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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 1: Design guide: Interface dimension and provision for thermoelectrical cooling systems (Peltier effect)

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Mechanical structures for electronic equipment – Thermal management for cabinets in accordance with IEC 60297 and IEC 60917 series – Part 1: Design guide: Interface dimension and provision for thermoelectrical cooling systems (Peltier effect)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: Design guide: Interface dimension and provision 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 62610-1, 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/393/DTS	48D/405/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- withdrawn,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 standard may be issued at a later date.

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INTRODUCTION

According to the Kyoto Protocol and to the directives of the European Parliament and of the Council, the usage of coolants with high potential for environmental pollution and global warming (Global Warming Potential (GWP) factor) is to be avoided.

The most promising alternatives to compressor cooling with e.g. R 134a are compressor cooling with CO_2, active cooling based on the Peltier effect and absorption cooling systems. Each of these techniques has its advantages and disadvantages.

The compressor cooling with CO_2 at the current state is more or less efficient, but high installation costs due to working pressures up to 100 bars makes this technique less interesting. Another disadvantage of CO_2 cooling systems occurs out of the physical properties of this coolant and requires additional cooling power to run this process. This fact reduces the degree of efficiency enormously.

The Peltier-effect seems to be very promising as the cooling effect is highly dependent of the properties of the material. Newly tested materials based on either porous materials or nano-structures show an improvement of the degree of efficiency. Furthermore, Peltier techniques do not need any kind of coolant and the only moving parts are the fans.

The absorption technique is a very intelligent way for cooling, but it is only profitable in combination with a heat-regenerator what makes absorption cooling system only feasible in very few applications.

For more details on mentioned alternatives for cooling, please see Annex A.

With respect to the demands of industry concerning high heat density/hotspots cooling, available space for the cooling systems, adapting to existing infrastructures, noise emission and respectively to the fact that conventional coolants like R 134a need to be replaced, this technical specification was initiated for the definition of dimensional interfaces and performances guidelines for thermoelectrical cooling systems based on the Peltier effect.

Three different arrangements for thermoelectrical cooling systems within cabinets, called “mounting locations”, have been regarded where locations 1 and 2 are feasible for cooling a whole cabinet and location 3 is for hotspot cooling inside the cabinet.

Below is the definition of each mounting location for thermoelectrical cooling systems within cabinets:

– mounting location 1: cabinet with inside or outside mounted thermoelectrical cooling system for the cooling of a whole cabinet;
– mounting location 2: cabinet with top mounted thermoelectrical cooling system for the cooling of a whole cabinet;
– mounting location 3: cabinet with inbuilt thermoelectrical cooling system in form of a subrack for hot spot cooling.

For a clear definition of interface dimensions and cooling performance guidelines, only cabinets from the IEC 60297 (19 inch) and IEC 60917 (25 mm) series have been regarded.

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

Part 1: Design guide: Interface dimension and provision for thermoelectrical cooling systems (Peltier effect)

1 Scope

This Technical Specification provides guidelines for the installation of thermoelectrical cooling systems (Peltier effect) within cabinets of the IEC 60297 (19 inch) and IEC 60917 (25 mm) series.

The cooling performance is in direct relation with the mounting location within a cabinet.

Three typical mounting locations are identified:

– mounting location 1: cabinet with inside or outside mounted thermoelectrical cooling system for the cooling of a whole cabinet;

– mounting location 2: cabinet with top mounted thermoelectrical cooling system for the cooling of a whole cabinet;

– mounting location 3: cabinet with inbuilt thermoelectrical cooling system in form of a subrack for hot spot cooling.

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.

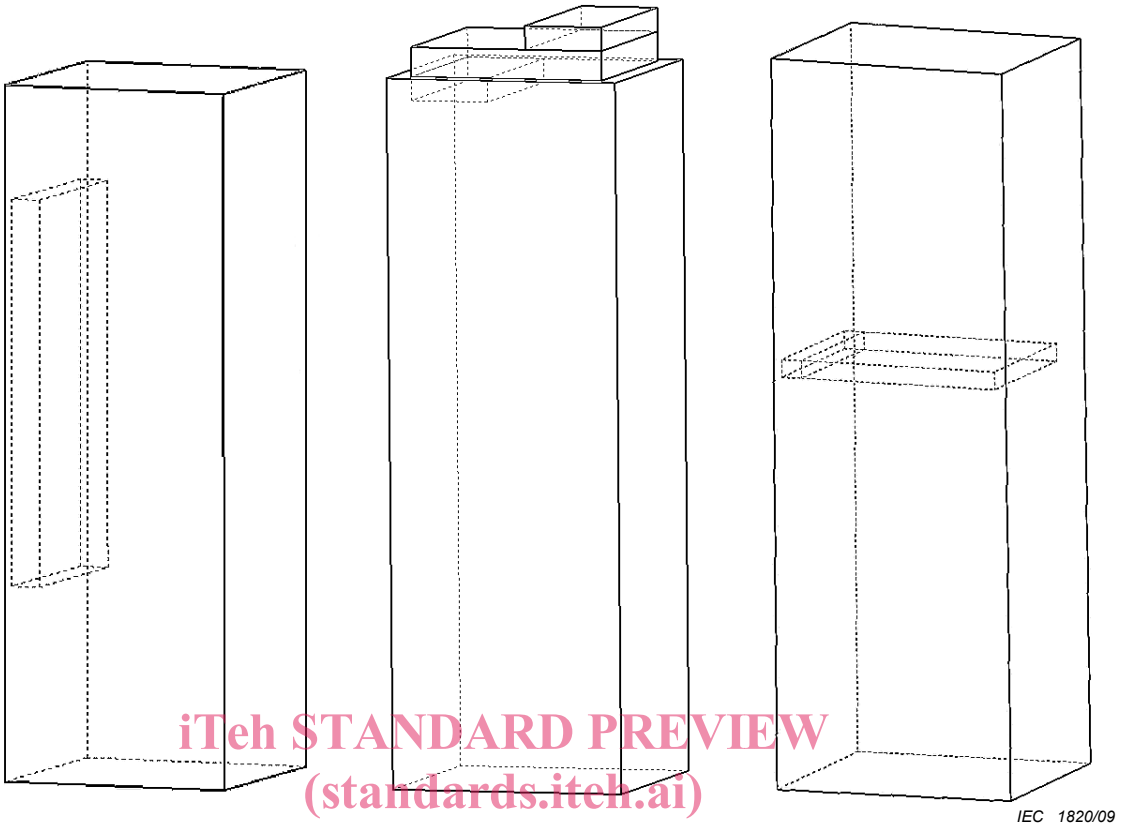
IEC 60297 (all parts), *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series*

IEC 60917 (all parts), *Modular order for the development of mechanical structures for electronic equipment practices*

3 Arrangement overview

Figure 1 illustrates the three mounting locations for thermoelectrical cooling systems.

NOTE This guideline for mounting thermoelectrical cooling systems applies to any width of cabinets. Second, the air flow management should satisfy the followings: no airflow short circuit depending on the equipment and the cable management inside the cabinet.



Mounting location 1:

cabinet with thermoelectrical cooling system inside or outside mounted for the cooling of a cabinet.

Mounting location 2:

cabinet with thermoelectrical cooling system top mounted for the cooling of a whole cabinet.

Mounting location 3:

cabinet with inbuilt thermoelectrical cooling system for hot spot cooling.

Figure 1 – Arrangement overview

4 Mounting location 1: cabinet with inside or outside mounted thermoelectrical cooling system in a vertical alignment

4.1 Cabinet with inside mounted thermoelectrical cooling system in a vertical alignment

4.1.1 General

Figure 2 illustrates the mounting positions of the thermoelectrical cooling system and the direction of the air circulation. For the individual application, the provided cabinet dimensions should be used as a reference.

4.1.2 Overview

Figure 2 compares inside mounted Peltier cooling systems versus external mounted Peltier systems.

The air inside the cabinet flows in vertical direction from the bottom to the top for optimal internal circulation.

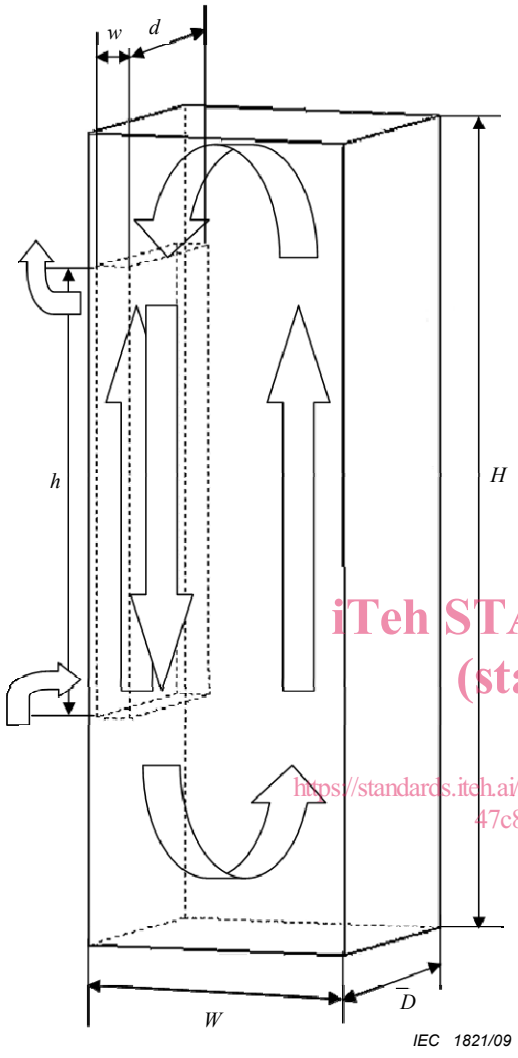


Figure 2a – Cabinet with inside mounted thermoelectrical cooling system in a vertical alignment

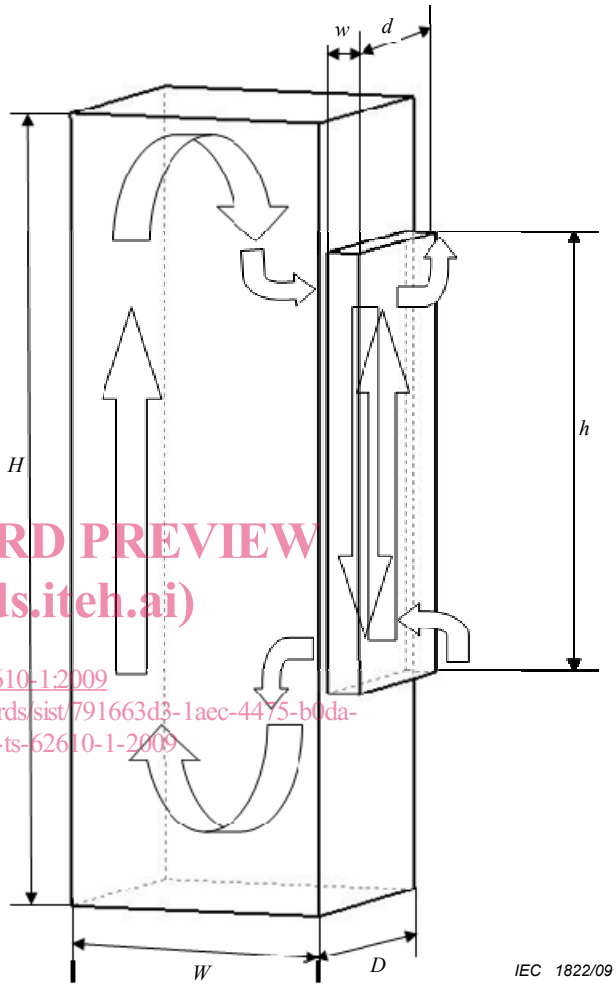


Figure 2b – Cabinet with outside mounted thermoelectrical cooling system in a vertical alignment

Key

W	width of the cabinet
D	depth of the cabinet
H	height of the cabinet
w	≤ 75 mm, width of the thermoelectrical cooling system
d	depth of the thermoelectrical cooling system
h	height of the thermoelectrical cooling system

Figure 2 – Mounting location 1