

## DUPLEX STEEL 4462 TYPE F51, WNR 1.4462, UNS S31803, AISI F51, AFNOR Z2CND22.05Az

### Introduction :

Duplex 4462 is also known as UNS S31803/ S32205, F51 and SS2377. It is a stainless acid resistant duplex steel with high strength and extremely good corrosion properties. It has very high resistance to pitting corrosion, crevice corrosion, uniform corrosion, corrosion fatigue and stress corrosion cracking due to the duplex structure of the steel and high contents of chrome and molybdenum. It also has low thermal expansion and high energy absorption. It can be welded by most of the common welding methods, for example submerged-arc welding, plasma arc welding, shielded metal arc welding and gas tungsten arc welding. Avesta Welding 2205 is to be used when you weld or something similar as filler metal. The steel can be both hot and cold formed. It is more difficult to machine than common austenitic steel. With high-speed tools machining shall be performed.

### Products Available in forms :

- DUPLEX STEEL 4462 Plates
- DUPLEX STEEL 4462 Pipes
- DUPLEX STEEL 4462 Round Bar
- DUPLEX STEEL 4462 Tube
- DUPLEX STEEL 4462 Flanges
- DUPLEX STEEL 4462 Wire
- DUPLEX STEEL 4462 Fittings

### Standard Available in forms :

- ASTM A182 / ASME SA182
- ASTM A240 / ASME SA240
- ASTM A798 / ASME SA798
- ASTM A790 / ASME SA790
- ASTM A815 / ASME SA815
- ASTM A276 / ASME SA276
- ASTM A479 / ASME SA479
- ASTM A789 / ASME SA789
- ASTM A928 / ASME SA928
- ASTM A988 / ASME SA988

### Chemical Composition

	TYPE F51	WNR 1.4462	UNS S31803	AISI F51	AFNOR Z2CND22.0 5Az
Carbon	0.030 max	0.030 max	0.030 max	0.030 max	0.030 max
Manganese	2.00 max	2.00 max	2.00 max	2.00 max	2.00 max
Phosphorus	0.030 max	0.030 max	0.030 max	0.030 max	0.030 max
Sulphur	0.020 max	0.020 max	0.020 max	0.020 max	0.020 max
Silicon	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Chromium	21.0-23.0	21.0-23.0	21.0-23.0	21.0-23.0	21.0-23.0
Nickel	4.5-6.5	4.5-6.5	4.5-6.5	4.5-6.5	4.5-6.5
Nitrogen*	0.08-0.20	0.08-0.20	0.08-0.20	0.08-0.20	0.08-0.20
Molybdenum	2.5-3.5	2.5-3.5	2.5-3.5	2.5-3.5	2.5-3.5

## Mechanical Properties

	TYPE F51	WNR 1.4462	UNS S31803	AISI F51	AFNOR Z2CND22.0 5Az
Tensile Strength, [Mpa]ksi	[650-800] 94-128	[650-800] 94-128	[650-800] 94-128	[650-800] 94-128	[650-800] 94-128
0.2 % Yield Strength, [Mpa]ksi, max	450Mpa [65KSI]	450Mpa [65KSI]	450Mpa [65KSI]	450Mpa [65KSI]	450Mpa [65KSI]
Elongation %	25	25	25	25	25
Hardness, Brinell	270max	270max	270max	270max	270max

SPECIFICATION	ASTM	ASME
Seamless Pipe	A790	SA790
Welded Pipe	A790	SA790
Seamless Tube	A789	SA789
Welded Tube	A789	SA789
Sheet/Plate	A240	SA240
Bar	A276	SA276
Flanges, Fittings & Valves	A182	SA182

## Applications

Duplex stainless steels are typically used in:

- Chemical processing, transport and storage
- Oil and gas exploration and offshore rigs
- Oil and gas refining
- Marine environments
- Pollution control equipment
- Pulp & paper manufacturing
- Chemical process plant

## Corrosion Resistance

- F51 is extremely corrosion resistant.
- It has high resistance to intergranular corrosion.
- Even in chloride and sulphide environments, it exhibits very high resistance to stress corrosion cracking.
- The super duplex grades are even more resistant to corrosion.

## Heat Resistance

- F51 has high chromium content that protects against corrosion, and causes embrittlement at temperatures over about 300°C.
- At low temperatures, F51 has better ductility than the ferritic and martensitic grades.
- It can readily be used down to at least -50°C.

## Fabrication

- Fabrication of all duplex steels should be done only with tools dedicated to duplex steel materials.
- Tooling and work surfaces must be thoroughly cleaned before use.
- These precautions are necessary to avoid cross contamination of stainless steel by easily corroded metals that may discolour the surface of the fabricated product.

## Machinability

- Although machinable, the high strength of F51 makes machining difficult.
- Machining of F51 is around 20% slower than for 304.

### **Machining can be enhanced by using the following rules:**

- Cutting edges must be kept sharp. Dull edges cause excess work hardening.
- Cuts should be light but deep enough to prevent work hardening by riding on the surface of the material.
- Chip breakers should be employed to assist in ensuring swarf remains clear of the work
- Low thermal conductivity of austenitic alloys results in heat concentrating at the cutting edges. This means coolants and lubricants are necessary and must be used in large quantities.

## Heat Treatment

- F51 cannot be hardened by heat treatment.
- It can however be work hardened.
- Solution treatment or annealing can be done by rapid cooling after heating to around 1100°C.

## Weldability

- F51 has good weldability.
- All standard welding processes can be used.
- It is not quite as easily welded as the austenitic grades but low thermal expansion in F51 reduces distortion and residual stresses after welding.
- The recommended filler material for F51 stainless steel is 2209.



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