



F/QA/04

# USHA MARTIN LIMITED (USHA ALLOYS & STEEL DIVISION)

P.O. GAMHARIA, DIST.-SARAIKELA KHARASWAN, JAMSHEDPUR-832108 JHARKHAND. PHONE 0657-3982200

## QUALITY ASSURANCE TEST CERTIFICATE

Customer/SP	RAMKRISHNA FORGINGS LTD				PO No/ Date	by mail/	
TC No	4000003223	Tax Invoice No	9000049746	Quantity	16.060 MT	Rolling Input	300 X 360 mm
Batch No.	C4012501,A01						
Heat No	C40125	Grade	20MNCr5H		Product	ROUND BAR FINISHED	
Spec code	RF/14/D-401/15C/VEC PARTS 7049	Date	12-11-2016	Issue No: 06	Rev: 0	Condition	AS ROLLED
Prod Dt	13-AUG-2017	Nom Size	125.00 mm		Colour Code	BLUE+ BLACK DOT & VEC AT CENTE	

CHEMICAL COMPOSITION														
Element	%C	%Mn	%Si	%P	%S	%Cr	%Ni	%Cu	%Mo	%Al	%Pb	%V	%Ti	%Ca
Min.	0.17	1.10	0.15	-	0.020	1.00	-	-	-	0.020	-	-	-	-
Max.	0.22	1.30	0.25	0.020	0.030	1.30	0.25	0.25	0.050	0.035	-	0.020	0.010	-
Actual	0.19	1.24	0.18	0.009	0.028	1.24	0.018	0.013	0.002	0.025	-	0.003	0.002	-

OTHER ELEMENTS								CARBON	GAS LEVEL		
Element	%Sn	%As	%Sb	%Nb	%B	%Te	%W	EQV	O2 PPM	H2 PPM	N2 PPM
n.	-	-	-	-	-	-	-	-	-	-	-
Max.	0.0500	-	-	0.0200	-	-	-	-	20	2.0	80
Actual	0.0010	-	-	0.0008	-	-	-	-	15	1.7	70

MECHANICAL PROPERTIES								JOMINY HARDENABILITY (HRC)					
Requirement	Hardness BHN	Impact Strength (IZOD/CHARPY) (Joule)	Yield Strength (Kg/mm2)	UTS (Kg/mm2)	%E	%RA							
Min.	-	-	-	-	-	-		J-5 MM	J-11 MM				
Max.	240	-	-	-	-	-	Min.	38.0	32.0	-	-	-	-
Act.Min.	180	-	-	-	-	-	Max.	43.0	36.0	-	-	-	-
Act.Max.	185	-	-	-	-	-	Act.	42.0	33.0	-	-	-	-

METALLURGICAL PROPERTIES						INCLUSION RATING AS PER ASTM E-45							
Specific	Depth of	Macro Etch	Max. Depth of	Grain Size	Spheroidised	A		B		C		D	
ation	Decarb (mm)	(ASTM E381)	Surface Defect(mm)	(ASTM E112)	(%)	T	H	T	H	T	H	T	H
Min	-	-	-	5	-	-	-	-	-	-	-	-	-
Max	0.30	C2R2S2	-	8	-	2.0	1.0	2.0	0.0	2.0	0.0	2.0	0.0
Actual	0.29	C2R1S1	-	7.5	-	1.5	0.5	1.0	0.0	0.0	0.0	1.0	0.0
Micro structure		Ferrite Pearlite											

Spark & Spectral Test/PMI	OK	MPI	100 % OK	Blue Fracture	NA	Hardness after Heat treatment of sample.	
Surface Inspection: (as per Spec.)	100% OK	Step Turn	No Streak	Cold Upset	NA	Requirement	
Ultrasonic Test:(as per Spec.)	100 % Satisfactory					Actual in BHN	

REDUCTION RATIO	8.80 : 1	PROCESS ROUTE	BF>EAF>LRF>VD>CCP>BM	
Remarks: SIZE TOLERANCE-(+1.20) (-0.00), OUT OF ROUNDNESS-0.80, MATERIAL IS FREE FROM RADIOACTIVE ELEMENTS.				
		Test certificate meets TDC Results based on sample testing	<div>Ashapal</div> <div>USHA MARTIN LIMITED</div> <div>(USHA ALLOYS &amp; STEELS DIVISION)</div>	
LENGTH OF BAR- 3.0 TO 6.0 MTRS.				
Corporate Office: 2 A, Shakespeare Sarani, Kolkata: 700 016.				
Email ID: uasdgq_hod@ushamartin.co.in				

M-5557 FTC