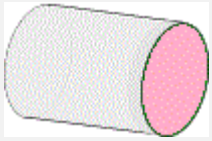
ENGINEERING STEELS + ALLOYS

# S1214 BRIGHT CARBON STEEL BAR

S1214 is a free machining low tensile, low hardenability carbon steel generally supplied in the cold drawn or turned and polished condition, with a typical tensile strength range 370 - 760 Mpa, and Brinell hardness range 105 - 225.Characterised by excellent machinability, moderate weldability, with reasonable strength and ductility.
S1214 due to its very low hardenability is generally used in the as supplied condition. It can however be carburised achieving case hardnesses over Rc 60 with smaller sections, this reducing as section size increases. Core strength will remain low for all sections. It can also be carbonititrided offering some advantages over 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.
S1214 was developed primarily as a free machining mild steel and it is used extensively by all industry sectors for parts and components where extensive machining is involved and strength or impact properties are not critical to the application.
Typical applications are: All Lightly Stressed Components and Machinery Parts either in the as supplied condition or carburised as required.

| Colour Code | Stocked Sizes | |
|---|---|---|
| Pink (Bar End)  | Rounds | Metric 4 mm - 150 mm Dia<br>Imperial 1/4" - 6"Dia |
| | Hexagons | 7/16" - 75 mm A/F |
| | Squares | 1/4" - 4" A/F |

| **Related Specifications** | |
|---|---|
| Australia | AS 1443 - 1994 1214 |
| Germany | W.Nr 1.0715 9SMn28 |
| Great Britain | BS970 - Part 3 - 1991 230M07<br>BS970 - 1955 EN1A |
| Japan | JIS G 4804 SUM22 |
| USA | AISI 1213 and 1215<br>ASTM A29/A29M - 91 1213 and 1215<br>SAE 1213 and 1215<br>UNS G 12130 |

| **Chemical Composition** | | |
|---|---|---|
| | **Min. %** | **Max. %** |
| Carbon | 0 | 0.15 |
| Silicon | 0 | 0.10 |
| Manganese | 0.80 | 1.20 |
| Phosphorous | 0.04 | 0.09 |
| Sulphur | 0.25 | 0.35 |

| **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) |
| Tensile Strength Mpa | Min | 480 | 430 | 400 | 370 |
| | Max | 760 | 690 | 630 | 520 |
| Yield Strength Mpa | Min | 350 | 330 | 290 | 230 |
| | Max | 590 | 550 | 500 | 310 |

| | | | | | |
|---|---|---|---|---|---|
| Elongation in 50mm % | Min | 7 | 8 | 9 | 17 |
| Hardness HB | Min | 142 | 120 | 115 | 105 |
| | Max | 225 | 205 | 185 | 155 |

**Forging**

Heat to 1300 ºC maximum, hold until temperature is uniform throughout the section and commence forging.Do not forge below 950 ºC
Finished forgings may be air cooled.

**Heat Treatment**

**Annealing**

Heat to 890 ºC - 920 ºC hold until temperature is uniform throughout the section, and cool in furnace.

**Carburizing**

Pack, salt or gas carburise at 900 ºC - 920 ºC, 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 880 ºC - 900 ºC, hold until temperature is uniform throughout the section and quench as required in oil, water.

**Case Hardening**

Following core refining, re-heat to 760 ºC - 790 ºC, 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 120 ºC - 230 ºC, 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 it's susceptibility to grinding cracks.

**Normalizing**

Heat to 900 ºC - 940 ºC hold until temperature is uniform throughout the section, soak for 10 - 15 minutes.Cool in still air.

**Stress Relieving**

Heat to 500 ºC - 700 ºC 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**

S1214 in the bright cold drawn or turned and polished as supplied condition has excellent machinability, all operations such as drilling, milling, reaming, tapping, turning etc. can be carried out satisfactorily as per machine manufacturers recommendations for suitable tool type, feeds and speeds.

**Welding**

S1214 has moderate weldability due to its higher sulphur content which can cause hot shortness and porosity during welding. For this reason welding should be avoided if at all possible except for non-critical applications in which case the following welding procedure may be taken as a guide.NB. Welding in the carburised condition is not recommended.

**Welding Procedure**

Welding electrodes selected should be suitable for welding sulphurised steels.
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 at 50 ºC can be beneficial as can a post-weld stress relieve if this is possible.