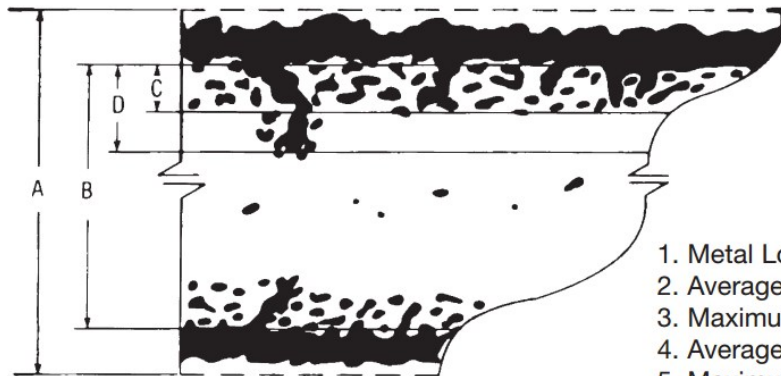


# HAYNES<sup>®</sup> HR-120<sup>®</sup> alloy

## Oxidation Resistance

### Metallographic Technique used for Evaluating Environmental Tests



1. Metal Loss = (A - B)/2
2. Average Internal Penetration = C
3. Maximum Internal Penetration = D
4. Average Metal Affected = ((A - B)/2) + C
5. Maximum Metal Affected = (A - B)/2 + D

### Static Oxidation

HAYNES<sup>®</sup> HR-120<sup>®</sup> alloy exhibits good resistance to oxidizing environments and can be used at temperatures up to 2100°F (1150°C). The following are comparative static oxidation test results at 1600°F (870°C), 1800°F (980°C), 2000°F (1090°C), and 2100°F (1150°C) for 1008 hours.

Alloy	1600°F (870°C)				1800°F (980°C)				2000°F (1090°C)				2100°F (1150°C)			
	Metal Loss		Average Metal Affected		Metal Loss		Average Metal Affected		Metal Loss		Average Metal Affected		Metal Loss		Average Metal Affected	
	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm
<b>HRâ €120<sup>®</sup></b>	0.1	0.00	0.9	0.02	0.4	0.01	2.1	0.05	1.0	0.03	4.4	0.11	7.9	0.20	10.1	0.26
<b>253MA</b>	0.2	0.01	0.9	0.02	1.3	0.03	3.0	0.08	0.7	0.02	8.2	0.21	8.7	0.22	16.5	0.42
<b>800HT</b>	0.1	0.00	1.0	0.03	0.5	0.01	4.1	0.10	7.6	0.19	11.6	0.29	11.0	0.28	15.0	0.38
<b>601</b>	-	-	-	-	0.4	0.01	1.7	0.04	1.3	0.03	3.8	0.10	2.8	0.07	6.5	0.17
<b>600</b>	-	-	-	-	0.3	0.01	2.4	0.06	0.9	0.02	3.3	0.08	2.8	0.07	4.8	0.12
<b>RA330</b>	-	-	-	-	0.3	0.01	3.0	0.08	0.8	0.02	6.7	0.17	-	-	-	-
<b>304SS</b>	-	-	-	-	5.5	0.14	8.1	0.21	NA	NA	>19.6	>0.498	NA	NA	>19.5	>0.498
<b>RA85H</b>	-	-	-	-	0.5	0.01	8.3	0.21	3.0	0.08	26.0	0.66	-	-	-	-

### Dynamic Oxidation

Burner rig oxidation tests were conducted by exposing samples of 3/8" x 2.5" x thickness (9mm x 64 mm x thickness), in a rotating holder to the products of combustion of 2 parts No. 1 and 1 part No. 2 fuel burned at a ratio of air to fuel of about 50:1. Gas velocity was about 0.3 mach. Samples were automatically removed from the gas stream every 30 minutes and fan-cooled to near ambient temperature and then reinserted into the flame tunnel.

1800°F/1000-h/2000-Cycles				
Alloy	Metal Loss		Average Metal Affected	
	mils	µm	mils	µm

<b>556®</b>	3.9	99	6.8	173
<b>HR-120®</b>	<b>6.3</b>	<b>160</b>	<b>8.4</b>	<b>213</b>
<b>RA 330</b>	6.5	165	9.5	241
<b>800H/800HT</b>	8.9	226	13.7	348
<b>310 SS</b>	16.0	406	18.3	465
<b>253MA</b>	16.6	422	17.8	452

### Long-term Oxidation

Amount of metal affected for high-temperature plate (0.25") alloys exposed for 360 days (8,640 hours) in flowing air. Cycled once per month.

Alloy	Exposure Duration h of cycles		1600°F				1800°F				2000°F				2100°F			
			Metal Loss		Average Metal Affected		Metal Loss		Average Metal Affected		Metal Loss		Average Metal Affected		Metal Loss		Average Metal Affected	
			mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm
<b>214®</b>	8640	12	0.1	0.00	0.2	0.01	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
<b>230®</b>	8640	12	0.2	0.01	1.4	0.04	0.1	0.00	2.5	0.06	3.4	0.09	11.0	0.28	28.5	0.72	34.4	0.87
<b>HR-120®</b>	<b>8640</b>	<b>12</b>	<b>0.3</b>	<b>0.01</b>	<b>1.6</b>	<b>0.04</b>	<b>0.5</b>	<b>0.01</b>	<b>3.3</b>	<b>0.08</b>	<b>18.1</b>	<b>0.46</b>	<b>23.2</b>	<b>0.59</b>	<b>33.6</b>	<b>0.85</b>	<b>44.0</b>	<b>1.12</b>
<b>556®</b>	8640	12	0.3	0.01	1.9	0.05	0.5	0.01	6.2	0.16	15.0	0.38	24.1	0.61	-	-	-	-
<b>617</b>	8640	12	0.3	0.01	1.6	0.04	-	-	-	-	-	-	-	-	-	-	-	-
<b>800HT</b>	8640	12	0.4	0.01	2.9	0.07	-	-	-	-	-	-	-	-	-	-	-	-

### Water Vapor Testing

Alloy	1008 hours at 1600°F Cycled 1x/week in air+10% H <sub>2</sub> O				1008 hours at 1600°F Cycled 1x/week in air+20% H <sub>2</sub> O				6 months at 1400°F Cycled 1x/week in air+10% H <sub>2</sub> O			
	Meal Loss		Average Metal Affected		Meal Loss		Average Metal Affected		Meal Loss		Average Metal Affected	
	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm
<b>HR-120®</b>	<b>0.09</b>	<b>0.002</b>	<b>0.68</b>	<b>0.017</b>	<b>0.04</b>	<b>0.001</b>	<b>0.29</b>	<b>0.007</b>	<b>0.10</b>	<b>0.003</b>	<b>0.50</b>	<b>0.013</b>
<b>253MA</b>	0.66	0.017	1.59	0.040	0.08	0.002	0.68	0.017	-	-	-	-
<b>347SS</b>	0.86	0.022	1.48	0.038	0.18	0.005	0.88	0.022	0.46	0.012	1.26	0.032
<b>800HT</b>	-	-	-	-	-	-	-	-	0.12	0.003	0.82	0.021

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