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SUPERALLOY SN253044 SPECIFICATIONS

1. Overview

SN253044 is a solid solution strengthened nickel base alloy, with plastic and moderate heat resistance high at 900 ℃, and has excellent oxidation resistance and good welding, stamping process performance, suitable for manufacturing in aviation engine below 900 ℃ long-term work of the main combustion chamber and the combustion chamber components as well as augmented heat shield, guide vane, the supply of varieties of sheet, strip, wire, bar and ring etc.

1.1.Material Grade

SN253044

1.2.Similar grades

ХН60ВТ，ЭИ868，ВЖ98 (Russia)

1.3.Technical Standard material

GB/T 14992-2005 - Classification and designation for superalloys and high temp. intermetallic materials
GB/T 14995-2010 - Hot-rolled superalloy sheets
GB/T 14996-2010 - Cold-rolled heat-resisting superalloy sheets
GB/T 15062-2008 - Superalloy tube for general application
GJB 3165-1998 - hot-rolled and forged heat-resisting superalloy bars for aviation load-bearing parts
GJB 3318-1998 - Specification for cold-rolled strips of heat-resisting superalloy for aviation

1.4.Chemical composition

C	Cr	Ni	W	Mo	Al	Ti	No more than				
							Fe	Mn	Si	P	S
≤0.10	23.5~26.5	Rest	13.0~16.0	≤1.50	≤0.50	0.30~0.70	4.0	0.50	0.80	0.013	0.013

1.5.Heat Treatment

State	Solution treatment
Hot/Cold rolled sheet & strip	1120℃~1160℃, air-cooled
Cold drawn tube	1120℃~1210℃, air-cooled

1.6.Product Form

These alloys available in bar, sheet, strip, pipe & ring blanks.

1.7.Melting and casting process

Alloys using electric arc furnace, Non-vacuum induction furnace or vacuum induction furnace + ESR or vacuum arc remelting process of melting.

1.8.Applications

Aerospace material, nuclear power facility, petroleum industry and extrusion die. High-temperature force bearing part of aircraft engine like turbine disc, compressor disk, rotor blade and fastener etc

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2. Physical Properties

2.1.Thermal Performance

2.1.1. Melting Temperature – 1352~1375℃.

2.1.2. Thermal Conductivity

℃	100	200	300	400	500	600	700	800	900	950
λ [W/(m·℃)]	11.7	13.0	14.2	15.9	17.2	18.4	19.7	21.8	24.7	25.1

2.1.3. Specific heat capacity

℃	100	200	300	400	500	600	700	800	900	1000
Cp [J/(kg·℃)	440	461	482	503	524	545	545	566	587	629

2.1.4. Coefficient of linear expansion

°C	20~100	20~200	20~300	20~400	20~500	20~600	20~700	20~800	20~9 00	20~1000
α [10^{-6}·°C^{-1}]	12.5	12.35	12.85	13.10	13.31	13.50	14.30	14.90	15.60	16.28

2.2.Density – ρ = 8.89 g/cm^3

2.3.Magnetic – Non magnetic alloy

3. Mechanical Properties

3.1.Performance of technical standards

Standard	State	Tensile Properties						Hardness [HBW]
		θ/℃	σ_b/ MPa	$\sigma_{0.2}$/ MPa	δ_5/%	φ/%	Impact	
GB/T 14995	Hot-rolled sheet	20	735	---	40	---	---	
		900	185	---	30	---	---	
GB/T 14996	Cold-rolled sheet	20	735	---	40	---	---	
		900	195	---	30	---	---	
GB/T 15062	Cold drawn tube	20	685	---	30	---	---	
GJB 3165	Hot-rolled & forged bars	20	685	---	40	45	---	285
		900	195	---	30	40	---	
GJB 3318	Cold-rolled strip	20	735	---	40		---	

3.2.Durability and creep properties

3.2.1. Durability properties

Material	θ/℃	σ/MPa	Time [hours]
Cold rolled plate	800	100	86

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3.2.2. High temperature creep properties

Material	θ/℃	σ/MPa	Time [hours]	δ_5/%
Cold rolled plate	700	83	100	0.2

3.2.3. Fatigue performance

Material	θ/℃	σ/MPa	N [no. of times]
Cold rolled plate	700	294	>10E7

3.3.Elastic properties

3.3.1. Modulus of elasticity

Tensile [E], compression [E_C] & dynamic [E_D] modulus of elasticity of sheet metal at different temperatures.

℃	20	100	200	300	400	500	600	700	800	900	1000
E [GPA]	203	---	---	---	178	---	---	157	128	100	---
E_C [GPA]	203	---	---	---	173	---	---	136	126	---	---
E_D [GPA]	210	206	200	196	189	183	177	170	161	153	142

3.4.2. Poisson's ratio – ν = 0.290

4. Process performance and requirements

4.1.Formability

4.1.1. Ingot forging heating temperature 1170 ± 10 ℃, terminal temperature not lower than 900 ℃. Slab rolling heating temperature 1190 ± 10 ℃, sheet hot rolling heating temperature 1130 ± 10 ℃, final rolling temperature not lower than 800°C; cold rolling of sheet the total reduction rate is about 30%.

4.1.2. Sheet stamping process with good performance. Limit supply of cold rolled sheet deep drawing coefficient for K limit =2.06.

4.2.Weldability

The alloy has good welding performance, can be welded with argon arc welding, spot welding, seam welding and brazing method. Argon arc weld pool of liquidity is poor, but the crack tendency is low. Contact welding core is easy to form the binding line to extend and shrink hole, the general use of the larger electrode and lower welding speed.