

Mechanical properties of stainless steel and other metals

Though there are many grades of stainless steel, this enquiry was about AISI 304, which is quite common and widely used. If you wish to have more information about other grades you may follow this [link](#).

When we work with different metallic materials, some precautions should be taken into account:

Galvanic corrosion.

It is very important and can appear when stainless steel is being used in

contact with other metallic material (for example, aluminium). If it is a dry environment, there should not be problem but if there is an electrolyte (humidity, acid Solutions, etc) galvanic corrosion can occur. When two metals with very different

galvanic potentials are in contact in an electrolyte. The electrolyte acts as a conduit moving metal ions from the anode to the cathode. The anode metal (less noble), as a result, corrodes more quickly than it otherwise would, while the cathode metal (more noble) corrodes more slowly and, in some cases, may not corrode at all. The galvanic series in seawater lists the common metals in order from the most anodic (less noble) to most cathodic (noble). The further apart the metals are in this series, the greater the corrosion difference and speed between the two. When dissimilar metals are in contact make sure that the less noble metal (anode) has a much larger surface area than the less noble metal (cathode). For example, use stainless steel fasteners for aluminium products and never do the opposite.

In case of mechanical join between stainless steel and aluminium in a corrosive atmosphere, joints should be isolated from each other using for instance, rubber elements.

Handling.

If you are not used to handle stainless steel in your workshop, you must know that stainless steel can be contaminated by other less noble materials (steel, zinc, aluminium, etc). The trace elements of them corrode quickly on the stainless steel surface causing rust stains. Although it may not be apparent under this circumstance, stainless steel is not the corroded one, but the other metal. However if traces are left for a long time, can cause the final corrosion of the stainless steel. So at your workshop both tools and place should be clean from other metallic elements contamination.

Alloy AISI SAE	Chemical composition (%)						Mechanical properties (annealed condition)	
	C	Cr	Mn	Ni	Mo	Otros	Rm (Mpa)	Rp 0,2 (Mpa)

Cast iron

G2500	3,4	-	0,7	-	-	2,2 Si	179	-
G3500	3,2	-	0,7	-	-	2,0 Si	252	-
32510	2,2	-	0,04	-	-	1,2 Si	345	224
45008	2,4	-	0,75	-	-	1,4 Si	440	310
60-40-18	3,5	-	-	-	-	2,2 Si	414	276

Low alloy steel

1340	0,4	-	1,75	-	-	-	704	435
5140	0,4	0,8	0,8	-	-	-	573	297
4140	0,4	1,0	0,9	-	0,2	-	655	421
4620	0,2	-	0,55	1,83	0,25	-	517	373
4340	0,4	0,8	0,9	1,83	0,2	-	745	469

Stainless steel

304	0,07	17,5-19	2 máx	8-10	-	-	540-750	230
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Source: Foundations of Materials Science and Engineering (William F. Simith & Javad Hashemi)