

Manauurite[®] XTM



MANOIR
A PARALLOY GROUP COMPANY

CHEMICAL COMPOSITION

Element	Minimum	Maximum
C	0.40	0.45
Mn	-	1.50
Si	1.2	2.0
Ni	43.0	48.0
Cr	35.0	37.0
Mo	-	0.50
Nb	0.50	1.0
Ti, Zr	Add	Add

PHYSICAL PROPERTIES

Specific gravity 8.02 kg/dm³ (0.29 pound/in³)

Thermal conductivity at 20°C (68°F) 10.5 W/m.°C (6.07 BTU/h.ft.°F)

at 1 036°C (1 897°F) 31W/m.°C (17.9 BTU/h.ft.°F)

Modulus of elasticity				
°C	°F	Kg/mm ²	MPa	ksi
20	68	18.630	182 800	26 500
100	212	18.350	180 000	26 100
200	392	17.930	175 900	25 510
300	572	17.390	170 600	24 710
400	752	16.930	166 100	24 080
500	932	16.340	160 300	23 240
600	1 112	15.740	154 400	22 390
700	1 292	14.850	145 700	21 120
800	1 472	14.420	141 500	20 510
900	1 652	13.540	132 800	19 260
1 000	1 832	12.500	122 600	17 780
1 100	2 012	11.100	108 900	15 790

Coefficient of expansion from 20 °C (68°F) to temperature		
°C	°F	mm/mm°C (x 10 ⁻⁶)
500	932	15.1
600	1 112	15.7
700	1 292	16.3
800	1 472	16.7
900	1 652	17.0
1 000	1 832	17.3
1 100	2 012	17.6
1 200	2 192	18.2

MECHANICAL PROPERTIES

1. At room temperature (minimum values)

Tensile strength:	448 MPa	65 000 psi
Yield strength:	245 MPa	35 500 psi
Elongation (on 4d):	3%	

2. At high temperatures on as cast material – short time tests

Temperature		Y.S. at 0.2%		U.T.S.		E	Reduction of area
°C	°F	MPa	ksi	MPa	ksi	%	%
750	1 382	156	22.6	312	45.3	25	27.8
850	1 562	121	17.5	205	29.8	27.5	28.3
900	1 652	106	15.4	155	22.5	43.7	51
1 000	1 832	64	9.1	87	12.7	43.7	64
1 050	1 922	55	8	61	8.8	36.2	64

(typical values)

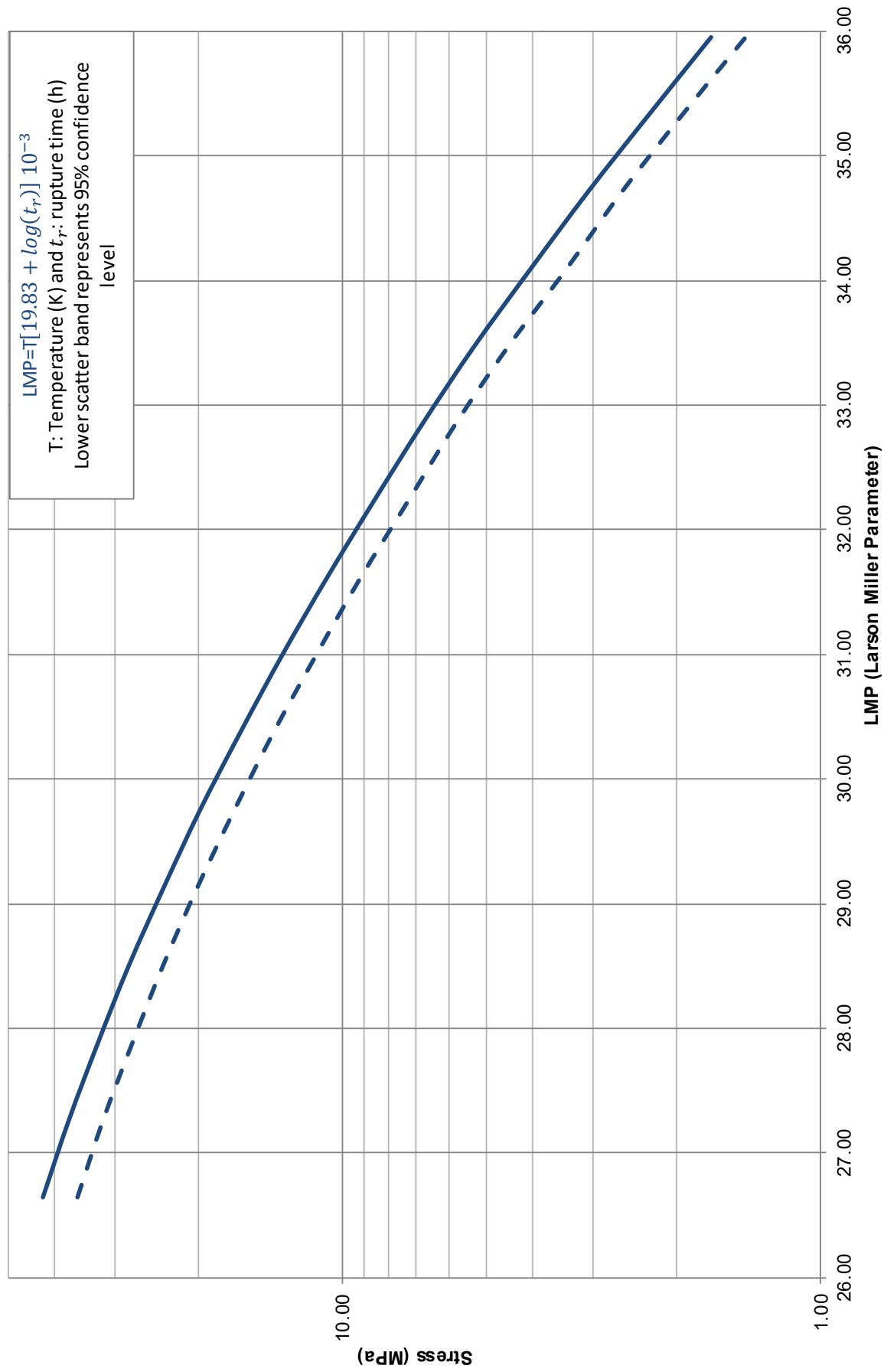
3. At high temperatures on as cast material – long time tests
10 000 h creep rupture stress data

Temperature		Average stresses		Minimum stresses	
°C	°F	MPa	ksi	MPa	ksi
800	1 470	51.20	7.40	43.50	6.30
825	1 515	46.50	6.70	39.50	5.70
850	1 560	41.40	6.00	35.20	5.10
875	1 605	36.50	5.30	31.00	4.50
900	1 652	32.00	4.60	27.20	3.95
925	1 697	27.70	4.00	23.50	3.40
950	1 742	23.60	3.40	20.10	2.90
975	1 787	19.90	2.90	16.90	2.45
1 000	1 832	16.60	2.40	14.10	2.04
1 025	1 877	13.70	1.98	11.60	1.69
1 050	1 922	11.18	1.62	9.50	1.38
1 075	1 967	9.00	1.30	7.60	1.10
1 100	2 012	7.20	1.04	6.08	0.88
1 125	2 057	5.60	0.81	4.80	0.69
1 150	2 102	4.40	0.63	3.70	0.54
1 175	2 147	3.30	0.49	2.85	0.41

100 000 h creep rupture stress data

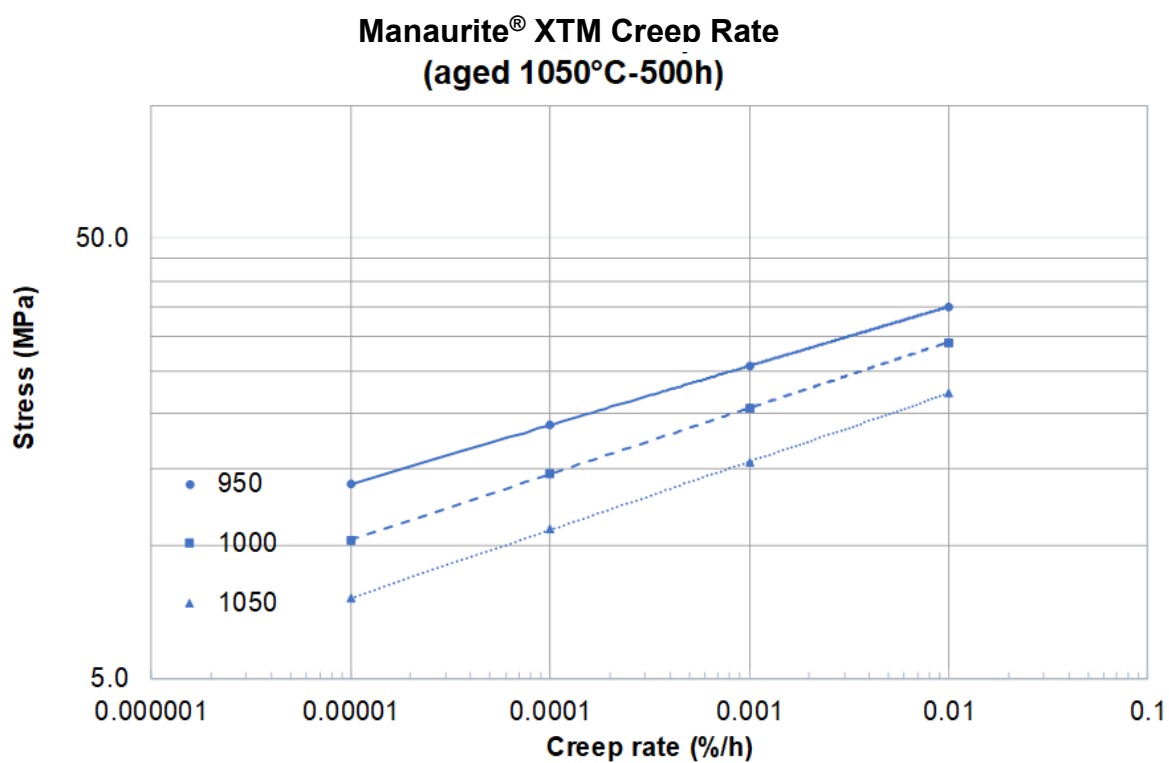
Temperature		Average stresses		Minimum stresses	
°C	°F	MPa	ksi	MPa	ksi
800	1 470	42.40	6.15	36.00	5.20
825	1 515	37.40	5.40	31.80	4.60
850	1 560	32.50	4.70	27.60	4.00
875	1 605	28.00	4.05	23.80	3.45
900	1 652	23.70	3.40	20.20	2.90
925	1 697	19.90	2.90	16.90	2.44
950	1 742	16.40	2.40	14.00	2.03
975	1 787	13.40	1.95	11.40	1.66
1 000	1 832	10.80	1.57	9.20	1.34
1 025	1 877	8.60	1.25	7.30	1.06
1 050	1 922	6.80	0.84	5.80	0.84
1 075	1 967	5.30	0.65	4.50	0.65
1 100	2 012	4.04	0.59	3.40	0.50
1 125	2 057	3.06	0.44	2.60	0.38
1 150	2 102	2.28	0.33	1.94	0.28
1 175	2 147	1.69	0.24	1.43	0.21

Manaurite® XTM creep rupture strength



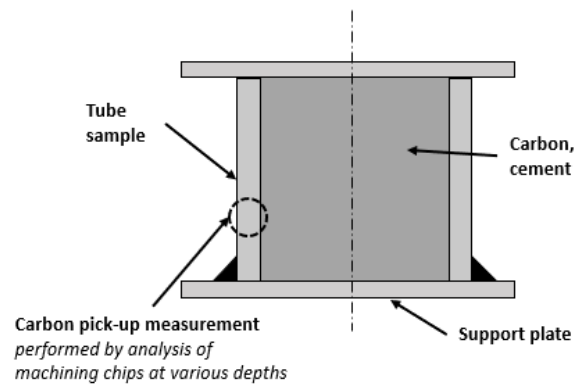
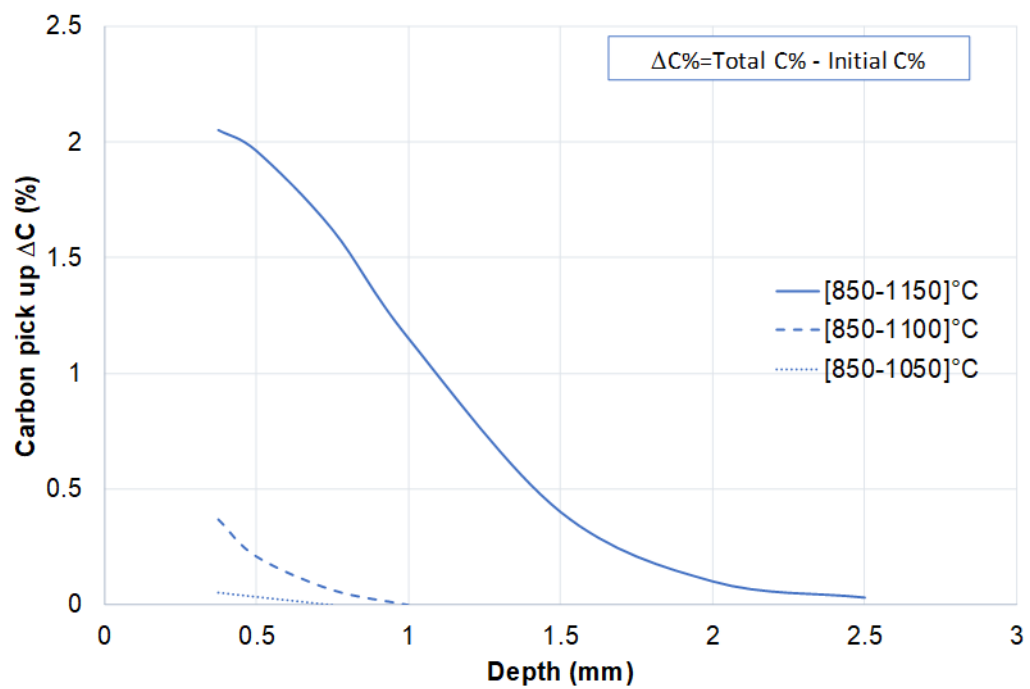
Material stabilized 1 050°C (1 942°F) – 500 hrs

Creep rates (% x hr ⁻¹)	Stresses in MPa		
	950°C	1 000°C	1 050°C
10 ⁻²	35	29	22.2
10 ⁻³	25.6	20.6	15.5
10 ⁻⁴	18.8	14.6	10.9
10 ⁻⁵	13.8	10.3	7.6



Carburization test

Carburization test at [850-1050]°C , [1562-2102]°F



MANOIR FRANCE

Future is our raw material.

As a metal processing specialist, Manoir Industries develops alloys and operates processes for the manufacture of high-performance components. Known and recognised for several decades, its know-how is complemented by its expertise in casting, forging, boilermaking, welding and assembly. Manoir's solid technical expertise continues to drive its sustainable leading position, offering innovative services to its customers worldwide as a true partner.