

1020 BRIGHT CARBON STEEL BAR

1020 is a general purpose low tensile low hardenability carbon steel generally supplied in the cold drawn or turned and polished condition, with a typical tensile strength range 410 - 790 Mpa, and Brinell hardness range 119 - 235. Characterised by excellent weldability, very good machinability with reasonable strength and very good ductility. 1020 due to its very low hardenability will through harden only in very small sections to relatively moderate strength levels, and is therefore generally used in the cold drawn or turned and polished condition. It can however be carburised achieving case hardnesses over Rc 65 with smaller sections, reducing as section size increases. Core strength will remain as supplied for all sections. Alternatively it can be carbonitrided offering some advantages over standard carburising. It will not respond satisfactorily to flame or induction hardening due to its low carbon content, nor to nitriding due to a lack of suitable alloying elements.

1020 is used extensively by all industry sectors for applications requiring good machinability or excellent weldability when high strength is not required plus lightly stressed carburised parts. It is also often used un-machined as supplied, its bright cold drawn or turned and polished finish being acceptable for many applications.

Typical applications are: Axles, General Engineering Parts and Components, Machinery Parts, Shafts etc. or Carburised: Camshafts, Light Duty Gears, Gudgon Pins, Ratchets, Spindles, Worm Gears etc.

Colour Code	Stocked Sizes	
	Rounds	Metric 6 mm - 200 mm Dia Imperial 3/16" - 10" Dia
	Squares	Metric 20 mm - 50 mm Imperial 1/2" - 5"
	Bar Finish Cold Drawn Turned and Polished	

Related Specifications

Australia	AS 1443 - 1994 M1020
Germany	W.Nr 1.0402 C22 W.Nr 1.1151 CK22
Great Britain	BS970 - Part 3 - 1991 070M20 BS970 - 1955 EN3B
Japan	JIS G 4051 S20C
USA	AISI C1020 ASTM A29/A29M - 91 1020 SAE 1020 UNS G 10200

Chemical Composition

	Min. %	Max. %
Carbon	0.15	0.25
Silicon	0	0.35
Manganese	0.30	0.90
Phosphorous	0	0.05
Sulphur	0	0.05

Typical Mechanical Properties - Cold Drawn and Turned and Polished Condition

Cold Drawn Size mm		up to 16mm	17 - 38mm	39 - 63mm	Turned & Polished (All Sizes)
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Tensile Strength Mpa	Min	480	460	430	410
	Max	790	710	660	560
Yield Strength Mpa	Min	380	370	340	230
	Max	610	570	480	330
Elongation in 50mm %	Min	10	12	13	22
Hardness HB	Min	142	135	120	119
	Max	235	210	195	170

Forging

Heat to 1100 °C - 1200 °C maximum, hold until temperature is uniform throughout the section and commence forging.
Do not forge below 900 °C
Finished forgings may be air cooled.

Heat Treatment

Annealing

Heat to 870 °C - 910 °C hold until temperature is uniform throughout the section, and cool in furnace.

Carburizing

Pack, salt or gas carburise at 880 °C - 920 °C, holding for sufficient time to develop the required case depth and carbon content, followed by a suitable refining/hardening and tempering cycle to optimise case and core properties.

Core Refine

Slow cool from Carburising temperature and re-heat to 870 °C - 900 °C, hold until temperature is uniform throughout the section and quench as required in oil, water or brine.

Case Hardening

Following core refining, re-heat to 760 °C - 780 °C, hold until temperature is uniform throughout the section and quench in water.
Temper immediately while still hand warm.

Tempering - After Carburising, Core Refining and Case Hardening

Re-heat to 150 °C - 200 °C, hold until temperature is uniform throughout the section, soak for 1 hour per 25 mm of section and cool in still air.
NB. Tempering will improve the toughness of the case with only slight reduction in case hardness. It will also reduce the susceptibility to grinding cracks.

Normalizing

Heat to 890 °C - 940 °C hold until temperature is uniform throughout the section, soak for 10 - 15 minutes and cool in still air.

Stress Relieving

Heat to 650 °C - 700 °C hold until temperature is uniform throughout the section, soak for 1 hour per 25mm of section, and cool in still air.

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

1020 in the bright cold drawn or turned and polished as supplied condition has very good machinability and all operations such as turning, drilling, tapping, milling etc. can be carried out satisfactorily as per machine manufacturers recommendations for suitable tool type, feeds and speeds.

Welding

1020 has excellent weldability in the cold drawn or turned and polished as supplied condition, and can be readily welded by any of the standard welding processes.
NB. Welding in the carburised or heat treated condition is not recommended.

Welding Procedure

Low carbon electrodes are recommended.

Please consult your welding consumables supplier for suitable electrodes etc.

A pre-heat or post-heat is not generally required, however pre-heating larger sections can be beneficial as can a post-weld stress relieve if this is possible.

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