



PRODUCT MANUAL FOR ELASTOMER INSULATED FLEXIBLE CABLES FOR USE IN MINES ACCORDING TO IS 14494: 2019

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, 2019 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	Product	:	IS 14494: 2019
	Title	:	Elastomer Insulated Flexible Cables for use in mines
	No. of Amendments	:	Nil
2.	Sampling Guidelines:		
a)	Raw material	:	Annealed tinned copper wires IS 8130
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	(i) 5 meters Copper wire (before stranding) (ii) 100 g Cu wire (for copper purity test) (iii) 15 meters Elastomer insulated cable
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.	Scope of the Licence:		
	“Licence is granted to use Standard Mark as per IS 14494:2019 with the following scope:		
	Name of the product	Elastomer Insulated Flexible Cables for use in mines	
	Cable Type	(As per Table 1 of IS 14494: 2019)	
	Size (Nominal Area of Power Conductor)	Up to and including mm ² .	

ANNEX A

Grouping Guidelines

1. The Construction details of various types of Elastomer Insulated Flexible Cables for use in mines covered in IS 14494: 2019 are given in Table 1 of the Standard.
2. Each Type of Cable as per Table 1 of IS 14494: 2019 shall be tested for GoL/CSoL.
3. The Firm shall declare the Types and Sizes (nominal cross-sectional area of power conductor) of various cables they intend to cover in the Licence. Cable with any Size, preferably the largest intended to be covered in the Licence shall 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.

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

Sl. No.	Test Equipment	Tests used in
1	Tensile Testing Machine	Annealing Test as per IS 8130, Tensile test and elongation at break of insulation and sheath
2	Micrometer	Measurement of dimension
3	Steel Scale	Annealing Test for Copper, Tensile test for Insulation and Sheath, Hot Set Test.
4	Hot Set Test Apparatus (Hot air oven with grips for suspension and weights)	Hot Set Test for insulation and sheath
5	Water Bath	High Voltage test, Insulation Resistance Test.
6	Conditioning chamber	Tensile test and elongation at break of insulation and Sheath
7	Vernier Caliper	Test for thickness of insulation and sheath
8	Micro ohm meter	Conductor resistance test
9	Million Mega ohm meter	Insulation Resistance Test
10	Dumb-bell cutting press	Tensile strength and elongation at break of insulation and sheath.
11	Thermometer	Hot Set test for insulation and sheath
12	AC High Voltage tester	High Voltage test
13	AC Spark tester	Spark test
14	DC High Voltage Tester	High Voltage Test
15	Standard Resistance Box	Insulation Resistance Test
16	Hot air ageing oven with air flow meter, digital temperature control and hour meter	Ageing in air oven
17	Air Bomb and Oxygen Bomb Apparatus	Ageing in air bomb and Ageing in Oxygen Bomb
18	Flammability test chamber with burner and Copper wire	Flammability test
19	Petroleum based oil, SAE 30 viscosity grade	Oil Resistance Test
20	Water absorption test apparatus (AC Voltage source, water tank with heating arrangement and insulated mats)	Water absorption Test as per Clause 27.9

21	Bending Test	Bending Test as per clause 27.3
22	Dielectric Power Factor Test	Dielectric Power Factor Test as per Clause 27.4
23	Heating Cycle Test	Heating Cycle Test as per Clause 27.5
24	Impulse Voltage Test	Impulse Voltage Test as per Clause 27.6
25	Partial Discharge Test	Partial Discharge test as per Clause 27.2
26	Tear resistance test	Tear resistance test as per IS 6380

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 – As per the requirements of IS 14494: 2019.

4. 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. 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	Requirements		Test Methods		No. of Sample	Frequency	Remarks	
		Cl.	Ref.	Part					Ref.
Test on Conductor									
--	Cu Purity test	IS 191		-	-	S	One	--	Pl see Note 1
Table 33 (a)	Annealing Test	IS 8130		1	IS 10810	R	Each continuous length of cable produced	Galvanized steel wire for armour shall be ISI marked	
	Conductor Resistance Test	IS 8130		5	IS 10810	R			
Dimensions									
Table 33 (b)	Thickness of insulation	16.2, 16.3 & resp. Table	IS 14494	6	IS 10810	R	Cable of each size & type manufactured in a day		
	Thickness of inner sheath	22.2 & resp. Table	IS 14494	6	IS 10810	R			
	Thickness of outer sheath	24.2 & resp. Table	IS 14494	6	IS 10810	R			
	Diameter of armour wire	Resp. Table	IS 14494	36	IS 10810	R	One from each length of finished cable		
IS 3975									
Tests for Armour Wires									
Table 33 (c)	Tensile strength & elongation at break	11.2	IS 14494	37	IS 10810	R	One from each length of finished cable		
	Torsion Test	11.2	IS 14494	38	IS 10810	R			
	Uniformity of zinc coating	11.2	IS 14494	40	IS 10810	R			
	Mass of zinc coating	11.2	IS 14494	41	IS 10810	R			
Table 33 (c)	Resistivity of steel wire	IS 3975		42	IS 10810	R			

(1)					(2)	(3)			
Test Details					Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control			
Cl.	Requirement	Requirements		Test Methods		No. of Sample	Frequency	Remarks	
		Cl.	Ref.	Part					Ref.
Physical tests on Insulation									
Table 33 (d)	Tensile strength & elongation at break	IS 6380		7	IS 10810	R	Cable of each size & type manufactured in a fortnight	—	
	Ageing in air oven			11		R			
	Ageing in air bomb			56		R			
	Hot Set Test			30		R			
	Ozone Resistance Test			13		R			
Physical tests on Sheath									
Table 33 (e)	Tensile strength & elongation at break	IS 6380		7	IS 10810	R	Cable of each size & type manufactured in a fortnight		
	Ageing in air bomb			56		R			
	Hot Set Test			30		R			
	Oil Resistance Test			31		R			
	Tear Resistance Test			17		R			
Table 33 (f)	Insulation resistance Test			43		R	Cable of each size and type manufactured in a week		
26.5(b), 27.2	Partial Discharge Test (Routine Test)	27.2	IS 14494	46		R	Each drum length		
26.5(c), 27.7.2	High Voltage Test (Routine Test)	27.7.2	IS 14494	45		R			

(1)						(2)	(3)		
Test Details						Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Requirements		Test Methods			No. of Sample	Frequency	Remarks
		Cl.	Ref.	Part	Ref.				
Table 33 (g) & 26.2(a)	Bending Test followed by Partial Discharge Test	27.3	IS 14494	50	IS 10810	R	Cable of each size and type manufactured in a week	—	
Table 33 (h)	Partial Discharge Test (Type Test)	27.2		46					
Table 33 (j) & 26.2(b)	Dielectric Power Factor (as a function of temperature)	27.4		48					
Table 33 (k) & 26.2(c)	Heating Cycle Test followed by Partial Discharge Test	27.5		49					
Table 33(m) & 26.2 (d)	Impulse Voltage Test	27.6		47					
Table 33(n) & 26.2(e)	High Voltage Test for 4h	27.7		45					
Table 33(p)	Water Absorption	27.9	IS 14494	28	IS 10810	R	Once in a fortnight		
		IS 6380							
Table 33(q)	Flammability Test	27.8	IS 14494	53	IS 10810	R			
Table 33(r)	Electrical Test on semi-conducting screen	Annex E	IS 14494	Annex E	IS 14494	R	Each continuous length of cable produced		

Note- 1: No further testing is required if consignment is accompanied with TC or ISI marked

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.

Note- 3: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau

ANNEX D

Possible Tests in a day

- a) Conductor Resistance Test
- b) Thickness of insulation and sheath
- c) Overall diameter
- d) Physical test on insulation and sheath (Tensile strength and elongation at break)
- e) Insulation resistance
- e) Flammability Test
- f) HV test
- g) Partial discharge test