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IS 10810-45 (1984): Methods of Test for Cables, Part 45:
High Voltage Test [ETD 9: Power Cables]



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Indian Standard

METHODS OF TEST FOR CABLES

"गुणवत् १९८४"
"RE-AFFIRMED 1996"

PART 45 HIGH VOLTAGE TEST

Power Cables Sectional Committee, ETDC 59/P1 [Ref: Doc : ETDC 59 (2240)]

1. Scope — Covers the method for high voltage test on electric cables.

2. Significance — The insulation material in a cable is used to isolate the conductors from one another and from ground, as well as provide the necessary mechanical strength. The fundamental requirement of the insulation in an electric cable is that it withstands the voltage imposed on it in service. It is necessary that a evaluation of the condition of the insulation be made by imposing a higher voltage stress for a short duration.

3. Terminology — As given in IS : 1885 (Part 32) - 1971 ' Electrotechnical vocabulary : Part 32 Cables, conductors and accessories for electricity supply ' and IS : 2071 (Part 1) - 1974 ' Methods of high voltage testing: Part 1 General definitions and test requirements '.

4. Apparatus

4.1 High Voltage Source — In accordance with 2 and 3 of IS : 2071 (Part 2) - 1974 ' Methods of high voltage testing: Part 2 Test procedures '.

4.2 Water Bath

4.3 Thermostatically Controlled Water Bath

5. Material — No material other than the specimen is required except certain materials for making end-terminations, wherever necessary.

6. Test Specimen — The full drum length of the cable or 3 m, *Min* sample piece shall constitute the test specimen.

7. Conditioning

7.1 For performing this test at ambient temperature for multi-core (armoured/unarmoured) and single core (armoured/screened) cable, no conditioning is required.

7.2 For performing this test at ambient temperature on unarmoured/unscreened single core cables, it shall be immersed in water at the ambient temperature and the duration of immersion shall be as stated in relevant cable specification.

7.3 For performing this test at an elevated temperature, the conditioning of the sample in water bath, the duration and temperature shall be as stated in relevant cable specification.

8. Test Procedure

8.1 The high voltage source is connected to the conductor of the core under test. The cores not under test, screen and armour are connected to the earth terminal, depending on the mode of connections as given in Fig. 1, 2A or 2B, as applicable.

8.2 The voltage is to be raised sufficient slowly to permit accurate reading of the measuring instruments, but not so slowly as to cause unnecessary prolongation of the stress near the test voltage.

These requirements are in general met if the rate of rise above 75 percent of the test voltage is about 2 percent per second of this voltage. However, different rate of rise may be used, but it should not exceed 2 000 V/s.

8.3 The test voltage is raised to the specified value as described in 8.2 and is maintained for the specified time. After the specified time, the voltage is rapidly decreased but the voltage is not interrupted suddenly to avoid the possibility of switching transients which may affect the subsequent test results.

Adopted 14 March 1984

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Sl No.	Type of Cable	Connection Diagram	Test Connection
1.	Single-Core Cable		1 against E
2.	Two-Core Cable		1 against $2+E$ 2 against $1+E$
3.	Three-Core Cable		1 against $2+3+E$ 2 against $3+1+E$ 3 against $1+2+E$
4.	Four-Core Cable		1 against $2+3+4+E$ 2 against $1+3+4+E$ 3 against $1+2+4+E$ 4 against $1+2+3+E$
5.	Multi-Core Cable		a) All odd numbered cores of all layers against all even numbered cores of all layers. b) First core against last core in each layer concerned if in at least one layer the total number of cores is odd and greater than one, otherwise not required. c) All odd numbered layers against all even numbered layers.

E = metallic screen, metallic sheath or armouring and earth.

V = test voltage.

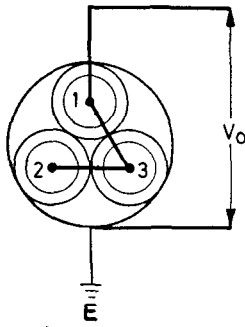
Note 1 — These test connections call for a single phase testing transformer, one end of the high voltage winding of which is earthed.

Note 2 — For single core unscreened, unarmoured cables, voltage test shall be done between the conductor and tank with the cable under water.

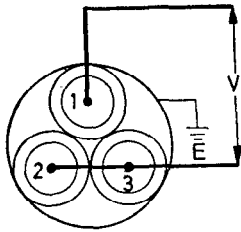
Note 3 — For multicore cables having more than four cores, the armouring shall be treated as a layer of source.

FIG. 1 VOLTAGE TEST CONNECTION FOR SINGLE PHASE TESTING

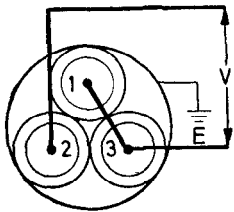
(Applicable where test voltage between cores and between conductors and earth are same)



1+2+3 against E (between conductors and earth)



1 against 2+3



2 against 1+3

E = metallic screen, metallic sheath or armouring and earth

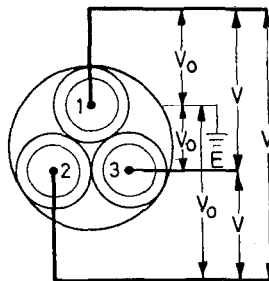
V = test voltage conductor to conductor

V_0 = tests voltage conductor to earth

Note — These test connections call for a single phase testing transformer with facility for mid point earthing on high voltage winding. Alternatively, two single phase transformers suitably connected to give the similar connections may be used.

FIG. 2A VOLTAGE TEST CONNECTIONS FOR SINGLE PHASE TESTING

(Applicable where test voltages between conductors and between conductors and earth are different)



E = metallic screen, metallic sheath or armouring and earth

V = test voltage, conductor to conductor

V_0 = test voltage, conductor to earth

Note — This figure is alternate to Fig. 2A.

FIG. 2B VOLTAGE TEST CONNECTIONS FOR THREE PHASE TESTING

(Applicable where test voltages between conductors and between conductors and earth are different)

IS : 10810 (Part 45) - 1984

8.3.1 In case of tests with dc voltage the smoothing capacitor is to be discharged through a suitable resistor.

Note — For tests, with dc voltage, the conductor shall be connected to the negative pole of the dc source and the positive pole of the dc source shall be earthed.

8.4 During the test, breakdown of insulation is to be observed.

9. Tabulation of Observations

<i>Sample No.</i>	<i>Cable Description</i>	<i>Length m</i>	<i>Temperature °C</i>	<i>Test Voltage kV ac/dc</i>	<i>Duration of Test</i>	<i>Observation of Breakdown</i>
						Yes/No

10. Calculation — No calculation is involved.

11. Report

11.1 Reference Specification _____

<i>Sample No.</i>	<i>Description of Sample</i>	<i>Test Voltage</i>	<i>Duration of Test</i>	<i>Breakdown</i>
				Yes/No

11.2 Conclusion — The specimen meets/does not meet the requirements of the specification.