MM11105450

RS 18/APR/2013

CMC Impact Metals

CMC IMPACT METALS OHIO
15 Union St, Building 3
Struthers OH 44471-[illegible]
330-[illegible]
[illegible]

Material Test Report

Production Date
07.17.2012

Tom Carter, Technical Director

Quality Management System certified to ISO 9001:2008 and Pressure Equipment Directive (PED) 97/23/EC [illegible], Annex I, Paragraph 4.3 by [illegible], Reg [illegible]

Sold To:	Ship To:
CMC Cometals Steel 6565 N MacArthur Blvd IRVING TX 75039-6283 US	CMC Cometals Steel 6565 N MacArthur Blvd IRVING TX 75039-6283 US

Customer PO No.	67355	BOL No.	Delivery No:	Sales Order No.
Customer Part No.				

Product Description
ROUND:SBQ 5" 20R 1518M1, 1022M/1518M A105/A350 LF2 Norm

Processing
Normalize, RND - Straighten 1/8" in 5 ft

Alternate Grades:
ASTM/ASME A/SA 105-10, ASTM A696-90A GR C
ASTM/ASME A/SA 350-07 GR. LF2 CLASS 1
ASTM/ASME A/SA 675-03 GR 70, EN 10204:04 3.1
ASTM A370 LATEST EDITION
ASTM A29 LATEST EDITION
NACE MR0175 LATEST EDITION

CHEMICAL ANALYSIS

Heat No.	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Cu (%)	Cr (%)	Ni (%)	Mo (%)	V (%)	Cb (Nb) (%)	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)**	**DI (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 0.5% Elongation Under Load (ksi)	Yield at 0.02% (ksi)	Test Orientation	Test Location	Brinell (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)

Distance (in.)

Test	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

07.23.2012

7/27/12 [illegible]

18/APR/2013

[illegible]
CMC IMPACT METALS OHIO
11 Union St, Building 3
Struthers OH 44471-1901
888-637-3337
www.cmcimpactmetals.com

Material Test Report

Production Date	07.17.2012
Heat No.	MM11105450
Furnace No.	C1677

Tom Carter, Technical Director

CHARPY IMPACT TESTS														
Test	Average*	Specimen 1*	Shear	Lateral Expansion	Specimen 2*	Shear	Lateral Expansion	Specimen 3*	Shear	Lateral Expansion	Test Temp.	Size	Location	Orientation
	ft-lb	ft-lb	%	in.	ft-lb	%	in.	ft-lb	%	in.	°F			
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	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	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

Country of Origin: United States