

PUBLIC POWER CORPORATION

ATHENS - GREECE



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TECHNICAL DESCRIPTION TD-15

HEAT-SHRINKABLE SEALING ENDS **SUITABLE FOR 20kV, XLPE SINGLE CORE CABLES**

I. SCOPE

This technical description sets forth the technical characteristics and tests for heat-shrinkable sealing ends suitable of outdoor installation and for 20kV, XLPE single core cables.

II. KEY WORDS

Heat-shrinkable sealing ends, sealing ends, cable terminations, cables.

III. ELECTRICAL CHARACTERISTICS OF THE SYSTEM

1.	Nominal Voltage	:	20kV rms
2.	Maximum Operating Voltage	:	24kV rms
3.	Frequency	:	50Hz
4.	Phases	:	3
5.	Basic Insulation Level	:	150kV crest
6.	Short Circuit Level	:	10kA

IV. OPERATING CONDITIONS

1.	Installation	:	Outdoors
2.	Ambient Temperature	:	-20°C ÷ +55°C
3.	Altitude	:	Up to 1,000m above sea level.
4.	Other conditions	:	Snow and ice.

V. REQUIRED SEALING ENDS BASIC COMPONENTS AND THEIR CHARACTERISTICS

Each sealing end will be comprised of the following basic components :

1. Cable protection tube.
2. Tube for smoothing the electric field.
3. Tube for sealing the terminal.
4. Terminal with proper hole.
5. Anti-tracking skirts.

6. Flexible meshed grounding band fitted with terminal with proper hole.
7. Anti-tracking hot melt adhesive.
 - The cable protection tube, the sealing tube and the tube for smoothing the electric field must be from heat-shrinkable material.
 - The sealing end terminal and the terminal of the grounding band must be from zinc plated copper.
 - The anti-tracking skirts must be from heat-shrinkable material.

In addition each sealing end must be supplied with every additional component which is required based on its design and its requirements for installation.

VI. ADDITIONAL REQUIRED TECHNICAL SEALING ENDS CHARACTERISTICS.

1. Sealing Ends Creepage Distance : $\geq 670\text{mm}$
2. Sealing Ends Withstand Impulse Voltage : 150kV crest
3. Sealing Ends 50Hz Power Frequency Withstand Voltage
 - Wet : 50kV, 10sec.
 - Dry : 50kV, 1min.
4. The sealing ends must be able to withstand temperatures up to 90°C under normal operating conditions and up to 120°C under short time over-loading conditions (24hours / year and not more than 3 hours each time).
5. The sealing ends must be able to withstand temperatures up to 250°C under short circuit conditions and for 5 sec. in duration.

VII. CABLE CHARACTERISTICS

The cable cross section in mm^2 and the cable conductor material shall be indicated every time in the inquiry.

VIII. TESTS

1. Routine (Production) Tests.

- a. Visual Examination.
- b. Dimensional Examination.

2. Type (Design) Tests.

- a. 50Hz power frequency withstand test (phase-to-ground)
 - Wet : 50kV, 10 seconds.
 - Dry : 50kV, 1 minute.
- b. Impulse withstand test in accordance with IEC-502

(phase-to-ground).

Ten (10) impulses of negative polarity and ten (10) impulses of positive polarity of amplitude of 150kV crest and 1.2/50 μ s waveform.

- c. Partial Discharge Test in accordance with IEC-885-2.
Test Voltage : 24kV (phase-to-ground)
Acceptable test partial discharge magnitude : ≤ 20 pC.
- d. Load Cycling Test in accordance with VDE-0278.
The test sample, after been installed on a cable, shall undergo 63 heating cycles in accordance with IEC-502.
Each cycle shall consist of 5 hours heating up to the rated conductor temperature +5°C by passing current through the test sample and 3 hours without current to allow it to cool down to the ambient temperature.
Test Voltage = 30kV phase-to-ground.
After the 3rd heating cycle the partial discharge test of paragraph VIII-2-C will be repeated (Only for one time).
- e. D.C. Voltage Withstand Test.
Applied Voltage : 96kV D.C. phase-to-ground
Duration : 30minutes
- f. Thermal Short Circuit Test in accordance with VDE-0278.
The test sample shall be subjected to two (2) 1 sec. short circuit currents to attain the cable allowable temperature.
One of the short circuit currents will be between phases and the other between phase and ground.
- g. Tracking and Erosion Resistance Test for external tubing and skirts in accordance with Standard ASTM-D2303.
- h. Humidity Test.
This test will be in accordance with IEC-466.
The test sample shall be tested for 1,000 hours with a water conductivity of 1.8 S/m.
Test Voltage : 15kV phase-to-ground.
- i. Salt-fog Test.
The test will be carried out in accordance with IEC-507.
The sample shall be exposed for 1 hour to a salt solution with a concentration of 160kg NaCl per m³, a conductivity of 167,300 μ S/cm and a density of 1104.5 kg/m³.
The test voltage shall be 15kV phase to ground.
The test will be performed three (3) times with no flashover.
If there is flashover then the test will be repeated for a fourth time during which there should be no flashover.

IX. ADDITIONAL DATA WHICH MUST BE PROVIDED BY THE SUPPLIER.

1. The supplier can submit, along with the offer, test certificates for the type tests of paragraph VIII which tests might have been carried out on identical sealing ends and which certificates will be evaluated by the purchaser.
If it is deemed necessary by the purchaser to have these tests repeated either all or some of them, then this will be done at the expense of the supplier.
2. The supplier shall submit, along with the offer, the following data:
 - a. Creepage distance of the sealing end.
 - b. Number of skirts.
 - c. Total length of the sealing end.
 - d. Material of the terminal.
 - e. Material of the terminal of the flexible grounding band.
 - f. 50Hz power frequency voltage withstand of the sealing end, dry and wet.
 - g. Impulse voltage withstand of the sealing end.
 - h. A list with all sealing end components.
 - i. A drawing of the sealing end.
 - j. Temperature withstand of the sealing end under normal, overloading and short circuit conditions.
 - k. Sealing end assembly instructions and the temperatures at which the heat shrinking is attained (maximum - minimum).
 - l. Declaration of acceptance or not of type tests.

Failure to submit the required data of paragraph IX-2 constitutes reason for rejection of the offer.

