



SUPPLY CHAIN MANAGEMENT
Thiruvananthapuram

TECHNICAL SPECIFICATION

CONTROL CABLES OF VARIOUS SIZES

Doc. #: SCM-SPEC/XT/Control Cable

Rev.#: 1.0

Effective Date 24/09/2022



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THIRUVANANTHAPURAM

SPECIFICATION

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APPLICABLE TO KSEBL

Rev#1.0

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(i) Document Approval & Control Status: (R0)

	Compiled by	Verified by	Approved by
Name	Sri.Shajkumar	Sri.Binukumar.M	Smt.Presannakumari.S
Position	Assistant Executive Engineer (Supply Chain Management)	Executive Engineer (Supply Chain Management)	Chief Engineer (Supply Chain Management)
Date	12/09/21	12/09/21	12/09/21
Signature	Sd/-	Sd/-	Sd/-

(ii) Amendments and History

Sec. #	Rev. #	Date	History of Change
1) 2 (5), (6), (7)	R1	22/09/22	IS:540, IS:502 and IS:754 replaced with IS:10810. IS:3961 (Part-II) recommended current rates for PVC insulated and PVC Sheathed Cables and IS:10418 for cable drum for Electric Cables added.
2) 7.1	R1	22/09/22	Clause-12.0 replaced with Clause-13
3) 12.1	R1	22/09/22	IS:8130-1984, IS:5831-1984 and IS:10810-1984 added.
4) 12.7	R1	22/09/22	Tensile Strength and elongation at break of insulation and sheath added.

(iv) Document Approval & Control Status: (R1)

	Compiled by	Verified by	Approved by
Name	Sri.Shajkumar	Smt.Anitha Sugathan	Sri.Surendra.P
Position	Assistant Executive Engineer (Supply Chain Management)	Executive Engineer (Supply Chain Management)	Chief Engineer (Supply Chain Management & Chief Safety Commissioner)
Date	24/09/2022	24/09/2022	24/09/2022
Signature	Sd/-	Sd/-	Sd/-



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1. PURPOSE:

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **Control Cables Of Various Sizes** in a professional manner

2. SCOPE:

The Scope of this document is to inform and alert all relevant stakeholders including KSEBL, Public, KSERC etc regarding the current specifications and historical changes adopted in specifications of **Control Cables Of Various Sizes** used in field by KSEBL

3. RESPONSIBILITY:

The Executive Engineer (T), Office of Chief Engineer, Supply Chain Management shall compile and take necessary steps to publish the specification in KSEBL website and shall inform relevant stakeholders regarding updates and revisions

4. PROCEDURE FOR REVISION:

Modifications if any, in the technical specification will be incorporated as **Revisions**. Any changes in values, minor corrections in pages, incorporation of small details etc. will be considered as Minor Modification. **The Revisions due to minor modifications will be assigned as Rev. No.0.1, 0.2 etc.**

A complete updation of the technical specification will be considered as Major modification. **The Revisions due to major modifications will be assigned as Rev. No.1.0, 2.0 etc.**

All the details of regarding the revisions (both minor and major) will be incorporated in **“(ii)-Amendments and history”** above.

The concerned officers, in consultation with the Technical Committee will review and suggest changes required and the revision suggestion will be approved by **Chief Engineer (SCM)**. Those who notice any discrepancy or have any suggestion regarding revision, may bring the matter to the attention of Chief Engineer (SCM) in writing or through e-mail id: **cescm@kseb.in**



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TECHNICAL SPECIFICATION FOR THE SUPPLY OF CONTROL CABLES

- 1) **Scope:-** This specification covers the design, manufacture and testing before despatch, supply and delivery of control cables of annealed stranded High Conductor Tinned Copper (HCTC) as specified here under. The cables are required for control, protection and instrumentation connections of the various equipments to be installed in EHT Sub Stations in KSEB Limited.
- 2) **Standards:-** The control cables to be supplied shall conform to the latest revisions of IS, IEC or any other acceptable international standards. Some of the Indian Standards considered relevant to the cables are given below.
 - 1) IS:1554 (Part I) - PVC insulated (heavy duty) electric cables for Working voltage up to and including 1100V
 - 2) IS:5831 - PVC insulation and sheath of electric cables.
 - 3) IS:8130 - Conductors for insulated electric cables and flexible cords.
 - 4) IS:3975 - Mild steel wires/ strips and tapes for armouring Cables.
 - 5) IS:10810 - Test methods for insulations and sheaths of Electric cables and cords.
 - 6) IS:10418 - Cable drum for Electric Cables
 - 7) IS:3961 (Part-II) - Recommended current ratings for PVC insulated and PVC sheathed heavy duty cable.
 - 8) Any other applicable - Standards, which satisfy the specified Technical requirements
- 3) **Type Of Cables:-**
 - 3.1) The control cables shall be 1100V grade, heavy duty, multicore, annealed stranded high conductivity tinned copper conductor, PVC insulated, armoured, overall sheathed by extruded PVC and shall conform to the latest revisions of IS:1554.



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4) **Conductor:-**

- 4.1) The cable conductors shall be made from stranded annealed high conductivity (complying IS:613-1964 and its amendments) tinned copper to form compact conductor having resistance within the limits specified in IS:8130. The conductor shall be of circular cross section. The minimum number of strands for conductor shall be 7(Seven).
- 4.2) Persulphate test and Annealing test shall be carried out on the conductors as specified in clause 6.1 of IS.8130-1984 or latest. Report of testing before stranding is to be furnished along with cable readiness intimation.

The cables shall have heat and moisture resistant properties for satisfactory operation under tropical humid conditions.

5) **Insulation:-**

- 5.1) The cable insulation shall be of best quality PVC compound Type C suitable for Heat resisting (85°C) operation as per IS:5831(1984). The insulation shall be extruded and shall be designed and manufactured for the specified voltage grade. The insulation shall fit closely in the conductor and shall be free of voids, foreign particles and burnt material etc. to ensure good insulating properties throughout the cable length.
- 5.2) The cables shall have heat and moisture resistant properties for satisfactory operation under tropical humid conditions.

6) **Inner Sheath:-**

- 6.1) The laid up cores in a cable are inner sheathed by extruded heat resisting PVC (Type ST2) covering, as per IS:5831, which shall be suitable to withstand the site conditions and the desired temperature. The sheath shall be of adequate thickness and applied continuous process to produce a sheath of consistent quality free from all defects. The thickness of inner sheath shall be as per Clause No.12.3 of IS:1554 (Part-I) and its amendments.



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7.0) **Armour / Shield:-**

7.1) The control cables shall be armoured with galvanized round steel wires or strip as per clause 13.0 of IS: 1554 (Part I).

8.0) **Serving / Outersheath:-**

8.1) Extruded heat resisting PVC (Type ST2) serving as per IS:5831 shall be applied over the armouring with suitable additives to prevent attack by rodents and termites. All servings must be given antitermite treatments.

9.0) **Identification:-**

9.1) The cores in control cables shall be identified by a colour scheme as per IS 1554 (Part I). Over and above, the indelible printing of serial numbers on the cores at distance not more than 75mm shall identify the cores.

9.2) All cables shall carry the manufacturer's data in a permanent legible manner at an interval of atleast three meters run. The manufacturer's data shall include the month / year of manufacture, the name, the cable size, voltage rating, together with any other information, which the manufacturer considers appropriate.

10.0) **Drum Length and Cable Drums (IS:10418-1982 and its amendments):-**

10.1) The cables covered by this specification shall be supplied in drum lengths (continuous length) of 500 metres $\pm 5\%$. The supplier shall obtain purchaser's approval for the drum lengths before packing the cables on drums.

10.2) The cables shall be supplied in non-returnable wooden drums of robust construction. The wood used for construction of the drums shall be properly seasoned sound and free from defects and wood preservative shall be applied to the entire drum. Also wood shall be reasonably free from rots fungus, decay and attack from termites and rodents.



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11.0) **Packing:-**

11.1) All cables shall be wound on substantial logged wooden non-returnable drums. A layer of waterproofed paper shall be applied to the surface of the drums and over the outer cable layer. A clear space of at least 40mm shall be left between the cable and the logging.

11.2) Each drum shall carry the manufacturer's name, the purchaser's name, address and purchase order number, item number and type, size and length of cable, net and gross weight stenciled on the drum.

12.0) **Test:-**

12.1) List of Type Test as per IS:1554-1988 (Part-I) and its amendments, IS:8130-1984, IS:5831 -1984 and IS:10810-1984 and its amendments.

a) Tests on the Conductor:-

- 1) Annealing test
- 2) Conductor resistance test.
- 3) Persulphate

b) Tests on Armouring Wire/ Strip:-

- 1) Tensile Test.
- 2) Elongation Test
- 3) Torsion/ Winding Test
- 4) Resistivity Test

c) Test on Thickness of Insulation and Sheath.

d) Physical Tests for Insulation & Outer Sheath:-

- 1) Tensile Strength & Elongation at break
- 2) Ageing in air oven
- 3) Shrinkage Test
- 4) Hot deformation Test.



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- 5) Loss of mass in air oven
 - 6) Heat shock Test
 - 7) Thermal Stability
- e) Insulation Resistance Test.
 - f) High Voltage Test (Water immersion Test)
 - g) High Voltage Test (At room temperature)
 - h) Flammability Test.
- 12.2) During the manufacture of cables, manufacturer's standard tests shall be performed and copies of test certificates shall be furnished.
- 12.3) After completion of manufacture of cables, routine and acceptance tests shall be performed strictly as per applicable standards and copies of test certificates shall be furnished.
- 12.4) The test report on all cables shall be got approved from the purchaser before despatch of the cables.
- 12.5) The tests on the cables that will be conducted by the supplier shall be mentioned in the schedule of tests for each type of cables separately in the form of a tabular chart. Also the testing facilities available at the manufacturer's work shall be clearly indicated in the schedule.
- 12.6) The purchaser reserves the right to witness all routine tests and the supplier shall provide all facilities to the purchaser in this regard and shall inform the purchase sufficiently in advance to enable the purchaser to depute his representative to witness the same.
- 12.7) Routine test and acceptance test: The following tests shall constitute routine tests and acceptance test.
- 1) Annealing test.
 - 2) Conductor resistance test.
 - 3) Test for thickness of insulation and sheath.
 - 4) Tensile Strength and elongation at break of insulation and sheath.
 - 5) Insulation resistance test.
 - 6) High voltage test.



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The test methods, Condition of test and test requirement shall comply with those given under the type test. The high voltage tests shall however be performed as per the methods specified under relevant clause for routine test in IS 1554 (Part I). Apart from these, conductor examination, check of dimension etc. shall be carried out as routine tests.

Sd/-

Chief Engineer (SCM) &CSC



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GUARANTEED TECHNICAL PARTICULARS FOR CONTROL CABLES OF VARIOUS SIZES, 1100V GRADE

Sl.No	Details	
1.0.	GENERAL	
1.1	Name & Address of the Manufacturer	
1.2.	Trade Name.	
1.3.	Location of Factory.	
2.0.	CABLE TYPE:	
2.1.	Type & Size of Cable. (No. of cores X Normal Area in Sq.mm)	
2.2.	Standard Applicable.	



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2.3.	Voltage Rating.	
2.4.	a) Permissible variation in voltage Frequency.	
	b) Combined voltage and Frequency	
2.5.	Suitable for earthed / unearthed system.	
3.0	CONDUCTOR:	
3.1.	Material Copper / Aluminium. (including grade)	
3.2.	Nominal Cross Sectional area Sq.mm.	
3.3.	Form of Conductor (Circular shaped)	

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3.4.	Minimum Number of strands.	
3.5.	Nominal diameter of each strand (mm)	
3.6.	Whether strands are tinned or not.	
3.7.	Temperature Co-efficient of resistance at 20°C per °C	
4.0.	INSULATION:	
4.1.	Material (Mention type)	
4.2.	Minimum average thickness (mm)	
4.3.	Tolerance on the smallest of the measured values of the thickness of insulation.	
4.4.	Diameter of core over insulation.	
4.5.	a) Minimum volume resistivity at 27°C. Ohm-cm	

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	b) Minimum volume resistivity at 80°C. Ohm-cm	
4.6.	Colour scheme of identification of core	
4.7.	Average Dielectric strength	
4.8.	Suitability with regard to moisture, Ozone, acid and oil and alkaline surroundings.	
5.0	INNER SHEATHING:	
5.1	Material (Mention type)	
5.2	Whether extruded	
5.3	Minimum thickness of inner sheath (mm)	
5.4	Whether the inner sheath and the filling material are suitable for the operating temperature of the cable.	
6.0	ARMOUR:	
6.1	Type and Material	

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6.2	Nominal dimension of steel strips or round armour wire.	
6.3	Whether galvanized	
6.4	Hardness grade of Aluminium armour wire.	
7.0	OUTER SHEATHING /OVERALL COVERING:	
7.1	Material (Mention type if any)	
7.2	Whether extruded	
7.3	Minimum average thickness	
7.4	Tolerance on the smallest of the measured value of the thickness of outer sheath.	
7.5	Calculated diameter under the sheath.	

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7.6	Whether anti termite treatment has been given in the outer sheath.	
8.0	ELECTRICAL PROPERTIES:	
8.1	Maximum DC Conductor resistance at 20°C (Ohm/Km)	
8.2	Maximum permissible conductor temperature (°C)	
	a) Under continuous full load.	
	b) Under transient conditions	
8.3	Loss tangent at normal frequency.	
8.4	Reactance at 50C/S (Ohm/Km)	



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8.5	Capacitance at 50C/S (Ohm/Km)	
8.6	Current Rating (Amps)	
8.6.1	In air (continuous)	
8.6.2	In Duct (continuous)	
8.6.3	Reference Ambient temperature for the above.	
	a) Land in Air (°C)	
	b) Land in Duct (°C)	

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8.6.4	Short Circuit Current rating for 1 second duration (KA)	
9.0	MECHANICAL DATA:	
9.1	Over all diameter of the cable $\pm 2\text{mm}$	
9.2	Diameter of the cable under the sheath $\pm 2\text{mm}$	
9.3	Diameter under armouring $\pm 2\text{mm}$	
9.4	Diameter over the stranded cores 2mm	
9.5	Weight of the cable Kg per Km $\pm 5\%$	
9.6	Total volume of non-metallic Material in the cable in litres/ metre.	



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9.7	Total volume of non-metallic Material in the cable in Kg / metre.	
9.8	Drum length (m)	
9.9	Tolerance on drum length	
9.10	Total weight of the drum $\pm 5\%$ (Kgs)	
9.11	Dimensions of the drum (inch)	
	i) FLANGE	
	ii) TRAVERSE WIDTH	
	iii) BARREL DIAMETER	
9.12	Recommended minimum installation Radius (bending radius) (mm)	



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9.13	Maximum safe pulling force (newtons) (When conductor pulled by pulling eye)	
9.14	Whether identification as per clause 9.0 of the specification is being provided.	
9.15	Whether packing shall be done as per clause 11.0 of the specification.	

Place :

Date :

Name and Address of Bidder