Material Data sheet Issue: July 2023

Cold-rolled alloy 718 strips = W.-Nr. 2.4668

1. Application examples

Alloy 718 is a heat treatable nickel alloy that is supplied in a solution heat treated condition and can be hardened by a two stage heat treatment.

This alloy was initially developed for parts in gas turbines, for which there are high demands on fatigue behavior and creep resistance.

In the automotive sector, this material is used for turbochargers and exhaust pipes, in general mechanical engineering also for high-strength screws, springs and fastening elements for very low temperatures (from -260°C) as well as high temperatures up to approx. 700° Celsius.

It has the following properties:
- Good processing properties in the solution-annealed condition
- Good short and long term mechanical properties and high fatigue strength in the hardened state
- good creep strength up to 700 °C
- good oxidation resistance up to approx. 1,000 °C
- Excellent mechanical properties even at low temperatures down to -260° Celsius
- good corrosion resistance
- not magnetizable

Further application examples:
- non-magnetizable springs and spacers
- Washers in space travel
- Pressure membranes in measurement technology, which must be usable over a wide temperature range
- Pump and drill parts in the oil and gas industry, especially at higher temperatures
- Containers for frozen liquids

The material is suitable as a spring material.

Compared to other precipitation hardening alloys, Alloy 718 is also significantly easier to weld and is less susceptible to hardening cracking.
At temperatures up to approx. 700°C, alloy 718 also has a significantly higher tensile strength (>1000 N/mm²) than alloy X750 (approx. 700 N/mm², but this can be used up to approx. 800° Celsius).

2. Material codes

German Norm:	2.4668 NiCr19Fe19Nb5Mo3
AISI:	-
UNS:	N07718
ISO	NiCr19Nb5Mo3
AFNOR	NC19FeNb

3. Alloy Composition *

Ni: 50,0-55,0% (incl. Cobalt)
Co: max. 1,0%
C: <0,08%
Fe: balance
Mn: max. 0,35%
Si: max. 0,35%
Cu: max. 0,30%
Al: 0,20-0,80%
Ti: 0,65-1,15%
Nb: 4,75-5,50% (inkl. Tantalum)
S: max. 0,015%
P: max. 0,015%

* the exact composition of each batch can be documented by a material certificate 2.2 or 3.1 according to DIN EN 10 204.

4. Delivery condition und age hardening

Condition:	solution annealed or annealed
Surface:	bright
Ultimate tensile strength:	800-1000 N/mm² in the solution annealed condition, >1240 N/mm² after the age hardening

In the solution-annealed condition, the precipitation elements (Al, Ti, Nb) are dissolved in the matrix. Hardening is accomplished by a two-stage heat treatment at approximately 620-790°C, first in a preheated furnace at 720°C for 8 hours, followed by furnace cooling to 620°C and holding again for 8 hours. The subsequent cooling to room temperature usually takes place in air.
A special deep freezing is not required.

Further mechanical data: see chapter 7 and 8.

5. Sizes

thicknesses:	0,10 - 0,50 mm
raw material width:	depending on the thicknesses from 270 to 310mm
standard widths:	270-310mm
edges:	cut
Lenghts:	individual lengths from 5 to 10 000mm or as coil

The following sizes are available from stock (without obligation):

thickness	***Tensile strength***	***Annotation***
0,10 0,15 0,20	Solution annealed, 800-1000 N/mm²	305mm 305mm 310mm

0,25 0,40 0,50		310mm 270mm 300mm

without obligation, Issue: July 2023

6. Tolerances

thickness tolerace:	+/- 10 % of the thickness
width tolerance:	DIN EN
straightness:	normal
flatness:	wave height max. 1,0 mm

7. Further mechanical data

Yield strength Rp0,2 :	ca. 800-1000 N/mm² in the solution annealed condition
Elongation A80:	ca. 40-50% in the solution annealed condition

The bending fatigue strength is approximately 260 N/mm² for cold rolled and precipitation hardened plates (see Special Metals Alloy 718 Technical Bulletin, Figure 3 on page 16). A small grain size is important for a high reverse bending strength. Since the flexural fatigue strength depends on various factors such as the environmental conditions and the edge properties, no values can be guaranteed.

The highest application temperature must not exceed 650° Celsius. Please note that Young's modulus values drop as temperature increases.

At higher temperatures of up to around 800 °C, we recommend the use of the X-750 alloy (alloy number 2.4669), which is currently not available from Schwab Metallfolien GmbH&Co.KG.

8. Physical properties

Density:	8,26 g/cm³ at 20 °C
Thermal conductivity:	11,5-28,7 W/(m °C) depending on the temperature
Heat capacity:	460 J/(kg °C) medium value at 50 – 100 °C
Thermal expansion:	14,1 x 10 -6 (between 0 - 100 °C) 14,1x 10 -6 (between 0 - 200 °C) 14,2 x 10 -6 (between 0 - 300 °C)
Electric resistance:	118-134 µOhm x cm depending on the temperature
Modus of elasticity:	200 000 MPa at 20 °C
Poisson ratio:	0,25-0,32 depending on the temperature
Relative permeability µr:	1,0013 in the solution annealed condition, Curie-Temperature -195 °Celsius 1,0011 in the age hardened condition, Curie-Temperature -112 °Celsius

9. Blanking

We recommend a punch-to-die clearance of 4-10 % of the strip thickness.
The corner radius should be at least 0.25 mm and the punching die should be at least twice the strip thickness.
The pieces should then be tumbled to receive a good edge roundness.

10. Laser cutting

This alloy can be laser cut by solid state lasers.

11. Photo etching
This alloy is very easy to etch.

12. Bending
Alloy 718 can be easily bent or deep drawn in the solution annealed condition.
In the case of strong deformations, intermediate annealing should be carried out.

The following minimum bending radius should be observed for the alloy 718 (supplied by h+s in the solution-annealed condition):

Bending (it is not necessary to pay attention to the rolling direction):

	Solution anneled (ca. 800-1000 N/mm²)	Age hardened (ca. 1250 N/mm²)
Up to 1,00 mm > 1,00mm	1 x t 2 x t	Not recommended Not recommended

t = strip thickness

13. Flat grinding
As the alloy 718 is not magnetic and can not be hold by magnetic clamping devices of flat grinding machines.

14. Welding
The material is very easy to weld, the same alloy should be used as filler wire.

15. Corrosion resistance
Alloy 718 has very good resistance to many corrosive media.
For very high requirements, especially at higher temperatures such as in waste incineration plants, however, alloy 625 should be used (which, however, is not precipitation hardenable).

Important Annotation
The specifications which are given in this technical information sheet about the condition and application of the alloys are only for reference and are no confirmation about certain performances and characteristics.
The information correspond to our own experiences and experiences of our suppliers.
We can not guarantee for the results during processing and utilisation.