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# Thermal calculations of electrical machines

**Abstract**. *The article discusses basic problems related to modeling of thermal phenomena occurring in electrical machines. The various methods used to solve these issues were compared. An attempt was made to select the most suitable method for calculating modern permanent magnet machinery designs.*

**Keywords:** electrical machine, machine thermal model.

## Introduction
One ot the phenomena accompanying the flow of electricity in the release of heat. This issue applies to all electrical devices and machines. Modern constructions solutions are characterized by maximizing efficiency, striving for miniaturization and reducing cocts. All this makes the operating conditions of these devices increasingly extreme. This causes designers to pay special attention to flow and heat dissipation. This is connected with the need to carry out accurate and detalized analyzes of thermal phenomena, which can be carried out, inter alia, thanks to modern calculation methods.

The use of permanent magnets causes the introduction of addi tional elements to the machine structure, also into the thermal system. Often this extra element is temperature sensitive

## Method of thermal calculations of electrical machines
Currently, two types of thermal calculation methods are most commonly used:
- thermal scheme method,,
- numerical methods, e.g. based on the finite element method.

The method of thermal schemes is very widely used. An important element is the creation of the correct model, which allows to obtain experimentally confirmed results in a relatively short time. Relatively new numerical methods require high computing power, but allow the analysis of devices of almost any geometry using any cooling systems.

## Conclusion
The most reliable indicator of the correct choice of method is the confirmation of the results of its application in the real model in experimental research. Currently available calculation packages allow to implement the model of the designed machine for thermal calculations

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