Duplex Stainless Steel 2205 Alloy

The **Duplex stainless steel 2205** alloy is broadly utilized in the different industrial applications as it offers high strength and excellent resistance to corrosion. Its constituent's concentration has been changed by different steel manufacturers to obtain an enhanced **resistance to corrosion** functionality. This steel certainly cannot be used in the applications at high temperatures over 300oc because it gets precipitates of fragile micro parts. So, steel 2205 should be used at temperatures lower than -50oC.

The features of **Duplex stainless steel 2205** are stated in ASTM A240/A240M. However these features may not match with the steel features of pipe and bar.

Chemical Composition of Duplex Stainless steel 2205 alloy

Steel		C	Mn	Si	P	S	Cr	Mo	Ni	N
2205 (S31803	Min	-	-	-	-	-	21.0	2.5	4.5	0.08
	Max	0.030	2.00	1.00	0.030	0.020	23.0	3.5	6.5	0.20
2205 (S32205	Min	-	-	-	-	-	22.0	3.0	4.5	0.14
	Max	0.030	2.00	1.00	0.030	0.020	23.0	3.5	6.5	0.20

Physical properties of duplex stainless steel 2205 alloy

Steel	Density	Elastic modulus	Mean coefficient of thermal expansion (m/m/°C)			Thermal Conductivity (W/m.K)		Specific Heat 0-100°C(J/kg.K)	Electrical Resistivity (nΩ.m)
			0-100oC	0-315oC	0-538oC	100oC	500oC		
2205	7805	200	13.7	14.7	-	19	-	450	850

The other feasible types of stainless steel are provided as following and the reason to choose these classes over of 2205 alloy are described:

904L	Superior formability is required with equivalent similar corrosion resistance and less strength.
UR52N +	High resistance to corrosion is in demand, for example resistance to elevated temperature seawater.
6%Mo	Large corrosion resistance is needed, but with minimum strength and enhanced formability.
316L	Superior corrosion resistance and strength of 2205 are not necessary 316L is lower cost.

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Mechanical Properties

The high strength 2205 alloy provides superior fatigue strength. The 2205 alloy and 316 L steel are analyzed at the reverse bending stress at room temperature. The fatigue limit is close to the yield strength. In various cases, the fatigue strength interacts with the corrosion rate so fatigue strength is reduced. In these conditions the stainless steel 2205 alloy provides valuable benefits over mild steel and conventionally formed stainless steel alloys.

The **Duplex stainless steel 2205 alloy** offers excellent strength at the room temperature as well as sub zero temperature ranges. It can be stress relieved at 525oC to 600oC for one hour. The stress reliving of alloy widely contributes in enhancing its resistance to stress corrosion cracking.

Mechanical properties of Duplex stainless steel 2205 alloy

Steel	Tensile strength, Mpa	Yield strength, Mpa	Elongation %	Hardness	
2205	620	450	25	31 C	293 HB

Corrosion Resistance

The **Duplex stainless steel 2205 alloy** offers extensive resistance to the local corrosion factors like intergranular, pitting and crevice corrosion. The CPT of duplex stainless steel 2205 alloy is minimum 35oC. It offers outstanding resistance to the chloride ion stress cracking at temperature ranges to 150oC. The steel offers enhanced performance in the conditions that cause rapid distortion of austenitic steels. It also offers excellent resistance to the sea water.

However, the duplex 2205 alloy provides excellent resistance to oxidation at the elevated temperature it may suffer embrittlement when it is kept at temperature over 300oC even for the short period. The embrittlement can be avoided by the complete solution annealing of steel 2205 so it should never be implemented in the temperatures above 300oC.

The alloy 2205 is heat processed at temperatures between 1020oC to 1100oC and quenched quickly. The steel of this class should not be toughened by the heat processing and it should be work hardened.

ASTM Standards

Pipe Smls	Pipe Welded	Tube Smls	Tube welded	Sheet/Plate	Bar	Flanges. Fittings & Valves
A790	A790	A789	A789	A240	A276	A182

Welding of Duplex Stainless Steel 2205

The **Duplex stainless steel 2205 alloy** is easily weldable by the common methods but it should not be welded in the absence of filler metal because it may produce ferrite. Since 1554.6 metal qualifies the welding of stainless steel 2205 alloy with the help of 2209 rods or electrodes that make sure that the metal has been deposited equally. The nitrogen is included as the shielding material to support in guarantee the sufficient austenite in the shape.

Machinability of Duplex Stainless Steel 2205

The input heat should be kept lower and pre or post heating is not essential. Minor coefficient of thermal expansion of duplex stainless steel as compare to the austenitic classes lowers the distortion and related stress levels. The large strength of alloy that makes it significant in various operations also decreases its machinability effectively. The cutting rate of alloy is almost 20% lesser than he stainless steel grade of 304 alloy.

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The large strength of **Duplex stainless steel 2205 alloy** makes the curving and production more typical such that for these processes the user needs high capacity system as compare to the requirement for other steel grades. The alloy's ductility is lesser than the austenitic class so severe operations like cold heating are not feasible. In case the outstanding cold processing of alloy is required it can be done by its moderate annealing.

As the use of **Duplex stainless steel 2205 alloy** in the high temperature like up to 300oC is not recommended due to production of precipitates that together affect the material's property of resistance to corrosion. At the low temperature, the embritllement occurs due to precipitation of nitride, chloride and alpha. Although in the normal formation and manufacturing of steel alloy, the critical temperatures risks the embritllement and affects the resistance to corrosion property at the minor level. Moreover this doesn't affect the nature of **Duplex stainless steel 2205 alloy** in the operation temperature and is nominally considered in the measurement. For example the heat exchange vessels are used at the high temperatures without causing any troubles. The completely annealed and quenched processing helps to regain the hardness and strength of alloy.

Applications of Duplex Stainless steel 2205 Alloy

1. Chemical Processing vessels
2. Pipe and heat exchangers
3. Oil field piping Flue gas desulfurization

Stainless Steel 2205 Product Forms Available:

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

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