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REDLINE VERSION

TECHNICAL REPORT

A method of temperature-rise verification of low-voltage switchgear and controlgear assemblies by calculation

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC TR 60890:2014. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC TR 60890 has been prepared by subcommittee 121B: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low-voltage. It is a Technical Report.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- alignment with IEC 61439-1:2020;
- addition of individual annexes for guidance of technical explanations related to:
  - effect of an uneven power distribution;
  - additional temperature-rise due to solar radiation;
  - effect of different enclosure materials;
  - effect of different natural ventilation management;
  - forced ventilation management;
  - power losses calculation;
  - impact of an adjacent wall can have on the assembly cooling surface(s);
- maximum internal ambient temperature limit into an assembly;
- validity area of the calculation extended from 3 150 A to 3 200 A;
- addition of an algebraic equation to the different curves included in the document.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
121B/136/DTR	121B/147/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
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- replaced by a revised edition, or
- amended.

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INTRODUCTION

In the series of design verifications of IEC 61439-1 a temperature-rise verification of low-voltage power switchgear and controlgear assemblies (hereafter called ASSEMBLIES) is specified. This may can be by test, however, alternatives are acceptableunder defined circumstances. Selection of the method used for temperature-rise verification is the responsibility of the original manufacturer. Where applicable this document may can also be used for temperature-rise verification of similar products in accordance with other standards (e.g. IEC 60204-1). The method of calculation can also be used to determine the thermal power dissipation capability of an enclosure in accordance with IEC 62208 for a given internal air temperature-rise. The factors and coefficients, set out in this document have been derived from measurements on numerous assemblies and the method has been verified by comparison with test results.

A METHOD OF TEMPERATURE-RISE VERIFICATION OF LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES BY CALCULATION

1 Scope

~~This Technical Report specifies a method of temperature-rise verification of low-voltage switchgear and controlgear assemblies by calculation.~~

~~The method is applicable to enclosed ASSEMBLIES or partitioned sections of ASSEMBLIES without forced ventilation. It is not applicable where temperature rise verification to the relevant product standard of the IEC 61439 series has been established~~

~~NOTE 1 The influence of the materials and wall thicknesses usually used for enclosures can have some effect on the steady state temperatures. However, the generalised approach used in this technical report ensures it is applicable to enclosures made of sheet steel, sheet aluminium, cast iron, insulating material and the like.~~

~~The proposed method is intended to determine the temperature rise of the air inside the enclosure.~~

~~NOTE 2 The air temperature within the enclosure is equal to the ambient air temperature outside the enclosure plus the temperaturerise of the air inside the enclosure caused by the power losses of the installed equipment.~~

~~Unless otherwise specified, the ambient air temperature outside the ASSEMBLY is the air temperature indicated for the installation (average value over 24 h) of 35 °C. If the ambient air temperature outside the assembly at the place of use exceeds 35 °C, this higher temperatureis deemed to be the ambient air temperature.~~

This document specifies a method of air temperature-rise calculation inside enclosures for low-voltage switchgear and controlgear assemblies or similar products in accordance with their respective standard.

The method is primarily applicable to enclosed assemblies or partitioned sections of assemblies without forced ventilation. However, some technical guidance to adapt it for the use of forced ventilation is given in this document. The results obtained by using this method are directly influenced by the accuracy of the evaluation of power losses used as inputs to perform the thermal calculations.

NOTE The air temperature within the enclosure is equal to the ambient air temperature outside the enclosure plus the temperature-rise of the air inside the enclosure caused by the power losses of the installed equipment.

For the method to be applied, the maximum daily average ambient air temperature outside the assembly at the place of installation is specified between 10 °C and 50 °C. The maximum daily temperature does not exceed the maximum daily average temperature by more than 5 K.

Several annexes in this document provide guidance on how temperature-rise within assemblies can be affected by influences which are not considered in the calculation method included in this document, for example, when the assembly is subject to solar radiation. In such cases, different means of verification to that given in this document can be applied to ensure a definitive result and verification of the design.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~IEC 61439-1:2011, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*~~

IEC 61439 (all parts), *Low-voltage switchgear and controlgear assemblies*

IEEE C37.24-2017, *IEEE Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal-Enclosed Switchgear*

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IEC TR 60890:2022-09(en)

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FOREWORD

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