CASE HARDENING STEEL to BS 970 – 1955 EN 36A

EN36A Nickel – Chromium Carburising Steel, generally supplied annealed to HB 229max. 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 850-1200 MPa, in small to fairly large sections.

Typical Chemical Analysis

Carbon	**0.13%**
Silicon	**0.25%**
Manganese	**0.50%**
Nickel	**3.25%**
Chromium	**0.85%**

Related specifications:

AS 1444-1996	X3312 or X3312H
AISI/SAE	E3310 or E9310
EN10084-1998	1.5752 15NiCr13 or 1.5752H 15NiCr13H
JIS G 4102 JIS G 4052	SNC 815 or SNC 815H
UNS	G33106 or H33106

Typical Applications:
Heavy-duty gears, bushings, king pins, ring gears, shafts, sprockets, collets etc. Or can be used for high tensile applications uncarburised but through hardened and tempered.

Good through hardening properties with excellent toughness due to the low carbon and 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	950	1150	15	45	340
50	810	970	17	70	285
100	730	900	20	87	265

Typical Mechanical Properties for guidance only

Hardenability Limits – for AS 1444 – X3312H 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	44	44	44	43	42	41	40	39	37	35	34	33	32
HRC	37	36	34	32	30	28	27	25	23	22	21	-	-

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

HEAT TREATMENT:

Forging:
Heat to 1150°C Hold till uniform
Minimum forging temp 850°C
Cool in ashes, warm dry lime or sand

Annealing:
Heat to 830°C - 850°C
Cool in furnace

Normalising:
Heat to 890°C - 920°C
Cool in still air

Stress Relieving:
Heat to 600°C - 650°C
Cool in still air

Hardening:
Heat to 830°C – 860°C
Quench in oil or polymer

Tempering:
Heat to 150°C – 200°C
Cool in still air

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

Carburising:
Carburise at 900°C – 950°C

Core Refining:
Heat to 840°C – 880°C
Quench in oil, polymer or salt bath held at 150°C – 250°C then air cool

Case Hardening:
Heat to 780°C – 820°C
Quench in oil

Tempering:
Temper at 150°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