



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	Dec'17/	
TC No	40000004407	Tax invoice No	9000065097	Quantity	27.230 MT	Rolling Input	300 X 360 mm
Batch No.	C4212601						
Heat No	C42126	Grade	SCM420H		Product	ROUND BAR FINISHED	
Spec code	RF/14/D-401/99A		Date	19-05-2016	Issue No: 0	Rev: 03	Condition HOT ROLLED
Prod Dt	06-JAN-2018	Nom Size	95.00 mm		Colour Code	BROWN	

CHEMICAL COMPOSITION

Element s	%C	%Mn	%Si	%P	%S	%Cr	%Ni	%Cu	%Mo	%Al	%Pb	%V	%Ti	%Ca
Min.	0.18	0.60	0.15	-	-	0.90	-	-	0.150	-	-	-	-	-
Max.	0.23	0.85	0.35	0.030	0.030	1.20	-	-	0.300	0.040	-	-	-	-
Actual	0.21	0.83	0.24	0.017	0.006	1.18	-	-	0.187	0.027	-	-	-	-

OTHER ELEMENTS**CARBON****GAS LEVEL**

Element s	%Sn	%As	%Sb	%Nb	%B	%Te	%W	EQV	O2 PPM	H2 PPM	N2 PPM
Min.	-	-	-	-	-	-	-	-	-	-	-
Max.	-	-	-	-	-	-	-	-	20	2.0	90
Actual	-	-	-	-	-	-	-	-	15	1.6	70

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-9 MM	J-13 MM		
Max.	250	-	-	-	-	-	Min. 41.0	33.0	29.0	-	-
Act.Min.	184	-	-	-	-	-	Max. 47.0	38.0	35.0	-	-
Act.Max.	190	-	-	-	-	-	Act. 46.0	37.0	33.0	-	-

METALLURGICAL PROPERTIES**INCLUSION RATING AS PER ASTM E-45**

Specific ation	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	-	-	-	6	-	-	-	-	-	-	-	-	-
Max	0.50	C2R2S2	-	8	-	2.5	1.0	2.0	0.5	2.0	0.5	2.0	0.5
Actual	0.24	C2R1S2	-	7	-	1.0	0.5	1.0	0.0	0.0	0.0	1.0	0.0
Micro structure		Ferrite Pearlite Bainite											

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	15.24 : 1	PROCESS ROUTE	BF>EAF>LRF>VD>CCP>BM				
-----------------	-----------	---------------	----------------------	--	--	--	--

Remarks: SIZE TOLERANCE -- (+0.90) (-0.0), OUT OF ROUNNESS --0.50

Length of Bar :- 3.0 TO 6.0 MTRS.

MATERIAL IS FREE FROM RADIOACTIVE ELEMENTS		Test certificate meets TDC Results based on sample testing	USHA MARTIN LIMITED (USHA ALLOYS & STEELS DIVISION)				
--	--	--	--	--	--	--	--

Corporate Office: 2 A, Shakespeare Sarani, Kolkata: 700 016.

Email ID: uasdg_a_hod@ushamartin.co.in

G P B