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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Railway applications – Environmental conditions for equipment – Part 2: Fixed electrical installations

Applications ferroviaires – Conditions d'environnement pour le matériel – Partie 2: Installations électriques fixes

IEC 62498-2:2010

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62498-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This standard is based on EN 50125-2.

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

FDIS	Report on voting
9/1403/FDIS	9/1452/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.

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

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.

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- withdrawn,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.

RAILWAY APPLICATIONS – ENVIRONMENTAL CONDITIONS FOR EQUIPMENT –

Part 2: Fixed electrical installations

1 Scope

This part of IEC 62498 takes into account environmental conditions to be considered in the railways.

This Standard deals with the environmental influences on fixed electrical installations for traction power supply and equipment essential to operate a railway

– in open air;
– in covered areas;
– in tunnels;
– within enclosures placed in the above-mentioned areas.

Escalators, lifts, fire protection, lighting in tunnels and on platforms, ticket machines, ventilation systems and non-essential functions are not included.

Such influences include altitude, temperature and humidity, air movement, rain, snow, hail, ice, sand, solar radiation, lightning, pollution, vibration, shocks, EMC and earthquakes.

This standard does not specify the test requirements for equipment.

In case of environmental conditions not covered by the standard, the data to be adopted for a specific project should be clearly stipulated when preparing a specification.

This standard is not intended to apply to cranes, installations in underground mines, suspended cable cars and funicular railways.

Nuclear radiation is excluded.

Signalling and telecommunications systems 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 60721-2-1:1982, *Classification of environmental conditions – Part 2-1 : Environmental conditions appearing in nature – Temperature and humidity*

IEC 60721-2-2, *Classification of environmental conditions – Part 2-2: Environmental conditions appearing in nature – Precipitation and wind*

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

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

IEC 60721-3-4, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weatherprotected locations*

IEC 62236-5, *Railway applications – Electromagnetic compatibility – Part 5: Emission and immunity of fixed power supply installations and apparatus*

IEC 62497-1, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

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

IEC 62498-3:2010, *Railway applications – Environmental conditions for equipment – Part 3: Equipment for signalling and telecommunications*

3 Terms and definitions

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

3.1
covered area
protected from precipitation, but open to the effects of humidity and wind

NOTE 1 Some constructions may be affected by solar radiation.

NOTE 2 Tunnels are excluded from this definition.

3.2
cubicle
closed space where the direct open air influences are excluded

3.3
environment
the surrounding objects, region or circumstances which may influence the behaviour of the system and/or may be influenced by the system

3.4
environmental conditions
conditions which are brought about because of the environment

3.5
environmental protection
provisions to avoid the interaction of the system with the environment

3.6
open air
not protected from direct environmental influences

3.7
tunnel
artificial underground passage through a hill or below the normal ground level or under sea level

4 Environmental conditions

4.1 General

The purchaser shall specify clearly in his specification the class to consider. Otherwise the class mentioned in the product standard shall apply where available. Where no other specifications are specified, the normal requirements in this standard shall be used. Installations shall function, or be capable of functioning, under all specified conditions.

The environmental conditions are considered for normal operation. More severe conditions may be specified for the equipment to withstand, when not operating, without suffering damage. An example of such a condition is wind velocity high enough to cause dewirements but not tearing down the overhead contact line.

Microclimates surrounding components may need special requirements which are covered by product standards.

Special conditions are classified with a suffix X.

The severities specified are those which have a low probability of being exceeded. All specified values are either maximum or minimum limits. These values can be reached, but do not occur permanently. Depending on the situation there are 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, if relevant. In this case they shall be specified by the infrastructure manager.

NOTE Some environmental conditions vary in relation to each other, so combined conditions should be taken into account. As an example, combined condition of temperature, wind, snow and ice is possible.

4.2 Altitude

Altitude related to sea level is relevant for air pressure. Air pressure shall be considered in accordance with IEC 60721-2-3.

The different classes of altitude above sea level in open air at which the equipment shall perform as specified are given in Table 1.

Table 1 – Altitude relative to sea level

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
NOTE In class A2, installations under sea level are included.	

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

4.3 Air temperature and humidity

4.3.1 General

For air temperature and humidity in open air, values are to be agreed between purchaser and supplier, as appropriate to the local conditions based on past data records. Unless otherwise specified, the climates according to Table 2 of IEC 60721-2-1 shall be used, excluding the first and the last two climates.

These values are illustrated in Figure 2 to Figure 7 of IEC 60721-2-1.

For weather-protected areas, information is given in IEC 60721-3-3.

In principle, air temperatures are measured in the shade.

The values of humidity can be 100 %.

4.3.2 Special conditions

When considering the temperature of an object, the effects of thermal radiation from the ground, or due to the proximity of other large objects, has to be taken into account.

In open air

The temperatures in railway surroundings, e.g. during summer on large expanses of ballast such as are to be found in large stations, can be higher than outside the area itself.

In covered areas

Maximum temperatures in covered areas should be not less than those specified for open air.

Special attention should be given to installations under transparent roofs which are subject to solar radiation. Conditions depend on the cover material.

In cubicles

Depending on the cubicle, the maximum ambient temperature should be specified up to 30 K higher than those specified in open air .

Temperatures inside a cubicle shall be measured in free space away from the vicinity of the heat emitting elements. Cubicles in covered areas or with other screening above should have modified values. Temperature and humidity in cubicles are a function of the design of the enclosure and will depend on the ventilation arrangements.

If the equipment is to be installed in a controlled climatic environment and is required to operate only under these conditions, the temperature range shall be agreed between purchaser and supplier.

The effect of condensation and also temperature changes and extremes of temperature shall not lead to any malfunction or failure.

4.4 Air movement

4.4.1 Wind

Wind velocity should be agreed between infrastructure manager and operator on a regional basis regarding

– the maximum velocity to be considered when assessing facility strength;
– velocity to be considered when assessing operational aspects.

Wind velocity should be referred either

– to a height of 10 m above ground, or
– to a height of 500 m above ground (gradient velocity).

The averaging period is 10 min and the reference values have a yearly probability of occurrence of 0,02 (equivalent to a return period of 50 years).

NOTE For other probabilities the corresponding wind velocities can be taken from Figure B.1 of EN 1991-1-4, in Annex B.

Wind action on structures is greatly influenced by details of the local landscape, tall buildings and height above the ground. The greater the roughness of the ground surface, the more the wind action close to this surface is reduced; thus there may be considerable differences between wind near the ground surface and that at greater heights above the ground surface.

Wind action depending on the surface is classified into four categories. Relatively open terrain with trees and other obstacles is most frequently experienced in Central Europe and is recommended as the basis for reference wind velocities.

Variation of the 10 min mean values with height h can be calculated by

$$v_h = v_{10}\left(\frac{h}{10}\right)^{\alpha} \quad (1)$$

where

v_{10} is the wind velocity at 10 m height in m/s,

v_h is the wind velocity at height h in m/s at m,

α is the roughness parameter depending on the terrain category which is in the range of α = 0,10 to 0,50.

Reference information on setting wind velocities is given in Annex B.

4.4.2 Surrounding air

The relative movement of surrounding air shall be defined where necessary, e. g. for calculating the current capacity of an overhead contact line or cooling devices within cubicles.

For calculating the current capacity of an overhead contact line, three classes of wind velocity in Table 2 should be adopted.

Table 2 – Wind velocities

Class	Wind velocity m/s
SW 1	0,6
SW 2	1,0
SW 3	2,0
SW X	lower than 0,6

Using SW X class, the minimum wind velocity shall be specified by the purchaser.

Pressure pulses (e. g. due to passing trains) should be taken into account, where applicable.

4.5 Rain

The normal rain rate to be taken into account shall be 6 mm/min.

If necessary other values can be selected from IEC 60721-2-2.

The effect of rain shall be considered depending on the equipment installation together with wind and other air movements and, if applicable, with negative temperatures of the surface hit by the rain (forming of ice shells).

4.6 Hail

Where applicable consideration shall be given to the effect of hail. The maximum diameter of the hail stones to be considered should be specified either by agreement between the infrastructure manager and the operator on a regional basis, or according to IEC 60721-2-2.

NOTE In Europe the maximum diameter of the hail stones is taken as 15 mm.

4.7 Snow and ice

4.7.1 Accretion of ice on conductors

Equipment required to be operated mechanically with exposed moving parts under iced up conditions shall have the capability to operate properly under the conditions specified by the infrastructure manager.

The values of ice accretion on conductors and its gravity should be specified by the infrastructure manager to consider the wind pressure, vertical load and sag with the loads on.

NOTE As a reference, an example of specifying ice loads on conductors is given in Table 3.

Table 3 – Ice loads

Class	Ice load N/m
I 0 (no ice)	0
I 1 (low)	3,5
I 2 (medium)	7
I 3 (heavy)	15

These values are used for conductors in the usual diameters between 10 mm and 20 mm.

4.7.2 Snow depth

Snow loads should be considered depending on the snow fall severity. Snow depth shall be considered for the access to cubicle doors and the height of live parts above ground.

Equipment required to be operated mechanically with exposed moving parts under iced up conditions shall have the capability to operate properly under the conditions specified by the infrastructure manager.

4.8 Solar radiation

The value for the thermal effect is valid for radiation perpendicular to the surface.