Stainless Steel 304/304L

Introduction

The **Stainless steel 304 and 304L** alloys offer similar chemical and mechanical characteristics. The stainless steel 304L is a kind of steel 304 alloy. It has lower magnitude of carbon that enhances the weldability and reduces the risk of decrease in corrosion resistance properties of the welded section. The steel 304L has lower mechanical properties as compare to 304 type.

Stainless steels consisting of minimum 10.5% chromium are used in the metallurgical processes.

Stainless steel 304/304L has adequate resistance to corrosion, distortion and, water as like other steels. But it is not absolutely stain proof and it gets corrosion in the smaller oxygen content, high salinity and highly polluted conditions. The stainless steel is categorized in the different classes and surface finishes suitable in the environments. The **stainless steel 304 alloy** is utilized in the situations that need resistance to corrosion and features of stainless steel.

Chemical composition of Stainless Steel Grade 304 Wire:-

Steel Type		C	Mn	Si	P	S	Cr	Mo	Ni	N
Steel 304	Min	-	-	-	-	-	18.0	-	8.0	-
	Max	0.08	2.0	0.75	0.045	0.030	20.0		10.5	0.10
Steel 304L	Min	-	-	-	-	-	18.0	-	8.0	-
	Max	0.030	2.0	0.75	0.045	0.030	20.0		12.0	0.10
Steel 304H	Min	-	-	-	-0.045	-	18.0	-	8.0	-
	Max	0.10	2.0	0.75		0.030	20.0		10.5	

Mechanical properties of Stainless Steel Grade 304 Wire:-

Steel Type	Tensile Strength (MPa) min	Yield Strength 0.2% Proof (MPa) min	Elongation (% in 50mm) min	Hardness
304	515	205	40	92 (HR) 201 (HB)
304L	485	170	40	92 (HR) 201 (HB)
304H	515	205	40	92 (HR) 201 (HB)

Physical Properties of Stainless Steel 304/304L alloy

Steel	Density (kg/m3)	Elastic Modulus (GPa)	Mean Coefficient of thermal expansion (µm/m/oC)			Thermal conductivity (W/m.K)		Specific heat 0-100oC (J/Kg.K)	Electrical reistivity (nΩ.m)
			0-100oC	0-315oC	0-538oC	100oC	500oC		
304/L/H	8000	193	17.2	17.8	18.4	16.2	21.5	500	720

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Possible substitutes of 304/304L stainless steel

430	Cheap, moderate corrosion resistance and fabrication properties are required
301L	Large work hardening steel for specific cold forming or stretch formed parts
303	Superior machinability and reduced corrosion resistance, forming and welding properties are required
3CR12	Cheap, minor corrosion resistance and consequential discoloration are adequate
321	Improved resistance to elevated temperature from 600oC to 900oC and high hot strength are required
302HQ	Lower work toughening rate is required for cold forging and bolts
316	Excellent resistance to pitting and crevice corrosion, chlorides

Corrosion resistance properties

Stainless steel 304/304L has superior resistance to broad range of atmospheric conditions and variety of corrosive conditions. It offers excellent resistance to pitting and crevice corrosion in hot chlorides and stress corrosion cracking at temperature more than 60oC. It provides resistance to potable water including 200mg/L chlorides at ambient temperatures.

The resistance to corrosion property can be broadly affected if the steel alloy is employed in the non oxygenated form like keel bolts. When the stainless steel parts like nuts are reinforced collectively, the oxide layer may disappear due to welding of two components. While disassembling, the welded alloy can be pitted that is called as galling. This impaired galling can be stopped by using the different components to join together such as joining bronze and stainless steel alloy or distinct kinds of stainless steel alloys like martensitic and austenitic when the steel to steel wear is considered.

Stainless steel Vs Carbon Steel

The stainless steel alloy is different from the carbon steel in terms of chromium content available. The unsecured carbon steel alloy gets corroded easily when it is kept in air and moisture. The iron oxide is very strong and improves the corrosion rate by making more layers of iron oxide. The stainless steel consists of chromium forms security layer of chromium oxide that prevents the further corrosion by restricting of contact of oxygen with the steel. It avoids the corrosion to disperse in the interior structure of metal.

The passivity occurs when the content of chromium is sufficient in the occurrence of oxygen. The resistance to oxidation in air at the ambient temperature is widely improved with an addition of least 13% chromium and 26% is utilized for rough situations. The content of chromium creates a defense level of chromium oxide when it is kept in contact of air. The protection layer is very thin that will not be glimpsed and the steel retains its shine. The oxide layer is resistant to air and water that defends the metal underneath. This layer is quickly multiplied when the exterior is scratched. This procedure is called as passivation and it occurs in the other metallic materials like aluminum and titanium.

Heat resistance properties

Stainless steel 304/304L has outstanding oxidation resistance in the intermittent service conditions up to 870oC and regular services to 925oC. The regular use of steel 304 at temperatures 425oC to 860oC is not preferred if resulting aqueous corrosion resistance is required. The alloy 304L provides great resistance to carbide precipitation and can be heated at above temperature limits.

Grade 304H possesses high strength at the elevated temperature limits therefore it is commonly employed in structure and pressure operations at temperature more than 500oC to 800oC. The steel 304H is inclined to sensitization at 425oC to 860oC but it is not an issue for elevated temperature operations however it lowers the resistance to aqueous corrosion.

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Heat Processing of steel 304/304L

The solution annealing is performed at 1010oC to 1120oC and quenched quickly. This steel cannot be toughened through heat processing.

Stainless steel 304 Welding

Steel Grade 304 can be welded easily through common welding methods, including or excluding filler metals. The pre-qualified welding of 304 is done with steel 308 and 304L with 308L rods, electrodes. The massive welding components in this steel may need for after weld annealing to obtain superior corrosion resistance. It is not essential for steel 304L. Steel 321 can replace 304 if massive welding is needed and after weld heat processing is not feasible.

Two different alloys are electrically connected in the humid conditions like stack and corrosion. The nitronic alloy declines the inclination to galling through selective alloying with manganese and nitrogen. Moreover the welded joints can be lubricated to bypass galling method to occur.

In the same way, **duplex stainless steel 304** is not a better conductor of electricity but a moderate conductor due to smaller percentage of copper that is a better conductor of electricity. The ferrite and martensitic stainless iron alloy are magnetic in nature though the austenitic stainless iron alloy are non magnetic in nature.

Applications of Stainless steel Grade 304/304L

1. Chemical containers, heat exchangers
2. Spring manufacturing
3. Kitchen sinks, devices and systems
4. Food processing systems
5. Welded mining screen

Stainless Steel 304/304L Product Forms Available:

Wire, Wiremesh Screen, Strip, Sheet, Pipe, Tubing, Plate, Ribbon, Tape

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