RA 602 CA® Chosen For Muffle For Tool Steel Hardening

Specifications

UNS: N06025 **W. Nr./EN:** 2.4633 **ASTM:** B 168, B 166 **ASME:** SB-168, SB-166, Code Case 2359

Chemical Composition, %

	Cr	Ni	Cu	P	S	Fe	C	Al	Ti	Y	Zr	Si	Mn
MIN	24.0	–	–	–	–	8.0	0.15	1.8	0.1	0.05	0.01	–	–
MAX	26.0	Balance	0.1	0.02	0.01	11.0	0.25	2.4	0.2	0.12	0.1	0.5	0.15

Creep Strength, ksi 1% Total in 10,000 hours

Temperature, °F	1400	1600	1800	2000	2100
RA 602 CA	9.4	2.4	1.0	0.33	0.15
601*	7.0	1.9	0.8	0.3	–
HR 120	10.0	5.1	1.0	–	–
22H	–	6.0	2.3	1.0	0.5

** Minimum Creep Rate*

Cast vs Wrought, The Advantages

	Cast	Wrought	
Weight		•	Cast parts are thicker and heavier than equivalent fabrication. This icreases the dead weight that goes through each heat treat cycle. Therefore wrought can offer up to 67% weight savings.
Repairability		•	Weld repair requires some retained ductility. Brittle cracking in castings makes weld repair impossible at some point.
Creep Strength	•		Similar compositions are inherantly stronger in castings due to higher carbon content and larger grain size. Some to much of this difference is offset when thinner walled wrought components are used.
Thermal Fatigue		•	Thinner sections reduce the amount of internal thermal stresses. This produces greater ductility and in turn better thermal and shock resistance.

Case History

A manufacturer of high speed tool steel parts has been using a small muffle constructed from RA 602 CA® for a continuous hardening operation. They operate at a temperature of 2150°F. Before trying RA 602 CA, the manufacturer had been using alloy 2.4879 or G-NiCr28 W and obtained a useful life between 1 and 1-1/2 years. The customer reported that the muffle failed in several ways; including creep and buckling or cracks would develop in the welds.

In consultation with HypeR Alloys, the customer decided to test a 27 ft long muffle using RA 602 CA. They report that after 2 years of continuous use, there are no signs of sagging and have ordered a second RA 602 CA muffle. In addition, there is a run out length for cold nitrogen quenching to ambient that also is holding up as well.

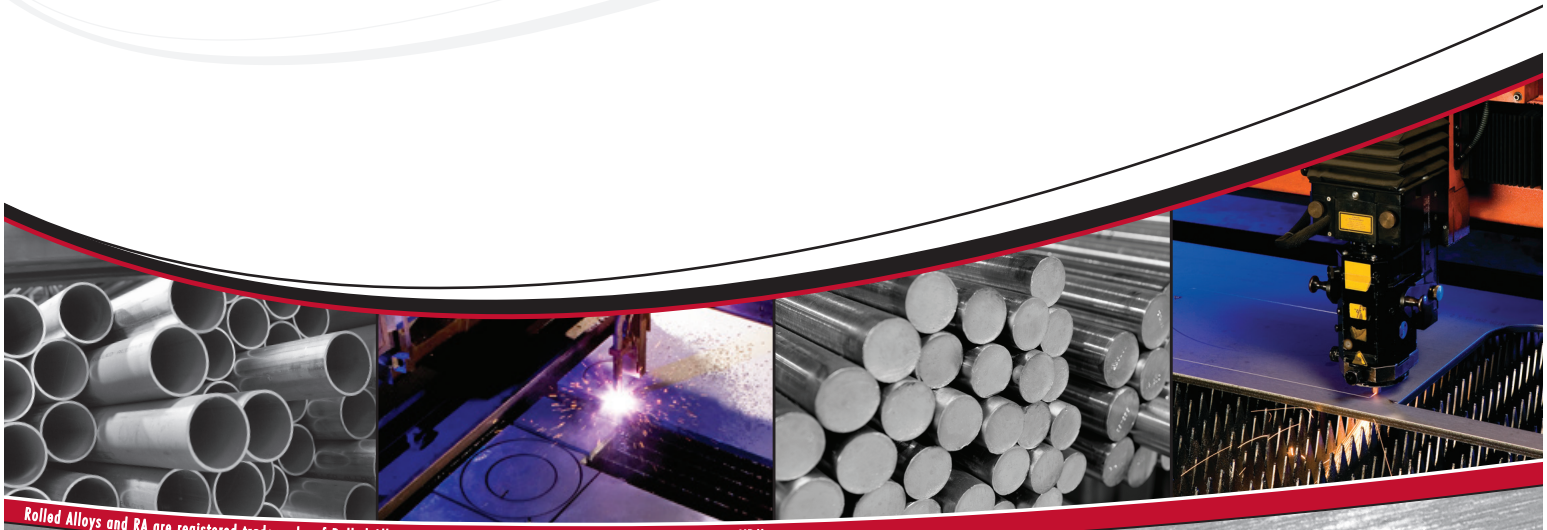
The furnace atmosphere is 100% nitrogen and is gas heated. This means that the metal itself is seeing a higher temperature in order to maintain the atmosphere of 2150°F. There is no thermocouple to measure the actual metal temperature.

RA 602 CA is a nickel based heat resistant alloy with high chromium and aluminum contents. The alloy provides the best combination of high temperature properties of any heat resistant alloy available. Because of its high chromium, aluminum and yttrium additions, RA 602 CA is highly oxidation resistant. A relatively high carbon content combined with titanium and zirconium additions provide the alloy with excellent creep resistance, as well as minimizes the susceptibility to grain growth above 1800°F.

RA 602 CA is available in sheet, plate, round bar, and matching welding consumables from Rolled Alloys.

ROLLED ALLOYS

The Global Leader in Specialty Metals



ROLLED ALLOYS

The Global Leader in Specialty Metals

www.rolledalloys.com

Bulletin No. 1357USe 04/15