



R. L. STEELS & ENERGY LTD.

TEST CERTIFICATE

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Customer: M/S SADHU FORGING LTD.

UNIT-2,PLOT NO-84,SECTOR-25, FARIDABAD-121001

General Information & Material Details

| TC NO. | Date | Invoice No. | Date | Truck No. | No. of PCS | Quantity in MT | Length | Supply Condition | Colour code |
|--------------------------|------------|--------------|------------|---------------|------------|----------------|----------------|------------------|--------------------------|
| 17-4641 | 06-03-2018 | RL17-SI-4248 | 06-03-2018 | RJ 19 GF 9088 | 9 | 3.040 | 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-WLY-4 | EN353 | 240X250 | | 90RCS | | 8.29:1 | As per TATA MOTORS SS-40 |

Chemical Composition & Trap Elements

| Element | %C | %Si | %Mn | %P | %S | %Cr | %Mo | %Ni | %Cu | %V | %Al | %Ti | %B | %Ca | %As |
|---------|-------|------|------|-------|-------|------|-------|------|-----|----|-------|-----|----|-----|-----|
| Min. | 0.14 | - | 0.50 | - | 0.020 | 0.75 | 0.080 | 1.00 | - | - | 0.020 | - | - | - | - |
| Max. | 0.20 | 0.35 | 1.00 | 0.035 | 0.040 | 1.25 | 0.15 | 1.50 | - | - | 0.040 | - | - | - | - |
| Actual | 0.190 | 0.25 | 1.00 | 0.030 | 0.026 | 1.13 | 0.135 | 1.02 | - | - | 0.026 | - | - | - | - |

Trap Elements (Contd.) & DI / CE

| Element | %Sn | %Pb | %Sb | CE | DI Value |
|---------|-------|-----|-----|----|----------|
| Min | - | - | - | - | - |
| Max | - | - | - | - | - |
| Actual | 0.005 | - | - | - | - |

Gas Analysis.

| Gas (PPM) | O2 | H2 | N2 |
|-----------|--------|-------|--------|
| | Min | - | 70.00 |
| | Max | 20.00 | 100.00 |
| | Actual | 12.00 | 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 (Mpa) | UTS (Mpa) | %El. | %RA | Impact Values (Joules) | | Macrostructure | Microstructure |
|--------------|--------------------------|--------------------------------|----------|-----------|------|-----|------------------------|--------|----------------------------------|----------------|
| | | | | | | | Izod | Charpy | Macrostructure As per ASTM E-381 | - |
| | | | | | | | - | - | | |
| Spec. | 240 Max. | - | - | - | - | - | - | - | Better Than C2R2S2 | - |
| Actual Value | 206-217 | - | - | - | - | - | - | - | 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/Spectral Test (100% Bars) | - | Step Down Test |
|--------------|-----------------------|-----------------------------|--|-----------|-----------|-----------|----------------------------|---------------------|---------------------------------|----|----------------|
| | | | Series | A | B | C | D | | | | |
| Spec. | - | 5.0 / 8.0 | T / H | 2.0 / 1.0 | 2.0 / 0.0 | 2.0 / 0.0 | 2.0 / 0.0 | - | - | - | - |
| Actual Value | - | 6.0 / 7.0 | T / H | 1.5 / 0.5 | 0.5 / 0.0 | 0.0 / 0.0 | 1.5 / 0.0 | OK | OK | OK | OK |

Other Test Results

Hardenability Test-Result

| Jominy Distance (mm/inch) | J 1.5 | J 5.0 | J 10.0 | J 30.0 | | | | | | | | | | |
|---------------------------|-------|-------|--------|--------|--|--|--|--|--|--|--|--|--|--|
| Spec (HRC) | - | - | 38-42 | - | | | | | | | | | | |
| Actual Hardness (HRC) | 45.00 | 43.50 | 39.00 | 29.00 | | | | | | | | | | |

Remarks : Material is conforming to the customer specification.

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)