

SPECIFICATION FOR
GENERAL STRUCTURAL STEEL
FOR COMPONENTS OF 3-PHASE
TRACTION MOTOR TYPE 6FRA-6068 & 6FXA-7059
OF ELECTRIC LOCOMOTIVES

Specification No. 4TMS.096.055, Rev-1

TRACTION MOTOR DEPARTMENT
CHITTARANJAN LOCOMOTIVE WORKS
CHITTARANJAN – 713365
WEST BENGAL

Approved By

**RAJIV KUMAR
BARNWAL**

CEE/TM

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AMENDMENT SHEET

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**SPECIFICATION FOR GENERAL STRUCTURAL STEEL FOR
COMPONENTS OF 3-PHASE TRACTION MOTOR TYPE
6FRA-6068 & 6FXA-7059 OF ELECTRIC LOCOMOTIVES**

1.0. Scope

1.1 The material covered by this specification are required to be used in manufacture of 3-Phase Traction Motor type 6FRA-6068/6FXA-7059. The material shall comply with this specification instructions in chemical composition, mechanical properties and all other listed requirements.

2.0. Governing Standard

2.1 The material shall conform to IS: 2062-2011, Gr. E250BR (KILLED) or Latest version.

3.0. Technical Requirement

3.1 Chemical composition: The chemical composition shall be generally specified in IS:2062-2011, Gr. E250BR (KILLED) or Latest version. The material when supplied shall have the following chemical composition:

| Constituent | Content (%) | Variation over the maximum specified limit (in %) |
|-------------|--------------|---------------------------------------------------|
| C | 0.22 (Max.) | 0.02 |
| Mn | 1.50 (Max.) | 0.05 |
| P | 0.045 (Max.) | 0.005 |
| S | 0.045 (Max.) | 0.005 |
| Si | 0.4 (Max.) | 0.03 |

3.2 Mechanical properties:

3.2.1 Mechanical Properties Test: The mechanical properties shall be generally specified in IS: 2062-2011, Gr. E250BR (KILLED) or Latest version. The material when supplied shall have the following mechanical properties:

- i) Tensile strength = 410 N/mm² (min.)
- ii) Yield strength < 20 mm (T) = 250 N/mm² (min.)
20-40 mm (T) = 240 N/mm² (min.)
> 40 mm (T) = 230 N/mm² (min.)
- iii) Elongation = 23%
- iv) Impact strength = 27 J
- v) Bend test (Internal dia.) = 2t (min.)

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4.0. Test and Test Methods

4.1 The following tests to be carried out in presence of inspection authority and values to be recorded.

4.2 **Sampling**: The sampling for the tests on each component shall be as follows:

| Sl. No. | Test | No. of samples for test in Prototype test | No. of samples for test in Routine test |
|---------|---------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1. | Dimension and Tolerance | 100% of offered Qty. | 20% of offered Qty. |
| 2. | Concentricity | 100% of offered Qty. | 20% of offered Qty. |
| 3. | Chemical Analysis | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. |
| 4. | Tensile strength, Yield strength and Elongation % | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. |
| 5. | Impact test | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. |
| 6. | Bend test | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. | 2 Nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. |

4.3 Freedom from Defects

4.3.1 All finished components shall be reasonably free from surface flaws, laminations, rough/lagged and imperfect edges and all other harmful defects.

4.3.2 Minor surface defects may be removed by the manufacturer by grinding provided the thickness is not reduced locally by more than 4% below the minimum specified thickness.

5.0. Inspection

5.1 The successful tenderer shall submit prototype to the competent authority of CLW/Chittaranjan before undertaking bulk production/supply.

5.2 The supplier shall offer prototype for inspection and test at his works with prior intimation to inspecting authority. They shall provide all necessary facilities for inspection and testing at their costs. After the test, if it is considered necessary by the authorised inspecting representative to carry out further additional test or trial of the prototype samples at Chittaranjan, the supplier shall arrange the same by quickest means.

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- 5.3 Any shortcoming/defects in the design and workmanship of the equipment shall be pointed out after the test to enable the supplier to incorporate the necessary improvement before bulk supply is commenced without affecting the guaranteed programme and delivery.
- 5.4 Any testing and approval by the purchaser of the design, drawing and prototype shall in no way absolve the supplier of his responsibility under the terms of contract for the items supplied.
- 5.5 The supplier shall not offer any material of service production to the inspecting officer authorised under the contract, until the prototype has been finally approved.
- 5.6 Routine inspection of the items shall be carried out only after the approval of prototype samples by the authorised representative. The manufacturer shall provide all the necessary facilities free of cost for inspection and testing for all tests in accordance with specification.

6.0. Marking

6.1 Each component shall be legibly marked with the following information:

- i) Grade of Steel.
- ii) Number of Identification mark, by which it can be traced from which metal it was made.
- iii) Manufacturer's name, Sl. No. and Batch No. etc.

7.0. Information for Tenderer

- 7.1 The tenderers shall study carefully the drawings and specifications before they submit their offers.
- 7.2 The tenderers shall note that CLW do not undertake to supply drawings for jigs and fixtures, toolings, templates and/or process sheets or any other such details. CLW may however, comment/suggest alterations/modifications to the supplier's drawings and methods, if required, during the manufacture, testing/inspection of material and/or use of the material in CLW production.
- 7.3 While submitting the offer, the tenderer shall furnish the following information failing which the offer may not be considered:
- a) List of M&P, test facilities and manufacturing process sheet.
 - b) Details of material offered.
 - c) Quality control system and Quality assurance plan adopted by the tenderer.
 - d) Past performance for similar type of item.
 - e) Tenderers may furnish additional details/information as relevant to establish their capacity to undertake the manufacturing of items covered by this specification.
 - f) Tenderer shall also furnish all the relevant details as asked for in 'BID DOCUMENTS' without fail.

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8.0. Deviations

8.1 While submitting the offer, the tenderer shall furnish a list of deviations, if any, from this specification/concerned drawing. Even if tenderer has no particular deviation in their offer, a 'NIL' statement shall be submitted.

9.0. Packing

9.1 The components shall be suitably packed to prevent transit/long storing damage.

9.2 The components shall be coated with antirust varnish/compound after inspection.

9.3 Varnished components shall be wrapped in polythene paper followed by corrugated paper.

9.4 The wrapped components shall finally be sealed in thick polythene bag.


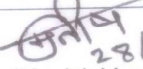

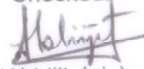
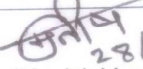

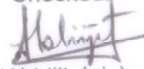
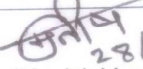

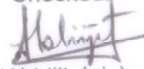
9.5 The sealed components shall be finally packed in wooden box filled with saw dust to prevent transit damage of machined surface.

10.0. Clause-wise comments have to be furnished by the tenderer. Vague comments like noted and understood are not acceptable. Compliance have to be clearly stated, otherwise CLW reserves the right to reject the offer.

11.0. Metallurgical testing for prototype supplies shall be carried out by Dy.CC&M/CLW/CRJ or NABL approved laboratory for which sample to be drawn, stamped and sealed by authorised representative of Dy.CEE/TMD/CLW/CRJ and for bulk supplies, metallurgical test shall be done by Dy.CC&M/CLW/CRJ or NABL approved laboratory, to be witnessed by authorised representative of CLW Zonal Inspection Cell.

12.0. Ultrasonic Test: Supplier shall use Ultrasonically tested plates before manufacturing the Tension Bars, Cross Piece and Accessory Bars. The plates shall be free from any internal harmful defects/cracks. The test results/records to be shown to the inspecting authority. However, during prototype and routine test, Ultrasonic test to be carried out on 100% offered quantity at firm's premises. The cost of such tests to be borne by the suppliers. Firm shall provide all facilities free of cost to the inspecting authority at his works.

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|  | PRODUCT STANDARD TME DIVISION, BHOPAL | | TM 11495 Rev.01 | | | | | | | | | | | | | | | | | | | |
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| | TME/2011 | | Page 01 of 03 | | | | | | | | | | | | | | | | | | | |
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company </p> | <p align="center"> <u>SPECIFICATION FOR GENERAL STRUCTURAL STEEL FOR COMPONENTS OF</u> <u>3PHASE TRACTION MOTOR TYPE 6FRA-6068 / 6FXA-7059</u> </p> | | | | | | | | | | | | | | | | | | | | | |
| | <p>1.0 SCOPE :</p> <p>1.1 The material covered by this specification are required to be used in manufacture of 3-phase Traction Motor type 6FRA-6068 / 6FXA-7059. The material shall comply with this specification instructions in chemical composition, mechanical properties and all other listed requirements.</p> <p>2.0 Governing Standard :</p> <p>2.1 The material shall conform to IS: 2062 '92 Grade Fe 410 WB IS:2062-2011, Gr.250BR (Killed) or latest version.</p> <p>3.0 Technical Requirement:</p> <p>3.1 Chemical Composition:</p> <p>The chemical composition shall be generally specified in IS:2062 '92 Gr. Fe 410 WB IS:2062-2011, Gr.250BR (Killed) or latest version. The material when supplied shall have the following chemical composition.</p> <table border="1" data-bbox="395 1205 1257 1433"> <thead> <tr> <th></th> <th></th> <th>Variation over the Max. specified limit in %</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>0.22 (Max)</td> <td>0.02</td> </tr> <tr> <td>Mn</td> <td>1.50 (Max)</td> <td>0.05</td> </tr> <tr> <td>P</td> <td>0.045 (Max)</td> <td>0.005</td> </tr> <tr> <td>S</td> <td>0.045 (Max)</td> <td>0.005</td> </tr> <tr> <td>Si</td> <td>0.4 (Max)</td> <td>0.03</td> </tr> </tbody> </table> <p>3.2 Mechanical Properties :</p> <p>3.2.1 Mechanical Properties Test :</p> <p>The mechanical properties shall be generally specified in IS:2062 '92 Gr. Fe 410WB IS:2062-2011, Gr.250BR (Killed) or latest version. The material when supplied shall have the following mechanical properties.</p> | | | | | | Variation over the Max. specified limit in % | C | 0.22 (Max) | 0.02 | Mn | 1.50 (Max) | 0.05 | P | 0.045 (Max) | 0.005 | S | 0.045 (Max) | 0.005 | Si | 0.4 (Max) | 0.03 |
| | | | Variation over the Max. specified limit in % | | | | | | | | | | | | | | | | | | | |
| C | 0.22 (Max) | 0.02 | | | | | | | | | | | | | | | | | | | | |
| Mn | 1.50 (Max) | 0.05 | | | | | | | | | | | | | | | | | | | | |
| P | 0.045 (Max) | 0.005 | | | | | | | | | | | | | | | | | | | | |
| S | 0.045 (Max) | 0.005 | | | | | | | | | | | | | | | | | | | | |
| Si | 0.4 (Max) | 0.03 | | | | | | | | | | | | | | | | | | | | |
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| Revision : 01 | Distribution | Qty. | Approved :  28/07/21 (Manish Verma) | | | | | | | | | | | | | | | | | | | |
| Date: 28/07/2021 | TXM QMX TME TSD | 1 1 1 1 | Prepared:  (Abhishek Shukla) | Checked:  (Abhijit Jain) | Date 28.07.2021 | | | | | | | | | | | | | | | | | |

TME/2011

Tensile Strength - 410 N/mm² (min)
Yield Strength - <20mm(t) = 250 N/mm² (min)
20-40mm(t) = 240 N/mm² (min)
>40mm(t) = 230 N/mm² (min)
Elongation - 23%
Impact Strength - 27 J
Bend test (Internal dia) - 2t (min)

4.0 Test and Test Methods

4.1 Sampling :

The sampling for the tests shall be as follows :


| Sl. No. | TESTS | No. of Samples for Test in Prototype Test | No. of Samples for Test in Routine Test |
|---------|------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1 | Dimension | 100% of offered Qty. | 20% of offered Qty. |
| 2 | Concentricity (If called in drawing) | -do- | -do- |
| 3 | Chemical analysis | 2 nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. | 2 nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. |
| 4 | Tensile Strength yield strength & Elongation % | -do- | -do- |
| 5 | Impact Test | 2 nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. | 2 nos. or 4% whichever is more, test piece from test coupon in each heat treatment batch. |
| 6 | Bend Test | -do- | -do- |

4.2 Metallurgical test certificate for prototype and bulk supplies shall be from raw material manufacturer (Mill TC) / NABL approved laboratory.

4.3 Freedom from defects

4.3.1 All finished components shall be reasonably free from surface flows, laminations, rough / lagged and imperfect edges and all other harmful defects.

4.3.2 Minor surface defects may be removed by the manufacturer by grinding provided the thickness is not reduced locally by more than 4% below the minimum specified thickness.

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| |  <p>PRODUCT STANDARD TME DIVISION, BHOPAL</p> <p>TME/2011</p> | <p>TM 11495 Rev.01</p> <p>Page 03 of 03</p> |
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">COPYRIGHT AND CONFIDENTIAL</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> | <p>5.0 <u>Marking :</u></p> <p>Each components shall be legibly marked with the following information.</p> <ul style="list-style-type: none"> i) Grade of Steel ii) Number of identification mark, by which it can be traced from which metal it was made. iii) Manufacturer's name, Sl. No. and batch No. etc. <p>6.0 <u>Information for tenderer</u></p> <p>6.1 The tenderers shall study carefully the drawing and specifications before they submit their offers.</p> <p>6.2 The tenderers shall note that BHEL do not undertake to supply drawings for jigs and fixtures, tooling's, templates and / or process sheets or any other such details.</p> <p>7.0 <u>Deviations:</u></p> <p>While submitting the offer the tenderer shall furnish a list of deviations, if any, from this specification / concerned drawing.</p> <p>8.0 <u>Packing :</u></p> <ul style="list-style-type: none"> 8.1 The components shall be suitably packed to prevent transit / long storing damage. 8.2 The components shall coated with antirust varnish / compound after inspection. 8.3 Varnished components shall be wrapped in polythene paper followed by corrugated paper. 8.4 The wrapped components shall finally be sealed in the polythene bag. 8.5 The sealed components shall be finally packed in wooden box filled with saw dust to prevent transit damage of machined surface. <p>9.0 <u>Ultrasonic Test:</u></p> <p>Supplier shall use ultrasonic tested plates before manufacturing the tension bars, cross piece and accessory bars. The plates shall be free from any internal harmful defects/ cracks. The test results/ records to be shown to the inspecting authority. However during prototype and routine test, ultrasonic test to be carried out on 100% offered quantity at firm's premises. The cost of such tests to be borne by the suppliers. Firm shall provide all facilities free of cost to the inspecting authority at his works.</p> | |
| | <p>10.0 <u>Reference:</u></p> <p>This specification is equivalent to CLW's specification no. 4TMS.096.055 ALT.-5.</p> | |