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
17-4366	17-02-2018	RL17-SI-4013	17-02-2018	RJ 07 GC 3770	28	25.840	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-WEA-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	-	0.50	-	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	0.25	0.96	0.028	0.030	1.05	1.03	0.135	-	-	0.026	-	-	-	-

Tramp Elements (Contd.) & DI / CE

Element	%Sn	%Pb	%Sb	CE	DI Value
Min	-	-	-	-	-
Max	-	-	-	-	-
Actual	-	-	-	-	-

Gas Analysis.

Gas (PPM)	O2	H2	N2
Min	-	-	-
Max	20.00	2.50	90.00
Actual	10.00	1.20	76.00

Dimension Tolerance

Size Tol. (MM)	-
Specification	As per IS 3739, Grade I.

Mechanical Properties

Test Code	Hardness As Rolled (BHN)	Hardness (H&T Condition) (BHN)	YS (Kg/mm²)	UTS (Kg/mm²)	%El.	%RA	Impact Values (Joules)	
							Izod	Charpy
Spec.	240 Max.	-	-	-	-	-	-	-
Actual Value	206-217	-	-	-	-	-	-	-

Macrostructure / Microstructure

Macrostructure	Microstructure
Macrostructure As per ASTME-381	Matrix
Better Than C2R2S2	Uniform distribution of Ferrite plus Pearlite
C2R2S2	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/ ASTME-45A) Plate IR				
			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

Other Test Results

Magnaflux Test (100% Bars)	UT Test (100% Bars)	Spark/ Spectral Test (100% Bars)	-	-
-	-	-	-	-
OK	OK	OK	-	-

Hardenability Test Result

Jominy Distance (mm/inch)	J 7/16"													
Spec (HRC)	34-38													
Actual Hardness (HRC)	35.00													

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)