

PARALLOY H39WM+

25/35 Cr/Ni 0.4%C

High Creep resistant Alloy

Steam Reforming

APPLICATION

In response to increased demand for improved material properties, **PARALLOY H39WM+** microalloy was developed from the highly successful **Paralloy H39WM** microalloy to provide much improved and superior properties to our range of heat resistant tubing technologies.

Extensive research was performed in order to meet the most stringent criteria for modern Steam Reforming Furnaces and exhibiting both superior creep-rupture strength and enhanced carburisation resistance. This alloy has progressed from the Paralloy R material.

The improved material properties were the result of chemical composition optimisation as well as specific melting and casting process developments.

The enhanced properties of **Paralloy H39WM+** enable customers to improve plant efficiency and gain financial benefits. The following "design" options can be considered.



DESIGN CHANGES

Minimum sound wall reduction	• Tubes heat up more quickly - Requiring less to heat up and maintain operating temperatures • Thinner tube wall reduces thermal gradient and therefore thermal stresses within the wall on start-ups and shutdowns.
Increase in the life of a furnace	• Longer tube life reduces the overall cost of furnace operation and replacement
Increase in tube skin temperature	• Potential increases in design temperature by up to 35°C for steam reformer applications • Increased yield of chemical products • Opportunity to explore new chemical reactions in the reformer
Increase in tube operating pressure	• Increase in overall productivity • Enhanced yield of chemical products

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MECHANICAL PROPERTIES

ROOM TEMPERATURE TENSILE PROPERTIES (Minimum Values) N/MM2		HOT TENSILE PROPERTIES N/MM2 (Typical value)				
UTS	460 (66.7 ksi)		800°C	900°C	1000°C	1100°C
0.2% PS	225 (32.6 ksi)	UTS	250 (36.3ksi)	160 (23.2ksi)	98 (14.2ksi)	74 (10.7ksi)
Elongation	10%	0.2% PS	162 (23.5ksi)	107 (15.5ksi)	72 (10.4ksi)	59 (8.6ksi)
DENSITY 7.97 Gm/cc (0.288 lb/in3)		Elongation%	26	28.5	32.5	21
COEFFICIENT OF LINEAR EXPANSION Mm/mm°C (1/K)		THERMAL CONDUCTIVITY W/mK				
20 - 100°C	14.4 x 10 ⁻⁶	100°C		13.0 (0.31 cal/cm sec °C)		
20 - 800°C	16.8 x 10 ⁻⁶	800°C		24.3 (0.058 cal/cm sec °C)		
20 - 1000°C	17.6 x 10 ⁻⁶	1000°C		27.7 (0.066 cal/cm sec °C)		
20 - 1100°C	18.1 x 10 ⁻⁶	1100°C		29.7 (0.07 cal/cm sec °C)		

CREEP RUPTURE STRESS (N/mm²)			
TEMP	10,000 HOUR LIFE	50,000 HOUR LIFE	100,000 HOUR LIFE
°C	Minimum	Minimum	Minimum
900	41,36	33,5	30,59
925	35,2	28,39	25,88
950	29,97	24,07	21,9
975	25,52	20,41	18,54
1000	21,73	17,31	15,69
1025	18,51	14,68	13,29
1050	15,77	12,45	11,25