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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock

Applications ferroviaires – Conditions d'environnement pour le matériel – Partie 1: Equipement embarqué du matériel roulant

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RAILWAY APPLICATIONS – ENVIRONMENTAL CONDITIONS FOR EQUIPMENT –

Part 1: Equipment on board rolling stock

FOREWORD

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International Standard IEC 62498-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This standard is based on EN 50125-1.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/1402/FDIS	9/1451/RVD

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

A list of all parts of IEC 62498 series, under the general title *Railway applications – Environmental conditions for equipment,* can be found on the IEC website.

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

The committee has decided that the contents of this publication will remain unchanged until the stability 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of November 2010 have been included in this copy.

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RAILWAY APPLICATIONS – ENVIRONMENTAL CONDITIONS FOR EQUIPMENT –

Part 1: Equipment on board rolling stock

1 Scope

This part of IEC 62498 intends to define environmental conditions.

The scope of this standard covers the use of on board electrical, electromechanical and electronic equipment for rolling stock, for the following parameters: altitude, temperature, humidity, air movement, rain, snow and hail, ice, solar radiation, lightning, pollution, vibrations and shocks, electromagnetic interference environment, acoustic noise environment, supply system characteristics.

In particular the standard defines:

– interface conditions between the vehicle and its environment;
– general environmental rules for the equipment of rolling stock, especially for the main sub-systems.

In this respect it gives general guidance in order to allow the fairness of bid assessments.

The defined environmental conditions are considered as normal in service; occasionally more severe conditions may be specified.

Microclimates surrounding components may be defined by relevant product standards or by special requirements.

This standard is not intended to apply to cranes, mining vehicles, cable cars.

Passenger effects on the equipment and equipment effects on the passengers are not considered in this standard.

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 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60721-1, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

IEC 60721-2-3, *Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Section 3: Air pressure*

IEC 60721-3-5, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 5: Ground vehicle installations*

IEC 60850, *Railway applications – Supply voltages of traction systems*

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

IEC 62236-3-1, *Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle*

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

IEC 62497-2, *Railway applications – Insulation coordination – Part 2: Overvoltages and related protection*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
environmental conditions
physical, chemical or biological condition, external to a product to which it is subjected at a certain time

3.2
vehicle compartment
compartment of vehicles in which people may enter during normal operation

3.3
vehicle cubicle
any enclosure for housing of mechanical, electrical and/or electronic equipment

3.4
environmental parameters
one or more physical, chemical or biological properties characterising an environmental factor (e.g. temperature, acceleration)

EXAMPLE The environmental factor ‘vibration’ is characterised by the parameters: type of vibration (sinusoidal, random), acceleration and frequency.

3.5
severity of environmental parameters
a value of each quantity characterising the environmental parameter

EXAMPLE The severity of sinusoidal vibration is defined by values of the acceleration (in m/s^2) and frequency (in Hz).

3.6
performance range
the range of parameters in which the equipment works with the specified performance

3.7
operation range
the performance range in which the equipment works with the limited performance range

3.8
storage temperature
the ambient temperature of storage without damage on the stored goods and/or equipment in no powered states

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4 Environmental conditions

4.1 General

In the following clauses the environmental parameters are given at which the vehicle and its equipment shall function as specified.

In the text, normal environmental conditions are considered as being those of all over the world. They are classified with a suffix 1, 2, 3, etc. and special conditions with a suffix X, Y, etc.

The purchaser shall specify clearly in his specification the class to consider, otherwise class with suffix 1 shall be assumed.

NOTE Except otherwise stated in this standard, general information is given by IEC 60721-3-5, IEC 60721-2-1, IEC 60721-2-2, IEC 60721-2-3 and IEC 60721-2-7.

The severities specified are those which will have a low probability of being exceeded. All specified values are maximum or limiting values. These values may be reached, but do not occur permanently. Depending on the situation there may be different frequencies of occurrence related to a certain period of time. Such frequencies of occurrence have not been included in this standard, but should be considered for any environmental parameter. They should additionally be specified if applicable.

4.2 Altitude

The equipment shall perform as specified for the different classes of altitude range relative to sea level given in Table 1.

Table 1 – Classes of altitude range

Classes	Altitude range relative to sea level m
A1	up to 1 400
A2	up to 1 000
A3	up to 1 200
AX	more than 1 400

Using AX class, the maximum altitude shall be specified by the purchaser.

Altitude is relevant, in particular for air pressure level and its consequence on cooling systems.

The air pressure shall be considered according to IEC 60721-2-3.

Particular local air pressure conditions may exist due to the effects of wind, vehicle movement, fans, etc. In this case, the relevant data will be exchanged between the appropriate interested parties engaged in the project.

4.3 Temperature

The equipment shall operate as specified for the different classes of temperatures given in Table 2.

“Performance range” and “operation range” can be set respectively in Table 2 by agreement between purchaser and supplier.

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Table 2 – Classes of air temperatures

Classes (Typical application area)	(1) Air temperature external to vehicle °C		(2) Inside vehicle compartment temperature °C		(3) Inside cubicle temperature °C	
T1 (ex. middle Europe)	–25	+40	–25	+50	–25	+70
T2 (ex. northern Europe)	–40	+35	–40	+45	–40	+65
T3 (ex. southern Europe)	–25	+45	–25	+55	–25	+70
T4 (mild climate area in mid-latitude)	–10	+40	–10	+50	–10	+70
T5 (tropical area except desert)	+5	+45	+5	+55	+5	+70
T6 (tropical area in desert)	–20	+55	–20	+65	–20	+75
TX	–40	+50	–40	+60	–40	+75

Class T1 of Table 2 corresponds to class 5K2 of IEC 60721-3-5.

Values given in columns (2) and (3) of Table 2 are temperatures that the system or equipment designer is not allowed to exceed in a given part because too much power is dissipated with insufficient cooling. They are also temperatures which the equipment manufacturer shall take into account in the design.

The storage temperature range without operation for equipment, devices, sub-assembly and parts should be defined between the purchaser and the supplier.

A reference temperature is considered as being the permanent temperature for which the effects on, for example, the insulating material ageing are equivalent to those of the climatic temperature during the lifetime.

The reference temperature should be chosen between Class TR1 of 20 °C and Class TR2 of 25 °C of Table 3.

Table 3 – Classes of reference temperature

Classes	Reference temperature °C
TR1	20
TR2	25

The yearly average temperature for column (3) in Table 2 is conventionally taken as 45 °C for all classes (e.g. for reliability calculation).

When stated in product standards, particular requirements apply.

The temperatures inside vehicle and cubicle are values measured in free air out of the heat emitting elements.

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If the equipment is to be installed in a controlled climatic environment, provided that the equipment is not required to operate outside of those conditions, the temperature range shall be agreed between purchaser and supplier.

It shall be taken into account that the external ambient air temperature in special locations such as near the ballast or over the roof may exceed the external open air temperature. In this case the temperature level to be considered shall be agreed between purchaser and supplier.

To ensure correct co-ordination of the temperature levels indicated in columns (1) to (3) in Table 2 and verification of good thermal design of all installed equipment, the relevant data shall be exchanged between purchaser and supplier, such as:

– geometrical characteristics of sub-assemblies;
– localisation of the main heat emitting elements and their heat dissipation;
– thermal time profile;
– characteristics of the cooling system;
– storage temperature condition for equipment, devices, and sub-assemblies when not applying current.

Deviation from the temperature table shall be subject to agreement between purchaser and supplier.

4.4 Humidity

The following external humidity levels shall be considered:

– yearly average: ≤ 75 % relative humidity;
– on 30 days in the year continuously: between 75 % and 95 % relative humidity;
– on the other days occasionally: between 95 % and 100 % relative humidity.

The psychrometric charts of Figures 1, 2, 3 and 4, assuming the maximum absolute humidity of 30 g/m^3 in tunnel, give the ranges of variation of the relative humidity for the different temperature classes that will not be exceeded for more than 30 days per year.

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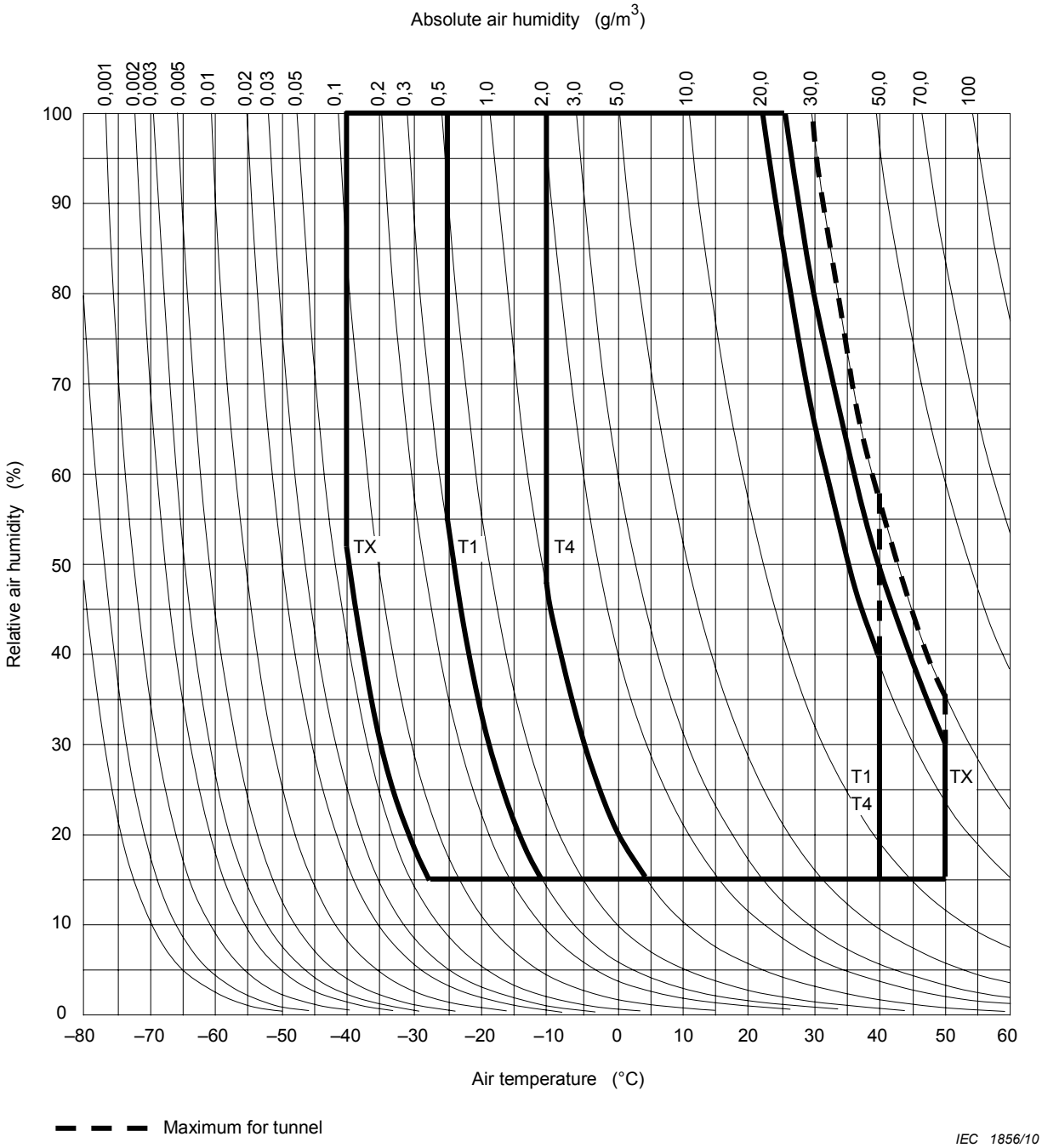

Figure 1 – Humidity ranges for temperature classes T1, T4 and TX

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