

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	JKEW FORGINGS LTD WORKS					PO No/ Date	Email date/	
TC No	40000004293	Tax invoice No	9000063552	Quantity	28.780 MT	Rolling Input	200 X 200 mm	
Batch No.	C4197601							
Heat No	C41976	Grade	20MNCR5H		Product	RCS BAR FINISHED		
Spec code	MAIL/JKEW/20MNCR5H		Date	25-09-2014	Issue No: 0	Rev: 0	Condition	HOT ROLLED
Prodt Dt	24-DEC-2017	Nom Size	75.00 mm		Colour Code	BLUE		

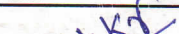
CHEMICAL COMPOSITION														
Element s	%C	%Mn	%Si	%P	%S	%Cr	%Ni	%Cu	%Mo	%Al	%Pb	%V	%Ti	%Ca
Min.	0.17	1.00	0.15	-	0.020	1.00	-	-	-	0.020	-	-	-	-
Max.	0.22	1.40	0.35	0.035	0.035	1.30	0.30	0.25	0.050	0.060	-	0.050	-	-
Actual	0.20	1.33	0.20	0.016	0.024	1.25	0.02	0.01	0.003	0.030	-	0.003	-	-

OTHER ELEMENTS								CARBON EQV	GAS LEVEL		
Element s	%Sn	%As	%Sb	%Nb	%B	%Te	%W		O2 PPM	H2 PPM	N2 PPM
Min.	-	-	-	-	-	-	-	-	-	-	70
Max.	-	-	-	-	0.0004	-	-	-	20	2.0	100
Actual	-	-	-	-	0.0003	-	-	-	15	1.7	71

MECHANICAL PROPERTIES							JOMINY HARDENABILITY (HRC)						
Requirement	Hardness BHN	Impact Strength (IZOD/CHARPY) (Joule)	Yield Strength (Kg/mm ²)	UTS (N/mm ²)	%E	%RA							
Min.	-	-	-	-	-	-	J- 6/16"						
Max.	250	-	-	-	-	-	Min.	36.0	-	-	-	-	-
Act.Min.	180	-	-	-	-	-	Max	40.0	-	-	-	-	-
Act.Max.	187	-	-	-	-	-	Act.	38.0	-	-	-	-	-

METALLURGICAL PROPERTIES						INCLUSION RATING AS PER ASTM E-45							
Specification	Depth of Decarb (mm)	Macro Etch (ASTM E381)	Max. Depth of Surface Defect(mm)	Grain Size (ASTM E112)	Spheroidised (%)	A		B		C		D	
						T	H	T	H	T	H	T	H
Min	-	-	-	5	-	-	-	-	-	-	-	-	-
Max	-	C2R2S2	-	8	-	2.5	1.5	2	0	2	0	2	0
Actual	-	C2R2S1	-	7.5	-	1.5	0.5	1	0	0	0	1.0	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	NA	Cold Upset	NA	Requirement	
Ultrasonic Test:(as per Spec.)	100 % Satisfactory					Actual in BHN	

REDUCTION RATIO	7.11 : 1	PROCESS ROUTE	BF>EAF>LRF>VD>CCP>BM
Remarks: SIZE TOLERANCE --- (+1.00) (-0.00) , OUT OF SQUARENESS --- 0.60			
LENGTH OF BAR --- 3.0 TO 6.0MTRS		Test certificate meets TDC Results based on sample testing	 USHA MARTIN LIMITED (USHA ALLOYS & STEELS DIVISION)
MATERIAL IS FREE FROM RADIOACTIVE ELEMENTS			
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