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TECHNICAL SPECIFICATION

colour inside

Mechanical structures for electronic equipment – Thermal management for cabinets in accordance with IEC 60297 and IEC 60917 series – Part 3: Design guide: Evaluation method for thermoelectrical cooling systems (Peltier effect)

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CONTENTS

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MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT – THERMAL MANAGEMENT FOR CABINETS IN ACCORDANCE WITH IEC 60297 AND IEC 60917 SERIES –

Part 3: Design guide: Evaluation method for thermoelectrical cooling systems (Peltier effect)

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62610-3, which is a technical specification, has been prepared by subcommittee 48D: Mechanical structures for electronic equipment, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
48D/401/DTS	48D/414/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62610 series can be found, under the general title *Mechanical structures for electronic equipment – Thermal management for cabinets in accordance with IEC 60297 and IEC 60917 series*, on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Besides the conventional compressor cooling there are several alternatives for cooling, for example: absorption cooling, thermoelectric cooling (Peltier), magneto caloric cooling, CO_2 cooling and others.

For the design of thermoelectrical cooling systems, values of the dissipation loss depending on the ambient temperature and internal temperature are necessary.

Thermoelectrical cooling systems performance is a function of ambient temperature, hot and cold side heat exchanger (heat sink) performance, thermal load, of the design of the Peltier device and of Peltier electrical parameters.

Therefore an evaluation method has to be developed. This design guide allows a comparison of thermoelectrical cooling systems.

MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT – THERMAL MANAGEMENT FOR CABINETS IN ACCORDANCE WITH IEC 60297 AND IEC 60917 SERIES –

Part 3: Design guide: Evaluation method for thermoelectrical cooling systems (Peltier effect)

1 Scope and object

This part of IEC 62610 provides an evaluation method for thermoelectrical cooling systems (Peltier effect).With this design guide it is possible to calculate the efficiency of the thermoelectrical cooling system (Peltier effect) and its cooling power depending on the ambient temperature and internal temperature. This design guide can also be used to appraise thermoelectrical cooling systems by its efficiency.

2 Normative references

The following referenced documents are indispensable for the application 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 62194:2005, *Method of evaluating the thermal performance of enclosures*

3 Abbreviations, symbols and indices

For the purposes of this document, the following abbreviations, symbols and indices apply.

3.1 Abbreviations

COP coefficient of performance [-]

c_P heat capacity [W/kgK]

D pipe diameter [m]

I current [A]

k overall heat transfer coefficient k [W/ m^2K]

n total number of Peltier devices [-]

Δp pressures difference [Pa]

Q energy flow (thermal, electrical, conductivity) [W]

Q_C effective cooling power of the thermoelectrical cooling system (Peltier) [W]

Q_{cPe} cooling power of a Peltier device at operating conditions [W]

Q_D total dissipated heat flow on the hot side [W]

Q_H heating power inside the cabinet [W]

R_{Pe} electrical resistance of the Peltier device [V/A]

R_i thermal resistance [K/W]

S surface [m^2]

T temperature [K]

V voltage [V]