



November 2018

TECHNICAL DESCRIPTION TD-227/4

150kV SINGLE-POLE OUTDOOR TYPE SEALING ENDS SUITABLE FOR XLPE 87/150 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, 87/150 (170) KV and also sets forth the required tests for the sealing ends in question.

II. **KEY WORDS**

Outdoor sealing ends, cable sealing ends, 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 – 60233
- IEC – 61462

IV. **USE**

The sealing ends are to be used at the ends of XLPE, 87/150 (170)KV underground cables inside substations or at the ends of underground cables at terminal installations, or at the end of underground transmission cable sites.

V. **OPERATING CONDITIONS**

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|------------------------------|-------------------------------|
| 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**

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| 1. Nominal Voltage | : 150 KV |
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|----|--|--|
| 2. | Maximum Operating Voltage | : 170 KV |
| 3. | Frequency | : 50Hz |
| 4. | Basic insulation level (lightning impulse level) | : 750 KV, peak |
| 5. | Short circuit level | : 31,5 KA for 1 sec |
| 6. | Method of earthing | : The 150 KV system is solidly earthed |

VII. REQUIRED CONSTRUCTIONAL AND OTHER CHARACTERISTICS OF THE SEALING ENDS

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| 1. | Insulation housing of the sealing end | : Porcelain or 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 insulators or silicon rubber insulators. |
| 3. | Sealing end terminal | : The terminal shall be of cylindrical shape with suitable diameter and material for connection with the conductor via clamp. |
| 4. | Sealing end earthing | : The earthing of the sealing ends and in extension of the cable's lead alloy sheath shall be through a special insulation single core cable of 120mm ² copper conductor 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 brass terminal. |
| 5. | Characteristics of the cable which is | : Single core, 87/150(170) KV, XLPE Suitable to be connected to the sealing end cable and lead alloy sheath, semiconducting conductor layer, semiconducting insulation layer, semiconducting dwelling tapes, PVC outer sheath and semiconducting layer on the PVC 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 construction date

VIII. BASIC REQUIRED PARTS OF THE SEALING END

The sealing end shall consist of following basic parts.

- Upper metal fitting
- Conductor connector (metallic)
- Insulator (Porcelain or silicon rubber*)
- Filling oil
- Stress cone
- Base plate
- Support insulators (four insulators)
- Cable gland

* The silicon rubber insulator consists of fibre glass reinforced cast resin tube on the surface of which, sheds of silicon rubber are applied

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 : ≥ 100000 N
2. Cantilever load withstand : ≥ 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	: 150KV
2. Maximum Operating Voltage	: 170KV
3. Lightning impulse Voltage withstand (1.2 / 50 μs)	: 750KV peak
4. Power Frequency Voltage withstand for one (1) min. under dry conditions	: 325KV rms
5. Minimum creepage distance (IEC 60815) of the porcelain or silicon rubber housing / Pollution Category:	
5a. Locations without pollution	: 25 mm/kV
5b. Pollution conditions	: 31 mm/kV
5c. Locations close to the sea (distance shorter than 1000 m)	: 31 mm/kV
6. Short circuit current withstand capability	: 31,5KA for 1 sec : According to cables power transmitting capacity to the nominal voltage in three phase system
7. Continuous current carrying capability	
8. Cantilever load withstand	: ≥ 4000 N

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 end.
2. Dimensional checking of all parts in accordance with the constructional drawing.
3. Electrical testing accordance with standard IEC – 60233 for the porcelain hollow casing (insulator) of the sealing end only. The test voltage shall be equal to 1.5 kV rms, 50Hz, per millimeter of wall thickness of the hollow insulator at its thinnest point with a minimum of 35kV. Test duration :5min

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 – 60137 for porcelain housing sealing end and in accordance with IEC – 61462 for the silicon rubber housing sealing end.

XII. NAMEPLATE INFORMATION

Each sealing end at its metallic base, shall have attached to it, a nameplate from aluminium or other noncorrosive 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 shown.
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 parts
5. Each bidder can submit along with the technical offer any available type test certificate for all tests which are listed in paragraph XI-B of this hereby technical description. Those certificates will be taken into consideration upon IPTO's discretion.

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

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 :
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2. Temperature range :
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3. Type of material of the insulating housing of the sealing end :
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4. Shape and type of sealing end terminal :
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5. Brief description of the earthing of the sealing end :
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6. Support (pedestral) insulator data:
 - a. Mechanical strength of the supporting insulators in compression :
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 - b. Cantilever load withstand :
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 - c. Number of support insulators :
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 - d. Mechanical withstand force due to short circuit :
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 - e. Type of material of the support insulators :
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7. Nominal voltage of the sealing end :
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8. Maximum Operating Voltage :
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9. Lightning impulse voltage withstand of the sealing end :
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10. Power frequency voltage withstand of the sealing end, 50 Hz, for (1) min under dry and wet conditions. :
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11. Creepage distance of the porcelain or silicon rubber housing :
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12. Short circuit current withstand for one (1) sec. :
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13. Continuous current withstand :
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14. Weight of the porcelain housing (if applicable) :
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15. Weight of the silicon rubber housing (if applicable) :
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16. Total weight of the sealing end :
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17. Total length of the sealing end :
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18. Shape and type of material of the selling end's terminals :
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19. Type of oil used for the filling of the sealing end :
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20. Electrical withstand strength of the porcelain housing for 5 minutes :
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21. Is the silicon rubber sealing end's housing designed to be operated under internal pressure? :
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22. If the answer is ' 'Yes' ' to the question No.21, indicate internal pressure :
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23. Life duration (expiration date) of the sealing end's parts :
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24. List all sealing end's parts :
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