



PRODUCT STANDARD
TME DIVISION, BHOPAL

TM 10411

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TME/2011

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SPECIFICATION OF COPPER RODS AND BARS FOR ELECTRICAL PURPOSES

1.0 Scope :

1.1 The material covered by this specification required to be used in manufacture of 3 Ø phase traction motor type 6FRA 6068 / 6FXA 7059. The material shall comply with this specification instruction in chemical composition, mechanical properties and all other listed requirements.

2.0 Covering Standard :

2.1 The material shall conform to IS: 613' 2000 annealed (o) in terms of material composition.

2.2 General requirement relating to the supply of material shall conform to IS: 1387 '93.

3.0 Technical Requirement :

3.1 Chemical composition :

The following chemical composition of ETP grade copper as per IS: 191 (part V) – '80 to be followed.

<u>Element</u>	<u>Percent</u>
Copper + Silver (Min)	99.90
Bismuth (Max.)	0.001
Lead (Max.)	0.005

Total of all impurities excluding
Silver & oxygen (Max.) 0.03
Oxygen shall be limited to 0.06 percent.

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Distribution

Qty.

Approved :


24/10/18
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Prepared:

Checked:

Date:

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		3.2 Mechanical Properties :					
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	Annealed (O)		6 – 10 mm	210 - 250 N/mm ²	40 (min)	60 (65) max	Other then rectangular
			--Do --	210 - 250 N/mm ²	40 (min)	60 (65) max	Rectangular
		3.3 Electrical Resistivity :					
		<u>Condition</u>		<u>Resistivity Ohm mm² /m at 20^o C. max.</u>		<u>Conductivity (IACS) Percentage, min</u>	
		Annealed (o)		0.01737		99.25	
		3.3.1 Resistance measurement on tests sample after annealing:					
		Resistance measurement shall be made on specimens of the rod after cleaning and processing down to a diameter of approximately 6 to 10 mm and annealing at temperature 500°C for 30 minutes. Other equivalent annealing method may be used.					
		4.0 Freedom from defects:					
		The rod shall be bright and clean. It shall be free from blisters, Silvers, scale, fins, spills cracks and other defects.					
		5.0 Tests and Tests method :					
		5.1 The following tests to be carried out in presence of inspection authority and values to be recorded.					
		5.2 The sampling of the tests on each component shall be followed as per Table – 1.					

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TABLE – 1				
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	1	Dimensions & Tolerances	100% of offered quantity.	10% of offered quantity of each component.
	2	Chemical component	2 Nos or 4 % whichever is more in a batch	4% of offered quantity or 2 Nos which ever is more in a batch
	3	Tensile Test	2 Nos or 4 % whichever is more in a batch	4% of offered quantity or 2 Nos which ever is more in a batch
	4	Elongation	2 Nos or 4 % whichever is more in a batch	4% of offered quantity or 2 Nos which ever is more in a batch
	5	Hardness	2 Nos or 4 % whichever is more in a batch	4% of offered quantity or 2 Nos which ever is more in a batch
	6	Electrical Resistivity	2 Nos or 4 % whichever is more in a batch	4% of offered quantity or 2 Nos which ever is more in a batch
6.0 Retest : 6.1 If the test result of the chemical analysis fails to satisfy the requirement for any of the constituents, two more test for that constituents shall be done on the same sample in order to confirm that the analysis has been done properly. If both the test results satisfy the relevant requirement, the lot shall be considered. 6.2 If the test results on any sample for Tensile Test and electrical resistivity Test, fails to satisfy the requirements for any of the mechanical properties and electrical resistivity, two more tests shall be done on the sample selected from the same lot. If both the test results satisfy the relevant requirements the lot shall be considered as conforming to the specification otherwise not.				

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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		7.0 Inspection_: 7.1 The successful Tender shall submit prototype to BHEL before undertaking bulk production/supply. 7.2 The supplier shall offer prototype for inspection and tests at his works with prior intimation to inspecting authority. They shall provide all the necessary facilities for inspection and testing at their cost. After the Test if it is considered by the authorized inspecting representative to carry out further additional Test or Trial of the prototype samples at BHEL, supplier shall have to arrange the same by quickest means. 7.3 Any short comings / defects in the design and workmanship of the equipment shall be pointed out after the test to enable the supplier to incorporate the necessary improvements before bulk supply is commenced without effecting the guaranteed program and delivery. 7.4 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 item supplied. 7.5 The supplier shall not offer any material of service production to the inspecting officer authorized under the contract until the prototype has been finally approved. 7.6 Routine inspection of the items shall be carried out only after the approval of the prototype samples by the authorized inspecting authority. The manufacturer shall provide all the necessary facilities for inspection and testing for all tests in accordance with the specification at their own cost. 8.0 Information for Tenderer : 8.1 The Tenderer shall study carefully the drawing and specification before they submit their offers. 8.2 The Tenderer shall note that BHEL do not undertake to supply drawing for jig and fixture, tooling, templates and / or process sheets on any other such detail. BHEL may however comment / suggest alteration / modification to the suppliers drawing and method, if required, during the manufacture, Testing / inspection of material and / or use of the material in BHEL production. 8.3 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) Detail of material offered. c) Quality control system and quality assurance plan adopted by tenderer. d) Past performance for similar type of items.	

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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		e) Tenderer may furnish additional details / information as relevant to establish their capacity to undertake the manufacturing of items covered by this specification. f) Tenderer shall furnish all the relevant detail as asked for in 'BID DOCUMENT' without fail. 9.0 Marking : 9.1 Finished material shall be legibly marked with following information. 1) Grade of Material. 2) Number of identification mark by which it can be traced from, which metal it was made. 3) Manufacturers initial, or trade mark, purchase order Ref. and date, batch order etc. 10.0 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. 11.0 Packing : 11.1 The finish material shall be packed in wooden boxes after tightly wrapped in polythene paper so that no damage can arise during transportation. Each wooden box shall have 30 Nos of finish material. 12.0 Reference to CLW standards : 12.1 This specification is as per CLWs specification 4.TMS.096.062 alt. 04.	