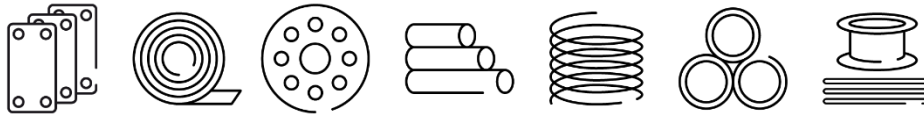


# HASTELLOY® C-4 alloy | NiMo16Cr16Ti | 2.4610

## High Performance Alloys Data Sheet



Zapp is Certified to ISO 9001



### HASTELLOY® C-4 alloy

belongs to the group of highly corrosion-resistant nickel-chromium-molybdenum alloys with good corrosion resistance even at elevated temperatures.

The alloy exhibits good resistance under reducing and oxidizing conditions, e.g. hot, contaminated media such as sulfuric acid, nitric acid, dry chlorine, formic acid, acetic acid, solvents, chlorine and chlorine-containing media.

The material is characterized by a low tendency toward intercrystalline corrosion, stress-crack corrosion and pitting. Its outstanding thermal stability enables problem-free welding, and it is generally used in an as-welded condition.

### Applications

- Environmental engineering: wastewater treatment, e.g. evaporation plants and crystallizers
- Construction components in waste incineration plants and flue gas desulfurization plants, e.g. piping, dampers, absorbers, blowers, agitators and heat exchangers
- Chemical engineering, e.g. heat exchangers, piping, fittings, measurement probes and centrifuges
- Plant equipment for de-acidifiers, e.g. vessels, piping, heat exchangers, gate valves and dampers
- Storage and transport vessels for acids

Further information under:

<https://www.zapp.com/en-us/materials/high-performance-alloys-ni-co-ti>

### Specifications

DIN Designation	NiMo16Cr16Ti
DIN Material Number	2.4610
VdTÜV Datasheet	424
UNS	N06455
DIN	17744, 17750, 17751, 17752
	B 336, B 574, B 575, B 619, B 622, B 626
ASME	SB 366, SB 574, SB 575, SB 619, SB 622, SB 626

### Delivery Forms

Sheet	hot or cold rolled, bright/solution annealed, pickled or de-scaled
Strip	cold rolled, bright/solution annealed, pickled or de-scaled
Pipe	longitudinally welded or seamless, solution annealed, pickled or de-scaled
Bar	hot rolled or forged, solution annealed, pickled or de-scaled
Wire	rolled or drawn, solution annealed, pickled or de-scaled
Forging	heat treated, machined on request
Welding filler metal	welding bar, wire electrode, coated bar electrode

Do you require other delivery forms or finishes? We will be glad to discuss your needs with you over the phone.

### Physical Properties

Melting temperature range	1,335–1,380 [°C]
Density*	8.640 [kg · m <sup>-3</sup> ]
Modulus of elasticity* (approximately)	211 [GPa]
Specific heat*	410 [J · kg <sup>-1</sup> · K <sup>-1</sup> ]
Thermal conductivity*	10.1 [W · m <sup>-1</sup> · K <sup>-1</sup> ]
Coefficient of thermal expansion 20–100°C	10.8 x 10 <sup>-6</sup> [K <sup>-1</sup> ]
Specific electrical resistivity*	1.25 [Ω · mm <sup>2</sup> · m <sup>-1</sup> ]

\* at room temperature

## Processing Instructions

HASTELLOY® C-4 alloy is cold and hot formable. The hot forming temperature is between 1,107 and 954 °C\*. All standard forming techniques can be used. The material tends to work harden.

Solution annealing should be repeated after hot forming in general and after cold forming with degrees of deformation greater than 15 %.

\* This applies especially for products from Haynes International, Inc. We will be glad to answer your questions relative to other suppliers.

## Heat Treatment

Solution annealing: duration depending on thickness of semi-finished product

Cooling: water, compressed air or inert gas

## Welding

The welding of HASTELLOY® C-4 alloy is preferably carried out on like materials using GTAW and GMAW gas metal arc welding processes as well as the fusion arc welding process. The semi-finished products should also be in a stress-free, metallic bright condition and be free of dirt. In order to achieve optimal corrosion resistance, care must be taken to apply a low amount of heat during welding. Preheating or secondary heat treatment is generally unnecessary.

## Welding Filler Metal

	DIN Material No.	DIN Designation	VdTÜV Data Sheet No.	DIN EN ISO	AWS/ASME
Bar (GTAW)				18274	A5.14
	2.4611	SG-NiMo16Cr16Ti	02267	Ni6455	ER NiCrMo-7
	2.4635	SG-NiCr21Mo14W	04536	Ni6057	ER NiCrMo-10
Wire (GMAW)				18274	A5.14
	2.4611	SG-NiMo16Cr16Ti	02666	Ni6455	ER NiCrMo-10
	2.4635	SG-NiCr21Mo14W	04535	Ni6057	ER NiCrMo-10
Coated Rod Elektrode (MMA)				14172	A5.11
	2.4699	EL-NiCr23Mo16Cu	09677	Ni6200	E NiCrMo-10
	2.4638	EL-NiCr21Mo14W	04534	Ni6022	E NiCrMo-10

We will be glad to provide you with information and instructions on machining and processing and on the selection of suitable welding filler metal. Please do not hesitate to call us.

® HASTELLOY is a registered trade mark of our contracted manufacturer HAYNES International, Inc., Kokomo, Indiana, USA.

Depending on the manufacturer the trade designations of products may vary from this given here.

## Zapp Precision Metals GmbH

HIGH PERFORMANCE ALLOYS

Zapp-Platz 1

40880 Ratingen

Phone +49 2102 710-204

Fax +49 2102 710-391

[highperformancealloys@zapp.com](mailto:highperformancealloys@zapp.com)

SERVICE CENTER DEUTSCHLAND

Zapp Precision Metals GmbH

HIGH PERFORMANCE ALLOYS

Hochstraße 32

58425 Unna

[www.zapp.com](http://www.zapp.com)

## Mechanical Properties at Room Temperature

Semi-finished product form	Sheet ≤ 5 mm thickness	Sheet > 5 to ≤ 20 mm thickness	Bar ≤ 160 mm Ø, forging ≤ 90 mm Ø or equivalent area, sheet > 20 to ≤ 65 mm thickness
R <sub>p 0.2</sub> min [MPa]	305	300	280
R <sub>m</sub> [MPa]	700 – 900	700 – 900	700 – 900
A min [%]	40	40	40

## Mechanical Properties at Elevated Temperatures\*

Semi-finished product form	Strength parameter	Temperature °C			
		100	200	300	400
Sheet ≤ 5 mm thickness	R <sub>p 0.2</sub> [MPa]	285	255	245	225
Sheet > 5 to ≤ 20 mm thickness	R <sub>p 0.2</sub> [MPa]	270	245	220	205
Bar ≤ 160 mm Ø, forging ≤ 90 mm Ø or equivalent area	R <sub>p 0.2</sub> [MPa]	260	235	215	205

\* minimum values

For further information about our products and locations, please refer to our image brochure or consult our website at [www.zapp.com](http://www.zapp.com).

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