



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	Jan'17/	
TC No	40000004449	Tax nvoice No	9000065739	Quantity	42.750 MT	Rolling Input	300 X 360 mm
Batch No.	C4219501,A01						
Heat No	C42195	Grade	EN353		Product	ROUND BAR FINISHED	
Spec code	RF/14/D-4 01 /EN353/VEC/5391	Date	28-02-2017	Issue No: 05	Rev: 0	Condition	AS ROLLED
Prodt Dt	12-JAN-2018	Nom Size	150.00 mm		Colour Code	BLACK	

CHEMICAL COMPOSITION

Element s	%C	%Mn	%Si	%P	%S	%Cr	%Ni	%Cu	%Mo	%Al	%Pb	%V	%Ti	%Ca
Min.	0.14	0.50	-	-	-	0.75	1.00	-	0.080	0.020	-	-	-	-
Max.	0.20	1.00	0.35	0.050	0.050	1.25	1.50	0.25	0.150	0.060	-	0.030	0.006	0.0020
Actual	0.16	0.77	0.225	0.014	0.025	0.80	1.02	0.01	0.100	0.023	-	0.003	0.002	0.0007

OTHER ELEMENTS

Element s	%Sn	%As	%Sb	%Nb	%B	%Te	%W	CARBON EQV	GAS LEVEL O2 PPM	H2 PPM	N2 PPM
Min.	-	-	-	-	-	-	-	-	-	-	-
Max.	-	-	-	0.1500	0.0004	-	-	-	20	2.0	80
Actual	-	-	-	0.0015	0.00032	-	-	-	15	1.5	65

MECHANICAL PROPERTIES

Require ment	Hardness BHN	Impact Strength (IZOD/CHARPY) (Joule)	Yield Strength (Kg/mm2)	UTS (Kg/mm2)	%E	%RA	JOMINY HARDENABILITY (HRC)				
Min.	-	-	-	-	-	-	J-5 MM	J-11 MM			
Max.	240	-	-	-	-	-	Min. 37.0	26.0	-	-	-
Act.Min.	210	-	-	-	-	-	Max. 43.0	32.0	-	-	-
Act.Max.	217	-	-	-	-	-	Act. 38.0	27.0	-	-	-

METALLURGICAL PROPERTIES

Specific ation	Depth of Decarb (mm)	Macro Etch (ASTM E381)	Max. Depth of Surface Defect(mm)	Grain Size (ASTM E112)	Spherodised (%)	INCLUSION RATING AS PER ASTM E-45							
						A		B		C		D	
						T	H	T	H	T	H	T	H
Min	-	-	-	5	-	-	-	-	-	-	-	-	-
Max	-	C2R2S2	-	8	-	2	1	2	0	2	0	2	1
Actual	-	C2R1S2	-	7.5	-	1.5	0.0	1	0	0	0	1	0
Micro structure		Ferrite +Pearlite											

Spark & Spectral Test/PMI	100%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	6.11 : 1	PROCESS ROUTE	BF>EAF>LRF>VD>CCP>BM		
Remarks: SIZE TOLERANCE--(+1.30)(- 0.0), OUT OF ROUNDNESS--0.80					
LENGTH OF BAR : 3.0 TO 6.0 MTRS		Test certificate meets TDC Results based on sample testing	<div>Rawat K</div> <div>USHA MARTIN LIMITED</div> <div>(USHA ALLOYS & STEELS DIVISION)</div>		
MATERIAL IS FREE FROM RADIOACTIVE ELEMENTS					
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