### Abstract

Synthetic insulation for cable terminations has been used for more than twenty years for medium and high voltage systems. If dry HV terminations can be proposed, the dielectric stresses encountered in service are such that it is not possible to let the stress cone without protection. An insulator filled with insulating liquid or gas must be used. Composite insulators have been developed to replace porcelain in 225 kV terminations. The terminations equipped with these insulators comply with EDF Company Specification HN 68 S 23. The report compares their performances with those of traditional equipment using porcelain. Long term tests are in progress. They confirm the excellent behaviour of these new terminations, which can already be used for temporary links.

### 1. INTRODUCTION

Synthetic insulation for outdoor applications of cable terminations were first developed more than 20 years ago [1] to replace traditional porcelain terminations for MV and HV levels.

The advantages of those terminations over traditional equipment are well known:

- no risk of explosion or fire in case of internal breakdown,
- simplicity and ease of installation.

In the field of higher voltages, there is a need for terminations without porcelain to reduce the risk of explosion, but at the present time, synthetic terminations are not available and the use of an insulating fluid is required (oil or SF6). Hollow core composite insulators have thus been developed in order to offer a safer behaviour of the termination in case of breakdown.

The basic specification for the development of non-ceramic EHV cable terminations described in this report was the EdF Company Technical Specification HN 68 S 23. The terminations equipped with these insulators comply with EDF Company Specification HN 68 S 23. The report compares their performances with those of traditional equipment using porcelain. Long term tests are in progress. They confirm the excellent behaviour of these new terminations, which can already be used for temporary links.

### 2. TECHNICAL REQUIREMENTS

Technical requirements are listed in the EDF Company Technical Specification HN 68 S 23.

- **HN 68 S 23** covers outdoor terminations for extruded cables rated 36 kV and above. Main points of this specification taken into account for the development of porcelain-free terminations were:

  1. **Rated voltages:** Uo/U (Um) = 130/225 (245) kV
  2. **Short circuit rating:** 31.5 kA during 0.5 s

#### 2-1 Rated voltages:Uo/U(Um)=130/225(245)kV

#### 2-2 Short circuit rating=31.5kA during 0.5s

#### 2-3 Construction and main characteristics of components

The insulator shall be dimensioned in accordance with the rules given in IEC 815 (3). Maximum internal service pressure in case of use of SF6 gas shall be 3.5 bars gauge at 20°C. The termination shall be equipped with a pressure monitoring system.

#### 2-4 Type tests:

- **Type tests** include short-term and long-term tests.

#### Short-term tests:

- hot impulse test: 10 pulses at + and - 1050 kV
- power frequency test at room temperature: 380 kV 24 hours

#### Long-term tests:

- 6000h at 225 kV (3 U) between conductor and metallic shield. In addition, 250 thermal cycles are performed while the voltage is applied.