

**JSW STEEL LIMITED - SALEM WORKS**

QR / QA / 54

Works: pottaneri Village, Mecheri Post - 636 453, salem, india

Registered Office: "JSW CENTRE", Bandra Kurla Complex, Bandra (East), Mumbai - 400 051

**TEST CERTIFICATE**

Certificate No. : 229534

Customer Name: RAMAKRISHNA FORGINGS LIMITED

Cust. Address : PLOT NO. M-15, 16 &amp; NS-26,

JAMSHEDPUR, Jharkhand-832109, India

Date : 24.01.2018

SO No : 400771038

SO Date : 23.01.2018

Truck No.: NL01G3029

Po Number: EMAIL

Po date : 23.01.2018

Packing Slip No : 705464844

Invoice No : 7100536474

Heat No	Grade	Size (mm)	Length (mm)	M/L (mm)	No. of Bundles	No. of PCS	Weight	Billet/Bloom Size
E72941	EN353	150.00 mm DIA	6,000.00 mm	0 mm	12	36	28.110 MT	340MM 400MM

TDC NO : RF\_14\_D\_4\_01\_EN353\_VEC\_5391,0\_6,07.12.2017

Process Route : BF\_EOF\_LRF\_VD\_CCM\_EMS\_BM

Reduction Ratio : 5.37 / - 7.70 : 1

**CHEMICAL ANALYSIS**

Prod STD No : QDQA06\_1092

Element	C%	Si%	Mn%	P%	S%	Cr%	Mo%	Ni%	B ppm	V%	Cu%	Pb%	Sn%	Ti%	Nb%	Zr%	As%	Sb%	Al%	Ca ppm	CE%
MIN	0.1400		0.500			0.750	0.080	1.000													
MAX	0.2000	0.350	1.000	0.050	0.0500	1.250	0.150	1.500	4	0.030	0.250			0.0060	0.150					20	
Actual	0.160	0.150	0.900	0.014	0.019	1.120	0.121	1.050	2	0.002	0.012	0.001	0.001	0.0027	0.002	0.001	0.001	0.001	0.029	4	0.629

Gas Levels : N ppm : [ / 80 ] -45

O ppm : [ / 20 ] -12.4

H ppm : [ / 2.00 ] -1.02

**MECHANICAL PROPERTIES :**

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	Tensile Test ( )				Hardness Test			Impact Test ( )						
Cond.					As rolled			Spec.						
Spec.	YS	UTS	Elong.	RA	As Rolled	As Quenched	As Q&T	Test Temp	Imp. Value (min)	1	2	3	Avg.	
			%	%	BHN									
Min														
Max					240									
Actual					207.0									

Edge / Corner Radius (mm) :

Upset Type :

Upsetability:

**JOMINY HARDENABILITY ( ASTM A255 - 10(2014) )**

Ideal Diameter (DI) : [ / ] -

Distance	J11																				
MIN (HRC)	34.0																				
MAX (HRC)	38.0																				
Actual(HRC)	37.70																				

**METALLURGICAL PROPERTIES & PHYSICAL INSPECTION**

	Surface Inspection	Step Down Test	BFT Test	MPI Test	Segregation Test	Spark Test	Spectra Test	Metascope Test
Actual	OK			100 % OK		100 % OK	100 % OK	100% OK.
	Macro Etch Test	Micro Structure	CN	CZ Looser	CZ Closer	GBC Level	DEG. SPH	Distortion
Spec		F_P	/	/	/			
Actual	C2R2S2	Ferrite - Pearlite						

	Grain Size	Decarb (mm)	Banding (µm)	A		B		C		D		DOS µm	Ultrasonic Test
Spec	5.0 / 8.0	/ 0.40	/	2.0	1.0	2.0	0.0	2.0	0.0	2.0	0.0		20% / 80% Back Wall Echo
Actual	7.00	0.300 mm		1.50	0.50	0.50	0.00	0.00	0.00	0.50	0.00		100% Pass

Inclusion Rating Test Standard: ASTM E45 - 13, A

Grain Size Standard: ASTM E112 - 13

Decarb Standard: SAE J419\_198312

Macro Etch Test Standard: ASTM E381 - 17

Banding Test Standard:

UT Standard: ASTM A388/A388M - 16

JSW COLOR CODE :

CUSTOMER COLOR CODE : BLACK

**INSPECTION CERTIFICATE 3.1 ACCORDING TO EN 10204 : 2004**

Supply Condition : AS ROLLED

Remarks :

**Reference** : WE HERE BY CERTIFY THAT THE MATERIAL SHIPPED UNDER THIS TEST CERTIFICATE DID NOT COME IN DIRECT CONTACT WITH ANY MERCURY, CADMIUM HEXAVALENT CHROMIUM CONTAINING DEVICES, FREE FROM RADIOACTIVE CONTAMINATION EMPLOYING A SINGLE BOUNDARY OF CONTAINMENT DURING THE MANUFACTURING PROCESS, TESTS, INSPECTION AND STORAGE

WE CERTIFY THAT CONTENTS OF THIS REPORT ARE CORRECT AND ACCURATE AND MEET THE REQUIREMENTS OF THE PURCHASE ORDER, TECHNICAL DELIVERY CONDITION, GENERAL STEEL REQUIREMENTS AND THE MATERIAL CERTIFICATION REQUIREMENTS.

**NOTE:**  
1. THE RESULTS RELATES ONLY TO THE ITEM TESTED.  
2. CERTIFICATE SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF ISSUING AUTHORITY.

For JSW STEEL LIMITED

S. M. KUMAR - AVP (PC &amp; QAD)

M-5771 GIBI