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Railway applications — Heating, ventilation and air conditioning systems for rolling stock —

Part 3: Energy efficiency

Applications ferroviaires — Systèmes de chauffage, ventilation et climatisation pour le matériel roulant —

Partie 3: Efficacité énergétique

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications, Subcommittee SC 2, Rolling Stock*.

A list of all parts in the ISO 19659 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The world's energy resources are being consumed at a significant rate that will result in the depletion of non-renewable resources. It is imperative that energy be conserved. Conservation of energy in railway vehicles can result in a slowdown of non-renewable resource usage and consequently of the build-up of greenhouse gases.

The HVAC (heating, ventilation and air-conditioning) system is one of the main energy consumers on a train, and its energy efficiency is a key issue to reduce the environmental impact of public transport.

As most railway vehicles are designed to last for a long period (15 y to 40 y), lower energy consumption can also be considered a means of reducing the cost to railway operators and authorities.

The energy consumption of the HVAC systems is affected by multiple parameters therefore, a common guideline is essential for comparative assessment of energy efficiency between different systems.

This document offers methodologies to deliver comparable energy consumption values of the HVAC system without unnecessary lead times and costs by suggesting appropriate conditions for simulation or testing.

In general, this document describes the conditions that should be considered:

— train mode,

— principles such as measurements, climatic and operational boundary conditions,

— assessment methods such as simulation, calculation, verification and post-processing.

These can be used to assess the effectiveness of energy efficiency measures to evaluate different cars and/or HVAC concepts and to provide an indication of the annual HVAC energy consumption for the whole train (except driver's cab).

The specifications in this document are to be considered together with the national/regional standards, which take different preferences, local weather and operational conditions into account.

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Railway applications — Heating, ventilation and air conditioning systems for rolling stock —

Part 3: Energy efficiency

1 Scope

This document is applicable to the calculation, measurement and/or verification of energy consumption of railway vehicle HVAC (heating, ventilation and air-conditioning) systems.

The HVAC system energy consumption is simulated, calculated, measured and validated in accordance with the requirements of thermal comfort defined in ISO 19659-2, considering the same category of passenger railway vehicles as detailed in ISO 19659-2, Clause 4:

— Category 1 (e.g. main line, intercity, long distance, high speed);

— Category 2 (e.g. suburban, commuter, regional);

— Category 3 (e.g. urban, LRV, tram, metro/subway).

This document only covers the passenger area HVAC systems. Driver's cab HVAC systems are excluded but could be treated in a similar way.

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.

ISO 19659-1, *Railway applications — Heating, ventilation and air conditioning systems for rolling stock — Part 1: Terms and definitions*

ISO 19659-2, *Railway applications — Heating, ventilation and air conditioning systems for rolling stock — Part 2: Thermal comfort*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19659-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

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