



**PRODUCT MANUAL FOR  
ELASTOMER INSULATED CABLES WITH LIMITED CIRCUIT  
INTEGRITY WHEN AFFECTED BY FIRE  
ACCORDING TO IS 16246: 2015**

*This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence 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 licence/certificate.*

1.	<b>Product Standard</b>	:	IS 16246: 2015
	<b>Title</b>	:	Elastomer Insulated Cables with Limited Circuit Integrity when affected by Fire
	<b>No. of Amendments</b>	:	Nil
2.	<b>Sampling Guidelines:</b>		
a)	<b>Raw material</b>	:	Plain copper/ Tinned Copper IS 8130 Armour material IS 3975
b)	<b>Grouping guidelines</b>	:	Please refer <a href="#">ANNEX – A</a>
c)	<b>Sample Size</b>	:	(i) Copper (before stranding) - 5 meters (ii) Copper wire – 100g (for Cu purity test) (iii) Armour material – 5 meters (iv) Elastomer insulated and sheathed Cable - 50 meters
3.	<b>List of Test Equipment</b>	:	Please refer <a href="#">ANNEX – B</a>
4.	<b>Scheme of Inspection and Testing</b>	:	Please refer <a href="#">ANNEX – C</a>
5.	<b>Possible tests in a day</b>	:	Please refer <a href="#">ANNEX - D</a>
6.	<b>Scope of the Licence:</b> Elastomer Insulated and Sheathed, Armoured/ Unarmoured Cable with Tinned Copper / Plain Copper, Class 2 conductor, with limited circuit integrity when affected by fire, for operation at voltages up to and including 1100 V, for the following varieties: a) Single Core for Sizes upto and including ..... sq.mm. b) Multi-core for Cores and up to and including .....Cores and sizes up to and including .....sq.mm.		

**ANNEX A****Grouping Guidelines**

1. Each variety of Cable shall be tested for GoL/CSoL considering the following:
  - i. No. of Cores (Single Core / Multicore)
  - ii. Armoured/ Unarmoured
2. The following relaxation may be given when a variety is tested for all the requirements and the manufacturing process remains the same:

<b>Variety Tested</b>	<b>Additional Variety that may be covered</b>
Tinned Copper conductor	Plain Copper conductor
Multicore	Single Core
Armoured	Unarmoured

3. Firm shall declare the Varieties and Sizes of various Cables they intend to cover in the Licence. Cable of any Size (Nominal Cross-Sectional Area of Conductor), preferably with the largest intended to be covered in the Licence may be drawn for Testing.
4. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
5. During the operation of the Licence, BO shall ensure that all the Varieties covered in the Licence are tested in rotation to the extent possible.
6. Only one Factory Sample and one Market Sample shall be drawn during an operative period of one year.

**ANNEX B****List Of Test Equipment***Major test equipment required to test as per the Indian Standard*

<b>Sl. No.</b>	<b>Tests with Clause Reference</b>	<b>Description Of the Test Equipment</b>
1	Annealing test (Table 1- i.a)	Tensile Testing Machine, Digital Vernier Caliper, Digital Micro meter, Steel Scale
2	Conductor Resistance Test (Table 1- i.b)	Double Kelvin Bridge with galvanometer, D.C. Source & Conductivity attachment, Digital Micro ohm Meter
3	Measurement of thickness and OD of insulation and sheath (Table 1- iii)	Digital Vernier Caliper, Digital Micro meter, Measuring Microscope, Graduated Magnifying Glass
4	Tensile Strength, Elongation at break (Table 1- iv.a, v.a)	Dumb-Bell Cutting Machine with Die, Tensile Testing Machine, Measuring instruments
5	Ageing in air oven (Table 1- iv.b, v.)	Thermostatic Heating Oven with controlled air flow, Thermometer
6	Ageing in oxygen bomb (Table 1- iv.c)	Air pressure chamber
7	Hot set test (Table 1- iv.d, v.c)	Thermostatic Heating Oven with controlled air flow, Thermometer, grips, scales, dies, suitable weight
8	Oxygen Index temperature And Temperature Index Test (Table 1- v.d, v.e)	Oxygen Index test apparatus, Oxygen, Nitrogen gas Cylinder & Burner
9	Acid Gas Generation Test (Table 1- v.f)	Tube Furnace, Quartz Combustion Tube, Porcelain combustion tube, Wash Bottles (03 Nos.), Glass Tubing and Silicon Rubber Stoppers, Air Flow Meter, Sodium Hydroxide Soln. (0.1 N), Nitric Acid Soln. (6 N), Silver Nitrate Soln. (0.1 N), Ammonium Thiocyanate Soln. (0.1 N), Ferric Ammonium Soln. (40 %), Potassium Hydroxide (0.1 N), Sulphuric Acid (0.1 N), weighing balance
10	High Voltage Test (Table 1- vi)	A C. high voltage tester
11	Insulation Resistance test (Table 1- vii)	Million Mega ohm Meter, Water Bath with thermostatic temp. control Stirrer & Hour Meter, H.V. Mega Ohm Box
12	Water absorption test (Table 1- viii)	Water-bath with Thermostatic digital temperature indicator/ Controller and water bath fitted with airtight cover, alongside High Voltage testing system, Stranded Capacitor and suitable capacitance Measuring bridge.
13	Flammability test (Table 1- ix)	Flame Retardant Test (for Single/ Bunched Cable) Apparatus, Ignition Fluid, Stopwatch
14	Circuit integrity test under fire condition (Table 1- x)	Test Equipment for Circuit Integrity Test Under Fire Condition Apparatus: Sample supporting system, voltage source, Suitable heat source, Pressure gauge Air pressure Gauge, Propane/ Town-gas or LPG with forced air supply, Voltmeter Lamp For Indicator of Use Circuit Through Cable Under Test And Suitable Burner Platinum /Iridium Thermocouple with sensor, Test chamber

<b>Additional Testing Equipment for Armour Testing</b>		
1	Curvature Gauge	Measurement of thickness test for Cl 15.4.1, 17.1Table 1 (ii)
2	Torsion test Apparatus	For Torsion test as per Cl 15.4.2 (c), 17.1Table 1 (ii)
3	Mandrels (15 times the nom. Thickness of Strip 0.8 mm)	For Winding test as per Cl 15.4.2 (d), 17.1 Table 1(ii)
4	Glass Container, Copper Sulphate Solution, Distilled Water, Hot Plate, Suitable Glassware	For Uniformity of Zinc Coating Testing as per Cl 15.4.2 (e), 17.1 Table 1(ii)
5	Beaker (500 ml with a watch glass), Antimony Chloride, Conc. Hydro Chloric Acid, Stripping Solution	For Mass of Zinc Coating testing as per Cl 15.4.2 (f), 17.1Table 1(ii)

*The above lists are indicative only and may not be treated as exhaustive.*

**ANNEX C**

**Scheme of Inspection And Testing**

**1. LABORATORY** - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

**1.1** The manufacturer shall prepare a calibration plan for the test equipment.

**2. TEST RECORDS** – The manufacturer shall maintain test records for the tests carried out to establish conformity.

**3. LABELLING AND MARKING** – In addition to requirements of IS 16246:2015, Identification in code or otherwise shall be either stencilled on the drum or contained in a label attached to it, in order that the date of manufacture and control unit can be traced back to factory records.

**4. CONTROL UNIT** – Every 25 delivery lengths or less of the same size and type of cable manufactured in a week under similar conditions of production shall constitute a control unit.

**5. LEVELS OF CONTROL** - The tests as indicated in column 1 of [Table 1](#) and the levels of control in column 3 of [Table 1](#), shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

**5.1** All the production which conforms to the Indian Standards and covered by the Licence should be marked with Standard Mark.

**6. REJECTIONS** – 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**

(1)					(2)	(3)	
Test Details					Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control	
Cl.	Requirement	Test		Test Methods		No. of Sample	Frequency
		Clause	Reference	Part ref of IS 10810			
	<b>Tests on Conductor</b>						
	Cu Purity test	-	IS 191	-	S	One	No further testing is required if consignment is accompanied with TC or ISI marked
17.2.1. a	Annealing test	17.2.1.a, Table 1-(i). a	IS 16246	1	R	One	Each length of finished cable. For annealing, every 10 spools of wire drawn or received (before stranding)
17.3. a	Conductor resistance	17.3.a, Table 1-(i). b	IS 16246	5	R	One	
17.1	Persulphate Test (Tinned Copper only)	17.1, Table 1-(i).c	IS 16246	4	R	One	
17.1 Table 1-(ii)	Test for armouring wires/ strips	8, IS 3975	IS 16246		R	One	Galvanized steel round wire/ galvanized formed wire shall be ISI marked
4 to 9	Materials	4 to 9	IS 16246	-	R	One	Each length of conductor /finished cable
10.1	Construction of conductor	10.1	IS 16246	-	R	One	
10.2	Application of Fire Barrier Tape	10.2	IS 16246	-	R	One	
11.4	Application of insulation	11.4	IS 16246	-	R	One	
12	Core identification	12	IS 16246	-	R	One	
13	Laying up of cores	13	IS 16246	-	R	One	
14	Inner Sheath	14	IS 16246	-	R	One	
15	Armouring	15.1,15.2, 15.3, 15.4	IS 16246	36 to 42	R	One	
16	Outer Sheath	16.1,16.2&16.3	IS 16246	-	R	One	

17.1 Table 1 (iii)	Thickness of insulation and sheath	11, 14 & 16	IS 16246	6	R	One	Each length of finished cable.
17.2.1. f	High Voltage test	18.2	IS 16246	45	R	One	
17.2.1. g	Insulation resistance (Volume resistivity)	Table 1-(vii)	IS 16246	43	R	One	
<b>17.1 Table 1</b>	<b><i>Physical tests on insulation</i></b>						
iv) a	Tensile strength and elongation at break	Table 1	IS 16246	7	R	One	Cable of each size & type manufactured in a month from each consignment of elastomeric compound
iv) b	Aging in air oven	Table 1	IS 16246	11	R	One	
iv) c	Aging in air bomb	Table 1	IS 16246	56	R	One	Cables manufactured in a month from each consignment of elastomeric compound
iv) d	Hot Set test	Table 1	IS 16246	30	R	One	Cable of each size & type manufactured in a fortnight from each consignment of elastomeric compound
viii)	Water absorption test	Table 1	IS 16246	28	S	One	Cables manufactured in a month from each consignment of elastomeric compound
17.1	<b><i>Physical tests for sheath</i></b>						
v) a	Tensile strength and elongation at break	Table 1 & Table 2	IS 16246	7	R	One	Cable of each size & type manufactured in a month from each consignment of elastomeric compound
v) b	Aging in air bomb	Table 1/ Table 2	IS 16246	11	R	One	Cables manufactured in a month from each consignment of elastomeric compound
v) c	Hot Set Test	Table 1 & Table 2	IS 16246	30	R	One	Cable of each size & type manufactured in a fortnight from each consignment of elastomeric compound

v) d	Oxygen Index Test	Table 1.v.d Table 2	IS 16246	58	S	One	Cables manufactured in a month from each consignment of elastomeric compound
v) e	Temperature Index	Table 1.v.e Table 2	IS 16246	64	S	One	
v) f	Acid gas generation	Table 1.v.f Table 2	IS 16246	59	S	One	
v) g	Smoke density test	Table 1.v.g Table 2	IS 16246	Under Preparation	S	One	
17.1	<b>Flammability test</b>						
Table 1 ix) a	Flame Retardant Test on single cable	18.4.1	IS 16246	61	S	One	Cables manufactured in a month from each consignment of elastomeric compound
Table 1 ix) b	Flame Retardant Test on bunched cable	18.4.2		62	S		
17.2.1.h Table 1- x	Circuit Integrity Test Under Fire Condition	18.3 Annex B	IS 16246	-	S		

Note-1: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by BO Head.



**Possible Tests in a day**

- i. Dimensions
- ii. Annealing Test
- iii. Conductor Resistance
- iv. Tests on armour
- v. Tensile Test (before ageing) on Insulation and Sheath
- vi. Thickness of insulation and sheath
- vii. Insulation Resistance Test
- viii. HV Test (at Room Temperature)