IN100™

alloy is a nickel-based superalloy strengthened by γ'-Ni_3Al precipitation. Vacuum cast is the method to process IN100 alloy. Its high percentage of aluminum and titanium leads to superior rupture strength through 1050°C and also has an advantage on density basis. The alloy's nickel base in conjunction with a high content of cobalt reduces the stacking fault energy of the face-centered cubic matrix and thus exhibits good high-temperature stability. The nominal chemical composition of the alloy is listed in Table.1. IN100 alloy is designed for applications that require withstanding high loading under elevated temperature for extended periods of time.

The alloy has been successfully utilized in turbine blades, vanes, and nozzles with complex shapes. It is also used as a die material for isothermal forging of titanium alloys and nickel-based superalloys.

TCA is able to provide near-shape IN100 investment castings from the customer's CAD file with material requirements in accordance with the AMS 5397 specification.

Table.1 - Composition (wt.%)

Element	Nominal
Carbon	0.17
Manganese	<0.10
Silicon	<0.10
Phosphorus	<0.015
Sulfur	<0.015
Chromium	9.50
Cobalt	15.00
Molybdenum	3.00
Titanium	4.75
Aluminum	5.50
Boron	0.015
Vanadium	0.95
Zirconium	0.06
Iron	<1.00
Nickel	Bal.

*Conforms to the AMS 5397 specification

Physical Properties

Basic physical constants of IN100 alloy are listed in Table. 2. The values from the table will vary slightly due to the changing composition from each heat.

Table. 2 – Physical Constants

Density		7.75 g/cm^3
Melting range		
	°F	2318 - 2439
	°C	1270 - 1337

Linear Thermal Expansion Coefficient	10^{-6}/℃
RT - 427°C	11.6
RT - 871°C	13.5
RT - 1093°C	15.4

The tensile test methods are in accordance with the ASTM E8/E8M specification. The data of IN100 tensile properties is listed in Table.3 and the temperature dependence of tensile properties is shown in Fig. 1.

Mechanical Properties

The outstanding characteristic of IN100 alloy is its excellent high-temperature mechanical properties including tensile and Stress-rupture properties. The mechanical data contained in the current publication is tested with as-cast IN100 alloy.

Tensile Properties

IN100 possesses high tensile and yield strength at room temperature and exhibits its peak strength at around 800℃.

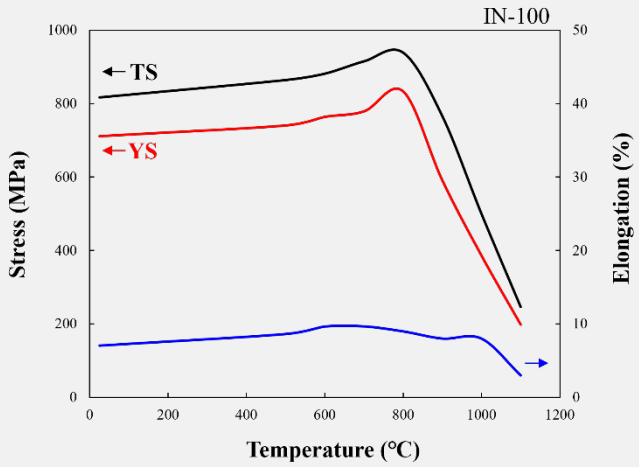

Fig. 1 The temperature dependence of Inconel IN-100 tensile properties

Table. 3 – Tensile properties of as-cast IN100 alloy

測試溫度 Temperature ℃	測試溫度 Temperature ℉	抗拉強度 Tensile strength MPa	降伏強度 Yield strength MPa	延伸率 Elongation %
25	77	816	711	7.0
500	932	864	740	8.6
600	1112	881	763	9.6
700	1292	915	778	9.6
800	1472	938	833	9.0
900	1652	765	590	8.0
1000	1832	499	386	8.0
1100	2012	246	198	3.0

Stress-rupture Properties

The Stress-rupture performance of the IN100 alloy is verified based on the AMS 5397 specification, which requires that specimens, maintained at 1800 °F ± 3 (982 °C ± 2) while a load sufficient to produce an initial axial stress of 29.0 ksi (200 MPa) or higher is applied continuously, shall not rupture in less than 23 hours.

The test shall be continued to rupture without change of load. Elongation after rupture, measured at room temperature, shall be not less than 4% in 4D. The Stress-rupture tests were conducted in accordance with the ASTM E139 specification. The data of IN-100 stress-rupture properties was shown in Fig. 2

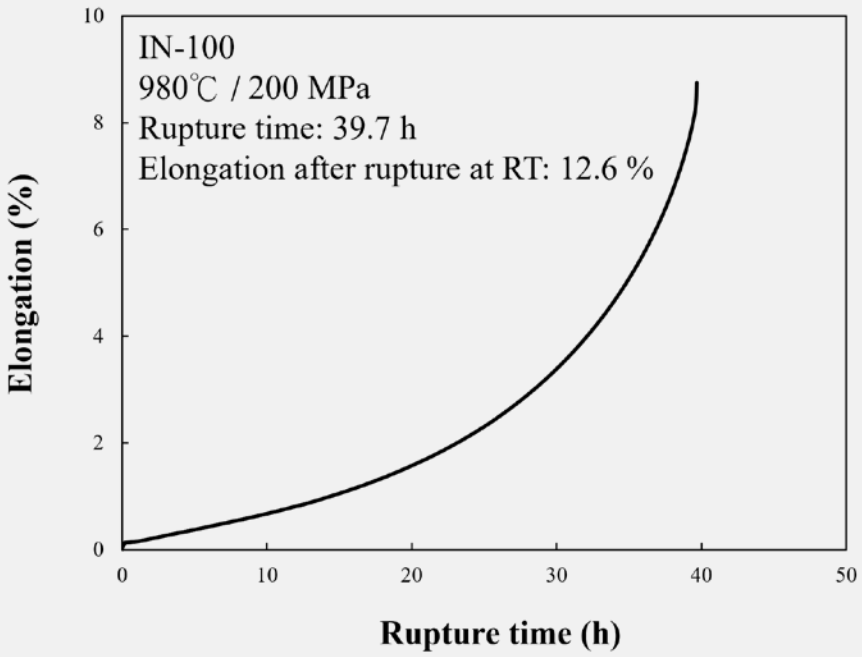

Fig. 2 Stress-rupture curve of as-cast Inconel IN-100

TCA

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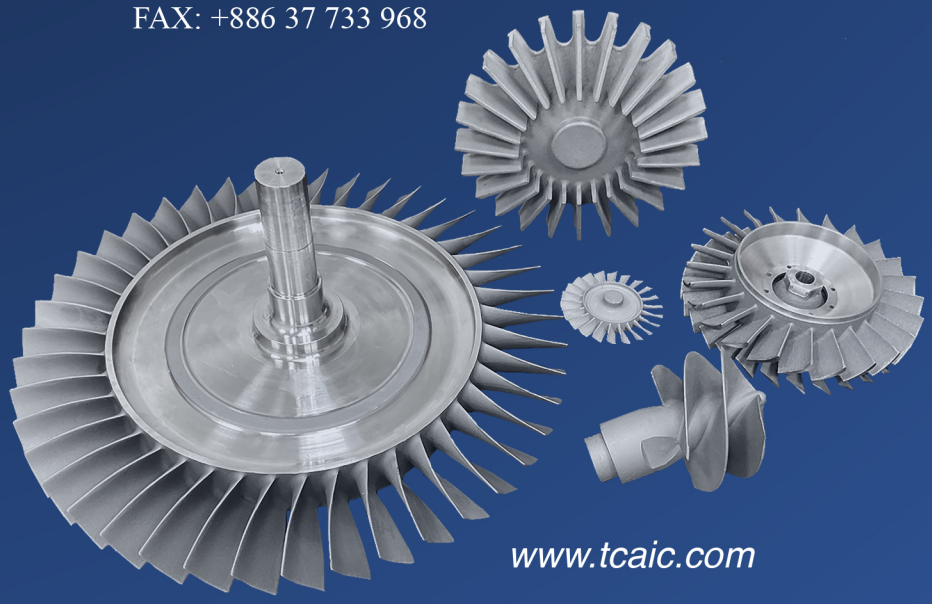

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