



November 2018

## TECHNICAL DESCRIPTION TD-228/2

### 400 kV SINGLE-POLE OUTDOOR TYPE SEALING ENDS

#### 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, 400 KV which are in accordance with Appendix A2

#### 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 – 62067, latest edition.

#### IV. **USE**

The sealing ends are to be used at the ends of XLPE, 400 KV underground cables, inside EHV S/S 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 |

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|---------------------|-------------------------------|
| 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                                     | : 400 kV                              |
| 2. Maximum Operating Voltage                           | : 420 kV                              |
| 3. Frequency   | : 50Hz                                |
| 4. Basic insulation level<br>(Lightning impulse level) | : 1425 KV, peak                       |
| 5. Short circuit level                                 | : 40 KA for 1 sec                     |
| 6. Method of earthing                                  | : The 400KV system is solidly earthed |
| 7. Continuous current carrying capability              | : $\geq 2000A$                        |

**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 ones. |
| 3. Sealing end terminal                  | : The terminal shall be of cylindrical shape with diameter $\varnothing$ 40mm and suitable material for connection with copper conductor via a brass clamp, unless it is specified otherwise.        |
| 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 <sup>2</sup>                                 |

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|---|---|
|   | copper conductor 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 going to connect with the sealing, end. | : According to the technical description td-221 (last valid revision)   |
| 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.  |
|   | <b>It is pointed out that the use of dry-type insulators is not permitted in sealing ends of 400 kV nominal voltage.</b>  |
| 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  |
| 9. Minimum creepage distance (IEC 60815)  |   |
| 9a. Locations without pollution   | : 25 mm/kV  |
| 9b. Pollution conditions  | : 31 mm/kV  |
| 9c. Locations close to the sea (distance shorter than 1000 m)                     | : 31 mm/kV  |
| 10. Flash-over distance   | : 4100 mm   |

#### **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 ELECTRICAL AND OTHER CHARACTERISTICS OF THE SEALING ENDS**

Nominal (rated) Voltage	: 400KV
Maximum Operating Voltage	: 420KV
Lightning impulse Voltage withstand (1.2 / 50 $\mu$ s)	: 1425 KV peak
Short circuit current withstand capability	: 40 kA for 1 sec

## **X. TESTS**

### **A. Routine Tests**

All tests that are reported in the IEC – 62067 standard shall be executed.

### **B. Type Tests**

All tests that are reported in the IEC – 62067 standard shall be executed.

## **XI. 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 ( 1,2 / 50  $\mu$ s )

## **XII. 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 attached "Technical Characteristics Datasheet".
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 X-B of this hereby technical description. Those certificates will be taken into consideration upon IPTO's discretion.

## **XIII. 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.

## **XIV. PACKING**

Every sealing end along with its parts must be packaged inside a robust wooden box. (One 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

## **XV. WARRANTY PERIOD**

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

## **TECHNICAL CHARACTERISTICS DATASHEET**

### **400 kV SINGLE-POLE OUTDOOR TYPE SEALING ENDS**

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  
( 1,2 /50  $\mu$ s ) : .....
10. Power frequency voltage withstand of the sealing end, 50  
Hz, for (1) min under dry and wet conditions. : .....
11. Creepage distance of the porcelain or silicon rubber  
housing : .....
12. Short circuit current withstand for one (1) sec. : .....
13. Continuous current withstand : .....
14. Weight of the porcelain housing (if applicable) : .....
15. Weight of the silicon rubber housing (if applicable) : .....
16. Total weight of the sealing end : .....
17. Total length of the sealing end : .....
18. Shape and type of material of the selling end's terminals : .....  
.....
19. Type of oil used for the filling of the sealing end : .....  
.....
20. Electrical withstand strength of the porcelain housing for 5  
minutes : .....
21. Is the silicon rubber sealing end's housing designed to be : .....  
operated under internal pressure?
22. If the answer is ' 'Yes' ' to the question No.21, indicate : .....  
internal pressure

23. Life duration (expiration date) of the sealing end 's parts : .....

24. List all sealing end's parts : .....

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