



**PRODUCT MANUAL FOR
ELASTOMER INSULATED CABLES (PART 1) FOR WORKING
VOLTAGES UP TO AND INCLUDING 1100 V
ACCORDING TO IS 9968 (Pt 1): 1988**

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.	Product	:	IS 9968 (Pt 1): 1988
	Title	:	Elastomer insulated cables for working voltages up to and including 1100 V
	No. of Amendments	:	3
2.	Sampling Guidelines:		
a)	Raw material	:	Plain copper conductors/ tinned annealed copper wires/ aluminium wires IS 8130
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	(i) Copper/Aluminium wire (before stranding) - 5 meters (ii) Cu wire – 100 g (for Cu purity test) (iii) Elastomer insulated cable- 15 meters
3.	List of Test Equipment	:	Please refer ANNEX – B
4.	Scheme of Inspection and Testing	:	Please refer ANNEX – C
5.	Possible tests in a day	:	Please refer ANNEX - D
6.	<p>Scope of the Licence :</p> <p>Elastomer Insulated, Sheathed/Unsheathed, Circular/Flat, Braided (if applicable) Cables/Cords with rigid/flexible Aluminium/Copper Conductor, Conductor Class 1/2/5, Insulation Type IE1/IE2/IE5, Sheath Type SE1/ SE2/SE3/SE4, for working Voltages up to and including 1100 V, for the following varieties:</p> <p>a) Single Core for Sizes upto and including mm².</p> <p>b) Multi-core upto and including Cores, Sizes upto and including mm².</p>		

ANNEX A**Grouping Guidelines**

1. Each variety of Cable shall be tested for GoL/CSoL considering the following:
 - i. Material for Conductor – Aluminium, Copper
 - ii. Type of Conductor – For fixed wiring: Solid (Class 1), Stranded (Class 2)
For flexible wiring: (Class 5)
 - iii. No. of Cores (Single Core, Multicore)
 - iv. Type of Insulation (IE1, IE2, IE5)
 - v. Type of Sheath (SE1, SE2, SE3, SE4)
2. The following relaxation may be given when a variety is tested for all the requirements:

Variety Tested	Additional Variety that may be covered
Stranded (Class 2)	Solid (Class 1)
Multicore	Single Core
Sheathed	Unsheathed
(a) Type SE2 sheath	(b) Type SE1 sheath
(a) Type SE4 sheath	(b) Type SE3 sheath
Flat cable	Circular cable
Braided	Without braiding
Tinned Copper	Plain Copper (only for type IE5 insulation)

3. The 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) and no. of Cores (preferably the largest) intended to be covered in the Licence may be drawn for Testing. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
4. 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.
5. A typical example for drawal of samples to cover the entire Varieties under the Scope of the Licence is given below for the purpose of general guidance:
 - a) Sample 1: Five Core Cable with Stranded (Class 2) Copper Conductor, insulation type IE2, sheath type SE4
 - and*
 - b) Sample 2: Flat twin Core cable with ECC Cable with Solid (Class 1) Aluminium Conductor, insulation type IE1, sheath type SE2
 - and*
 - c) Sample 3: Single core glass braided and varnished unsheathed Cord with Class 5 Copper conductor, insulation type IE5

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

Sl. No.	Description Of the Test Equipment	Tests used in with Clause Reference
1	Digital Tensile Testing Machine	Annealing Test for Copper (Cl 21.2 a), Tensile test for Aluminium (Cl 21.2b), Tensile test and elongation at break of insulation and sheath (Cl 21.2f), Ageing in Air Oven (Cl 21.1)
2	Micrometer	Annealing test for Copper (Cl 21.2a) , Tensile test for Aluminium (Cl 21.2b), Test for Overall diameter (Cl 21.2e)
3	Steel Scale	Annealing Test for Copper (Cl 21.2a) , Tensile test for aluminium (Cl 21.2 b) , Hot Set Test (Cl 21.2g)
4	Hot Set Test Apparatus (Hot air oven with grips for suspension and weights)	Hot Set Test for insulation and sheath (Cl 21.2 g)
5	Water Bath	High Voltage test (Cl 21.2h) , Insulation Resistance test (Cl 21.2i)
6	Conditioning chamber	Tensile test and elongation at break of insulation and sheath (Cl 21.2f)
7	Vernier Caliper	Test for thickness of insulation and sheath (Cl 21.2 e)
8	Micro ohm meter	Conductor resistance test (Cl 21.2 d)
9	Million Mega ohm meter	Insulation Resistance Test (Cl 21.2 i)
10	Dumbell cutting press	Tensile strength and elongation at break of insulation and sheath. (Cl 21.2 f)
11	Thermometer	Hot Set test for insulaton and sheath (Cl 21.1 g)
12	AC High Voltage tester	High Voltage test (Cl 21.2 h)
13	AC Spark tester	Spark test (Cl 22.2.3)
14	DC High Voltage Tester	High Voltage Test (Cl 22.2.2)
15	Standard Resistance Box	Insulation Resistance Test (Cl 21.2i)
16	Hot air ageing oven with air flow meter, digital temperature control and hour meter	Ageing in air oven (Cl 21.1)
17	Air Bomb and Oxygen Bomb apparatus	Ageing in air bomb (Cl 21.1) and Ageing in Oxygen Bomb (Cl 21.1)
18	Flammability test chamber with burner and Copper wire	Flammability test (Cl 21.1)

19	Petroleum based oil, SAE 30 viscosity grade	Oil Resistance (Cl 21.1)
20	Water absorption test apparatus(AC Voltage source, water tank with heating arrangement and insulated mats)	Water absorption test (Cl 21.1)

The above list is 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 9968 (Pt 1): 1988, Identification in code or otherwise shall be either stencilled on reel/drum, packages of individual or contained in the label attached to the coil, in order that the date of manufacture and control unit can be traced back to factory records.

4. CONTROL UNIT – A cable/ cord of continuous length manufactured/ extruded under similar conditions of production for one nominal cross-sectional area and class of conductor 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.

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: Subcontracting permitted	Levels of Control	
Cl.	Requirement	Test		Test Methods		No. of Sample	Frequency
		Clause	Ref	Part Ref of IS 10810			
	Purity test for Cu	Table 4	IS 191	-	S	One	Each consignment. Further testing is not required if ISI marked or accompanied with TC.
21.3(a)	Conductor resistance	7.3, Table 1, 2, 3	IS 8130	5	R	One	Entire length of core after extrusion of insulation. If so desired routine tests may be conducted on entire length of control unit before cutting into individual coils.
21.3(b)	High voltage test/ Spark test	22.2.2/ 22.2.3	IS 9968 (Pt 1)	45/44	R	One	
5	Tape	5.1,5.2,5.3, 14.1	IS 9968 (Pt 1)	-	R	Two	Each control unit
6	Fillers	6.1		-	R	One	Each length of finished cable
7	Braid	7.1,7.2,15.1		-	R		
9	Compound & varnish	9.1,9.2,16.1		-	R		
11	Separator tape (where applicable)	11.1		-	R		
17	Laying up of cores	17.1, 17.1.1		-	R		
18	Binder tape	18.1		-	R		
19	Colour	19.4		-	R		
23	Identification	23.1, 23.2		-	R		
21.1	Persulphate test (for Copper)	7.1.1	IS 8130	4	R	One	Each control unit
21.1	Annealing test (for Copper)	7.1.2.1, 7.2.3		-	R		Every consignment of wire
21.1	Tensile test (for Aluminium)	7.2.1		2	R	Three	Each control unit

21.1	Wrapping test (for Aluminium)	7.2.2		3	R	Three	Each control unit		
21.1	Thickness of insulation and sheath and overall diameter	12, 19, 20 Tables 1 to 10	IS 9968 (Pt 1)	6	R	Two	Each control unit		
21.1	Physical tests for insulation and sheath (as applicable)	4.1	IS 6380			One	Cable of the same size and type manufactured in a week		
(a)	Tensile strength and elongation at break of Insulation and Sheath							7	R
(b)	Ageing in air oven							11	R
(c)	Ageing in air bomb							56	R
(d)	Ageing in oxygen bomb							16	R
(e)	Hot set test							30	R
(f)	Oil resistance							31	R
(g)	Tear resistance							17	R
21.1	Insulation resistance	4.1	IS 6380	43	R	One	Each length of cable of the same size and type manufactured in a week from the same batch of insulation		
22.1	High voltage (water immersion) test	22.2	IS 9968 (Pt 1)	45	R				
22.1	Flammability test	22.3	IS 9968 (Pt 1)	53	R				
22.1	Water absorption test	4.1	IS 6380	28	R				
21.4	Flexing test for cords for use with electric iron (Optional test)	22.4, Appendix B	IS 9968 (Pt 1)	1	-	As per agreement between manufacturer and purchaser			

Note-1: 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.

ANNEX D

Possible Tests in a day

- a) Tensile test (for Aluminium)
- b) Wrapping test (for Aluminium)
- c) Conductor Resistance Test
- d) Test for thickness of insulation and sheath and overall diameter
- e) Physical test for insulation and sheath (Tensile and elongation at break)
- f) Insulation resistance
- g) Flammability Test