

**C10.1****Type testing of cables and accessories**

BERLIJN S.M., GRUNTJES R.J.B., ROELOFS G.P.T., Kema Nederland, Arnhem, The Netherlands

Résumé

Parce que les câbles et leurs accessoires représentent une partie importante des réseaux électriques, ils sont soumis à de nombreux essais, dont les essais de type. Pour ces essais plusieurs normes sont applicables. Les essais de type ne sont pas superflus car il apparaît que 26% des matériels essayés sont refusés suite à un défaut de conception. Le taux de refus pour les accessoires (33%) est supérieur à celui des câbles (17%). Pour les accessoires, le VDE 278 est une norme sévère; 50% des matériels sont refusés en essai. Il ne se dégage pas de tendance particulière sur le taux de refus, cependant le taux de défaillance en essai des accessoires tend à augmenter.

Abstract

Because cables and accessories are an important part of the electric infrastructure they are subjected to several tests. One of these tests are type tests. For type tests several standards are available. Type testing of cables and accessories is not a superfluous luxury, while it appears that around 26% of the objects do not pass the type tests because of design failures. The failure rate for accessories (33%) is higher than for cables (17%). For accessories, VDE 278 is a severe standard, 50% of the objects does not pass type tests according to this standard. No clear trend in failure rate can be seen over the years, although the failure rate of accessories has the tendency to increase.

Introduction

Cables and accessories are an important part of the electric infrastructure. The necessity of a high quality of manufacturing is basically expected [1]. Because of this, cables and accessories are subjected to several tests in several manufacturing stages. One can distinguish between for instance pre-qualification tests, type tests, routine tests, acceptance tests and after laying tests.

These tests can be performed according to different standards, depending on the rated voltage of the cable or accessory and the requirements of the purchaser, for instance VDE 278 [2], IEC 60502 [3], IEC 60840 [4], etc.

To prove the correct design of the cable and accessories, type tests are often required. The manufacturer and the utilities have to make choices between several standards and they have to decide if only the cable or accessories will be tested or that the combination that will be used will be tested.

In this paper results will be presented of type tests performed on cables and accessories during the last six years (1993-1998) at KEMA High-Voltage Laboratory. Figures are presented about the total number of cables and accessories tested, according to which standard, the number of failures and causes of the failures. At the end of the paper some conclusions are drawn and some recommendations are given.

Standards used for type testing of cables and accessories

At this moment there are several national and international standards for testing of MV and HV cables and accessories. The most applied international standards can be divided into four categories, according to the nominal voltage:

- 150 – 500 kV, IEC 60267⁵ in preparation
- 6 – 30 kV, e.g. IEC 60502-2 and -4 and VDE 278
- 30 – 150 kV, e.g. IEC 60840
- 1 and 3 kV, e.g. IEC 60502-1

From the 166 type tests performed in six years time, most tests are performed according to IEC 60840, IEC 60502 and VDE 278, as is shown in Figure 1.

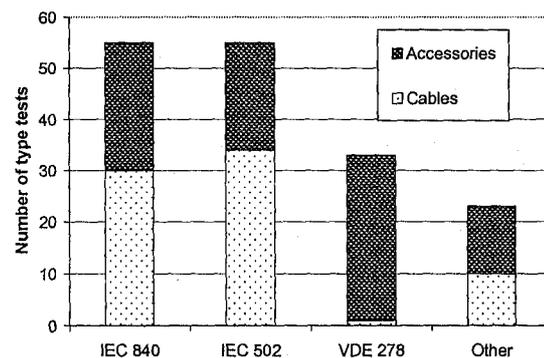


Figure 1 Number of type tests performed as a function of the standard