

Nickel-Based Alloy Investment Cast

Cast Nickel-Based Alloys

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Technical Data: Cast Nickel-Based Alloy

Product Description

Investment casting of nickel-based alloys, such as Inconel and Monel, offers exceptional properties crucial in various industries. These alloys boast outstanding corrosion resistance, making them ideal for applications in challenging environments, particularly in the aerospace and energy sectors. Additionally, their high-temperature strength and creep resistance ensure their suitability in gas turbine components and petrochemical processing equipment, where extreme conditions are commonplace.

Nickel-based alloys play a pivotal role in precision parts in consumer electronics due to their remarkable dimensional stability. In the lighting solutions industry, their resistance to oxidation and thermal expansion properties make them indispensable for lamp components.

Inconel 718 (UNS N07718)

Inconel 625 (UNS N06625)

Monel 400 (UNS N04400)

Hastelloy C-276 (UNS N10276)

Nimonic Alloys (e.g., Nimonic 75 and Nimonic 90)

Waspaloy (UNS N07001)



Chemical Comparison of Cast Stainless Steel

Alloy Name	Ni (%)	Cr (%)	Mo (%)	Nb (%)	Fe (%)	Al (%)	Ti (%)	Cu (%)	Co (%)
Inconel 718	53	19	3.05	5.13	18.5	0.9	0.5	-	-
Inconel 625	58	21.5	9	3.8	5	0.4	0.4	-	-
Monel 400	63	-	-	-	-	-	-	31.5	-
Hastelloy C-276	57	15	16	-	5.5	-	-	-	2.5
Nimonic 75	80	19	-	-	-	-	1	-	-
Nimonic 90	53	19	-	-	-	1.3	2.4	-	15
Waspaloy	50	19	7	-	1.4	-	2.5	-	10

Physical and Mechanical

Grade	Tensile Strength	Yield Strength	Hardness	Shear Strength	Impact Strength	Fatigue Strength	Thermal Conductivity	Density	Melting Range
	(MPa)	(MPa)	(Brinell)	(MPa)	(J)	(MPa)	(W/m·K)	(g/cm ³)	(°C)
Inconel 718	965	758	363	550	145	440	11.4	8.19	1260-1336
Inconel 625	827	414	185	513	100	350	8.44	8.44	1290-1350
Monel 400	586	241	75	350	-	-	21.8	8.8	1300-1350
Hastelloy C-276	690	283	240	415	-	-	9.09	8.89	1300-1350
Waspaloy	1180	1035	341	690	-	-	11.7	8.19	1320-1395

Note

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Typical Properties

Inconel 718 (UNS N07718) Investment Castings

Inconel 718 (UNS N07718) investment castings are renowned for their exceptional properties and versatility. Comprising primarily of nickel, chromium, molybdenum, niobium, and tantalum, these castings offer a unique combination of attributes. Notably, Inconel 718 exhibits remarkably high tensile strength retention even at elevated temperatures, with the ability to maintain its structural integrity up to a scorching 1300°F (704°C).

In the aerospace industry, Inconel 718 investment castings shine, finding extensive use in components for jet engines and gas turbines. Their high strength and resilience to extreme temperatures make them pivotal in ensuring aircraft and turbine performance. Additionally, Inconel 718 plays a crucial role in applications within the energy sector, providing durability and reliability in high-temperature environments.



Inconel 625 (UNS N06625) Investment Castings

Inconel 625 (UNS N06625) investment castings are highly sought after due to their exceptional attributes and diverse applications. This alloy, primarily composed of nickel, chromium, and molybdenum, enriched with niobium, boasts remarkable corrosion resistance, particularly in aggressive environments. This quality positions Inconel 625 as a material of choice in chemical processing, marine, and aerospace industries.

One of its standout features is a high tensile strength, approximately 130 ksi, which makes it an ideal candidate for applications where structural integrity and durability are paramount. In the chemical processing industry, Inconel 625 investment castings are favored for their ability to withstand corrosive chemicals and high-temperature conditions, ensuring the longevity of critical equipment. Furthermore, its use in the marine industry is prevalent, combining saltwater's corrosion resistance. In aerospace, Inconel 625's exceptional strength and corrosion resistance make it indispensable in various components, reinforcing its reputation as a reliable and high-performance material for investment castings.



Nimonic alloys Investment Castings

Nimonic alloys, such as Nimonic 75 and Nimonic 90, are highly sought-after materials for investment castings due to their remarkable properties and versatile applications. These alloys comprise nickel, chromium, iron, and other alloying elements. What sets Nimonic alloys apart is their exceptional high-temperature strength and resistance to creep, making them ideal for demanding applications.

In investment castings, Nimonic alloys shine as they maintain their mechanical properties even under extreme conditions, including temperatures exceeding 1000°C. These attributes are particularly crucial in the aerospace and automotive industries, where Nimonic 90, with its superior properties, is used for critical components. In the aerospace sector, it finds applications in high-stress parts like turbine blades, while in the automotive industry, it contributes to enhancing engine performance and reliability. Nimonic 75, on the other hand, proves invaluable in gas turbine components.



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Typical Properties

Monel 400 (UNS N04400) Investment Castings



Monel 400 (UNS N04400) investment castings offer a remarkable combination of features that make them highly sought after in various industries. This alloy, predominantly composed of nickel and copper with small amounts of iron and other elements, exhibits exceptional resistance to corrosive environments, making it a standout choice for critical applications. In addition to its remarkable corrosion resistance, Monel 400 maintains its mechanical properties even at sub-zero temperatures, ensuring reliable performance in challenging conditions. In investment castings, Monel 400 finds its niche in the marine, chemical processing, and aerospace industries. Its resistance to corrosion, especially in seawater, positions it as an ideal material for marine components like propeller shafts and valve bodies. Monel 400's corrosion-resistant chemical processing equipment properties contribute to various components' longevity and efficiency, from pumps to heat exchangers. Furthermore, its ability to withstand sub-zero temperatures makes it an excellent choice in aerospace applications, where precise mechanical performance is crucial.

Hastelloy C-276 (UNS N10276) Investment Castings

Hastelloy C-276 (UNS N10276) alloy investment castings are renowned for their exceptional features and diverse applications. This alloy, composed primarily of nickel, molybdenum, and chromium, with shallow carbon content, offers unparalleled corrosion resistance in aggressive environments, making it a prime choice for critical applications. Its resistance extends to pitting, stress-corrosion cracking, and crevice corrosion, ensuring long-term reliability in challenging conditions. Hastelloy C-276 investment castings find their niche in chemical processing and pollution control industries. This alloy's resistance to a wide range of oxidizing and reducing corrosive agents is invaluable in chemical processing equipment. It's commonly employed in constructing components like reactors, heat exchangers, and piping systems. Additionally, within pollution control equipment, where exposure to aggressive chemicals and gases is prevalent, Hastelloy C-276 investment castings excel, providing robust solutions for scrubbers, fans, and ducting. This alloy's ability to withstand the harshest environments makes it a top choice for critical applications where corrosion resistance is paramount.



Waspaloy (UNS N07001) Investment Castings



Waspaloy (UNS N07001) investment castings are renowned for their exceptional properties and find critical applications in high-temperature environments. This nickel-based superalloy, consisting of nickel, cobalt, chromium, and molybdenum, offers a unique combination of features that make it indispensable in various industries. Notably, Waspaloy exhibits outstanding creep and fatigue resistance, a key attribute differentiating it from other materials.

In applications demanding extreme heat tolerance, Waspaloy truly shines. It can maintain its mechanical properties even at staggering temperatures of up to 1600°F (871°C), making it a prime choice for aerospace components and gas turbine engines. Within the aerospace industry, Waspaloy investment castings are employed in critical parts such as turbine disks and blades, where high precision and reliability are paramount. Its exceptional resistance to creep and fatigue ensures prolonged component life, enhancing aerospace systems' overall safety and efficiency. In the realm of gas turbine engines, Waspaloy's ability to withstand extreme temperatures plays a pivotal role in maintaining engine performance, making it an indispensable material in this domain.

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