

# 17-7 PH, WNR 1.4568, UNS S17700, AISI 631, Grade 17-7 PH, AFNOR Z8CNA17.07 - Stainless Steel

## Introduction :

17-7 PH Stainless steel grade is a precipitation hardened stainless steel that provides high strength and hardness, excellent fatigue properties, good formability, good corrosion resistance, and minimum distortion upon heat treatment. And hence for aerospace applications the properties of this alloy are well suited. Stainless steel grade 17-7 PH is suitable for use in fresh water and industrial atmospheres, oxidizing environments and mild chemical. It is recommended that 17-7 PH steel should not be used in salt water or reducing environments. 17-7 PH material machinability is rated at 75 % of B1112. This alloy displays long gummy chips and requires chip breakers on machining. It is suggested that slow speeds and constant feeds whereas machining can offer excellent results. There are three important steps which need to be carried out are austenite conditioning, cooling to transform the austenite to martensite and precipitation hardening to condition TH 1050 or RH 950. Stainless steel 17-7 PH has similar forming characteristics of stainless steel 301. With stainless steel grade 17-7 PH, common arc and resistance methods can be used. To reduce the oxidation of aluminum during the process it is suggested that during fusion welding inert gas shielding should be performed. It is primarily used for applications which require corrosion resistance, good strength, and mechanical properties up to 427°C (800°F) in operation. It is also regularly used for complex parts due to its low distortion in heat treatment.

## Chemical Composition

	17-7 PH	TYPE 17-7 PH	WNR 1.4568	UNS S17700	AISI 631	GRADE 17-7 PH	AFNOR Z8CNA17.07
Carbon	0.090 max	0.090 max	0.090 max	0.090 max	0.090 max	0.090 max	0.090 max
Manganese	1.00 max	1.00 max	1.00 max	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	0.040 max	0.040 max	0.040 max
Sulfur	0.030max	0.030max	0.030max	0.030max	0.030max	0.030max	0.030max
Silicon	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Chromium	16.0-18.0	16.0-18.0	16.0-18.0	16.0-18.0	16.0-18.0	16.0-18.0	16.0-18.0
Nickel	6.50-7.75	6.50-7.75	6.50-7.75	6.50-7.75	6.50-7.75	6.50-7.75	6.50-7.75
Aluminum	0.75-1.50	0.75-1.50	0.75-1.50	0.75-1.50	0.75-1.50	0.75-1.50	0.75-1.50

## Mechanical Properties

	17-7 PH	TYPE 17-7	WNR 1.4568	UNS S17700	AISI 631	GRADE 17-7	AFNOR Z8CNA17.07
Ultimate Tensile Strength	1170Mpa, 170000psi	1170Mpa, 170000psi	1170Mpa, 170000psi	1170Mpa, 170000psi	1170Mpa, 170000psi	1170Mpa, 170000psi	1170Mpa, 170000psi
Yield Strength	965Mpa, 140000psi	965Mpa, 140000psi	965Mpa, 140000psi	965Mpa, 140000psi	965Mpa, 140000psi	965Mpa, 140000psi	965Mpa, 140000psi
Elongation %	6 min	6 min	6 min	6 min	6 min	6 min	6 min

## 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

## Products Available in forms :

- 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Plates
- 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Pipes
- 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Round Bar
- 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Tube
- 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Flanges
- 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Wire

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

• 17-7 PH, WNR 1.4568, UNS S17700, AISI 631 Fittings

## **Fabrication and Heat Treatment Machinability**

- The machinability of grade 17-7 stainless steel is rated as 75 compared to that of B1112 alloy.
- Slow speed and constant feeds are preferred to obtain best results.

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## **Forming**

- Grade 17-7 stainless steel has forming characteristics similar to that of 301 stainless steel.
- Intermediate annealing can be done for radical forming operations.

## **Welding**

- Grade 17-7 stainless steel can be welded using arc and resistance welding techniques.
- Inert gas shielding is preferred during fusion welding in order to reduce oxidation of aluminum.
- It is not necessary to perform pre-heating and post-weld annealing processes.

## **Heat Treatment**

- Solution treated material is heavily cold worked which results in condition C material.
- Condition C material is heated at 482°C (900°F) for 1 h in condition CH900 followed by cooling.
- Solution treated material is heated at 955°C (1750°F) for 10 min after fabrication in condition A1750 followed by rapidly cooling at room temperature.
- Within 1 h of treating to condition A1750, it is cooled at -73°C (-100°F) for 8 h in condition R100. It is then heated at 510°C (950°F) for 90 min in condition RH 950 followed by cooling.
- After fabrication, it is heated at 760°C (1400°F) for 90 min in condition T.
- Within 60 min of cooling, it is then cooled at 13°C (55°F) for 30 min. From condition T, it is heated at 565°C (1050°F) for 90 min in condition TH1050 followed by cooling.

## Cold Working

- Grade 17-7 stainless steel can be easily cold worked using common methods in the condition A.

## Annealing

- Grade 17-7 stainless steel is annealed at 1066°C (1950°F) for 3 min for 0.1 in. (2.5 mm) of thickness followed by air cooling.

## Aging

- Aging of grade 17-7 stainless steel can be done at 1177°C (2150°F) for 4 h followed by cooling.
- This process is followed by heating at 1078°C (1975°F) for 4 h and cooling.
- It is again heated at 844°C (1550°F) for 24 h and cooled, and heated at 760°C (1400°F) for 16 h followed by cooling to complete precipitation hardening process.

## Applications

- Grade 17-7 stainless steel is mostly found in washers and springs.
- It is used in applications which require high strength and corrosion resistance.
- It is also used in intricate parts due its low distortion on heat treatment.



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