



# 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 Pieces	Quantity in MT	Length	Supply Condition	Colour code
17-4218	14-02-2018	RL17-SI-3980	14-02-2018	PB 11 AT 9340	19	16.990	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-VYU-4	EN353	280X320		115 DIA		8.63:1	-

#### Chemical Composition & Tramp Elements

Element	%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	%V	%Al	%Ti	%B	%Ca	%As
Min.	0.14	0.10	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	0.19	0.22	0.95	0.030	0.028	1.14	1.04	0.13	0.055	0.013	0.034	0.0026	0.0006	0.0008	0.0035

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

Element	%Sn	%Pb	%Co	CE	DI Value	Gas (PPM)			O2	H2	N2	Size Tol. (MM)	
Min	-	-	-	-	-	Min			-	-	-	-	
Max	-	-	-	-	-	Max			20.00	2.50	90.00	Specification	
Actual	-	-	0.0115	-	-	Actual			11.00	1.30	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	Impact Values (Joules)		Macrostructure As per ASTM-E-381	Microstructure
Spec.	240 Max.	-	90 Min.	110-140	7 Min.	Izod	Charpy	Better Than C2R2S2	-
Actual Value	206-217	-	102.45	132.28	14.40	-	-	C2R2S2	-

#### 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				Magnaflux Test (100% Bars)	UT Test (100% Bars)	Spark/Specral Test (100% Bars)	Step Down Test
			Series	A	B	C	D			
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)	34-38									
Actual Hardness (HRC)	37.00									

Remarks : Material is conforming to the customer specification.

NOTE:- 1)This material is made for AL, and is complying to AL Std 258.02

2)Material is free from Radioactive contamination.

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)