



उत्पाद मैनुअल

आई एस 17505 (भाग 1) : 2021 के अनुसार

1100 वो. एएवं.सी. 1500 वो. डीतक.सी. एवं सहित कार्यकारी वोल्टता में अग्नि द्वारा प्रभावित हो, धूयें एवं संक्षारक गैसों के अल्प उत्सर्जन वाली, स्थिर सस्थापन में फॉयर सर्वाइकल केवल, थर्मोसेटिंग इंसुलेटेड विशिष्टि भाग 1 कवच वाली केबलों के लिए आवश्यकताएँ के लिए

दस्तावेज़ संख्या – पी एम/आई एस 17505 (भाग 1) / 1/फ़रवरी 2022

भारतीय मानक ब्यूरो की स्कीम-I (अनुरूपता मूल्यांकन) विनियम, 2018 के तहत यह उत्पाद मैनुअल प्रमाणीकरण के प्रचालन में रीति और पारिश्रिता की सुसंगतता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसी द्वारा संदर्भ सामग्री के रूप में उपयोग किया जाएगा। बीआईएस प्रमाणीकरण लाइसेंस/प्रमाणपत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज़ का उपयोग किया जा सकता है।

PRODUCT MANUAL FOR

**Thermosetting Insulated Fire Survival Cables For Fixed Installation Having Low Emission Of Smoke And Corrosive Gases When Affected By Fire For Working Voltages Upto And Including 1100 V Ac And 1500 V Dc Part 1 Requirements For Armoured Cables
ACCORDING TO IS 17505 (Pt 1): 2021**

Document No.- PM/ IS 17505 (Pt 1)/ 1/ Feb 2022

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.

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**PRODUCT MANUAL FOR
THERMOSETTING INSULATED FIRE SURVIVAL CABLES FOR FIXED
INSTALLATION HAVING LOW EMISSION OF SMOKE AND CORROSIVE
GASES WHEN AFFECTED BY FIRE FOR WORKING VOLTAGES UPTO
AND INCLUDING 1100 V AC AND 1500 V DC PART 1 REQUIREMENTS
FOR ARMOURED CABLES
ACCORDING TO IS 17505 (Pt 1): 2021**

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1.	Product Standard	:	IS 17505 (Pt 1): 2021
	Title	:	Thermosetting insulated armoured fire survival cables for fixed installations having low emission of smoke and corrosive gases when affected by fire, for working voltages up to and including 1100 V AC and 1 500 V DC
	No. of Amendments	:	Nil
2.	Sampling Guidelines:		
a)	Raw material	:	Annealed plain / tinned copper IS 8130 Armour material (Galvanized round steel wire) IS 3975
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	Please refer ANNEX – B
3.	List of Test Equipment	:	Please refer ANNEX-C
4.	Scheme of Inspection and Testing	:	Please refer ANNEX – D
5.	Possible tests in a day	:	Please refer ANNEX - E
6.	Scope of the Licence:	:	Please refer ANNEX- F

ANNEX A**Grouping Guidelines**

1(a). Samples of each variety of Cable shall be tested considering the following:

- i. Material for Conductor – Annealed Plain / Tinned Copper
- ii. Type of Conductor – Class 1 / Class 2
- iii. No. of Cores (Single Core, Multi-core)
- iv. Type of Insulation (XLPE , XL-HFFR)
- v. Type of Outer Sheath (HFS-TP 90/ HFS-XL 90)
- vi. Fire Survival Category of Cable –
 Resistant to fire alone (F)
 Resistant to fire and water (W)
 Resistant to fire and mechanical shock (S)
 Resistant to fire, water and mechanical shock (FWS) - category F 3, F 30, F 60, F 120
- vii. Cable intended for use in mines.

1(b). The following relaxation may be given when a variety is tested for all the requirements:

Variety Tested	Additional Variety that may be covered
Tinned Copper	Plain Copper
Stranded (Class 2)	Solid (Class 1)
Multi-core	Single Core

1. 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) intended to be covered in the Licence may be drawn for Testing.
2. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
3. 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.
4. Only one Factory Sample and one Market Sample shall be drawn during an operative period of one year. The Factory sample shall be subjected to complete testing whereas the Market sample shall be subjected to acceptance tests (as per Cl 17.2.1 of IS 17505 (Pt 1)) only.

ANNEX- B

Sample Size

- (i) Copper wire (before stranding) - 5 meters
- (ii) Copper wire – 100g (for Cu purity test)
- (iii) Fire survival cable -
 - Sizes 25 Sq.mm & above : 50mtrs
 - Sizes 10 Sq.mm upto 25 Sq.mm : 70mtrs
 - Upto 10 Sq.mm : 90mtrs
- (iv) 30m of Fire survival cable (irrespective of size) to be drawn for acceptance tests on Market Sample.

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

Sl. No.	Tests with Clause Reference	Description Of the Test Equipment
1	Annealing test (Table 9- i.a)	Tensile Testing Machine, Digital Vernier Caliper, Digital Micro meter, Steel Scale
2	Conductor Resistance Test (Table 9- i.b)	Double Kelvin Bridge with galvanometer, D.C. Source & Conductivity attachment, Digital Micro ohm Meter
3	Persuphate Test for tinned copper (Table 9- i.c)	Chemicals and apparatus as per IS 10810 Part-4
4	Measurement of thickness and OD of insulation and sheath (Table 9- iii)	Digital Vernier Caliper, Digital Micro meter, Measuring Microscope, Graduated Magnifying Glass
5	Tensile Strength, Elongation at break (Table 9- iv.a)	Dumb-Bell Cutting Machine with Die, Tensile Testing Machine, Measuring instruments
6	Ageing in air oven (Table 9- iv.b)	Thermostatic Heating Oven with controlled air flow, Thermometer
7	Hot set test (Table 9- iv.c)	Thermostatic Heating Oven with controlled air flow, Thermometer, grips, scales, dies, suitable weight
8	Shrinkage test (Table 9- iv.d)	Hot Air Oven with thermostatic Temperature Controller, Steel scale
9	Heat Shock test (Table 9- iv.e)	Hot Air Oven with thermostatic Temperature Controller, Mandrels
10	Cold Bend/ Cold Impact Test (Table 9- iv.f, iv.g)	Low temperature Impact Apparatus with anvil, hammer, Conditioning chamber & Refrigerator with Humidity Indicator, Mandrels
11	Water absorption test (gravimetric) (Table 9- iv.h)	Vacuum oven with thermostatic Temperature Controller, Weighing Balance, Glassware
12	Oxygen Index temperature And Temperature Index Test (Table 9- iv.j, iv.k)	Oxygen Index test apparatus, Oxygen, Nitrogen gas Cylinder & Burner (ethanol, methanol, water), table type fan, light source.
13	Assessment of halogen (HCl) (Table 9- iv.m)	Tube Furnace, Quartz Combustion Tube, Porcelain combustion tube, Wash Bottles, Glass Tubing and Silicon Rubber Stoppers, Air Flow Meter, Sodium Hydroxide Soln., Nitric Acid Soln., Silver Nitrate Soln., Ammonium Thiocynate Soln. (0.1 N), Ferric Ammonium Soln. (40 %), Potassium Hydroxide (0.1 N), Sulphuric Acid (0.1 N), Sodium metal, Acetic Acid, Zirconium -alzarin red S, Alzarin-Flourine Blue reagent, Sodium fluoride, Propanol, Dodecanol, Photo meter, weighing balance and various glassware. 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
14	Smoke Density test (Table 9- iv.n)	Smoke Density Test apparatus consisting of cubic enclosure 3000+-30mm with horizontal photometric system, ignition fluid
15	Ozone Resistance Test (Table 9- iv.p)	Ozone Resistance Test apparatus (Test chamber with air flow meter, mandrels for bending, ozone generator) as per Part 13 of IS 10810
16	Insulation Resistance test (Table 9- iv. q)	Million Mega ohm Meter, Water Bath with thermostatic temp. control Stirrer & Hour Meter, H.V. Mega Ohm Box
17	Effect of water on sheath (Table 9- v)	De-ionized water, Tensile testing machine, Hot air oven
18	High Voltage Test (Table 9- vi)	A C. high voltage tester
19	Flammability test (Table 9- vii)	Flame Retardant Test (for Single/ Bunched Cable) Apparatus as per IS 10810 Part 61 & 62, Ignition Fluid, Stopwatch
20	Circuit integrity test under fire condition (Table 9- viii)	Test Equipment for Circuit Integrity Test Under Fire Condition Apparatus as per Annex-E of IS 17505: Sample supporting system, voltage source, Suitable heat source, Air pressure Gauge, Propane/ Town-gas or LPG with forced air supply, water spray Jet, Mechanical shock producing device, Indicator for Use Circuit Through Cable Under Test and Suitable Burner Platinum /Iridium Thermocouple with sensor, Test chamber
21	Abrasion resistance test (Table 9- ix)	Abrasion resistance test apparatus as per IS 17505 Annex-D, Magnifying glass
1	Diameter (Cl 15.3)	Dimension test
2	For Tensile Strength & Elongation Test (Cl 15.4 a) & 15.4 b)	Tensile Testing Machine, Scale
3	For Torsion test (Cl 15.4 c)	Torsion test Apparatus
4	For Uniformity of Zinc Coating Testing (Cl 15.4 d)	Glass Container, Copper Sulphate Solution, Distilled Water, Hot Plate, Suitable Glassware
5	For Mass of Zinc Coating testing (Cl 15.4 e)	Beaker (500 ml with a watch glass), Antimony Chloride, Conc. Hydro Chloric Acid, Stripping Solution
6	Resistivity Test (Cl 15.4 f)	Double Kelvin Bridge with galvanometer, D.C. Source & Conductivity attachment, Digital Micro ohm Meter

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

ANNEX D

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 17505 (Pt 1):2021, 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. 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.

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

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	Test		Test Methods		No. of Sample	Frequency	Remarks
		Clause	Reference	Part ref of IS 10810				
	Tests on Conductor							
	Cu Purity test	-	IS 191	-	S	One	For each consignment	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 9-(i). a	IS 17505 (Pt 1)	1	R	One	one sample out of ten units or part thereof received before stranding.	
17.3.a	Conductor resistance	17.3.a, Table 9-(i). b	IS 17505 (Pt 1)	5	R	One	Each drum of finished cable.	
17.1	Persulphate Test (Tinned Copper only)	17.1, Table 9-(i).c	IS 17505 (Pt 1)	4	R	One	Each drum of finished cable.	
17.1 Table 1-(ii)	Test for armouring wires	8, 15,Table 7, IS 3975	IS 17505 (Pt 1)	36-42	R	One	Each drum of finished cable of each size & type manufactured from the same consignment of armour wires.	Wires used for armouring shall be ISI marked
15.6.2	Resistance test for armour (for mining cables)	15.6.2	IS 17505 (Pt 1)	42	R	One		
4 to 9	Materials	4 to 9	IS 17505 (Pt 1)	-	R	One	Each consignment of material	Constructional requirements
10	Conductor	10.1	IS 17505 (Pt 1)	-	R	One		
11.4	Application of insulation	11.4	IS 17505 (Pt 1)	-	R	One	Each drum of finished cable.	
12	Core identification	12	IS 17505 (Pt 1)	-	R	One		
13	Laying up of cores	13	IS 17505 (Pt 1)	-	R	One		
14	Inner Sheath	14	IS 17505 (Pt 1)	-	R	One		
15	Armouring	15	IS 17505 (Pt 1)	-	R	One		
16	Outer Sheath	16.1	IS 17505 (Pt 1)	-	R	One		

17.1 Table 1 (iii)	Thickness of insulation and sheath	11, 14 & 16, Table 4 & 6	IS 17505 (Pt 1)	6	R	One	Each drum of finished cable.	
17.3.b	High Voltage test	18.2	IS 17505 (Pt 1)	45	R	One		
17.1 Table 9	<i>Physical tests on insulation</i>							
iv) a	Tensile strength and elongation at break	Table 1	IS 17505 (Pt 1)	7	R	One	Cable of each size & type manufactured in a month from each consignment of insulating compound	
iv) b	Ageing in air oven	Table 1	IS 17505 (Pt 1)	11	R	One		
iv) q	Insulation resistance (Volume resistivity)	Table 1	IS 17505 (Pt 1)	43	R	One		
iv) c	Hot Set test	Table 1	IS 17505 (Pt 1)	30	R	One	Cables of each size & type manufactured in a fortnight from each consignment of insulating compound	
iv) d	Shrinkage test	Table 1	IS 17505 (Pt 1)	12	R	One	Cables manufactured in six months from each consignment of insulating compound	
iv) h	Water absorption test	Table 1	IS 17505 (Pt 1)	33	S	One	Cables manufactured in six months from each consignment of insulating compound	
iv) m	Assessment of halogen	Table 2, Annex F	IS 17505 (Pt 1)	59	S	One	Cables manufactured in six months from each consignment of sheathing compound	
iv) p	Ozone resistance test	Table 1	IS 17505 (Pt 1)	13	S	One	Cables manufactured in six months from each consignment of insulating compound	
17.1 Table 9	<i>Physical tests for outer sheath</i>							

iv) a	Tensile strength and elongation at break	Table 2	IS 17505 (Pt 1)	7	R	One	Cable of each size & type manufactured in a month from each consignment of sheathing compound	
iv) b	Ageing in air oven	Table 2	IS 17505 (Pt 1)	11	R	One		
-	Hot Deformation test	Table 2	IS 17505 (Pt 1)	15	R	One	Cable of each size & type manufactured in six months from each consignment of sheathing compound	
iv) c	Hot Set Test	Table 2	IS 17505 (Pt 1)	30	R	One	Cable of each size & type manufactured in a fortnight from each consignment of sheathing compound	
iv) e	Heat Shock Test	Table 2	IS 17505 (Pt 1)	14	R	One	Cables manufactured in six months from each consignment of sheathing compound	
iv) f	Cold Bend Test	Table 2	IS 17505 (Pt 1)	20	S	One	Cables manufactured every six months from each consignment of sheathing compound	
iv) g	Cold Impact Test	Table 2	IS 17505 (Pt 1)	21	S	One	Cables manufactured every six months from each consignment of sheathing compound	
iv) j	Oxygen Index Test	18.6	IS 17505 (Pt 1)	58	S	One	Cables manufactured in six months from each consignment of sheathing compound	
iv) k	Temperature Index	18.7	IS 17505 (Pt 1)	64	S	One	Cables manufactured in six months from each consignment of sheathing compound	
iv) m	Assessment of halogen	Table 2, Annex F	IS 17505 (Pt 1)	59	S	One	Cables manufactured in six months from each consignment of sheathing compound	

iv) n	Smoke density test	18.8	IS 17505 (Pt 1)	63	S	One	Cables manufactured in six months from each consignment of sheathing compound	
iv) p	Ozone resistance test	Table 2	IS 17505 (Pt 1)	13	S	One	Cables manufactured in six months from each consignment of sheathing compound	
17.1, Table 9-v	Effect of water on sheath	Table 2 , 18.9	IS 17505 (Pt 1)	-	S	One	Cables manufactured in six months from each consignment of sheathing compound	
17.1, Table 9-vii a	Flammability Test on single cable	18.5.1	IS 17505 (Pt 1)	61	S	One	Cables manufactured every six months from each consignment of sheathing compound	
17.1, Table 9-vii b	Flammability Test on bunched cable	18.5.2	IS 17505 (Pt 1)	62	S	One	Cables manufactured every six months from each consignment of sheathing compound	
17.1, Table 9-viii	Circuit Integrity Test Under Fire Condition	18.4 Annex E	IS 17505 (Pt 1)	-	S	One	Cables of each type manufactured every six months from each consignment of insulating and sheathing compound	
17.1, Table 9-ix	Abrasion resistance test	18.3 Annex D	IS 17505 (Pt 1)	-	S	One	Cables manufactured in six months from each consignment of insulating and sheathing compound	

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.

ANNEX - E
Possible Tests in a day

- (a) Annealing Test (for Copper wires)
- (b) Conductor Resistance
- (c) Test for thickness of Insulation and Sheath
- (d) Tensile Test and Elongation (before ageing) of Insulation and Sheath
- (e) Insulation Resistance Test
- (f) Shrinkage
- (g) HV Test (at Room Temperature)
- (h) Hot Deformation Test
- (i) Flammability Test
- (j) Circuit Integrity Test under fire
- (k) Abrasion resistance test
- (l) Smoke Density

ANNEX- F

Scope of the Licence: Licence is granted to use the Standard Mark as per IS 17505 (Part 1): 2021 with the following scope:	
Name of the Product	Thermosetting Insulated, Armoured, Fire Survival Cables for fixed installation having low emission of smoke and corrosive gases when affected by fire, for working Voltages upto and including 1100 V AC and 1500V DC
Conductor Material	Annealed Plain Copper / Tinned Copper
Type of Conductor	Class 1 / Class 2
Type of Insulation	XLPE/ XL-HFFR
Type of Outer Sheath	HFS-TP 90/ HFS-XL 90
No. of Cores & Size of cable	• Single core - for Sizes upto and including mm 2 • Multi-core (upto and including cores) - Sizes upto and including mm 2
Fire Survival Category	• Resistant to fire alone (F) • Resistant to fire and water (W) • Resistant to fire and mechanical shock (S) • Resistant to fire, water and shock (FWS) -(Category F 3/ F 30/ F 60/ F 120)
Use in Mines (as applicable)	Except for use in mines / Intended for use in mines.