

QUALITY ASSURANCE TEST CERTIFICATE

Customer/SP	RAMKRISHNA FORGINGS LTD				PO No/ Date		Sep'17/	
TC No	40000004447	Tax Invoice No	9000065633	Quantity	25.810 MT	Rolling Input	300 X 360 mm	
Batch No.	C4219601							
Heat No	C42196	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	HOT ROLLED
Prod/ Dt	19-SEP-2017	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
Ac	0.165	0.77	0.24	0.018	0.019	0.81	1.01	0.012	0.100	0.024	-	0.003	0.003	0.0012

OTHER ELEMENTS								CARBON EQV	GAS LEVEL		
Element s	%Sn	%As	%Sb	%Nb	%B	%Te	%W		O2 PPM	H2 PPM	N2 PPM
Min.	-	-	-	-	-	-	-	-	-	-	-
Max.	-	-	-	0.1500	0.0004	-	-	-	20	2.0	80
Actual	-	-	-	0.0018	0.0003	-	-	-	16	1.5	66

MECHANICAL PROPERTIES


Requirement	Hardness BHN	Impact Strength (IZOD/CHARPY) (Joule)	Yield Strength (Kg/mm2)	UTS (Kg/mm2)	%E	%RA	JOMINY HARDENABILITY (HRC)						
								J-5 MM	J-11 MM				
Min.	-	-	-	-	-	-							
Max.	240	-	-	-	-	-	Min.	37.0	26.0	-	-	-	-
Act.Min.	207	-	-	-	-	-	Max	43.0	32.0	-	-	-	-
Act.Max.	214	-	-	-	-	-	Act.	38.0	28.0	-	-	-	-

METALLURGICAL PROPERTIES

INCLUSION RATING AS PER ASTM E-45

METALLOGRAPHY PROPERTIES						MECHANICAL PROPERTIES							
Specimen	Depth of Decarb (mm)	Macro Etch (ASTME381)	Max. Depth of Surface Defect(mm)	Grain Size (ASTME112)	Spheroidised (%)	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	 USHA MARTIN LIMITED (USHA ALLOYS & STEELS DIVISION)	
MATERIAL IS FREE FROM RADIOACTIVE ELEMENTS			
Corporate Office: 2 A, Shakespeare Sarani, Kolkata: 700 016. Email ID: uasdga_hod@ushamartin.co.in			