



September 2005

**TECHNICAL DESCRIPTION TD-75**  
**SINGLE-POLE OUTDOOR TYPE SEALING ENDS (CABLE TERMINATIONS)**  
**SUITABLE FOR XLPE, 26/45/(52) KV, SINGLE CORE CABLES**

**I. SCOPE**

This technical description sets forth the requirements for the technical and constructional characteristics and for the testing of single-pole sealing ends of the outdoor type, suitable for XLPE, 26/45/(52) KV single core cable with aluminum conductor of cross section of 1200 mm<sup>2</sup> and with screen of copper wires as metallic sheath .

**II. KEY WORDS**

Outdoor sealing ends, cable sealing ends, outdoor cable terminations.

**III. STANDARDS**

The sealing ends shall be in accordance with this hereby technical description and also in accordance with the following IEC standards.

- IEC – 60815
- IEC – 60137
- IEC – 61462

**IV. USE**

The sealing ends are to be used at the ends of XLPE, 26/45/(52)KV underground cables of aluminum conductor of cross section of 1200 mm<sup>2</sup> inside ehv substations for the connection of the 30kV tertiary winding of the 400/150/30kV autotransformers with 30kV shunt reactors

**V. OPERATING CONDITIONS**

- |                              |                               |
|------------------------------|-------------------------------|
| 1. Installation              | : Outdoors                    |
| 2. Ambient temperature range | : Maximum + 45°C              |
|                              | : Minimum - 25°C              |
| 3. Altitude                  | : Up to 1000m above sea level |
| 4. Other conditions          | : Snow, Ice and fog           |

## **VI. ELECTRICAL CHARACTERISTICS OF THE SYSTEM**

1. Nominal Voltage : 30 KV
2. Maximum Operating Voltage : 36 KV
3. Frequency : 50Hz
4. Basic insulation level (lightning impulse level) : 250 KV, peak
5. Short circuit level : 20 KA for 1 sec
6. Method of earthing : The 30 KV system is solidly earthed only when at least one shunt reactor is in service.

## **VII. REQUIRED CONSTRUCTIONAL AND OTHER CHARACTERISTICS OF THE SEALING ENDS**

1. Insulation housing of the sealing end : Silicon rubber
2. Sealing end installation : The sealing ends shall be installed in a vertical position, on a metallic support structure and they will be mounted on the support structure through porcelain or silicon insulators.
3. Sealing end terminal : The terminal shall be of cylindrical shape with diameter of 60mm and from material which shall be suitable for connection with copper conductor via bronze clamp unless it is specified otherwise in the inquiry.
4. Sealing end earthing : The earthing of the sealing ends and in extension of the cable's metallic (screen of copper wires) sheath shall be through a single cable of special insulation, of copper conductor of 120mm<sup>2</sup> in cross section, to the grounding (earthing) mat of the substation. For this purpose, therefore, the sealing ends shall be equipped with a proper earthing bronze terminal.
5. Characteristics of the cable which is to be connected to the sealing end : Single core, 26/45/(52) KV, XLPE cable with aluminium conductor of 1200 mm<sup>2</sup> cross section and a screen of copper wires as metallic sheath, aluminium tape of 2 mm in thickness, semiconducting conductor layer,

semiconducting insulation layer,  
semiconducting metallic sheath layer  
swelling tapes in the presense of water  
or moisture and PE  
outer sheath.

6. Metallic parts of the sealing end : Any metallic parts of the sealing end shall either be from stainless steel or from other metal but with proper plating (such as zinc-plated or tin-plated).
7. Filling of the insulating housing (insulator) : The insulating housing shall be filled with non-toxic synthetic oil which shall be free from PCB's or PCT's.
8. Life duration of the sealing end's parts : The life duration of the parts shall be at least five (5) years from their production date.

#### **VIII. BASIC REQUIRED PARTS OF THE SEALING END**

The sealing end shall consist of following basic parts.

- Upper metal fitting
- Conductor connector (mechanical)
- Insulator consisting of fiber glass reinforced cast resin tude on the surface of which, sheds of silicon rubber are applied
- Filling oil
- Stress cone
- Base plate
- Support insulators
- Cable gland

#### **IX. REQUIRED CHARACTERISTICS OF THE SUPPORT (PEDESTAL) INSULATORS OF THE SEALING ENDS**

The porcelain or silicon rubber insulators with which the sealing ends are supported on the metallic support structure, must have the following characteristics :

1. Mechanical compression strength :  $\geq 100000$  N
2. Cantilever load withstand :  $\geq 5000$  N
3. The entire insulator support arrangement must be able to withstand mechanical forces of 2500 N in magnitude produced by short circuits.

**X. REQUIRED ELECTRICAL AND OTHER CHARACTERISTICS OF THE SEALING ENDS**

- |   |                   |
|---|-------------------|
| 1. Nominal (rated) Voltage  | : 30KV            |
| 2. Maximum Operating Voltage  | : 36KV            |
| 3. Lightning impulse Voltage<br>withstand (1.2 / 50 $\mu$ s)                          | : 250KV peak      |
| 4. Power Frequency Voltage withstand for one (1)<br>min. under dry and wet conditions | : 95KV rms        |
| 5. Creepage distance of the silicon rubber<br>housing                                 | : 1300mm          |
| 6. Continuous Operating Current withstand   | : $\geq$ 1000A    |
| 7. Short circuit current withstand capability   | : 20 KA for 1 sec |

**XI. TESTING**

**A. Routine Tests**

1. Visual checking of all parts which comprise the sealing end for verification of probable deficiencies. In addition checking of the existence of all parts as envisaged in the constructional drawing of the sealing end.
2. Dimensional checking of all parts in accordance with the constructional drawing.

**B. Type Tests**

1. Dry and wet power frequency voltage test for one (1) min  
    In accordance with IEC – 60137
2. Dry lightning impulse voltage test in accordance with IEC - 60137
3. Cantilever load withstand test in accordance with IEC – 61642 for the silicon rubber housing of the sealing end.

**XII. NAMEPLATE INFORMATION**

Each sealing end at its metallic base, shall have attached to it, a nameplate from aluminium or other non corrosive metal which must bear the following information:

- Name of the equipment
- Name of the manufacturer
- Serial number
- Year of manufacturing
- Lightning impulse voltage withstand

**XIII. INFORMATION WHICH MUST BE PROVIDED BY ALL BIDDERS**

1. A drawing of the offered sealing end on which all parts of the sealing end are shown. In addition details of connection of the sealing end to the cable must be provided.
2. Technical pamphlets and complete description of the offered sealing end and of its parts.
3. Each bidder must complete the attachment "A". Failure to do so or incomplete filling of attachment "A", shall constitute sufficient reason for rejection of the offer.
4. Life duration (expiration date) of the sealing end's parts
5. Each bidder can submit along with the technical offer any type test certificate that may have for all type tests which are listed in paragraph XI-B of this hereby technical description. Whether these certificates will be taken into consideration, that remains at the discretion of IPTO S.A.

#### **XIV. DATA WHICH MUST BE PROVIDED BY THE SUCCESSFUL BIDDER**

1. Complete drawing of the sealing end in which all parts are shown and described in detail before shipment of the sealing end.
2. Detailed drawing in which the connection of the sealing end to the cable is explicitly shown in addition to any instructions which may be required for this purpose before shipment of the sealing end.
3. Detailed drawing showing the erection of the sealing end on the support structure end before shipment of the sealing end.
4. Detailed drawing showing the assembly of all parts of the sealing end before shipment of the sealing end.

#### **XV. PACKING**

Every sealing end along with its parts must be packaged inside a robust wooden box. (on sealing end along with its parts per one box)

The outer surface of the box must bear, with large letters the following:

- Contact Number
- Name of the equipment or part
- Year of manufacturing
- Serial number of the equipment or part
- Expiration date of equipment or part
- Weight of the box

**XIV. WARRANTY PERIOD**

The supplier of the sealing ends must provide a warranty period consisting of three (3) years from the delivery date

## **ATTACHMENT ‘A’**

Information by the Bidders. Failure to fill or partial filling of this attachment shall constitute sufficient reason for rejection of the offer.

1. Type of sealing end : .....  
.....
2. Temperature range : .....
3. Type of material of the insulating housing of the sealing end : .....
4. Shape and type of sealing end terminal : .....
5. Brief description of the earthing of the sealing end : .....  
.....  
.....
6. Support (pedestral) insulator data:
  - a. Mechanical strength of the supporting insulators in compression : .....
  - b. Cantilever load withstand : .....
  - c. Number of support insulators : .....
  - d. Mechanical withstand force due to short circuit : .....
  - e. Type of material of the support insulators : .....
7. Nominal voltage of the sealing end : .....
8. Maximum Operating Voltage : .....
9. Lightning impulse voltage withstand of the sealing end : .....
10. Power frequency voltage withstand of the sealing end, 50 Hz, for (1) min under dry and wet conditions. : .....
11. Creepage distance of the silicon rubber housing : .....
12. Short circuit current withstand for one (1) sec. : .....
13. Continuous current withstand : .....
14. Weight of the silicon rubber housing : .....

15. Total weight of the sealing end : .....
16. Total length of the sealing end : .....
17. Shape and type of material of the selling end's terminals : .....  
.....
18. Type of oil used for the filling of the sealing end : .....  
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19. Is the silicon rubber sealing end's housing designed to be operated under internal pressure? : .....
20. If the answer is "Yes" to the question No.21, indicate internal pressure : .....
21. Life duration (expiration date) of the sealing end's parts : .....
22. List the basic parts of the sealing end. : .....  
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IIδ/pmAG/September 2005