizing temperature to 820 °C - 840 °C, hold until temperature is uniform throughout the section. Quench in oil. Temper immediately while still hand warm.

Or: Cool from carburizing temperature to room temperature, re-heat to 820 °C - 840 °C and hold until temperature is uniform throughout the section and quench in oil.
Temper immediately.

*Suitable for fine grained steels only.

Stress Relieving

Heat to 630 °C - 650 °C, hold until temperature is uniform throughout the section, soak for 1 hour per 25 mm section, and cool in still air.

Tempering

Heat to 150 °C - 200 °C as required, hold until temperature is uniform throughout the section, soak for 1 - 2 hours per 25 mm of section, and cool in still air.

N.B.Tempering will improve the toughness of both case and core, with only a slight reduction in core strength and case hardness. It will also reduce the susceptibility of the case to grinding cracks.

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

8620 in the as rolled as supplied condition, has very good machinability and all operations such as turning, drilling, milling and tapping etc. can be carried out satisfactorily as per machine manufacturers recommendations for suitable tool type - feeds and speeds.

Welding

8620 is readily weldable in the as rolled as supplied condition. Following welding, the work piece immediately upon cooling to hand warm should be stress relieved at 630 °C - 650 °C if possible.

N.B. Welding in the carburized and heat treated condition is not recommended.

Welding Procedure

Welding of 8620 should always be carried out using low hydrogen electrodes - please consult your welding consumables supplier.

Suggested pre-heat temperature

Section	**°C**
40 mm	25
50 mm	40
75 mm	100
150 mm	150

Post Welding

Allow to cool in still air. Alternatively cover in sand or dry lime etc..