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First edition  
2011-11-01

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## **Standard test method for measuring the heat release rate of low flammability mattresses and mattress sets**

*Méthode d'essai normalisée pour mesurer le débit calorifique de  
matelas et d'éléments de matelas à inflammabilité réduite*



Reference number  
ISO 12949:2011(E)

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Published in Switzerland

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12949 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*.

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## Introduction

A typical bed consists of several components, including a mattress, a foundation, and a collection of bedclothes (e.g. mattress pad, sheets, pillows, blankets, quilts and/or comforters). Mattress and bedding fires are a major contributor to residential fire deaths <sup>[1]</sup>. A significant portion of these deaths and injuries results from fires in which the bedclothes are the first items ignited, and those flames ignite the mattress or foundation. In the United States, approximately two-thirds of all deaths from flaming bed fires occur after the room has reached the point of flashover <sup>[2]</sup>. This accounts for nearly all the fatalities that occur outside the room of fire origin and about half of the fatalities that occur within the room of origin.

A burning mattress is generally the primary energy contributor to a fatal bedroom fire. Once the mattress is ignited, the fire develops rapidly. Room flashover occurs at heat release rates near or above 1 000 kW (1 MW) for small-to-medium size bedrooms <sup>[3]</sup>. 1 m wide mattresses, without bedclothes, have been shown to reach peak heat release rates of 2 MW and flash over a room in less than 300 s <sup>[3]</sup>. In addition, a typical set of bedclothes on a 1 m wide bed can lead to a fire whose peak rate of heat release is approximately 100 kW to 200 kW <sup>[4]</sup>, with values up to 400 kW possible for the heaviest sets <sup>[5]</sup>. A bed clothes fire can become appreciably more threatening on larger beds <sup>[6]</sup>.

It follows that a significant reduction in bed fire fatalities can be achieved by reducing the combined peak heat release rate of a bed, the bedclothes, and other furnishings ignited by the bedclothes to a level well below 1 MW. Current regulation in the United States limits the peak rate of heat release of a mattress and foundation to 200 kW and the total heat release to 15 MJ during the first 10 min of the test <sup>[7]</sup>, <sup>[8]</sup>. Combined with the typical heat release rate of the bedclothes, which generally occurs well before the peak heat release from the mattress, the overall heat release rate from the burning bed is substantially below the value that leads to room flashover. Furthermore, as the intensity of the bed fire is decreased this much, there is an accompanying reduction in the spatial extent of the radiant heat from flames. This reduces the likelihood that other bedroom furnishings will be ignited by the bed fire and greatly increases the time available for occupants to recognize and escape the fire.

This International Standard addresses a fire hazard scenario different from one in which a cigarette ignites the bed and threatens people who might be asleep on the bed with their heads near the location of the dropped cigarette. The resulting deaths most often result from inhalation of the toxic fumes from the smouldering fire and are distinct from the deaths that are to be averted by limiting the flaming intensity of the bed fire. In several countries, mattresses are tested for cigarette ignition resistance <sup>[9]</sup>, which reduces the likelihood of smouldering fires, but infrequently addresses the fire hazard addressed by this International Standard.