

Manaurite® 900X



MANOIR
A PARALLOY GROUP COMPANY





MANAURITE® 900X, AN EVOLUTION FROM MANAURITE® 900

This new alloy was developed to improve the creep properties of Manaurite® 900 by further optimizing its composition thanks to some addition elements.

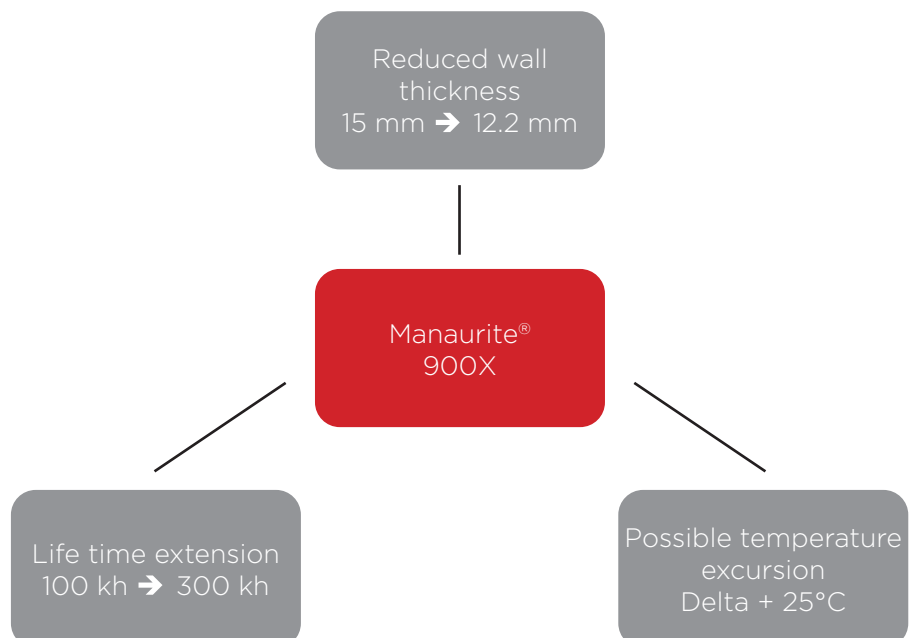
Manaurite® 900 has become a classical alloy used worldwide since the late 70's. Its properties and performance are well known. This grade was developed by Manoir Industries as a cast material to surpass extruded equivalent materials.

Manaurite® 900 has excellent thermal shock resistance and its ductility remains high after ageing. This has been assessed by independent laboratory tests and large operating experience.

All the properties of the standard Manaurite® 900 are maintained in Manaurite® 900X, but with better creep behavior.

Applications

- Reformer furnaces headers & manifolds
 - Transfer lines
- Pyrolysis furnaces outlet lines
 - Quench inlet tube
- Steam injection parts...





Chemical composition

Element	Minimum (wt.%)	Maximum (wt.%)
C	0.1	0.18
Mn	-	1.50
Si	0.5	1.10
Ni	30	35
Cr	19	23
Nb	0.7	1.00
Ti	Add.	Add.

Physical properties

Property	Value
Density	8.02 g/cm ³
Melting point	1380 °C

Temperature (°C)	Thermal expansion coefficient (10 ⁻⁶ /K)*
800	18.7
900	18.9

*mean coefficient of thermal expansion between 20°C and indicated temperature.

Microstructure

As cast microstructures show austenitic matrix with fine, intergranular and lamellar eutectic primary carbides identified as chromium and niobium carbides.

Titanium has an effect on the carbides stabilization.

After ageing, precipitation of carbides occurs first at dendrite boundaries and then intragranularly.

Tensile properties

Tensile Manaurite® 900X properties are similar to standard Manaurite® 900, at room temperature and after ageing.
The chemical modification by micro addition does not affect the actual tensile properties of Manaurite® 900X.
Even though ductility reaches a minimum value after ageing at 750°C, elongation stays over 15%.

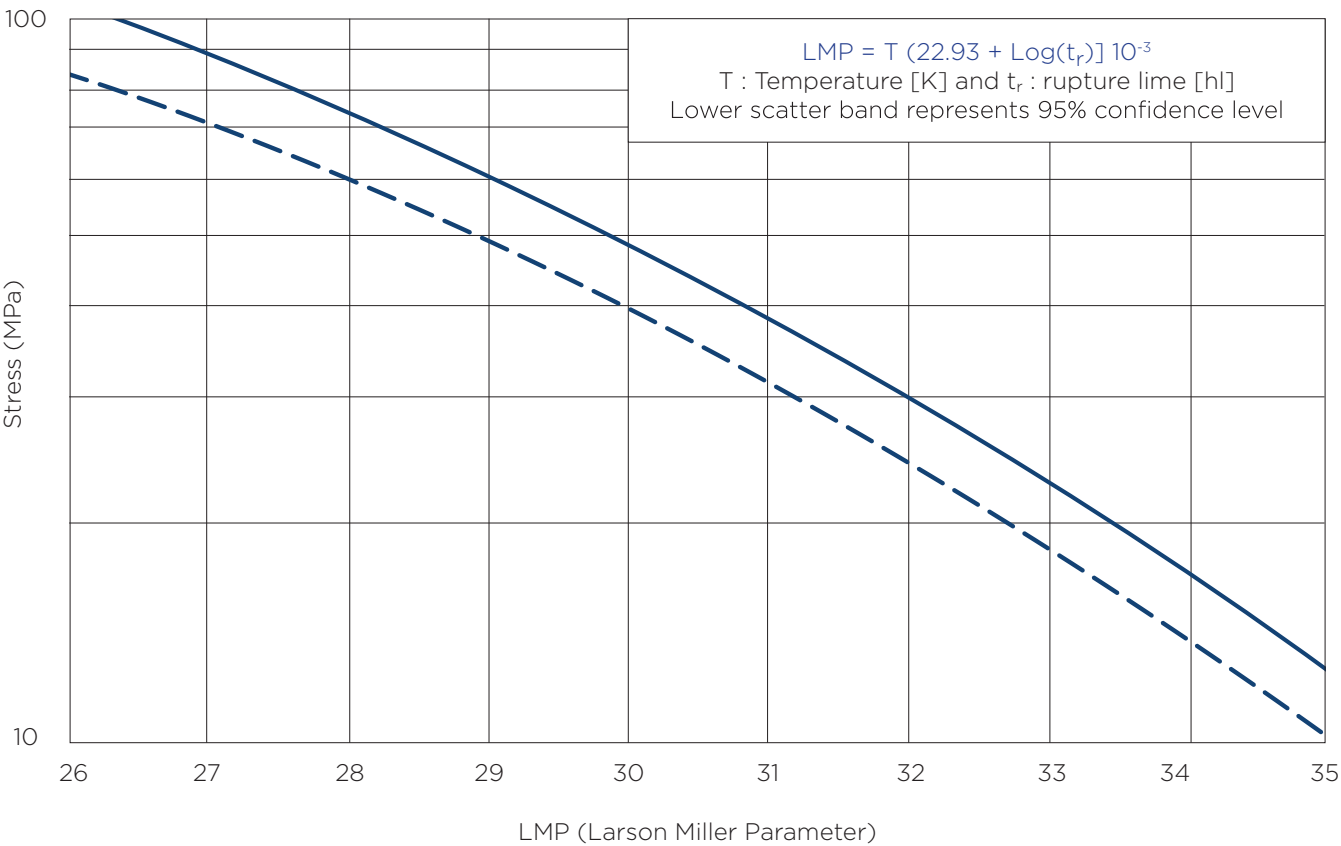
	Temperature (°C)	U.T.S. (MPa)	Y.S (MPa)	E (%)
As-cast (minimum values)	Room	448	186	30

	Temperature (°C)	U.T.S. (MPa)	Y.S (MPa)	E (%)
As-cast (typical values)	600	377	131	36.9
	750	317	123	29.1
	830	204	123	41
	900	141	124	41
	930	118	98	41.7

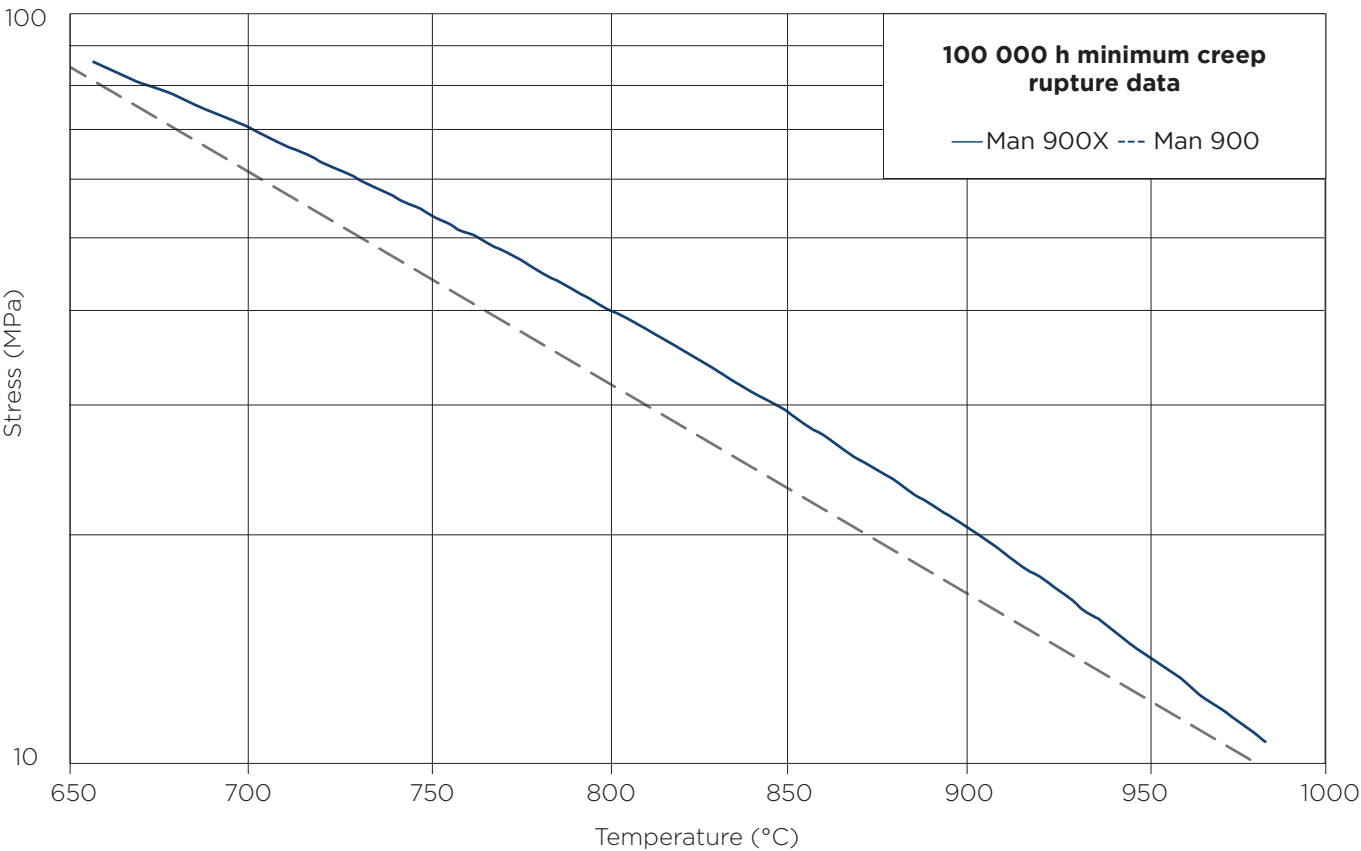
	Ageing conditions	U.T.S. (MPa)	Y.S (MPa)	E (%)
After ageing room temperature (typical values)	5000 h at 750 °C	510	264	15.2
	10 000 h at 750 °C	488	261	15.9
	2 000 h at 830 °C	515	245	24.8
	5 000 h at 830 °C	509	240	28.1
	1 000 h at 900 °C	521	231	29.5
	2 000 h at 900 °C	526	239	26.9

Creep Data

Manaurite® 900X creep rupture strength



Manaurite® 900X vs Manaurite® 900



Creep data may be updated as new test results are available.

Rupture time

	10 000h		100 000h	
Temperature	$\sigma_{\min}$	σ_{avg}	$\sigma_{\min}$	σ_{avg}
(°C)	(MPa)	(MPa)	(MPa)	(MPa)
700	83.4	102.4	70.7	86.4
750	66.1	80.6	54.4	66.1
800	50.9	61.8	40.5	49.1
850	38.1	46.1	29.2	35.4
900	27.7	33.5	20.4	24.8
950	19.5	23.7	13.8	16.9
1000	13.3	16.3	9.1	11.1

Data based on LMP extrapolation.

Weldability

The weldability of Manaurite® 900X is equivalent to that of Manaurite® 900. No specific precaution is to be taken for the welding of large thicknesses. The presence of titanium does not lead to any decrease in the resistance to hot cracking, which remains equal to Manaurite® 900. Moreover, the material is not sensitive to cracking in the heat-affected zone.



MANOIR FRANCE

Future is our raw material.

As a metal processing specialist, Manoir France 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.