

*Stress-rupture strengths for selected polycrystalline nickel-base superalloys*

Alloy	Rupture stress					
	At 815°C (1500°F)		At 870°C (1600°F)		At 980°C (1800°F)	
	100 h MPa (ksi)	1000 h MPa (ksi)	100 h MPa (ksi)	1000 h MPa (ksi)	100 h MPa (ksi)	1000 h MPa (ksi)
IN-713 LC	425 (62)	325 (47)	295 (43)	240 (35)	140 (20)	105 (15)
IN-713 C	370 (54)	305 (44)	305 (44)	215 (31)	130 (19)	70 (10)
IN-738 C	470 (68)	345 (50)	330 (48)	235 (34)	130 (19)	90 (13)
IN-738 LC	430 (62))	315 (46)	295 (43)	215 (31)	140 (20)	90 (13)
IN-100	455 (66)	365 (53)	360 (52)	260 (38)	160 (23)	90 (13)
MAR-M 247 (MM 0011)	585 (85)	415 (60)	455 (66)	290 (42)	185 (27)	125 (18)
MAR-M 246	525 (76)	435 (62)	440 (63)	290 (42)	195 (28)	125 (18)
MAR-M 246 Hf (MM 006)	530 (77)	425 (62)	425 (62)	285 (41)	205 (30)	130 (19)
MAR-M 200	495 (72)	415 (60)	385 (56)	295 (43)	170 (25)	125 (18)
MAR-M 200 Hf (MM 009))	—	—	—	305 (44)	—	125 (18)
B-1900	510 (74)	380 (55)	385 (56)	250 (36)	180 (26)	110 (16)
René 77	—	—	310 (45)	215 (31.5)	130 (19)	62 (9.0)
René 80	—	—	350 (51)	240 (35)	160 (23)	105 (15)
IN-625	130 (19)	110 (16)	97 (14)	76 (11)	34 (5)	28 (4)
IN-162	505 (73)	370 (54)	340 (49)	255 (37)	165 (24)	110 (16)
IN-731	505 (73)	365 (53)	—	—	165 (24)	105 (15)
IN-792	515 (75)	380 (55)	365 (53)	260 (38)	165 (24)	105 (15)
M-22	515 (75)	385 (56)	395 (57)	285 (41)	200 (29)	130 (19)
MAR-M 421	450 (65)	305 (44)	310 (46)	215 (31)	125 (18)	83 (12)
MAR-M 432	435 (63)	330 (48)	295 (40)	215 (31)	140 (20)	97 (14)
MC-102	195 (28)	145 (21)	145 (21)	105 (15)	—	—
Nimocast 90	160 (23)	110 (17)	125 (18)	83 (12)	—	—
Nimocast 242	110 (16)	83 (12)	90 (13)	59 (8.6)	45 (6.5)	—
Udimet 500	330 (48)	240 (35)	230 (33)	165 (24)	90 (13)	—
Udimet 710	420 (61)	325 (47)	305 (44)	215 (31)	150 (22)	76 (11)
CMSX-2	—	—	—	345 (50)	—	170 (25)
GMR-235	—	—	—	180 (26)	—	75 (11)
IN-939	—	—	—	195 (28)	—	60 (9)
MM 002)	—	—	—	305 (44)	—	125 (18)
IN-713 Hf (MM 004)	—	—	—	205 (30)	—	90 (13)
René 125 Hf (MM 005)	—	—	—	305 (44)	—	115 (17)
SEL-15	—	—	—	295 (43)	—	75 (11)
UDM 56	—	—	—	270 (39)	—	125 (18)

## Waspaloy

Solution Treatment (+ Aged*)	Stress Rupture					
	1350°F (732°C)/75 ksi (517 MPa)			1500°F (816°C)/47.5 ksi (327.5 MPa)		
	Life (Hrs)	% Elongation	% Reduction of Area	Life (Hrs)	% Elongation	% Reduction of Area
1850 °F (1010 °C)/ 4 hrs/O.Q.	35.3	32.8	42.2	5.6	39.4	62.6
1875 °F (1024 °C)/ 4 hrs/O.Q.	56.1	11.0	17.2	8.2	36.1	54.6
1900 °F (1038 °C)/ 4 hrs/O.Q.	131.7	13.2	13.2	46.5	30.0	30.9
1925 °F (1051 °C)/ 4 hrs/O.Q.	125.6	8.7	17.4	38.9	19.2	26.6
1950 °F (1066 °C)/ 4 hrs/O.Q.	92.7	10.3	13.2	43.6	22.7	26.1
1975 °F (1079 °C)/ 3 hrs/O.Q.	91.3	5.3	12.0	52.4	19.4	23.3

\* Aging: 1550 °F (843 °C)/4 hrs/A.C. + 1400 °F (760 °C)/16 hrs/A.C.

Yield strength and elongation of wrought superalloys\*\*

Alloy*	UNS No.	Yield strength at 0.2 % offset										Tensile elongation, %				
		MPa at 21°C (70°F)	ksi at 21°C (70°F)	MPa at 540°C (1000°F)	ksi at 540°C (1000°F)	MPa at 650°C (1200°F)	ksi at 650°C (1200°F)	MPa at 760°C (1400°F)	ksi at 760°C (1400°F)	MPa at 870°C (1600°F)	ksi at 870°C (1600°F)	At 21°C (70°F)	At 540°C (1000°F)	At 650°C (1200°F)	At 760°C (1400°F)	At 870°C (1600°F)
Nickel base																
Astroloy	N13017	1050	152	965	140	965	140	910	132	690	100	16	16	18	21	25
D-979	N09979	1005	146	925	134	980	129	655	95	305	44	15	15	21	17	18
Hastelloy C-22 (S)	N26022	405	59	275	40	250	36	240	35	—	—	57	61	65	63	—
Hastelloy G-30 (S)	N06030	315	46	170	25	—	—	—	—	—	—	64	75	—	—	—
Hastelloy S	N06635	455	65	340	49	320	47	310	45	220	32	49	50	57	70	47
Hastelloy X (S)	N06002	360	52	290	42	275	40	260	38	180	26	43	45	37	37	50
Haynes 230 (a)	N06230	390	57	275	40	270	39	285	41	225	32	48	56	55	46	59
Inconel 587	none	705	102	620	90	615	89	605	88	400	58	28	22	21	20	16
Inconel 597	none	760	110	720	104	675	98	665	96	—	—	15	15	15	16	—
Inconel 600	N06600	285	41	220	32	205	30	180	26	40	6	45	41	49	70	80
Inconel 601 (S)	N06601	455	66	350	51	310	45	220	32	55	8	40	34	33	78	128
Inconel 617	N06617	295	43	200	29	170	25	180	26	195	28	70	68	75	84	118
Inconel 617 (S)	N06617	345	50	230	33	220	32	230	33	205	30	55	62	61	59	73
Inconel 625	N06625	490	71	415	60	420	61	415	60	275	40	50	50	34	45	125
Inconel 706	N09706	1005	146	910	132	860	125	660	96	—	—	20	19	24	32	—
Inconel 718	N07718	1185	172	1065	154	1020	148	740	107	330	48	21	18	19	25	88
Inconel 718 Direct Age	none	1365	198	1180	171	1090	158	—	—	—	—	16	15	23	—	—
Inconel 718 Super	none	1105	160	1020	148	960	139	—	—	—	—	16	18	14	—	—
Inconel X750	N07750	815	118	725	105	710	103	—	—	—	—	27	26	10	—	—
M-252	N07252	840	122	765	111	745	108	720	104	485	70	16	15	11	10	18
Nimonic 75	N06075	285	41	200	29	200	29	160	23	90	13	40	40	46	67	68
Nimonic 80A	N07080	620	90	530	77	550	80	505	73	260	38	39	37	21	17	30
Nimonic 90	N07090	810	117	725	105	685	99	540	78	260	38	33	28	14	12	23
Nimonic 105	none	830	120	775	112	765	111	740	107	490	71	16	22	24	25	27
Nimonic 115	none	865	125	795	115	815	118	800	116	550	80	27	18	23	24	16
Nimonic 263 (S)	N07263	580	84	485	70	485	70	460	67	180	26	39	42	27	21	25
Nimonic 942	none	1060	154	970	141	1000	145	860	125	—	—	—	—	—	—	—
Nimonic PE.11	none	720	105	690	100	670	97	560	81	—	—	—	—	—	—	—
Nimonic PE.16	none	530	77	485	70	485	70	370	54	140	20	37	26	30	42	80
Nimonic PK.33 (S)	none	780	113	725	105	725	105	670	97	420	61	30	30	26	18	24
Pyromet 860	none	835	121	840	122	890	123	835	121	—	—	22	15	17	18	—
René 41	N07041	1060	154	1020	147	1000	145	940	136	550	80	14	14	14	11	19
René 95	none	1310	190	1255	182	1220	177	1100	160	—	—	15	12	14	15	—
Udimet 400	none	930	135	830	120	—	—	—	—	—	—	30	26	—	—	—
Udimet 500	N07500	840	122	795	115	760	110	730	106	495	72	32	28	28	39	20
Udimet 520	none	860	125	825	120	795	115	725	105	520	75	21	20	17	15	20
Udimet 630	none	1310	190	1170	170	1105	160	860	125	—	—	15	15	7	5	—
Udimet 700	none	965	140	895	130	855	124	825	120	635	92	17	16	16	20	27
Udimet 710	none	910	132	850	123	860	125	815	118	635	92	7	10	15	25	29
Udimet 720	none	1195	173	—	—	1130	164	1050	152	—	—	13	—	17	9	—
Unitemp AF2-IDA6	none	1015	147	1040	151	1020	148	995	144	—	—	20	19	18	16	—
Waspaloy	N07001	795	115	725	105	690	100	675	98	520	75	25	23	34	28	35
Iron base																
A-286	S66286	725	105	605	88	605	88	430	62	—	—	25	19	13	19	—
Alloy 901	N09901	895	130	780	113	760	110	635	92	—	—	14	14	13	19	—
Discaloy	S66220	730	106	650	94	630	91	430	62	—	—	19	16	19	—	—
Haynes 556 (S)	R30556	410	60	240	35	225	33	220	32	195	29	48	54	52	49	53
Incoloy 800	N08800	250	36	180	26	180	26	150	22	—	—	44	38	51	83	—
Incoloy 801	N08801	385	56	310	45	305	44	290	42	—	—	30	28	26	55	—
Incoloy 802	N08802	290	42	195	28	200	29	200	29	150	22	44	39	25	15	38
Incoloy 807	none	380	55	255	37	240	35	225	32.5	185	26.5	48	40	35	34	71

Continued

*Yield strength and elongation of superalloys (continued)*

Alloy	UNS No.	Yield strength at 0.2 % offset								Tensile elongation, %						
		MPa at 21°C (70°F)	ksi at 21°C (70°F)	MPa at 540°C (1000°F)	ksi at 540°C (1000°F)	MPa at 650°C (1200°F)	ksi at 650°C (1200°F)	MPa at 760°C (1400°F)	ksi at 760°C (1400°F)	MPa at 870°C (1600°F)	ksi at 870°C (1600°F)	At 21°C (70°F)	At 540°C (1000°F)	At 650°C (1200°F)	At 760°C (1400°F)	At 870°C (1600°F)
Iron base, continued																
Incoloy 825(b)	N08825	310	45	~234	~34	~220	~32	180	~26	~105	~15	45	~44	~35	~86	~100
Incoloy 903	N19903	1105	160	—	—	895	130	—	—	—	—	14	—	18	—	—
Incoloy 907(c)	none	~1110	~161	~960	~139	~895	~130	~565	~82	—	—	~12	~11	~10	~20	—
Incoloy 909	none	1020	148	945	137	870	126	540	78	—	—	16	14	24	34	—
N-155	R30155	400	58	340	49	295	43	250	36	175	25	40	33	32	32	33
V-57	none	830	120	760	110	745	108	485	70	—	—	26	19	22	34	—
19-9 DL	S63198	570	83	395	57	360	52	—	—	—	—	43	30	30	—	—
16-25-6	none	770	112	—	—	517	75	345	50	255	37	23	—	12	11	9
Cobalt base																
AirResist 213	none	625	91	—	—	425	66	385	56	220	32	14	—	28	47	55
Elgiloy(d) (S)	R30003	480(b) ~2000 (d)	70-290	—	—	—	—	—	—	—	—	34	—	—	—	—
Haynes 188 (S)	R30188	485	70	305	44	305	44	290	42	260	38	56	70	61	43	73
L-605 (S)	R30605	460	67	250	36	240	35	260	38	240	35	64	59	35	12	35
MAR-M 918 (S)	none	895	130	—	—	—	—	—	—	—	—	48	—	—	—	—
MP30N	R30035	1620	235	—	—	—	—	—	—	—	—	10	—	—	—	—
MP159	R30159	1825	265	1495	217	1415	205	—	—	—	—	8	8	7	—	—
Stellite 6B (S)	R30016	635	92	—	—	—	—	—	—	270	39	11	—	—	—	18
Haynes 150	none	317	46	—	—	160	23	—	—	—	—	8	—	—	—	—

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