

Technical Specification

Accessories related to L.T. Arial Bunch Cable

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CONNECTORS AND FITTINGS FOR LV – ABC

Standards: NF C 33020, 33021, 33040, 33041, 33042 & ESI 43-14

Summary:

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2. Anchoring clamps
3. Suspension clamps
4. Service clamps
5. Transformer connections
6. Junctions
7. Insulation Piercing Connectors
8. Distribution boxes
9. Eye Hooks

1. General Conditions

The products shall be in accordance with Indian standards and most of the European recognised standards used in LT ABC (NFC for example) or with any relevant standard.

- Marking: Each product shall be clearly identified with Manufacturer name or trade mark, reference and capacity of the item and batch No.
- Packaging: Manufacturer shall mention the packaging of each item. Installation instruction should be included in the packaging.
- Type tests: Each supplier should provide type test reports with the offer, carried out in accordance with one of the referenced standards in NABL accredited laboratory.
- Routine tests: Suppliers shall provide a control plan, which will be implemented on each item. Routine Test reports should be submitted by the manufacturer with the Inspection Call.
- Quality: All suppliers should be ISO 9000 certified.
- Anchoring and Suspension clamps should be installable on existing poles using appropriate devices (hooks, pigtails, brackets etc.)
- All crimped connectors should be installed with mechanical or hydraulic hand crimping tools.

2. Anchoring clamp for Insulated messenger:

The clamps should be designed to anchor LV-AB Cable with insulated neutral messenger. The clamp should consists of an Aluminium alloy corrosion resistant casted body, bail of stainless steel and self-adjusting plastic wedges which shall anchor/hold the neutral messenger without damaging the insulation.

- The clamp should be installed properly.
- No losable part in the process of clamping arrangement.
- The clamp should conform to the standard NF C 33041 and 042 or equivalent I.S., if any.
- The clamp body should be made of corrosion resistant Aluminium alloy, bail should be of stainless steel and wedges should be of weather and UV resistant polymer.
- Clamps should be fixed with pole by eye hook/bracket. Bracket should be made of corrosion resistant Aluminium alloy.
- Ultimate Tensile Strength of the clamp should not be less than 15 KN for 50/70 Sq.mm insulated messenger wire / 10 KN for 25/35 sq.mm insulated messenger wire.
- Slip load of the clamp should not be less than 3 KN for 50/70 Sq.mm insulated messenger wire/2 KN for 25/35 sq.mm insulated messenger wire.
- Design as per furnished drawing.

3. Suspension clamp for insulated neutral messenger:

The clamps should be designed to hang LV-AB Cables with insulated neutral messengers. The neutral messengers should be fixed by an adjustable grip device. A movable link should allow longitudinal and transversal movement of the clamp body.

- The clamp should be installed properly.
- No losable part in the process of clamping arrangement.
- The clamp should conform to the standard NF C 33040 or equivalent I.S., if any.
- The clamp and the link made of the Polymer should provide an additional insulation between the cable and the pole.
- The clamps and the movable links should be made of weather and UV resistant glass fibre reinforced polymer.
- Clamps should be fixed with pole by eye hook/bracket. Bracket should be made of corrosion resistant aluminium alloy.
- Ultimate Tensile Strength of the clamp should not be less than 15 KN for 50/70 Sq.mm insulated messenger wire / 4.3 KN for 25/35 sq.mm insulated messenger wire.
- Maximum Allowable load of the clamp should not be less than 20 KN for 50/70 Sq.mm insulated messenger wire / 15 KN for 25/35 sq.mm insulated messenger wire
- The clamp should sustain to maximum angle of deviation of 60 degrees of the conductors.
- Design as per furnished drawing.

4. *Service clamps*

The clamps should be designed to anchor insulated service lines (armoured or unarmoured) with 2/4 conductors.

- The clamps should be made of weather and UV resistant polymer.
- The clamp should be installed properly.
- No losable part in the process of clamping arrangement.
- The clamp should conform to the standard NF C 33042 or equivalent I.S., if any.
- Breaking load of the clamp should not be less than 3 KN.
- Design as per furnished drawing.

5. *Transformer connections*

- The connection to the transformer should be made with Pre-Insulated Lugs for Phase and Street Lighting conductors and with an Aluminium Lug for Neutral Messenger. If the Bus Bars are of Copper, the Lugs should be preferably Bi-metallic type.
- The Barrel of the Lug normally insulated with an Anti-UV black Thermoplastic tube sealed with a Flexible ring. Die reference, size and strip length are indicated on the plastic.
- Sizes Covered: 16 – 70 & up to 150 mm² Aluminium XLPE insulated
- Referenced standard: NFC 33 021 or equivalent I.S., if any.
- Design as per furnished drawing.

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6. Junction sleeves

- The sleeves should be Pre - Insulated for Phases, neutral messengers and Street Lighting conductors.
- Sleeve should be made of Aluminium, insulated with an anti UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings. Die reference, size and strip length are indicated on the sleeve itself.
- Sizes needed: 16 – 70 -& upto 150 mm² for Aluminium XLPE insulated
- Referenced standard: NFC 33 021 or equivalent I.S., if any.
- Design as per furnished drawing.

7. Insulation Piercing Connectors as per the standard NF C 33020 or equivalent I.S., if any.

SCOPE

In the process of replacing the Bare Conductors with LT AB Cables to reduce power theft & Transmission Losses, it is important to analyze the proper method of providing service connection from AB Cables to our consumers without damaging the cable. Removal of Bare Conductor, Stringing of LT AB Cable & re-establishing the service connections should be simultaneous process. In this regard the Insulating Piercing Connectors are required- a) for providing 1-2 service connections from 8 mtr. PCC LT pole, b) for providing supply to Junction/ Distribution Box from AB Cable & c) for establishing Tee connection from LT ABC to LT ABC.

This Insulating Piercing Connectors should not be exposed to any bare conductor in the environment during connection. The connectors should be totally Weather & Moisture proof so that no water or moisture can enter through the pierced holes on to the cable insulation.

It must have Shear Head type mechanism to control the effective Torque during connection and to ensure perfect installation. Connectors should not have any losable parts, which may drop and then lost while installation at overhead conditions. For individual connectors Torque required for different conductor sizes should be mentioned in the equipment.

TECHNICAL

REQUISITES

Construction:

The connectors should be totally insulated with no loose parts. The connectors should be totally Weather & Moisture proof so that no water or moisture can enter through the pierced holes on the cable insulation.

Voltage Ratings:

The maximum voltage withstand capacity should be 6 KV.

Moisture Ingress:

The connectors should work at 30 cm under water bath for 30 min. & voltage applied of 6KV for 1 min. without any flashover/ failure & moisture ingress in it.

Working Temp.:

Designed for installation from -10°C upto +60°C & operation experience with temperature from -20°C upto +75°C.

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Materials:

Material used in the manufacturing process of the components of this product should be specified in the respective product drawings & can be summarized as follows:

- All the metallic part of the connector should be Corrosion resistance & should be proven in Salt Fog chamber & Wet SO₂ gas chamber & there should not be any change in contact resistance & temperature after overloads & load cycling.
- The contact plates should be made of tinned Copper.
- Connector teeth should be factory greased & sealed to retard water or moisture ingress & corrosion.
- The insulation material should be made of weather & UV resistance, reinforced polymer.
- The outer metallic part should have potential free tightening bolts to allow safe installation on life lines.
- The bolts should be of Shear Head type so that it controls the effective applied Torque during installation & break off at a specified torque after establishing proper connection.
- The connector should not have any losable component. The cable end cap should be attached to the body.

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8. ABC Service main Distribution boxes

SCOPE

This Distribution Box should be Weather & Moisture Proof with Spring loaded Bus Bar system & should be able to carry a current according to specified ampacity. It can have 1 /3-phase input & provision for 4 or 9 nos. of 3- phase or 1-phase outputs. The box should have the provision for special key for locking & Proper arrangement of sealing. The boxes should be assembled on the pole using Metal Tapes & Buckles or Bolts. No. of Boxes per pole may vary with supporting arrangement for more no. of service connections.

TECHNICAL

REQUISITES

Construction:

Distribution Boxes should be designed with Bus Bars with spring action contact, so that no screw-bolt technique is required to operate & only insertion of the conductor into the specified groove of the Busbar is sufficient for proper connection. It should be used for multiple connections (3-phase or 1-phase) in low voltage Distribution Network.

The boxes should be suitable for 1/ 3-phase (4 cores) inputs & provision for 4 or 9 nos. of 3- phase or 1-phase outputs. Bus bars should be with a continuous pair of contact bars with colour code to facilitate the identification of the correct energy phase.

The box should be able to incorporate the input or output cable dia. of maximum 16mm. (Equivalent to 120Sqmm.)

The Boxes should consist of special type Lock & key system as well as provision for sealing for complete protection of the service connection contacts.

Current Ratings:

The maximum current rating should be 140A/ 200A/ 250A. & concerned authority should have the liberty to choose among the above ratings as per their requirement.

Voltage Ratings:

The maximum voltage withstand capacity should be 600V.

Working Temp.:

Safe working temperature should be around 80°C for Outer Box & 100°C for metallic Bus bars.

Materials:

Material used in the manufacturing process of the components of this product should be specified in the respective product drawings & can be summarized as follows:

- Outer Box (Base & Cap): With UV protection & Flame retardant characteristics (HB, as per UL 94- Tests for Flammability of Plastic materials) & preferably made up of ASA (Acrylonitrile Styrene Acrylate).
- Cable Grommets: Ethylene-Propylene Rubber.
- Safety Key: PA 6.6 (Nylon).
- Safety Screw: Stainless Steel or Plating Finished steel.
- Insulator protection as per IP 44
- Bus bars or Terminal Blocks: PA 6.6 (Nylon), Stainless Steel & Copper.
- Button & Cable Holder: PA 6.6 (Nylon) with 50% Glass Fibre.
- Busbar Insulation: Polyamide.

Locking System:

The boxes should consist of Special type Lock & Key arrangement as well as provision for sealing for complete protection of the service connection contacts.

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**TESTING
STANDARDS**

Impact Resistance should be according to UL 746C. Insulation Protection should be as per IP 44. The Outer Plastic box should conform to following std.-

Test / Standard	Requirements	Test Procedures
Degree of Protection IEC 60529	IP 44 - Protected against the penetration of solid objects exceeding 1.0 mm in diameter and against penetration of water jets that may affect the product operation.	First Digit: A 1.0 mm diameter test wire should not penetrate in any apparent opening (force = 1 N \pm 10%). Second Digit: A spray nozzle is used to spread a water jet in all possible directions.
Impact Resistance UL 746-C	After the test the product should not show any evidence of: - Live electrical parts accessible to the test probe, as described in this test specification. - Any results, which may affect the mechanical performance of the product. - Any results, which may increase the probability of electrical shocks.	The impact should be generated by dropping a steel ball - with a diameter of 50.8 mm and a mass of 0.535 kg - from a specified height sufficient to produce an impact energy of 6.8 J (0.6913 kg.m).
UV Resistance UL 746-C	The sample physical properties average value - after an accelerated aging with UV radiation - should not be lower than 70% of its initial value, without aging, that is, a variation of \pm 30% is allowed.	According to ASTM G26, Exposure Method 1, Xenon Arc Lamp Type B or ASTM G155, Exposure Cycle 1, with continuous exposure to light and intermittent exposure to water jets, with programmed cycles of 120 minutes, consisting of a 102 minutes light-only exposure and a 18 minutes exposure to light and water jets.
Withstanding Voltage UL 746-C	Product should withstand the specified voltage.	A 5 kV voltage should be applied to the samples after the 40 hours conditioning cycle at 23 \pm 2 $^{\circ}$ C and 50 \pm 5 % relative humidity plus 96 hours at 35 \pm 2 $^{\circ}$ C and 90 \pm 5 % relative humidity.
Flammability UL 94	After the UV radiation accelerated aging, the material should maintain the same original flammability level (HB).	The test can be applied to test samples molded with the same material used for the base and the cap of the box or taking a piece of these components.
Flexural Strength ASTM D790 UL 746-C	After UV radiation accelerated aging, the average value for this test should not be lower than 70% of the original value, that is, a maximum variation of 30% is allowed.	A group of test samples without aging should be tested and the average values calculated. Another group should be aged under UV radiation, then it should be tested and the new average should be calculated and compared to the initial average value.

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Tensile Strength ASTM D638 UL 746-C	After aging with UV radiation, the average value should not be lower than 70% of the initial values, that is, a maximum variation of 30% is allowed.	One of the test bodies must be tested without being submitted to accelerated aging and is computed over mean values. Another group is submitted to the radiation induced aging and then tested and the new mean value is computed and compared to the first computed mean value.
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9. Eye Hooks:

Eye hooks should be designed as to hold Suspension Clamps and Dead end Clamps and to be installed with the Pole Clamps:-

- Eye hooks should be made of forged Galvanised Steel.
- The clamps corrosion resistance should confirm to the standard IS: 2629 and IS: 2633
- Bolt and nuts should be made of hot dip galvanised steel ,according to VDE 0210 and VDE 0212.
- Ultimate Tensile Strength (UTS) of the clamp should be 20 KN.
- Design as per furnished drawing.