

# AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13

## Introduction :

Stainless steel 405 is a ferritic stainless steel with lower corrosion resistance than type 430. For welding grade 405 stainless steel shielded fusion and resistance methods are suggested. Oxyacetylene welding is not acceptable for 405 stainless steel grade. Hardening of this grade is controlled by the use of 405 Cb electrodes that contain columbium. 405 stainless steel, ductility can be maximized by post weld annealing. At 817-871°C grade 405 is soaked and then the temperature is increased to 1038-1121°C. Forging below 816°C is not suggested for this grade. Forging is accompanied by air cooling and finally annealing. By utilization of forming techniques allow grade 405 steel to be easily spun, drawn and formed. Grade 405 stainless steel machinability process is carried out by the usage of standard methods. It is used in annealing boxes, partitions, quenching racks, steam nozzles and for various other fabrications that cannot be annealed after welding.

## Products Available

### in forms :

- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Plates
- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Pipes
- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Round Bar
- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Tube
- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Flanges
- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Wire
- AISI 405, WNR 1.4724, AFNOR Z13C13, DIN X10CrAlSi13 Fittings

## Standard Available

### in forms :

- ASTM A182/ ASME SA182 Stainless Steel Pipe Fittings
- ASTM A213 / ASME SA213 Seamless Stainless Steel Pipes
- ASTM A240/ ASME SA240 Stainless Steels Sheets / Plates
- ASTM A249/ ASME SA249 Stainless Steel Welded Tubes
- ASTM A269/ ASME SA269 Stainless Steel Tubes
- ASTM A270/ ASME SA270 Stainless Steel Sanitary Tubes
- ASTM A312/ ASME SA312 Stainless Steel Pipes
- ASTM A403/ ASME SA403 Stainless Steel Pipe Fittings
- ASTM A554/ ASME SA554 Stainless Steel Welded Tubes
- ASTM A731/ ASME SA731 Stainless Steel Pipes
- ASTM A789/ ASME SA789 Stainless Steel Tubes
- ASTM A790/ ASME SA790 Stainless Steel Pipes
- ASTM A791/ ASME SA791 Stainless Steel Tubes

## Properties

- Corrosion Resistance - Average
- Mechanical Properties - Average
- Forgeability - Good
- Weldability - Limited
- Machinability - Average

## Chemical Composition

	AISI 405	WNR 1.4724	AFNOR Z13C13	DIN X10CrAlSi13
Carbon	0.12 max	0.12 max	0.12 max	0.12 max
Manganese	1.00 max	1.00 max	1.00 max	1.00 max
Phosphorus	0.040 max	0.040 max	0.040 max	0.040 max
Sulfur	0.015 max	0.015 max	0.015 max	0.015 max
Silicon	0.7-1.4	0.7-1.4	0.7-1.4	0.7-1.4
Chromium	12.0-14.0	12.0-14.0	12.0-14.0	12.0-14.0
Aluminum	0.7-1.20	0.7-1.20	0.7-1.20	0.7-1.20

## Mechanical Properties

	AISI 405	WNR 1.4724	AFNOR Z13C13	DIN X10CrAlSi13
Ultimate Tensile Strength, Mpa	450-650	450-650	450-650	450-650
0.2% Offset Yield Strength, Mpa	220 min	220 min	220 min	220 min
Elongation in 2 inches, %	11 min	11 min	11 min	11 min
Reduction in Area, %	-	-	-	-
Hardness, Rockwell B	192 max	192 max	192 max	192 max

## Applications

- High temperature nozzles and jets
- High temperature conveyor systems
- Mechanical engineering
- Furnace engineering, grills
- Chains

## Corrosion Resistance

- 4724 is resistant to oxidising sulphur bearing gases and displays somewhat less, but still good, resistance to sulphur bearing gasses in reducing environments.
- 4724 displays poor resistance to carburising gasses, and is also not resistant to high temperature nitriding, oxygen denuded gasses. This grade of steel is resistant to scaling in air up to temperatures of 850 °C.

## Heat Treatment

- Optimal material properties are realised after annealing by holding in the temperature range 800 °C – 860 °C\*, followed by rapid cooling in air or water.

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## Temperature Properties

- Due to the much poorer high temperature mechanical properties of 4724, compared to the heat resistant austenitic grades, this steel can only be used in applications where the high temperature mechanical requirements are not too great.

## Welding

- 4724 is weldable using all usual welding processes with preheating to a temperature between 200 °C and 300 °C, being recommended.
- Low heat inputs should be used when welding to reduce any possible grain coarsening effects.
- Although post weld heat treatment is not necessary, a stress relief treatment is sometimes performed in the temperature range 750 °C to 800 °C, followed by air cooling, when large differences in cross-section exist and/or when the components have been extensively cold worked.
- 4723, 4820 and 4829 are all suitable for use as filler material when welding 4724.

## Forging

- Forging is usually performed at 1150 °C – 800 °C followed by rapid cooling in air or water.
- Generally, forging is followed by the heat treatment described previously.
- Ferritic stainless steels such as 4724 tend to smear during machining which results in the formation of longer swarf thereby making machining difficult.



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