



BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL

QUALITY PLAN FOR CTC (Continuously Transposed Conductor)

QA PLAN NO: QC/TCB/QAP/BO/55 REV 01

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SL	COMPONENT / OPERATION	CHARACTERISTICS	TYPE OF CHECK	REFERENCE DOCUMENT	QUANTUM OF CHECK	INSPECTION AGENCY	REMARKS
Raw material Inspection							
1	Kraft Insulating Paper	- Thickness - Routine tests - Type Test (test to be conducted for each manufacturer once in 5 Yrs.)	M / T	BHEL spec. AA 21111 AA 21116	1 Sample per lot for each thickness	CTC Vendor, BHEL/TPIA	- CHP For Record Review - CTC manufacturer shall send one set of samples (20 sheets of size 300mm x 300mm) and paper Manufacturer's test certificates for approval from BHEL Bhopal before use. Complete consignment details e.g. No. of reel, weight, invoice and linking paper shall be sent. - Paper from BHEL Bhopal approved source shall only be used.
2	CC Rod	- Surface finish. - Chemical composition: i) Copper including silver ii) Oxygen content. - Mass Resistivity. - Elongation	V / T	BHEL spec. AA 12024	1 sample per lot.	CTC Vendor, BHEL/TPIA	- CHP For Record Review - Any discrepancy observed in CC rod at any stage of processing should be reported to BHEL with full details stating coil no. nature of defect with photographs. - CC Rod from BHEL Bhopal approved source shall only be used.
3	a) PVA based adhesive used for Kraft paper Bonding	i) Type grade & make. ii) Non volatile matter content, consistency, bond strength, pH Value, Compatibility with Transformer oil (Type test)	T	IS 2257	1 sample per lot.	CTC Vendor	Record review by CTC vendor
	b) Enamel and Epoxy coat	Colour, appearance, Solid contents, Viscosity, Flash point, storage and shelf life of enamel. Compatibility with Transformer Oil	T	CTC Vendor's spec.	1 sample per lot	CTC Vendor	

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In process inspection								
4	Manufacturing and storage area	Proper cleaning of copper dust and normal dust in plant and machinery	V	BHEL Spec AA28125/ AA28128	100%	Vendor	- Surveillance Check By BHEL/TPIA/CQ	
5	(a) Drawing / Flattening and annealing	- Surface finish - Corner radius - Dimension - Elongation / Proof stress	V / M / T	AA 28127 AA 28129	100% mother reels	CTC Vendor	1-Surface defects like burrs, sharp edges, blisters, flakes, cracks, grease, foreign particles, and embedded impurities are not acceptable.	
	(b) Enameling and Epoxy coating	- Surface finish of bare strip - Appearance of enameled strip - Bare and covered Dimensions - Shelf life	V / M	AA 28127 AA 28129 IEC 317-18 TRE 036	100%	CTC Vendor	2-The conductor shall have smooth, bright and polished surface. 3-The enamel coating shall be smooth and continuous, free from streaks, blisters and foreign material.	
		- Tests: Resistance, Elongation, Proof stress (if applicable), springiness, flexibility and adherence, heat shock, resistance to solvents, BDV	T		3 samples per enamel setting (start, end and in between)		Complete records to be maintained by vendor for ensuring traceability from CC rod to Finish stage	
	(c) Transposition and Paper Covering	- Visual Inspection - Dimensions of CTC stack - Pitch of Transposition - No. of layers, width and arrangement of paper lapping	V / M / T	AA 28127 AA 28129	100%	CTC Vendor, BHEL/TPIA	CHP for witness of covering for 2 reels of each size. The CTC stack shall be compact in both the directions; there shall be no damage to enamel.	
Final inspection								
6	(a) Visual, Dimensions and Insulation covering	- Covered dimension of cable - Increase in dimension due to paper insulation. - Paper covering: Thickness, width, staggering and overlap - Inter column paper - Bare dimensions of cable - Pitch of transposition - Appearance of enameled conductor	V / M	AA 28127 AA 28129 IEC 317-18 TRE 036	3 samples per lot for each size	BHEL/TPIA	CHP for witness	

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		<ul style="list-style-type: none"> - Increase in thickness due to enameling and epoxy coating. - Corner radius perpendicular ness of edges and merging - Bare thickness and width 					
	(b) Tests	<ul style="list-style-type: none"> - Resistivity - Elongation - Proof stress test (if applicable) - Flexibility and adherence - Springiness - Heat shock - resistance to solvent - BDV - Insulation test (between each and every other strip) at 250V - Epoxy curing check 	T	AA 28127 AA 28129 IEC 317-18 TRE 036	1 sample per lot per size	BHEL/TPIA	CHP for witness
7	Packing and Dispatch	<ul style="list-style-type: none"> - Provision of inter-layer paper. - Sufficient gap from drum brim to packed conductor top - Marking of winding direction. - Use of proper drum size - Proper identification - use of refrigerated container as per PO requirement 	V	AA 28127 AA 28129 TRE 036 TR 10133	100%	CTC Vendor	Surveillance check by BHEL/TPIA

LEGENDS: V – VISUAL, M – MEASUREMENT, T – TEST, TPIA – THIRD PARTY INSPECTION AGENCY, CQ- BHEL CORPORATE QUALITY, CHP – CUSTOMER HOLD POINT (VENDOR CAN NOT PROCEED WITHOUT GETTING CLEARANCE FROM BHEL CQ TPIA)

Changes in the revision:

- Remarks for clause 2 updated.
- Clause 4 added and renumbering done.

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