Nickel Alloys

HX

HX nickel is a nickel-chromium-iron-alloy important for high-temperature applications in corrosive environments for a number of industries. In a corrosive environment, this alloy can be used up to 1177 °C for static components, while creep strength is given up to 850 °C.

Chemical Composition (nominal) %

Element / Material[1]	Ni	Cr	Co	Mo	Fe	W	C	Mn	P	S	Si
HX 10-45 µm	Bal.	20.50 - 23.00	0.50 - 2.50	8.00 - 10.00	17.00 - 20.00	0.20 - 1.00	0.05 - 0.15	1.00	0.04	0.03	1.00

Mechanical Data[2]	Formula Symbol and Unit	As-Built[3]
Tensile strength	R_m [MPa]	720
Offset yield strength	$R_{p0,2}$ [MPa]	545
Elogation at break	A [%]	17
Reduction of area	Z [%]	20
Young's modulus	E [GPa]	155
Vickers hardness	HV10	240
Roughness average	Ra [µm]	10
Mean roughness depth	Rz [µm]	55

Material Characteristics

- High strength
- Good ductility
- Excellent oxidation resistance at high temperatures
- High creep strength up to 850 °C

Typical Application Areas

- Turbine engine components
- Furnace assemblies
- Energy applications

IN625

IN625 is a precipitation-hardenable nickel-chromium alloy containing significant amounts of iron, niobium, and molybdenum. It combines high corrosion resistance and strength with outstanding weldability and resistance to postweld cracking. This alloy has excellent creep-rupture strength at temperatures to 700 °C.

Chemical Composition (nominal) %

Element / Material[1]	Ni	Cr	Mo	Nb	Fe	Co	Si	Mn	Ti	Al	C	S	P
IN625 10-45 µm	Bal.	20.00 - 23.00	8.00 - 10.00	3.15 - 4.15	5.00	1.00	0.50	0.50	0.40	0.40	0.10[3]	0.015	0.015

Mechanical Data[2]	Formula Symbol and Unit	As-Built[3]	Heat Treated[3]
Tensile strength	R_m [MPa]	25	1020
Offset yield strength	$R_{p0,2}$ [MPa]	665	665
Elongation at break	A [%]	31	38
Reduction of area	Z [%]	45	41
Young's modulus	E [GPa]	175	185
Vickers hardness	HV10	280	290
Roughness average	Ra [µm]	10	-
Mean roughness depth	Rz [µm]	40	-

Material Characteristics

- High strength
- Good ductility
- Excellent creep-rupture strength below 700 °C
- Excellent corrosion resistance

Typical Application Areas

- Aircraft engine components
- Energy applications
- Turbine parts

1 Maximum values, unless stated otherwise as a range
2 Process conditions and parameters according to SLM Solutions' standards
3 Rounded mean values of identified layer thicknesses and different orientations (elongations at break are not rounded)

Further information and data can be found in our material data sheets.

IN718

IN718 is a precipitation-hardenable nickel-chromium alloy combining good corrosion resistance at low and high temperatures up to 100+0 °C. The alloy shows outstanding weldability including resistance to postweld cracking. Furthermore, the material has excellent tensile, fatigue, creep and rupture strength at temperatures up to 700 °C.

Chemical Composition (nominal) %

Element / Material[1]	Ni	Cr	Fe	Ta + Nb	Mo	Ti	Al	Cu	C	Si , Mn	B	Co	P, S
IN718 10-45 µm	50.00 - 55.00	17.00 - 21.00	Bal	4.75 - 5.50	2.80 - 3.30	0.65 - 1.15	0.20 - 0.80	0.30	0.08	0.35 each	0.006	1.00	0.015 each

Mechanical Data[2]	Formula Symbol and Unit	As-Built[3]	Heat Treated
Tensile strength	R_m [MPa]	1025	1440
Offset yield strength	$R_{p0,2}$ [MPa]	680	1240
Elongation at break	A [%]	31	12
Reduction of area	Z [%]	35	20
Young's modulus	E [GPa]	170	200
Vickers hardness	HV10	300	465
Impact energy	[J]	75	25
Roughness average	Ra [µm]	5	-
Mean roughness depth	Rz [µm]	50	-

Material Characteristics

- High strength
- Good ductility
- Excellent mechanical properties up to 700 °C
- Excellent oxidation resistance

Typical Application Areas

- Aircraft engine components
- Rocket parts
- High-temperature environments
- Energy applications

IN939

IN939 is a highly heat- and corrosion resistant nickel based alloy. It can be used at temperatures up to 700 °C, making it ideally suited for aerospace technologies and turbine production. Nickel-based alloys exhibit good mechanical characteristic values such as high tensile- and good endurance strength.

Chemical Composition (nominal) %

Element / Material[1]	Ni	Cr	Co	Ti	W	Al	Ta	Nb	Mn	Si	C	Zr
IN939 10-45 µm	Bal.	22.00 - 23.00	18.00 - 20.00	3.00 - 4.50	1.00 - 3.00	1.00 - 3.00	1.00 - 1.80	0.50 - 1.50	0.50	0.50	0.15	0.10

Mechanical Data[2]	Formula Symbol and Unit	As-Built[3]	Heat Treated	+ HIP
Tensile strength	R_m [MPa]	970	1245	1350
Offset yield strength	$R_{p0,2}$ [MPa]	685	750	955
Elongation at break	A [%]	26	13	11
Reduction of area	Z [%]	35	10	10
Young's modulus	E [GPa]	165	200	195
Vickers hardness	HV10	305	-	-
Roughness average	Ra [µm]	5	-	-
Mean roughness depth	Rz [µm]	45	-	-

Material Characteristics

- High strength
- Good ductility
- Excellent high temperature mechanical properties
- Excellent corrosion resistance

Typical Application Areas

- Aerospace
- Turbine components
- Toolmaking

1 Maximum values, unless stated otherwise as a range
2 Process conditions and parameters according to SLM Solutions' standards
3 Rounded mean values of identified layer thicknesses and different orientations (elongations at break are not rounded)

Further information and data can be found in our material data sheets.