CASE HARDENING STEEL to BS 970 – 1955 EN 39B

EN 39B Nickel – Chrome – Moly Carburising Steel, generally supplied annealed to HB 277max. Carburised and heat treated it develops a hard wear resistant case to HRC 60-63 and a tough strong core with a typical tensile strength range of 1000-1400 MPa, in small to quite large sections.

TYPICAL APPLICATIONS:

Highly stressed and/or large gears, camshafts, bearings, heavy-duty worms, etc. Or can be used for high tensile applications uncarburised but through hardened and tempered.

TYPICAL CHEMICAL ANALYSIS

Carbon	0.15%
Silicon	0.25%
Manganese	0.40%
Nickel	4.20%
Chromium	1.20%
Molybdenum	0.20%

RELATED SPECIFICATIONS:

AS 1443-1996	X9315 or X9315H
BS 970-1-1996	835M15 or 835H15
JIS G 4103	SNCM 815
Werkstoff	1.6723 15NiCrMo16-5

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Very good through hardening properties with excellent toughness due to the low carbon and quite high alloy content, also suitable for Nitriding.

TYPICAL MECHANICAL PROPERTIES – Quenched and Tempered at 200°C

Section mm	Yield Strength MPa	Tensile Strength MPa	Elongation %	Impact Izod J	Hardness HB
25	1150	1350	13	50	400
50	1100	1300	15	72	380
100	920	1180	17	82	350
200	830	1130	18	76	332

Typical Mechanical Properties for guidance only

HARDENABILITY LIMITS – FOR AS1444 – X9315H GRADE

Distance from quenched end – mm													
Hardness values max - min – HRC													
mm	1.5	3	5	7	9	11	13	15	20	25	30	35	40
HRC	45	45	45	45	45	45	45	45	45	45	44	44	44
HRC	38	38	38	38	38	38	38	38	37	36	35	34	33

CASE HARDENING STEEL TO BS 970 – 1955 EN 39B - continued

WELDING:

Readily welded in the annealed condition with the correct procedure, but welding in the case hardened or through hardened condition is not recommended.

Welding procedure:

The use of low hydrogen electrodes recommended. Pre-heat at 250°C – 350°C and maintain during welding. Cool slowly in ashes etc, followed if possible with a stress-relieve.

Welding details for guidance only

HEAT TREATMENT:

Forging:

Heat to 1150°C Hold till uniform
Minimum forging temperature 900°C
Cool slowly in ashes or sand etc .

Annealing:

Heat to 830°C – 850°C
Cool in furnace

Normalising:

Heat to 900°C – 930°C
Cool in still air

Stress Relieving:

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

Hardening:

Heat to 830°C – 860°C
Cool in air or oil as required

Tempering:

Heat to 160°C – 200°C
Cool in still air

Carburising:

Carburise at 900°C – 950°C

Core Refining

Heat to 850°C – 880°C
Cool in air or quench in oil

Case Hardening:

Heat to 760°C – 800°C
Quench in oil

Tempering:

Temper at 160°C – 200°C to improve case toughness with minimal effect on its hardness. This will also reduce the possibility of grinding cracks.

Nitriding:

Heat to 500°C – 530°C

Heat treatment details for guidance only