

# SUMMARY OF DOCTORAL THESIS

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## **Recognition of the basic forms of electrical discharges generated in insulating oil, measured using optical spectrophotometry method**

The main scientific objective of the dissertation was to define the scope of the application of optical spectrum analysis emitted by the basic forms of electrical discharge generated in insulating oil, recorded using an optical spectrophotometer for diagnostics of insulation systems of high voltage electrical equipment. In addition, the cognitive purpose of the proposed research was to determine the energy share for the different optical radiation fields emitted by modelled electrical discharge in insulating oil. In addition, it was possible to select a group of descriptors characterising the optical signals generated in the basic modelling forms of the electrical discharge, on the basis of which they would be able to recognise their forms.

The measurements carried out in the framework of the research were carried out in order to examine the quantitative distribution of the intensity of optical radiation in the range of: ultraviolet, visible and near infrared, which accompany the formation and development of electrical discharge generated by electrolytic insulating oil: pure, exploited and operated with air bubbles. An optical measurement system based on the optical spectrophotometry method was used to record the emission of optical radiation. Electrical discharges were generated in the following modelling systems: blade-blade, blade-plate, and surface electrical discharge system. In order to identify the electrical discharges forms based on optical wave-forms, distinctive descriptors were selected which clearly describe them. Of the group of parameters characterising the recorded spectra of optical radiation emission, a group of descriptors was selected, and then it was proven that, based on the comparative analysis of their values, it is possible to identify the analysed forms of electrical discharges.

Within the framework of the work, a parametric model was developed, which describes the recorded spectral distributions of the emitted optical radiation for all investigated forms of electric discharges.

On the basis of the results of the research work carried out during the trial, it has been shown that it is possible to identify the basic single source forms of electrical discharge generated by insulating oil, using characteristic descriptors based on the recorded spectra of the emitted optical radiation. The results of the analyses confirm the possibility of using the optical spectrophotometry method to measure the electrical discharge generated in insulating oil. The results of measurements and analyses and mathematical models obtained during the course of the research confirm this thesis.