

## MECHANICAL PROPERTIES

The table below lists the nominal/typical mechanical properties of more commonly used grades of stainless steel. Refer to note 1.

Grade of stainless steel	Condition (3)	Tensile Strength MPa (min)	0.2% Proof Strength MPa (min)	Elongation % in 50mm (min)	Hardness Brinell (max)
<b>Plain carbon steel</b> ie for comparison purposes only	Hot rolled	460	240	25	180
<b>Austenitic stainless steels</b> 301, 304, 304H, 304LN, 309S, 310S, 316, 316H, 316TI, 321 301L	Annealed	515	205	40	200
304L, 316L	Annealed	550	220	45	200
304N	Annealed	485	170	40	200
316N	Annealed	550	240	40	200
N08904 {904L™, 1925LC™, 2RK65™}	Annealed	550	240	35	200
	Annealed	490	220	35	200
<b>Duplex stainless steels</b> S32304 (2304)	Annealed	600	400	25	290
S32205 (2205)	Annealed	620	450	25	290
S32750 (2507)	Annealed	795	500	15	310
<b>Ferritic stainless steels</b> 409	Annealed	380	170	20	180
430	Annealed	450	205	22	180
3CR12™	Annealed	460	300	20	220
<b>Martensitic stainless steels (2) &amp; (4)</b> 410, 420, 431, 440B	Q & T (5)	Dependant on heat treatment			
<b>Precipitation hardenable (PH) stainless steels (4)</b> S17400, S17700, S15700	Ppt. hard. (Aged) (6)	Dependant on heat treatment			

Notes :

1. It is **stressed** the values given in the above table are typical/nominal for plate material with respect to those as in the American ASTM Specifications (with the exception of 3CR12™). Therefore they **must not** be used for design or specification purposes.

Specified values can differ in different specifications, and/or for different product forms (plate, sheet, coil, bar, forgings, castings, etc), and will differ for different conditions of supply as per note 3. Therefore, the values as stipulated in the specifications to which the stainless steel is ordered/supplied **must** be used for design or specification purposes.

2. Martensitic stainless steel are usually available only as bar, forgings, or as similar (not equivalent) cast grades.

3. The different conditions of supply include :

- Annealed, i.e. fully softened and thus lowest strength, hardness
- Cold worked, e.g. by temper rolling, by cold drawing
- Heat treated, e.g. by quenching and tempering, by precipitation hardening (ageing).

## **MECHANICAL PROPERTIES cont'd.**

4. Martensitic stainless steels and precipitation hardenable stainless steels are usually supplied in the annealed condition. After machining, forming and, in the case of precipitation hardenable stainless steels welding, they **must** be heat treated to give the required properties.

Martensitic stainless steels can be ordered/supplied in the quench and tempered condition (Ref Note 5). As such the tempering temperature employed would normally have been at the higher temperatures to give a tensile strength of  $\sim 900 \pm 50$  MPa.

5. Quenching and tempering. The steel is rapidly cooled from a high temperature ( $925^{\circ}$ - $1060^{\circ}$ C dependant on grade) and subsequently tempered at a specific elevated temperature (in the range of  $150^{\circ}$ - $720^{\circ}$ C) to give the required interrelated combination of strength/harness and associated ductility/toughness.

6. Precipitation hardening (ageing). The steel is heated to a specific intermediate temperature (in range of  $480^{\circ}$ - $620^{\circ}$ C) to give the required interrelated combination of strength/harness and associated ductility/toughness.