

## STAINLESS STEEL PLATE, SHEET & COIL 321 Technical Data

### Summary

321 is a titanium-stabilised version of 304, used in particular applications within the sensitizing temperature range. Its resistance to sensitization, coupled with its higher strength at high temperature makes it suitable in application where 304 will become sensitized, or where 304L has insufficient hot strength. It is not subject to weld decay (intergranular corrosion) when exposed to mildly corrosive environments. However, welded

321 must never be used in highly oxidising environments as it is liable to 'Knife-line' attack.

### Typical Applications

321 is today used almost exclusively for service within the sensitizing temperature range (450-850°C). In welded ambient temperature applications it has been replaced by 304L. Some typical areas of application are:

- Furnace components.
- Superheater and afterburner parts.
- Compensators and expansion bellows.

### Chemical Composition (ASTM A240)

	C	Mn	P	S	Si	Cr	Ni	Ti
Analysis	0.08 max	2.0 max	0.045 max	0.030 max	1.0 max	17.0 - 19.0	9.0 - 12.0	5X%C min 0.5 max
Typical	0.06	1.2	0.020	0.020	0.5	17.5	9.4	0.48

### Typical Properties in the Annealed Condition

The properties quoted in this publication are typical of mill products. Unless otherwise indicated they should not be regarded as guaranteed minimum values for specification purposes.

## 1. Mechanical Properties at Room Temperature

	Typical	Minimum
Tensile Strength, MPa	580	515
Proof Stress (0.2 % offset), MPa	280	205
Elongation (Percent in $L_0 = 5.65 S_0$ )	60	40
Hardness (Brinell)	163	-
Endurance (fatigue) limit, MPa	260	-

## 2. Properties at Elevated Temperatures

### Short Time Elevated Temperature Tensile Strength

Temperature, °C	600	650	700	750	800	850
Tensile Strength, MPa	390	329	280	230	190	140

### Creep data

Stress to develop a creep rate of 1% in the indicated time at the indicated temperature.

Time	Temperature °C	550	600	650	700	800
10 000 h	Stress MPa	180	100	70	40	10
100 000 h	Stress MPa	120	80	50	25	5

### Creep Rupture Stress

Time	Temperature °C	500	600	650	700	800
1 000 h	Stress MPa	270	180	140	70	30
10 000 h	Stress MPa	240	130	90	50	10
100 000 h	Stress MPa	200	90	50	15	5

## Recommended Maximum Service Temperature (Oxidising Conditions)

Continuous Service	950°C
Intermittent Service	870°C

## Thermal Processing

1. Annealing Heat from 1050 to 1150°C and cool in air. This ensures maximum ductility of the steel.
2. Stress Relieving 321 can be stress-relief annealed within the sensitization temperature range 450-800°C without carbide precipitation occurring, thus avoiding the possibility of intergranular corrosion.
3. Hot working  
Initial forging and pressing temperature:- 1150 - 1250°C  
Finishing temperature:- 950°C

*Note: Soaking times to ensure uniformity of temperature are up to 12 times that required for carbon steel. Care must be exercised with this grade, and long soaking times to ensure even distribution of carbides should be employed. The initial reductions must be light to allow dispersion of carbides in the flow pattern during forging.*