



RA 602 CA is one of the most high strength and heat resistant alloys available. Elevated levels of chromium and aluminum along with the addition of yttrium permit RA 602 CA to develop a tightly adhering oxide scale with an alumina subscale. This allows it to be considered for applications up to 2250°F. RA 602 CA is often used for applications where it is important to minimize product contamination at extreme temperatures. The high strengths are achieved due to the carbon content of nearly 0.2% as well as the addition of zirconium. These additions help RA 602 CA maintain its ductility over time by restricting grain growth that would normally be seen in other alloys above 1800°F.

RA 353 MA is a strong, highly oxidation resistant alloy that is designed for service at temperatures up to 2200°F. The addition of nitrogen allows RA 353 MA to increase its creep strength at extreme temperatures in order to compete with high nickel alloys. The elevated levels of chromium, silicon, and an addition of rare earth metal cerium, result in superior oxidation resistance. While RA 353 MA has been used over other grades due to economical cost to life ratios, RA 602 CA should be considered for more applications due to its availability. RA 602 CA is readily available from stock in plate, sheet, round bar and welding consumables. RA 353 MA is currently only available in pipe products in mill quantities.

Chemical Composition, %

	Cr	Ni	Si	Al	Fe	C	N	Mn	Ce	Zr
RA 602 CA [®] UNS N06025	25.0	63.0	—	2.2	9.5	0.18	—	0.1	—	0.08
RA 353 MA [®] UNS S35315	25.0	35.0	1.2	—	36.0	0.05	0.16	1.5	0.05	—

Room Temperature Mechanical Properties

	Temperature, °F	68
RA 602 CA	Ultimate Tensile Strength, ksi	105.0
	0.2% Offset Yield Strength, ksi	50.5
	Elongation, %	38
RA 353 MA	Ultimate Tensile Strength, ksi	103.0
	0.2% Offset Yield Strength, ksi	46.0
	Elongation, %	48.0

Stress for 1% Total Creep in 10,000 hours, ksi

Temperature, °F	1400	1600	1800	2000
RA 602 CA	9.4	2.4	1.0	0.4
RA 353 MA	3.0	1.4	0.7	0.4

10,000 Hour Rupture Strength, ksi

Temperature, °F	1400	1600	1800	2000
RA 602 CA	11.3	3.2	1.5	0.67
RA 353 MA	5.4	2.6	1.3	0.68

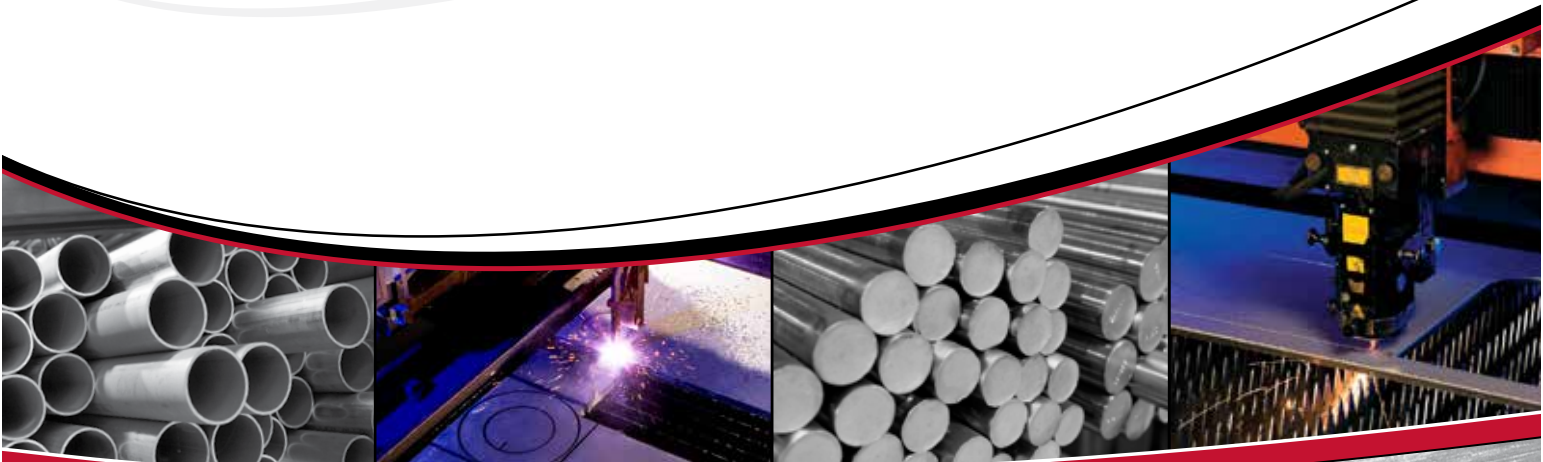
Average Metal Affected, Oxidation Depth

	1800°F		2000°F	
	mils	mm	mils	mm
RA 602 CA	1.75	0.044	4.5	0.113
RA 353 MA	—	—	9.3	0.236

Physical Properties

	Temperature, °F	68	1000	1200	1400	1600	1800
RA 602 CA	Coefficient of Thermal Expansion*, in/in°F x 10 ⁶	—	8.2	8.5	9.0	9.5	9.7
	Thermal Conductivity, Btu • ft/ft ² • hr • °F	6.5	11.6	12.3	13.8	14.8	15.8
	Modulus of Elasticity, Dynamic, psi x 10 ⁶	30.0	25.4	24.1	22.5	20.6	18.4
RA 353 MA	Coefficient of Thermal Expansion*, in/in°F x 10 ⁶	—	9.3	9.5	9.7	9.9	10.0
	Thermal Conductivity, Btu • ft/ft ² • hr • °F	6.5	11.0	11.9	12.9	13.9	14.8
	Modulus of Elasticity, Dynamic, psi x 10 ⁶	27.8	23.0	22.0	21.1	20.0	19.0

* 68°F to indicated temperature.



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