

MEDIUM TENSILE STEEL – AISI 1045

AISI 1045 Medium Carbon, Medium Tensile Steel, supplied black as rolled, black as forged or normalised and bright drawn or smooth turned, offering good strength, toughness and wear resistance. Will through harden in sections up to 63mm – with a tensile strength of 620 - 850 MPa.

Typical Applications:

Axles, bolts, connecting rods, studs, rams, pins, rolls, spindles, ratchets, crankshafts, torsion bars, sockets, worms, light gears, guide rods etc.

Typical Chemical Analysis

Carbon	0.45%
Silicon	0.25%
Manganese	0.75%
Phosphorus	0.050% max
Sulphur	0.050% max

Related specifications:

AS 1442-1992	1045 Black
AS 1443-1994	1045 Bright
BS 970-3-1991	080A42 or 080A47
EN10083-1-1991	1.1191 C45E
JIS G 4051	S45C
SAE & UNS	1045 & G10450
Werkstoff	1.0503 C45

Surface Treatment:

Will **Flame or Induction** harden with a typical surface hardness up to **HRC 58**.

Plating: Will electroplate but not suitable for hot dip galvanising.

Typical Mechanical Properties – for guidance only

Finish	Yield Strength MPa	Tensile Strength MPa	Elong %	Hardness HB
Cold Drawn	500 – 650	640 – 850	8 min	190 – 270
Smooth Turned	300 – 450	570 – 700	14 – 30	170 – 210
Hot Rolled / Forged	300 – 450	570 – 700	14 – 30	170 – 210

Typical Mechanical Properties – for guidance only

Water or oil quenched at 830°C – 850°C and tempered between 540°C – 680°C.

Section mm	Yield Strength MPa	Tensile Strength MPa	Elong %	Izod J	Hardness HB
Up to 63	370 min	620 – 850	11 min	30	185 – 245

Supplied to chemical analysis only unless ordered in the heat-treated condition

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Welding:

Readily welded as supplied with the correct procedure, but welding when through hardened, flame or induction hardened is not recommended.

Welding procedure:

Low hydrogen electrodes are recommended. Pre-heat at 200°C – 300°C and maintain during welding. Cool slowly in ashes or sand etc and stress relieve when this is possible.

Welding details for guidance only

HEAT TREATMENT:**Forging:**

Heat to 1250°C Hold till uniform
Minimum forging temperature 850°C
Cool in still air

Flame and Induction hardening:

Heat quickly to the required case depth at 830°C – 860°C and quench immediately in water or oil.

Annealing:

Heat to 800°C – 850°C
Cool in furnace

Tempering at 150°C – 200°C will reduce stresses in the case with minimal effect on its hardness.

Normalising:

Heat to 870°C – 920°C
Cool in still air

All de-carburised surface material must first be removed to ensure best results

Stress Relieving:

Heat to 550°C – 660°C
Cool in still air

Heat treatment details for guidance only

Hardening:

Heat to 820°C – 860°C
Quench in oil or water

Dimensional Tolerance:

The dimensional tolerance and the straightness of black “as forged” bar can vary quite considerably. Bars should always be checked prior to machining to ensure that they will clean up as required.

Tempering:

Heat to 400°C – 680°C
Cool in still air