
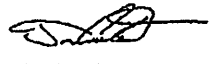


MM11105450

PK
19/APR/2013

 <p>Material Test Report</p> <p>CMC (USA) METALS CORP 15 Union St, Building 3 Stoughton MA 01101-1901 508-687-3337 www.cmcgroup.com</p>				<p>Production Date 07.17.2012</p>  <p>Tom Carter, Technical Director</p>	
<p>Sold To: CMC Comerals Steel 6565 N MacArthur Blvd IRVING TX 75039-6283 US</p>		<p>Ship To: CMC Comerals Steel 6565 N MacArthur Blvd IRVING TX 75039-6283 US</p>		<p>Quality Management System certified to ISO 9001:2008 and Pressure Equipment Directive (PED) 2009/102/EC Annex 1, Paragraph 4.3 by SHCHONG SYSTEM REPORT, No. 1202940</p>	
Customer PO No.	67355	BOL No.	Delivery No.	Sales Order No.	
Customer Part No.					
<p>Product Description ROUND:58Q 5" 20R 1548M1, 1022M/1518M A105/A350 LF2 Norm</p> <p>Processing Normalize, RND - Straighten 1/8" in 5 ft</p>			<p>Alternate Grades: ASTM A578 A/SA 105-10, ASTM A696-90A GR C ASTM A578 A/SA 350-07 GR. LF2 CLASS 1 ASTM A578 A/SA 675-03 GR 70, EN 10204-01 3.1 ASTM A370 LATEST EDITION ASTM A29 LATEST EDITION NACE MR0175 LATEST EDITION</p>		

CHEMICAL ANALYSIS												
Heat No.	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Cu (%)	Cr (%)	Ni (%)	Mo (%)	V (%)	Co (Hb) (%)	Al (%)
MM11105450	0.18	1.16	0.011	0.005	0.24	0.21	0.11	0.08	0.030	0.016	0.001	0.021
Batch No.	Ti (%)	B (%)	As (%)	Pb (%)	Sb (%)	Zr (%)	N2 (ppm)	O2 (ppm)	H2 (ppm)	OI (in.)	CE (%)	
105450C677											0.42	

THERMAL PROCESSING								
Furnace No.	Austenitizing Temp. (°F)	Austenitizing Time (min)	Tempering Temp. (°F)	Tempering Time (min)	Normalizing Temp. (°F)	Normalizing Time (min)	Quench Media	Quench Media Temp. (°F)
C1677					1675	300		


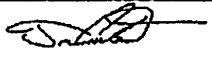
Notes:

Test	Tensile Test						Hardness Test					
	Yield 0.2% (ksi)	Tensile (ksi)	Elongation (%)	Reduction of Area (%)	Yield at 0.6% Elongation Under Load (ksi)	Yield at 0.07% (ksi)	Test Orientation	Test Location	Brimell (BHN)	Test Location	Rockwell	Test Location
1	46.0	73.0	24	72				Mid Radius	138	Surface		
2	✓	✓	✓	✓					142	Mid Radius		
3												
4												
5												
6												
7												
8												

JOMINY RESULTS (HRC)												
Test	Distance (in.)											
	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
1	J13	J14	J15	J16	J18	J20	J22	J24	J26	J28	J30	J32

2/27/12
JG

PS
18/APR/2013

 CNC IMPACT METALS OHIO 11 Union St., Parkersburg Shreveport OH 44471-7001 688-637-2337 www.cncimpactmetals.com	<h2>Material Test Report</h2>	Production Date 07.17.2012
		Heat No. MM11105450
		Furnace No. C1677
		 Tom Carter, Technical Director

CHARPY IMPACT TESTS														
Test	Average*		Specimen 1*		Specimen 2*		Specimen 3*		Specimen 4*		Test Temp.	Site	Location	Orientation
	ft-lb	J	ft-lb	J	ft-lb	J	ft-lb	J	ft-lb	J				
1	81.3	90.0	50	0.104	67.0	20	0.085	87.0	30	0.085	-50	Full	Mid Radius	Longitudinal
2														
3														
4														
5														
6														
7														
8														

*Absorbed energy values converted from sub-size results (ref. ASTM A370) when applicable.

INCLUSION RATING								
Method	Test 1		Test 2		Test 3		Test 4	
	Thin (T)	Heavy (H)	Thin (T)	Heavy (H)	Thin (T)	Heavy (H)	Thin (T)	Heavy (H)
1								
2								
3								

BEND TESTS				
Test	Pin Radius (in.)	Orientation	Result	Final Bend Angle
1				
2				

OTHER TESTS				
Type of Test	Method	Grain Size:	Observed Velocity:	Result:
Grain Size	Fine Grain	Grain Size:		
Ballistic Test 1		Req'd Velocity:	Observed Velocity:	Result:
Ballistic Test 2		Req'd Velocity:	Observed Velocity:	Result:
Ultrasonic Test		Criteria:	Result:	
Decarburization				
Macro Test	ASTM E381	SRC		
Reduction Ratio		15:1		

Additional Comments
 NO WELD REPAIR OR MERCURY CONTAMINATION IN THE PROCESS/USA/ELECTRIC FURNACE-VACUUM DEGASSED STEEL