



# R. L. STEELS & ENERGY LTD.

## TEST CERTIFICATE

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**Customer: M/S HAPPY FORGINGS.LTD.(UNIT II)**

B- XXIX-2254/1 & OPP. HINDUSTAN TYRES (ADJ. WARYAM STEELS), KANGANWAL ROAD, PO-JUGIANA, LUDHIANA.

### General Information & Material Details

TC NO.	Date	Invoice No.	Date	Truck No.	No. of Pcs	Quantity in MT	Length	Supply Condition	Colour code
17-4932	03-04-2018	RL18-SI-0024	03-04-2018	RJ 07 GD 1383	20	3.340	5.0 TO 6.0 MTR	AS ROLLED	YELLOW+ BLUE+WHITE
Process Route		Heat No.	Grade	As Cast Size	Product Size	Reduction Ratio	Customer TDC		
EAF/LRF/VD/CCP-with MEMS		2-WVS-4	EN353	180X220	63RCS	9.97:1			

### Chemical Composition & Tramp Elements

Element	%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	%V	%Al	%Ti	%B	%Ca	%As
Min.	0.14	-	0.50	-	0.020	0.75	1.00	0.08	-	-	0.020	-	-	-	-
Max.	0.20	0.35	1.00	0.035	0.040	1.25	1.50	0.15	-	-	0.040	-	-	-	-
Actual	0.185	0.22	0.95	0.023	0.028	1.15	1.03	0.145	-	-	0.025	-	-	-	-

### Tramp Elements (Contd.) & DI / CE

Tramp Elements (Contd.) & DI / CE						Gas Analysis.			Dimension Tolerance	
Element	%Sn	%Pb	%Sb	CE	DI Value	Gas (PPM)	O2	H2	N2	Size Tol. (MM)
Min	-	-	-	-	-		-	-	-	Specification
Max	-	-	-	-	-		20.00	2.50	90.00	
Actual	-	-	-	-	-		12.00	1.40	75.00	
										As per IS 3739, Grade I.

### Mechanical Properties

Test Code	Hardness As Rolled (BHN)	Hardness (H&T Condition) (BHN)	YS (Kg/mm <sup>2</sup> )	UTS (Kg/mm <sup>2</sup> )	%El.	%RA	Impact Values (Joules)		Macrostructure	Microstructure
							Izod	Charpy	Macrostructure As per ASTM E-381	Matrix
Spec.	240 Max.	-	-	-	-	-	-	-	Better Than C2R2S2	Uniform distribution of Ferrite plus Pearlite
Actual Value	206-217	-	-	-	-	-	-	-	C2R1S2	Uniform distribution of Ferrite plus Pearlite

### Metallurgical Properties

Test Code	Decarb ASTM J419 (mm)	Grain Size as per ASTM E112	Inclusion Rating (As per IS 4163/ ASTM E-45A) Plate IR					Other Test Results			
			Series	A	B	C	D	Magnaflux Test (100% Bars)	UT Test (100% Bars)	Spark/Spectral Test (100% Bars)	
Spec.	-	6.0 / 8.0	T / H	2.0 / 1.0	2.0 / 0.0	2.0 / 0.0	2.0 / 1.0	-	-	-	-
Actual Value	-	6.0 / 7.0	T / H	1.5 / 0.5	0.5 / 0.0	0.0 / 0.0	1.5 / 0.5	OK	OK	OK	-

### Hardenability Test Result

Jominy Distance (mm/inch)	J 7/16"										
Spec (HRC)	37-41										
Actual Hardness (HRC)	38.00										

Remarks : Material is conforming to the customer specification.

NOTE:- This material is made for AL, and is complying to AL Std 258.02

DECLARATION : TEST RESULTS ARE BASED ON ACTUAL TESTS CARRIED OUT ON SAMPLES DRAWN AS PER QUALITY ASSURANCE PLAN. TEST CERTIFICATE CONFORMS TO THE CUSTOMER TDC.

For R.L. STEELS & ENERGY

(AUTHORISED SIGNATORY)

