
Železniške naprave - Ogrevalni, prezračevalni in klimatski sistemi za vozna sredstva - 4. del: Konstruktivski parametri, preskusni in kontrolni elementi za enoto HVAC (ISO 19659-4:2026)

Railway applications - Heating, ventilation and air conditioning systems for rolling stock - Part 4: Design parameters, test and inspection items for the HVAC unit (ISO 19659-4:2026)

Bahnanwendungen - Heizung, Lüftung und Klimatisierung von Schienenfahrzeugen - Teil 4: Grundlegende Konstruktionsparameter, Messungen und Prüfungen für die HLK-Einheit (ISO 19659-4:2026)

Applications ferroviaires - Systèmes de chauffage, ventilation et climatisation pour le matériel roulant - Partie 4: Paramètres de conception, éléments d'essai et d'inspection pour l'unité HVAC (ISO 19659-4:2026)

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Railway applications - Heating, ventilation and air conditioning systems for rolling stock - Part 4: Design parameters, and test and inspection items for the HVAC unit (ISO 19659-4:2026)

Applications ferroviaires - Systèmes de chauffage, ventilation et climatisation pour le matériel roulant - Partie 4: Paramètres de conception et éléments d'essai et d'inspection pour l'unité HVAC (ISO 19659-4:2026)

Bahnanwendungen - Heizung, Lüftung und Klimatisierung von Schienenfahrzeugen - Teil 4: Grundlegende Auslegungsparameter, Messungen und Prüfungen für die HLK-Einheit (ISO 19659-4:2026)

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European foreword

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**International
Standard**

ISO 19659-4

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

**Part 4:
Design parameters, and test and
inspection items for the HVAC unit**

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

*Partie 4: Paramètres de conception et éléments d'essai et
d'inspection pour l'unité HVAC*

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Foreword

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This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 2, *Rolling stock*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 256, *Railway applications*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

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Introduction

Since the heating, ventilation and air conditioning (HVAC) unit is one of the main components of the HVAC system, its quality and performance is a key issue to improve thermal comfort and energy efficiency for rolling stock.

The purpose is:

- to develop a common International Standard for the validation of a HVAC unit,
- to establish methodologies and requirements on a component basis to demonstrate conformity with the technical specifications of the HVAC unit,
- to establish a clear scope of responsibility in case performance issues occur after mounting the HVAC unit on the rolling stock.

The justification is:

- currently, there is no common International Standard for the validation of a HVAC unit;
- generally, existing national and regional HVAC unit standards are designed for air-conditioning systems in buildings; there only a few standards for rolling stock;
- therefore, there is a need to unify the methodologies of the HVAC unit standards into one single document;
- this will not affect any existing national or regional standard.

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

Part 4: Design parameters, and test and inspection items for the HVAC unit

1 Scope

This document specifies requirements and guidelines for:

- the design parameters to be provided to the heating, ventilation and air conditioning (HVAC) unit manufacturer by the rolling stock manufacturer (“Customer”) and the railway operator,
- the test and inspection items, requirements and methods used by the HVAC unit manufacturer to verify that the HVAC unit conforms with the design parameters.

This document is applicable to HVAC units for the passenger area and driver’s cabs in urban (metro, tramway), suburban, regional and main line vehicles.

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 3743-1, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for small movable sources in reverberant fields — Part 1: Comparison method for a hard-walled test room*

ISO 3743-2, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering methods for small, movable sources in reverberant fields — Part 2: Methods for special reverberation test rooms*

ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 3745, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms*

ISO 3746, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

ISO 3747, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering/survey methods for use in situ in a reverberant environment*

ISO 9614-2, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning*

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

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

ISO 19659-3, *Railway applications — Heating, ventilation and air conditioning systems for rolling stock — Part 3: Energy efficiency*

IEC 60077-1, *Railway applications — Electric equipment for rolling stock — Part 1: General service conditions and general rules*

IEC 60077-2, *Railway applications — Electric equipment for rolling stock — Part 2: Electrotechnical components — General rules*

IEC 61373, *Railway applications — Rolling stock equipment — Shock and vibration tests*

IEC 62236-3-2, *Railway applications — Electromagnetic compatibility — Part 3-2: Rolling stock — Apparatus*

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 abbreviated terms given in ISO 19659-1 and the following apply.

AC	Alternating current
CMM	Coordinate measuring machine
DB	Dry bulb
DC	Direct current
EMC	Electromagnetic compatibility
FEM	Finite element method
FFT	Fast Fourier transform
FST	Fire, smoke and toxicity
GWP	Global warming potential
HF	High frequency
HVAC	Heating, ventilation and air conditioning
LED	Light emitting diode
PTC	Positive temperature coefficient
PTU	Portable testing unit
RMS	Root mean square

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RPM	Revolutions per minute
TCMS	Train control monitor system
VOC	Volatile organic compounds
WB	Wet bulb

4 Prerequisites (design parameters) for the HVAC unit

4.1 General

The design parameters shall be clearly specified in the technical specification so that the HVAC unit manufacturer can design and build the HVAC unit to meet the customers' requirements.

This clause gives an overview of the design parameters that should be specified as good engineering practice including the parameters to calculate the total annual energy consumption and the total annual energy efficiency of the HVAC unit. The latter is important, as in most cases, after the traction system, the HVAC system is the second largest power consumer on the train.

4.2 Design parameters to be provided to the HVAC unit manufacturer

4.2.1 HVAC unit installation requirements

As a minimum, the following design parameters shall be provided:

- the type of the railway vehicle (high speed, commuter, Cat. 1, Cat. 2, Cat. 3 in ISO 19659-2),
- the type of the HVAC unit (compact, split in ISO 19659-1),
- HVAC unit location (roof mounted, roof embedded, ceiling mounted, on floor mounted, under floor mounted in ISO 19659-1),
- the number of the HVAC units per railway vehicle.

These design parameters are summarized in [Table A.1](#).

4.2.2 Air flow requirements

4.2.2.1 Air volume flow rates

The following design parameters shall be considered for air flow requirements:

- a) fresh air volume flow rate:
 - fresh air volume flow rate per person depending on operating conditions as specified in relevant national or regional standard or in its absence ISO 19659-2,
 - number of passengers (normal and maximum);

NOTE In case the free cooling mode is required, the fresh air volume flow rate can be higher. The free cooling mode is specified in ISO 19659-1.
- b) supply air volume flow rate based on following heat gains:
 - heat transfer (including glazing),
 - heat emission from person specified in ISO 19659-2,
 - fresh air (specified in ISO 19659-1) (ventilation),