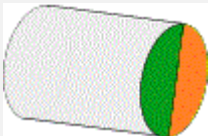


## EN39B CASE HARDENING STEEL

EN39B is a 4 1/4% Nickel Chromium Molybdenum carburising steel, generally supplied annealed to HB 277 max. Carburised and heat treated it develops a hard wear resistant case of about Rc 6-63 and a tough strong core with a typical tensile strength range 1000-1400MPa, in small to quite large sections.

Colour Code	Stocked Sizes		
Green & Orange (Bar End)	Rounds	50mm to 205 mm Diameter	
			

### Related Specifications

Australia	AS X9315 / EN39B
Germany	DIN: 15NiCrMo16-5
Great Britain	835M15 or 835H15
Japan	SNM 815, JIS G 4103
USA	EN: 39B

### Chemical Composition

	Min. %	Max. %
Carbon	0.12	0.18
Silicon	0.10	0.35
Manganese	0.25	0.50
Nickel	3.90	4.30
Chromium	1.00	1.40
Molybdenum	0.15	0.3

### Mechanical Test Requirements - If supplied to BS 970 - 1 - 1996 835M15

Test Bar Diameter	19mm
Tensile Strength	1310MPa
Elongation on 5.65 So	8%
Impact - Izod	34 J min

Check test certificate if critical for end use.

#### Typical Mechanical Properties - Quenched at 830°C and tempered at 200°C

Section Size mm	25	50	100
Tensile Strength	1350	1300	1180
Yield Strength Mpa	1150	1100	920
Elongation %	13	15	17
Impact Izod J	50	72	82
Hardness HB	400	380	350

#### Forging

Heat to 1150°C and hold until uniform. Minimum forging temperature 900°C. Cool in ashes, warm dry lime or sand. Note: Soaking time at forging temperature should be as short as possible to avoid heavy scaling and excessive grain growth.

#### Heat Treatment

##### Annealing

Heat to 830°C - 850°C, hold until temperature is uniform throughout the section and cool in furnace.

##### Normalising

Heat to 900°C - 930°C, Cool in still air

Temper at 640°C - 660°C Cool in still air

For optimum machinability

##### Stress Relieving

Heat to 600°C - 650°C Cool in furnace to 450°C and air cool

##### Carburizing

Pack, salt or gas carburize at 900°C - 950°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.

#### Refining & Hardening

##### Core Refine

Slow cool from carburizing temperature and re-heat to 850°C - 880°C, hold until temperature is uniform throughout the section, quench as required in water, oil or air cool. Alternatively quench in salt bath held at 150°C - 250°C, followed by air cool.

##### Case Hardening

Following core refining, re-heat to 760°C - 800°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 810 °C - 830 °C, hold until temperature is uniform throughout the section. Quench as required in water, oil or air cool. Alternatively quench in salt bath held at 150 °C - 250 °C, followed by air cool and temper immediately.

**Or:** Cool from carburizing temperature to room temperature, re-heat to 810 °C - 830 °C and hold until temperature is uniform throughout the section and quench or air cool as previous. Temper immediately.

Note: When air cooling large sections a uniform fan cooling is recommended, especially when direct cooling from carburizing temperature.

\*Suitable for fine grained steels only.

#### 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.

#### Welding

EN39B is readily weldable in the annealed condition with correct procedure, but welding in the case hardened or through condition is not recommended.

**Welding Procedure**

Low hydrogen electrodes recommended. Pre-heat at 250°C - 350°C and maintain during welding. Cool slowly in ashes, warm dry lime or sand etc, followed when possible with a stress relieve.

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