Na stranách 1-2 tohoto dokumentu naleznete základní popis a specifikace slitin HAYNES/HASTELLOY odolávajících vysokým teplotám a charakteristiku jejich složení. Na straně 3 se nachází grafické srovnání korozních odolností jednotlivých slitin v různých pracovních prostředích. Na stranách 4-6 uvádíme v grafech a tabulkách srovnání mechanických a fyzikálních vlastností materiálů firmy HAYNES s ostatními vybranými Ni slitinami a nerez ocelí.

Descriptions of High-Temperature Alloys

HASTELLOY® B alloy N10001	67Ni-28Mo-5Fe-0.3V-2.5Co*-1Cr*-1Mn*-1Si*-0.5Cu*-0.05C* Material used in older gas turbines and rocket engines. Good strength at temperatures up to about 2000°F (1095°C), but limited to low temperatures by lack of oxidation resistance.
HASTELLOY® S alloy N06635	67Ni-16Cr-15Mo-0.5Mn-0.4Si-0.25Al-0.02La-3Fe*-2Co*-1W*-0.02C*-0.015B* Excellent thermal stability, good thermal fatigue resistance, good oxidation-resistance and relatively low expansion characteristics. Used in low-stress gas turbine parts. Excellent dissimilar filler metal.
HASTELLOY® W alloy N10004	63Ni-24Mo-6Fe-5Cr-2.5Co*-1Mn*-1Si*-0.6V*-0.12C* Excellent for welding dissimilar high-temperature alloys. Used extensively in aircraft engine repair and maintenance.
HASTELLOY® X alloy N06002	47Ni-22Cr-18Fe-9Mo-1.5Co-0.6W-0.10C-1Mn*-1Si*-0.008B* Very good balance of strength, oxidation-resistance and fabricability. Widely used material for aircraft, marine and industrial gas turbine engine combustors and fabricated parts.
HAYNES® 25 alloy R30605	51Co-20Cr-15W-10Ni-1.5Mn-0.10C-3Fe*-0.4Si* Excellent strength, good oxidation resistance to 1800°F (980°C), very good sulfidation resistance and relatively good resistance to wear and galling. Used in gas turbine parts, bearings and various industrial applications.
HAYNES® R-41 alloy N07041	52Ni-19Cr-11Co-10Mo-3.1Ti-1.5Al-0.09C-0.006B-5Fe*-0.5Si*-0.1Mn* Age-hardenable alloy with excellent strength in the 1000-1650°F (540-900°C) temperature range. Used for critical gas turbine engine components.
HAYNES® 75 alloy N06075	76Ni-20Cr-5Fe-0.4Ti-0.11C-1Mn*-1Si*-0.5Cu* Basic heat-resistant alloy used in low-stress gas turbine and industrial applications.
HAYNES® HR-120® alloy N08120	33Fe-37Ni-25Cr-0.7Mn-0.7Cb-0.6Si-0.2N-0.1Al-0.05C-0.004B-3Co*-2.5Mo*-2.5W* Economical high-strength alloy with good resistance to industrial environments. Designed for use in heat treating fixture and industrial heating applications as an upgrade from 330 alloy, 800H alloy and stainless steels. Excellent carburization and sulfidation resistance.
HAYNES® HR-160® alloy N12160	37Ni-29Co-28Cr-2.75Si-2Fe-0.5Mn-0.05C Outstanding resistance to sulfidation and other high-temperature aggressive environments. Used in waste incineration, boiler, high-temperature reaction vessel, rotary calciner applications and thermocouple shielding.
HAYNES® 188 alloy R30188	39Co-22Ni-22Cr-14W-0.35Si-0.10C-0.03La-3Fe*-1.25Mn* Excellent strength with superior oxidation resistance and thermal stability compared to HAYNES® 25 alloy . Good sulfidation resistance. Used extensively in demanding military and civil aircraft gas turbine engine combustors and other key components.
HAYNES® 214® alloy N07214	75Ni-16Cr-4.5Al-3Fe-0.05C-0.01Y-0.5Mn*-0.2Si*-0.1Zr-*0.01B* Outstanding oxidation resistance to 2300°F (1260°C), excellent resistance to carburization, and excellent resistance to chlorine-bearing environments. Used in demanding industrial heating applications and specialized gas turbine parts, such as honeycomb seals.
HAYNES® 230® alloy N06230	57Ni-22Cr-14W-2Mo-0.5Mn-0.4Si-0.3Al-0.10C-0.02La-5Co*-3Fe*-0.015B* Best balance of strength, thermal stability, oxidation resistance,thermal cycling resistance and fabricability of any major high-temperature alloy. Used in gas turbine combustors and other key stationary components. Also used for heat treating and industrial heating applications, chemical/petrochemical process industry and fossil energy plants. For welding, use 230-W® filler wire.
HAYNES® 242® alloy N10242	65Ni-25Mo-8Cr-2.5Co*-2Fe*-0.8Mn*-0.8Si*-0.5Al*-0.5Cu*-0.03C*-0.006B* Age-hardenable alloy with excellent strength to 1300°F (705°C), low thermal expansion characteristics, good oxidation resistance to 1500°F (815°C) and excellent fabricability. Also has excellent resistance to high-temperature fluorine and fluoride-bearing environments. Used in gas turbine seal rings, containment structures and high-strength fasteners. Also used in fluoropolymer plastics production and chemical processing industry applications.
HAYNES® 263 alloy N07263	52Ni-20Co-20Cr-6Mo-0.06C-2.4Ti*-0.7Fe*-0.6Mn*-0.6Al*-0.4Si*-0.2Cu* Age-hardenable alloy with excellent strength in the 1000-1400°F (540-760°C) temperature range and excellent forming and welding characteristics.
HAYNES® 282® alloy	57Ni-19.5Cr-10Co-8.5Mo-2.1Ti-1.5Al-1.5*Fe-0.3*Mn-0.15*Si-0.06C-0.005B Unique age-hardenable superalloy which combines exceptional high-temperature properties to 1650°F (900°C) with good weldability and fabricability. Used in aerospace and industrial gas turbine combustion path parts.
HAYNES® 556® alloy R30556	31Fe-22Cr-20Ni-18Co-3Mo-2.5W-1Mn-0.6Ta-0.4Si-0.2N-0.2Al-0.1C-0.02Zr-0.02La High-strength alloy with broad spectrum of resistance to high-temperature corrosive environments. Used in waste incineration, heat-treating, calcining, chemical processing, galvanizing, refinery, boiler and gas turbine components of various types. Excellent fabricability and excellent as a dissimilar filler metal for welding nickel or cobalt alloys to iron-base alloys.
HAYNES® 617 alloy N06617	54Ni-22Cr-12.5Co-9Mo-1Al-0.3Ti-0.07C Widely used in gas turbines for combustion cans, ducting and transitions.
HAYNES® 625 alloy N06625	62Ni-21Cr-9Mo-3.7(Cb+Ta)-5Fe*-1Co*-0.5Si*-0.5Mn*-0.4Al*-0.4Ti*-0.10C* Widely used in various aerospace, chemical process and industrial heating components.
HAYNES® 625SQ® alloy N06626	62Ni-21Cr-9Mo-3.7(Cb+Ta)-5Fe*-1Co*-0.15Si*-0.5*Mn-0.4Al*-0.4Ti*0.03C*-0.02N* Widely used in the aerospace industry.
HAYNES® 718 alloy N07718	52Ni-19Fe-18Cr-5(Cb+Ta)-3Mo-0.9Ti-0.5Al-0.05C-0.009B-1Co*-0.35Mn*-0.35Si*-0.1Cu* Age-hardenable alloy with excellent strength to 1200°F (650°C). Used extensively in gas turbine components.
HAYNES® X-750 alloy N07750	70Ni-16Cr-8Fe-2.5Ti-1(Cb+Ta)-0.8Al-1Co*-0.5Cu*-0.35Mn*-0.35Si*-0.08C* Age-hardenable alloy with good strength to 1500°F (815°C).
MULTIMET® alloy R30155	30Fe-21Cr-20Ni-20Co-3Mo-2.5W-1.5Mn-1(Cb+Ta)-0.15N-0.12C-1Si* Predecessor of 556® alloy, used extensively in older aircraft gas turbines.

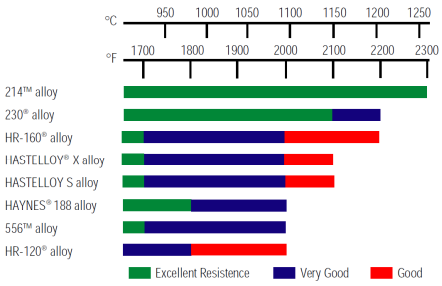
Specifikace HAYNES/HASTELLOY slitin odolávajících vysokým teplotám

Applicable Specifications of High-Temperature Alloys

Alloy	Sheet, Plate & Strip	Billet Rod/Bar	Coated Electrodes	Bare Welding Rods	Seamless Pipe & Tube	Welded Pipe & Tube	Fittings	Forgings
HASTELLOY® B alloy N10001	SB 333/B 333	SB 335/B 335	SFA 5.11 (ENiMo-1) A 5.11 (ENiMo-1)	SFA 5.14 (ERNiMo-1) A 5.14 (ERNiMo-1)				
HASTELLOY® S alloy N06635	AMS 5873	AMS 5711		AMS 5838				AMS 5711
HASTELLOY® W alloy N10004		AMS 5755	SFA 5.11 (EnIMo-3) A 5.11 (ENiMo-3) AMS 5787	SFA 5.14 (ERNiMo-3) A 5.14 (ERNiMo-3) AMS 5786				
HASTELLOY® X alloy N06002 (W86002)	AMS 5536 SB 435/B 435	AMS 5754 SB 572/B 572 B 472	SFA 5.11 (ENiCrMo-2) A 5.11 (ENiCrMo-2)	SFA 5.14 (ERNiCrMo-2) A 5.14 (ERNiCrMo-2) AMS 5798	SB 622/B 622	AMS 5588 SB 619/B 619 SB 626/B 626	SB 366/B 366	AMS 5754
HAYNES® 25 alloy R30605	AMS 5537	AMS 5759 MIL-C-24252D	AMS 5797	AMS 5796				AMS 5759
HAYNES® R-41 alloy N07041	AMS 5545	AMS 5712		AMS 5800				AMS 5712
HAYNES® 75 alloy								
HAYNES® HR-120® alloy N08120	AMS 5916 SB 409/B 409	SB 408/B 408 B 472			SB 407/B 407 SB 163/B 163	SB 514/B 514 SB 515/B 515	SB 366/B 366	SB 564/ B 564
HAYNES® HR-160® alloy N12160	SB 435/B 435	SB 572/B 572 B 472		SFA 5.14 (ERNiCoCrSi-1) A 5.14 (ERNiCoCrSi-1)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366	SB 564/ B 564
HAYNES® 188 alloy R30188	AMS 5608	AMS 5772		AMS 5801				AMS 5772
HAYNES® 214® alloy N07214								
HAYNES® 230® alloy N06230 **HAYNES® 230-W® alloy** N06231 (W86231)	AMS 5878 SB 435/B 435	AMS 5891 SB 572/B 572 B 472	SFA 5.11 (ENiCrWMo-1) A 5.11 (ENiCrWMo-1)	SFA 5.14 (ERNiCrWMo-1) A 5.14 (ERNiCrWMo-1) AMS 5839	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366	AMS 5891 SB 564/ B 564
HAYNES® 242® alloy N10242	SB 434/B 434	SB 573/B 573 B 472		SFA 5.14 (ERNiMo-12) A 5.14 (ERNiMo-12)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366	SB 564/ B 564
HAYNES® 263 alloy N07263	AMS 5872	AMS 5886		AMS 5966				AMS 5886
HAYNES® 556® alloy R30556	AMS 5874 SB 435/B 435	AMS 5877 SB 572/B 572 B 472		SFA 5.9 (ER3556) A 5.9 (ER3556) AMS 5831	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366	AMS 5877
HAYNES® 617 alloy N06617 (W86117)	AMS 5888 AMS 5889 SB 168/B 168	SB 166/B 166 B 472 AMS 5887	SFA 5.11 (ENiCrCoMo-1) A 5.11 (ENiCrCoMo-1)	SFA 5.14 (ERNiCrCoMo-1) A 5.14 (ERNiCrCoMo-1)	SB 167/B 167			SB 564/ B 564
HAYNES® 625 alloy N06625 (W86112)	AMS 5599 SB 443/B 443 AMS 5869	AMS 5666 SB 446/B 446 B 472	SFA 5.11 (ENiCrMo-3) A 5.11 (ENiCrMo-3)	SFA 5.14 (ERNiCrMo-3) A 5.14 (ERNICrMo-3) AMS 5837	AMS 5581 SB 444/B 444	AMS 5581 SB 704/B 704 SB 705/B 705	SB 366/B 366	AMS 5666 SB 564/ B 564
HAYNES® 625SQ® alloy N06626								ASME Code Case No. 2276
HAYNES® 718 alloy N07718	AMS 5596 AMS 5597	AMS 5662 AMS 5663 AMS 5664 SB 637/B 637		A 5.14 (ERNiFeCr-2) AMS 5832	AMS 5589 AMS 5590			AMS 5662 AMS 5663 AMS 5664 SB 637/B 637
HAYNES® X-750 alloy N07750	AMS 5542 AMS 5598	AMS 5667 AMS 5668 AMS 5670 AMS 5671 AMS 5747		AMS 5699				AMS 5667 AMS 5668 AMS 5670 AMS 5671 AMS 5747 SB 637/B 637
MULTIMET® alloy R30155 (W73155)	AMS 5532	AMS 5768 AMS 5769	AMS 5795	AMS 5794 MIL-R-5031 B Class 9				AMS 5768 AMS 5769

Srovnání korozních odolností jednotlivých slitin v různých pracovních prostředích

ALLOYS FOR OXIDIZING ENVIRONMENTS



ALLOYS FOR SULFUR-BEARING ENVIRONMENTS

EXCELLENT RESISTANCE:
- HR-160 alloy

VERY GOOD RESISTANCE:
- HAYNES 188 alloy
- 556 alloy
- HR-120 alloy

GOOD RESISTANCE:
- HASTELLOY X alloy
- 230 alloy

ALLOYS FOR CARBURIZING ENVIRONMENTS

EXCELLENT RESISTANCE:
- 214 alloy

VERY GOOD RESISTANCE:
- HR-120 alloy
- HR-160 alloy
- 556 alloy
- 230 alloy

GOOD RESISTANCE:
- HASTELLOY X alloy
- HAYNES 188 alloy
- HASTELLOY S alloy

ALLOYS FOR NITRIDING ENVIRONMENTS

EXCELLENT RESISTANCE:
- 230® alloy
- 214™ alloy
- 242™ alloy

VERY GOOD RESISTANCE:
- HR-160® alloy
- HASTELLOY® S alloy
- HAYNES® 188 alloy

GOOD RESISTANCE:
- HASTELLOY X alloy

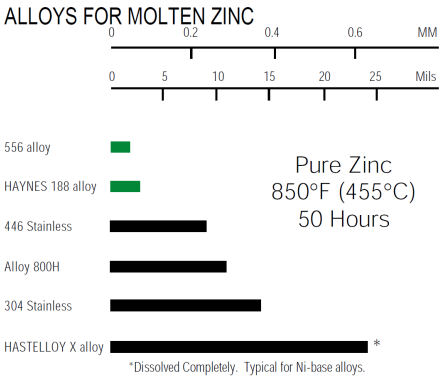
ALLOYS FOR MOLTEN CHLORIDE SALTS

EXCELLENT RESISTANCE:
- HAYNES 188 alloy
- 242 alloy

VERY GOOD RESISTANCE:
- HR-160 alloy
- HASTELLOY S alloy
- 556 alloy

GOOD RESISTANCE:
- HASTELLOY X alloy
- 214 alloy

ALLOYS FOR MOLTEN ZINC



ALLOYS FOR OXIDIZING, CHLORINE-BEARING ENVIRONMENTS

EXCELLENT RESISTANCE:
- 214™ alloy
- HR-160® alloy
- 556™ alloy

VERY GOOD RESISTANCE:
- HASTELLOY® X alloy

GOOD RESISTANCE:
- HR-120® alloy

ALLOYS FOR REDUCING, CHLORINE-BEARING ENVIRONMENTS

EXCELLENT RESISTANCE:
- 242™ alloy
- HASTELLOY S alloy

VERY GOOD RESISTANCE:
- 214 alloy
- HR-160 alloy

GOOD RESISTANCE:
- HASTELLOY X alloy
- 556 alloy
- HR-120 alloy

ALLOYS FOR REDUCING, FLUORINE-BEARING ENVIRONMENTS

EXCELLENT RESISTANCE:
- 242 alloy

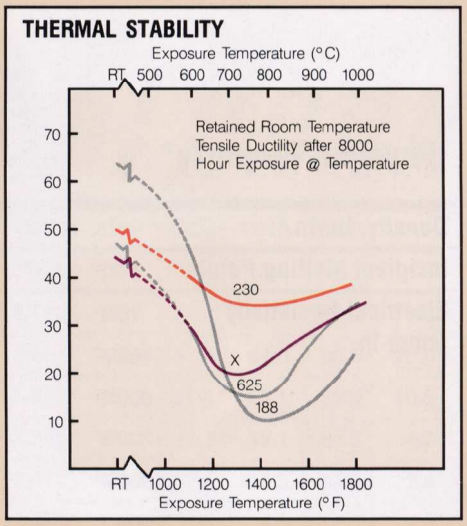
VERY GOOD RESISTANCE:
- HASTELLOY S alloy
- HASTELLOY N alloy

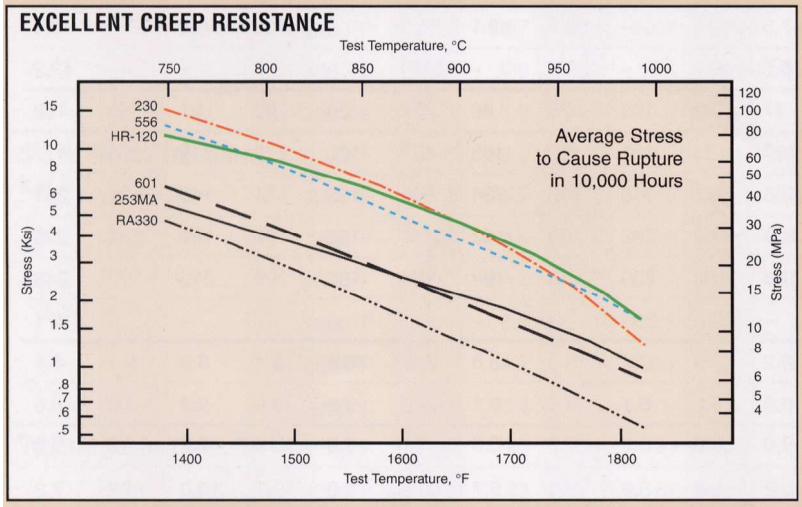
GOOD RESISTANCE:
- HR-160 alloy
- 230® alloy

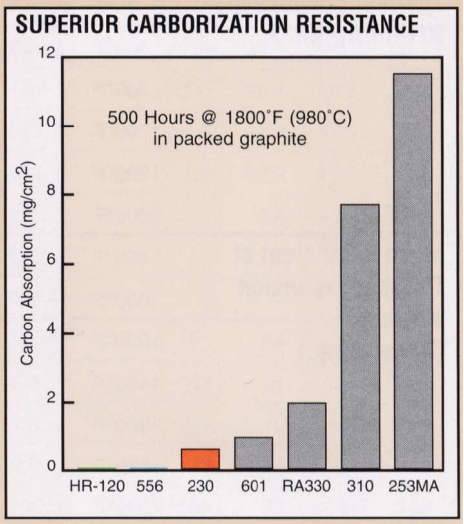
UNSURPASSED HIGH-TEMPERATURE PROPERTIES

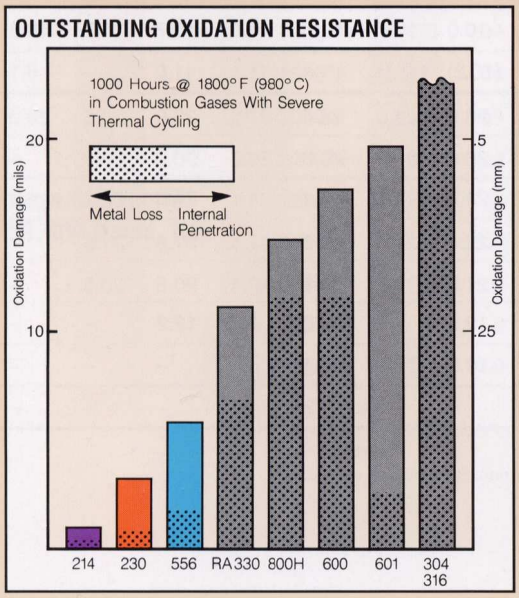
HAYNES high-temperature alloys are developments of the company's world-renowned laboratories located in Kokomo, Indiana. Alloys, such as MULTIMET® alloy, HASTELLOY® X alloy and HAYNES® 188 alloy have been leaders in the aerospace and aircraft engine field during the entire latter half of the twentieth century. The data on the following pages document the unsurpassed high-temperature properties of our latest alloys.

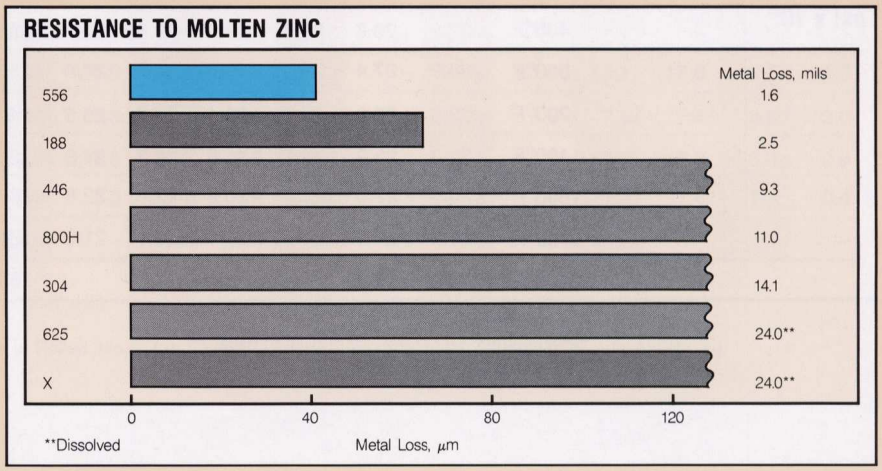
The accompanying charts demonstrate the outstanding heat-resistance of HR-120™ alloy, 214™ alloy, 230™ alloy, 556™ alloy and X alloy. Individual booklets are available to give you a complete properties profile.











Srovnání fyzikálních vlastností slitin HAYNES s ostatními vybranými Ni slitinami a nerez ocelí

Physical Property*		HAYNES® HR-120 alloy	HAYNES® 214 alloy	HAYNES® 230 alloy	HAYNES® 556 alloy	HASTELLOY® X alloy	Alloy 600	Alloy 601	RA330® alloy	253MA® alloy	Alloy 800H	Type 304 Stainless	Type 310 Stainless	Type 316 Stainless	Type 446 Stainless
Density, lb./in.³		.291	.291	.324	.297	.297	.304	.291	.289	.282	.287	.287	.285	.287	.274
Incipient Melting Point	°F	2375	2475	2345	2425	2300	2470	2375	2450	2500	2475	2550	2550	2500	2600
Electrical Resistivity μohm-in.	70°F	41.4	53.5	49.2	37.5	45.2	40.6	46.9	39.9	33.1	38.9	28.7	38.2	29.4	22.8
	400°F	44.4	53.9	49.8	40.5	46.7	41.5	48.2	43.0	40.6	43.0	34.6	41.7	34.5	31.5
	800°F	46.3	54.3	50.7	43.5	48.4	43.0	49.2	45.6	48.8	46.1	40.6	45.7	39.3	39.4
	1200°F	48.2	53.5	51.6	45.7	49.5	–	49.5	47.8	54.3	–	45.7	48.4	43.7	45.3
	1600°F	49.4	49.6	50.3	47.3	49.8	–	50.2	49.1	56.3	–	47.2	50.8	–	48.4
	2000°F	50.3	47.6	(48.4)	48.6	49.7	–	51.1	–	(57.5)	–	–	–	–	49.2
Thermal Conductivity BTU-in./ft.²-hr.°F	70°F	78	83	62	77	63	103	78	86	101	80	99	91	90	158
	400°F	96	99	87	107	83	121	100	108	121	103	116	112	108	177
	800°F	121	132	118	135	121	145	126	134	140	127	141	145	132	201
	1200°F	150	175	148	160	152	172	153	162	156	152	167	182	152	226
	1600°F	180	215	179	185	182	200	178	198	184	181	192	213	172	248
	2000°F	205	(210)	210	–	(230)	203	–	–	–	–	–	–	–	271
Mean Coefficient of Thermal Expansion μin./in.-°F (RT to Temp.)	400°F	8.3	7.4	7.2	8.2	7.9	7.7	8.0	8.6	9.3	8.8	9.1	8.9	9.1	6.1
	800°F	8.8	7.9	7.6	8.6	8.2	8.1	8.3	9.1	9.8	9.2	9.6	9.2	9.8	6.8
	1200°F	9.2	8.6	8.1	9.0	8.6	8.6	8.9	8.6	10.1	9.6	10.2	9.7	10.3	7.3
	1400°F	9.5	9.0	8.3	9.2	8.8	8.9	9.2	9.7	10.3	9.9	10.7	10.0	10.4	7.3
	1600°F	9.7	9.6	8.6	9.4	9.0	9.1	9.5	9.8	10.5	10.2	10.8	10.4	10.5	7.7
	1800°F	9.9	10.2	8.9	9.5	9.2	9.3	9.8	10.0	10.8	(10.5)	11.0	10.7	10.7	8.3
	2000°F	(10.1)	11.1	(9.2)	906	(9.4)	(.5)	10.2	(10.2)	(11.1)	–	11.4	11.0	–	9.1
Modulus of Elasticity psi x 10⁶	70°F	28.6	31.6	30.6	29.7	29.8	31.1	30.0	28.5	29.0	28.4	27.9	29.0	28.5	29.0
	400°F	27.2	29.6	29.3	28.2	28.6	29.7	28.5	26.9	26.8	26.6	26.6	26.9	26.9	–
	800°F	24.9	27.4	27.3	25.6	26.7	27.8	26.6	24.9	24.4	24.4	24.1	24.3	24.2	–
	1200°F	22.5	25.3	25.3	23.1	24.7	25.5	24.1	22.4	21.7	22.3	21.1	21.8	21.5	
	1400°F	21.3	23.9	24.1	21.8	23.3	24.3	22.5	21.0	20.2	21.1	19.4	20.5	20.0	–
	1600°F	20.0	22.3	23.1	20.9	22.2	22.8	20.5	19.5	–	20.0	–	19.2	–	–
	1800°F	18.8	20.2	21.9	20.1	20.4	21.0	18.4	18.0	17.6	18.7	–	–	–	–
	2000°F	–	19.0	–	–	–	–	16.2	–	–	17.2	–	–	–	–

( ) Estimated
*Manufacturer's laboratory or published data

Srovnání mechanických vlastností slitin HAYNES s ostatními vybranými Ni slitinami a nerez ocelí

Mechanical Property*		HAYNES® HR-120 alloy	HAYNES® 214 alloy	HAYNES® 230 alloy	HAYNES® 556 alloy	HASTELLOY® X alloy	Alloy 600	Alloy 601	RA330® alloy	253MA® alloy	Alloy 800H	Type 304 Stainless	Type 310 Stainless	Type 316 Stainless	Type 446 Stainless
Annealing Temperature	°F	2200	2000	2250	2150	2150	2050	2100	2050	2000	2100	2000	2150	2000	–
Typical ASTM Grain Size		2-4	3-5	5-6	5-6	5-6	2-4	2-4	4-6	3-6	2-4	2-5	3-4	5-7	4-6
Ultimate Tensile Strength, Ksi	70°F	106.5	138.9	125.4	116.4	107.5	96.0	102.0	85.0	104.0	82.0	85.0	82.7	103.9	78.6
	1200°F	73.0	114.9	97.7	83.1	78.5	65.0	74.0	55.7	64.6	59.0	43.0	54.0	60.5	20.9
	1400°F	64.1	97.4	87.7	68.5	66.6	38.0	43.0	34.0	49.8	39.0	27.6	35.1	39.0	10.5
	1600°F	47.5	66.4	63.1	49.3	49.6	20.0	22.0	18.7	30.8	21.0	17.5	19.1	24.6	4.7
	1800°F	27.9	16.7	35.2	30..7	31.1	11.0	13.0	10.7	–	11.0	**7.4	10.5	14.0	2.8
	2000°F	15.1	9.0	19.5	16.1	16.5	(5.1)	6.5	–	–	5.0	–	4.3	7.1	1.5
	2200°F	4.9	5.0	9.4	–	–	–	**5.2	–	–	–	–	–	–	–
0.2% Yield Strength, Ksi	70°F	45.6	82.2	57.4	54.6	49.4	41.0	35.0	42.0	50.8	35.0	27.9	35.1	36.7	50.7
	1200°F	24.9	75.9	39.5	30.6	30.3	30.0	25.4	21.5	24.1	16.9	11.0	20.7	20.5	14.2
	1400°F	25.4	73.6	42.5	29.3	31.0	26.0	26.8	18.8	22.4	18.5	10.5	19.3	17.9	5.6
	1600°F	27.0	50.4	37.3	27.9	28.4	11.0	19.2	15.9	18.1	18.5	7.4	12.2	10.6	1.0
	1800°F	19.4	8.4	21.1	18.5	17.9	6.0	10.9	9.0	–	8.1	–	6.4	–	–
	2000°F	9.1	4.2	10.8	8.7	9.1	(3.1)	5.1	–	–	3.3	–	3.1	–	–
	2200°F	3.9	1.4	4.3	–	–	–	**2.0	–	–	–	–	–	–	–
Tensile Elongation, %	70°F	50	43	50	51	53	45	50	45	51	49	61	54	59	32
	1200°F	60	33	55	57	64	49	46	51	44	38	37	21	40	63
	1400°F	50	23	53	53	58	70	72	65	44	43	31	19	49	179
	1600°F	51	34	65	59	75	80	90	69	–	87	35	28	59	156
	1800°F	81	86	83	84	95	115	100	74	–	100	**38	24	41	155
	2000°F	89	89	83	95	98	(120)	120	–	–	108	–	–	85	–
	2200°F	89	92	109	–	–	–	121	–	–	–	–	–	–	–
Stress to Rupture in 1,000 Hours, Ksi	1200°F	33.0	–	42.5	38.0	34.0	20.0	28.0	–	23.0	23.8	14.1	17.0	20.5	5.0
	1400°F	15.3	25.0	20.0	17.5	15.0	8.1	9.8	7.0	9.2	9.8	7.4	7.4	8.8	2.0
	1600°F	7.7	8.9	9.5	7.5	6.0	3.5	4.4	3.1	4.4	4.8	3.0	3.3	3.4	0.9
	1800°F	3.0	1.8	3.0	3.0	2.4	1.8	2.2	1.3	1.9	1.9	1.2	1.4	1.3	0.4
	2000°F	**1.0	0.9	**1.0	–	**0.8	(0.9)	1.0	0.7	1.0	–	–	–	–	–

( ) Estimated
*Manufacturer's laboratory or published data
**Limited data
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