IS 694: 2010
के अनुसार

पॉलीविनाइल क्लोराइड इंसुलेटेड अनशीथेड और शीथेड केबल/कॉर्ड कठोर और लचीले कंडक्टर के साथ 1100V तक और इसमें शामिल रेटेड वोल्टेज

के लिये
उत्पाद मैन्युअल

PRODUCT MANUAL

For Polyvinyl Chloride Insulated Unsheathed and Sheathed Cables/Cords with Rigid and Flexible Conductor for Rated Voltages up to and including 1100 V
According To
IS 694:2010

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो अनुरूपता मूल्यांकन)विनियम, 2018 की योजना -I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations,2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification.

1.	**मानक संख्या** **IS No.**	**:**	IS 694: 2010
	शीर्षक **Title**	**:**	Polyvinyl Chloride Insulated Unsheathed And Sheathed Cables/Cords With Rigid And Flexible Conductor For Rated Voltages Up To And Including 1100 V
	संशोधनों की संख्या **No. of amendments**	**:**	4
2.	**नमूना दिशानिर्देश** **Sampling Guidelines**		
a)	**कच्चा माल** **Raw material**	**:**	Annealed, bare or tinned high conductivity copper wires (or) Aluminium wires as per IS 8130
b)	**समूहीकरण दिशानिर्देश** **Grouping Guidelines**	**:**	Please refer Annex – A
c)	**नमूने का परिमाण** **Sample Quantity**	**:**	25 m
3.	**परीक्षण उपकरणों की सूची** **List of Test Equipment**	**:**	Please refer to Annex-B

4.	**निरीक्षण और परीक्षण की स्कीम** **Scheme of Inspection and Testing**	**:**	Please refer to Annex-C
5.	**एक दिन में संभावित परीक्षण** **Possible tests in a day**		
	1. Dimensions (Cl. 9) 2. Conductor Resistance (Cl.10) 3. Tensile Test (before ageing) on Insulation and Sheath (Cl.10) 4. Shrinkage Test (Cl.10) 5. Hot Deformation (Cl.10) 6. Heat Shock Test (Cl.10) 7. Insulation Resistance Test (Cl.10) 8. HV Test (at room temperature) (Cl.10) 9. Flammability Test (Cl. 10)		
6.	**लाइसेंस का दायरा /Scope of the Licence:**		
	"Licence is granted to use Standard Mark as per **IS 694: 2010** with the following scope:		
	Name of the product		Polyvinyl Chloride Insulated Unsheathed And Sheathed Cables/Cords With Rigid And Flexible Conductor For Rated Voltages Up To And Including 1100 V
	Type & Conductor material		Unsheathed/Sheathed, Circular/Flat, Cables/Cords with Rigid/Flexible Copper (Bare/Tinned)/Aluminum Conductor
	Class of Conductor		Class 1 / Class 2 / Class 5
	Insulation Type		Type A / Type C / Type D
	Sheath Type		ST1 / ST2 / ST3
	Category		01 / 02 / FR / FR - LSH
	No. of Cores & Nominal Area of Conductor		Single Core for Conductor Sizes upto and including ….. Multi-core upto and including …. Cores for Conductor Sizes upto and including …..

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN,9, BAHADUR SHAH ZAFAR MARG,
NEW DELHI-110002

ANNEX-A

GROUPING GUIDELINES

1. Polyvinyl Chloride Insulated Unsheathed and Sheathed Cables/Cords with Rigid and Flexible Conductor for Rated Voltages upto and including 1100 V are classified based on the following:

i. Material for Conductor – Aluminium, Copper
ii. No. of Cores (Single core, Multi core)
iii. Type of Conductor – Rigid (Class 1, Class 2), Flexible (Class 5)
iv. Type of Insulation - Type A, Type C, Type D
v. Type of Sheath – ST1, ST2, ST3
vi. Category of Cable [01, 02, FR, FR-LSH]

2. For considering GoL/CSoL, each variety of cable shall be tested. However, additional variety may be considered when a particular variety of cable is tested as given below:

Variety Tested	**Additional Variety that may be covered**
Tinned Copper	Bare Copper
Stranded (Class 2)	Solid (Class 1)
Multi-core	Upto the no. of cores tested including single core
Insulation - Type A	Insulation - Type D
Sheathed	Unsheathed
Sheath Type – ST1	Sheath Type – ST3
FR-LSH FR 02	FR and 01 01 01
Flat Cable	Circular Cable

3. Firm shall declare the varieties and sizes of various cables they intend to cover in the Licence. Cable with the largest Size (Nominal Cross Sectional Area of Conductor), and maximum no. of cores, intended to be covered in the Licence shall be drawn for Testing.

4. Scope of licence shall be restricted based on the manufacturing and testing facilities available.

5. During operation of licence, samples of each variety covered in the scope of licence, shall be tested in rotation, to the extent possible.

ANNEX – B

LIST OF TEST EQUIPMENTS

(INDICATIVE LIST, FOR GUIDANCE ONLY)

Sl. No.	Tests Used In With Clause Reference	Test Equipment/Chemical
1.	Measurement of thickness & Outer Dia. (4, 17.1.1, 5.3, 8.3, 9) Measurement of Flammability, Annealing and Elongation (10.4, 4.1, 5.4) Measurement of Wire Dia (4, 17.1.1) Measurement of thickness (insulation & sheath) and hot deformation test (4, 17.1.1, 10)	Vernier Calipers, Steel Scale, Micrometer, Magnifying glass
2.	Tensile Strength, Elongation Test, Annealing Test, Thermal stability Test (Cl 10)	Tensile testing machine, Dumb-bell cutting machine, Hot Air oven with thermostatic Temperature controller, Thermal Ageing Oven with Thermostatic Temperature controller, Air flow Meter & Hour Meter
3.	Water immersion A.C. & D.C. Test, Insulation Resistance Constant/ Volume Resistivity Test (Cl 10.1, 10.2)	Water Bath with thermostatic temperature controller, Stirrer & Hour Meter
4.	Heat Shock Test, Cold Bend Test, Cold Impact Test, Hot Deformation Test (Cl 10)	Hot Air oven with thermostatic Temperature controller, Heat Shock Mandrels, Low temperature Impact Apparatus, Hot Pressure Test Apparatus with Weights
5.	Loss of Mass Test & Thermal Stability Test, Persulphate Test, Flammability Test (Cl 4, 17.1.1, 10)	
6.	Conductor Resistance Test (Cl 10)	Kelvin Double bridge with Galvanometer, DC Source
7.	Flammability Test (Cl 10.4)	Flammability Test apparatus with burner, Gas cylinder, Scale, Stopwatch & 0.71 mm copper wire
8.	Spark Testing (Cl 10.3)	Spark tester
9.	D.C. / AC High Voltage Test (Cl. 10.1, 10.2)	High Voltage tested
10.	Oxygen Index and Temperature Index Test (Cl 10)	Oxygen Index test apparatus, Oxygen & Nitrogen gas
11.	Halogen Acid Gas Evolution Testing (Cl 10)	Tube Furnace, Quartz Combustion Tube, Porcelain combustion boat, Wash Bottles, Glass Tubing and Silicon Rubber Stoppers, Air Flow Meter, Reagents
12.	Smoke density rating test (Cl 10)	Smoke density test apparatus

ANNEX C

SCHEME OF INSPECTION AND TESTING

1. QUALITY ASSURANCE PLAN

1.1 It is expected that manufacturers (licensees/applicants) will implement a Quality Assurance Plan that is a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan defining the control unit (i.e. lot/batch etc.) and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is: *PVC Insulated Unsheathed/Sheathed Cables/Cords with Rigid/Flexible Conductor of continuous length extruded under similar conditions of production of same nominal cross-sectional area and class of conductor in a day* shall constitute a control unit.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in Table 1.

1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan. Alternatively, the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING

2.1 It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer and testing parameters/requirements which can only be performed in the factory.

2.2 For the guidance of manufacturers, Table 1 of this Manual provides the recommended levels of control. Column 2 of Table 1 indicates routine tests where test equipment is required in house as “R” or other tests which can be subcontracted as “S”. Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility for routine tests (indicated as “R” in Column 2 of Table 1) is also optional.

2.3.1 MSME manufacturers may utilize common cluster based facilities as per guidelines for the utilization of cluster based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.4 Large Scale manufacturers shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as "R" in Column 2 of Table 1), where different tests given in the specification shall be carried out in accordance with the method given in the specification. They shall also implement a calibration plan for the in-house test equipment.

2.4.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of Sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

2.5 TEST RECORDS

The manufacturers maintaining an in-house laboratory or utilizing common cluster based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. PACKING AND MARKING

3.1 The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on the insulation in case of unsheathed cables and on the sheath in case of sheathed cables either by printing, indentation or embossing, provided always that the material so marked conforms to each requirement of the specification.

3.2 Packing and Marking shall be done as per Cl. 15 of IS 694: 2010.

3.3 Additional Marking requirements: The following additional marking details shall be marked on each of the Cable reels/drums or packaging of packed coils.

a) Class-1 conductor or Class-2 conductor (*as applicable*)- for fixed installations
   Class-5 conductor for flexible installations
b) "For BIS certification details please visit www.bis.gov.in"

4. HYGIENIC CONDITIONS (if applicable) – NA.

5. REJECTION

All the production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act,2016.

TABLE 1
(ONLY FOR GUIDANCE PURPOSE)

(1)						(2)	(3)		
Test Details						**Test equipment requirement R: required (or) S: Sub-contracting permitted**	**Levels of Control**		
Cl.	**Requirement**	**Test**		**Test Methods**			**No. ofSample**	**Frequency**	**Remarks**
		Clause	**Ref**	**Part**	**Ref**				
4.1 & 4.2	Conductor Material a) Resistance b) Tensile strength (for Al, before stranding) c) Annealing test (for Cu., before stranding) d) Wrapping (for Al) e) Purity test (for Cu) (Chemical composition) f) Persulphate test	 7.3 7.2.1 7.1.2.1, 7.2.3 7.2.2 - 7.1.1	 IS 8130 IS 12444 IS 8130	 5 2 1 3 - 4	 IS 10810 - - IS 10810	 R S S	 one 	 Each consignment 	 Further testing is not required if ISI marked or accompanied with TC. For tinned copper only
5.1, 6, 7, 8.2 11 18.1.3, 19.1.4, 20.1.3, 21.1.3, 22.1.3	a) Material b) Identification c) Assembly of cores	Section 2 & 3	IS 694			R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity.		
5.3 8.3 9	a) Thickness of Insulation b) Thickness of Sheath c) Overall dimension	Section 2 & 3 Sec 3 Section 2 & 3	IS 694	6 -	IS 10810 -	R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity.		
9.1 4.1	Ovality a) Tensile strength (for Al, after stranding) a) Wrapping test (for Al)	Sec 3 7.2.1 7.2.2	IS 694 IS 8130	2 3	IS 10810	R R	Each Coil	Each Control Unit	

10	a) Conductor Resistance b) High Voltage at room temperature or c) Spark test (as applicable)	7.3 10.2 10.3	IS 694	5 45 44	IS 10810	R	Each Coil	Each Control Unit	
10	***Insulation*** Tensile strength Elongation at break ***Sheath*** Tensile strength Elongation at break	Table 1 Table 2	IS 5831	7	IS 10810	S	One	Cable/Cord of each size and type manufactured in a month from same consignment of PVC compound	Additional samples shall be tested whenever there is a change in formulation of the PVC compound or in the manufacturing process
10	Insulation Resistance/ Volume Resistivity	Table 1	IS 5831	43	IS 10810	S	One		
10	Insulation & Sheath a) Heat Shock b) Hot deformation c) Loss of Mass d) Tests after Ageing e) Thermal Stability f)Shrinkage	Table 1 & 2	IS 5831	14 15 10 11 60 12	IS 10810	S	One	Cable/Cord of each size and type manufactured in a month from same consignment of PVC compound	
10	High Voltage (Water Immersion) Test	10.1	IS 694	45	IS 10810	S	One	Cable/Cord of each size manufactured in 3 months from each consignment of PVC compound	
10	Flammability test	10.4	IS 694	53	IS 10810	S	One	Cable/Cord of each size and type manufactured in a month from same consignment of PVC compound	Additional samples shall be tested whenever there is a change in formulation of the PVC compound or in the manufacturing process

10	Cold Bend test Cold Impact test	Table 1 & 2	IS 5831	20 2 1	IS 10810	S	One	Every 3 months for each consignment of PVC compound	
10	Additional Ageing test Oxygen Index test Temperature Index test Halogen Acid Gas evaluation Smoke density rating	10.9 10.5 10.7 10.6 10.8	IS 694	- 58 64 59 IS 13360 (Part 6 / Sec 9)	- IS 10810	S	One		For Category 02 cable only For FR & FR-LSH For FR & FR-LSH For FR-LSH For FR-LSH