SLOVENSKI STANDARD
SIST EN 50125-3:2003

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Železniške naprave – Okoljski pogoji za opremo – 3. del: Oprema za signalne in telekomunikacijske naprave

Railway applications - Environmental conditions for equipment -- Part 3: Equipment for signalling and telecommunications

Bahnanwendungen - Umweltbedingungen für Betriebsmittel -- Teil 3: Umweltbedingungen für Signal- und Telekommunikationseinrichtungen

Applications ferroviaires - Conditions d'environnement pour le matériel -- Partie 3: Equipement pour la signalisation et les télécommunications

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33.040.99	Druga oprema za telekomunikacijske sisteme	Other equipment for telecommunication systems
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Railway applications - Environmental conditions for equipment Part 3: Equipment for signalling and telecommunications

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

This European Standard was prepared by SC 9XA, Communication, signalling and processing systems, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50125-3 on 2002-12-01.

This European Standard was prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and supports the essential requirements of Directive 96/48/EC.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-12-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-12-01

Annexes designated « normative » are part of the body of the standard.
Annexes designated « informative » are given for information only.
In this European Standard, Annexes A and C are normative and Annexes B and D are informative.

Contents

1 Scope

This European Standard specifies the environmental conditions encountered within Europe. It can also be applied elsewhere by agreement between the supplier and the customer.

The scope of this European Standard covers the design and the use of equipment and any portable equipment for signalling and telecommunications systems (including test, measure, monitoring equipment, etc.).

The portable equipment must comply with the sections of this European Standard relevant to their use.

This European Standard does not specify the test requirements for equipment.

In particular the standard intends to define

- interface conditions between the equipment and its environment,
- parameters to be used by designers when calculating R.A.M.S. and life time with respect to environmental condition effects.

In this respect it gives general guidance in order to allow consistent assessments of contract documentation for European projects.

The defined environmental conditions are considered as normal in service.

Microclimates surrounding components may need special requirements to be defined by the product standard.

The effects of any signalling and telecommunications equipment (in either or failure mode of operation) on the overall signalling system safety are not within the scope of this European Standard. This European Standard does not provide the designer with information to enable him to determine the safety risk associated with environmental conditions. The safety of persons in the vicinity of (or working on) the signalling and telecommunications equipment is also out of the scope of this European Standard. The effects of vandalism on the equipment are not considered in this European Standard.

This European Standard applies to all signalling and telecommunications systems except those used for cranes, mining vehicles and cable cars. It does not define the specifications for train-borne signalling and telecommunications systems.

The train-borne signalling and telecommunications systems must comply with rolling stock environmental conditions specifications (EN 50125-1).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50121-1	Railway applications – Electromagnetic compatibility – Part 1: General
EN 50121-2	Railway applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world
EN 50121-4	Railway applications – Electromagnetic compatibility – Part 4: Emission and immunity of the signalling and telecommunications apparatus

EN 50124-2		Railway applications – Insulation coordination – Part 2: Overvoltages and related protection
EN 50125-1	1999	Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock
EN 60529	1991	Degrees of protection provided by enclosures (IP code) *(IEC 60529:1989)*
EN 60721-3-3	1995	Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 3: Stationary use at weather protected locations *(IEC 60721-3-3:1994)*
EN 60721-3-4	1995	Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weather protected locations *(IEC 60721-3-4:1995)*
HD 478.2.1 S1	1989	Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Temperature and humidity *(IEC 60721-2-1:1982 + A1:1987)*
HD 478.2.3 S1	1990	Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Air pressure *(IEC 60721-2-3:1987)*
ISO 4354		Wind actions on structures

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1
environmental conditions

range of physical, chemical, electrical and biological conditions external to the equipment to which it is subjected in service

3.2
equipment housing

case, or other protective housing, provided by the manufacturer to mount his equipment and protect it from accidental damage, and occasionally from EMC or environmental effects. It may offer protection to personnel e.g. from electric shock.

Where the equipment housing provides the full required environmental protection, then it is treated as a cubicle to define the relevant environmental parameters.

The housing normally contains only the single suppliers' equipment, and is only a part of a signalling or telecommunications system

3.3
cubicle

housing for apparatus which normally is used to co-locate various parts of the signalling or telecommunications system equipment, on occasion from different suppliers. It may contain various equipment housings installed within the cubicle and offers further environmental protection.

A cubicle is normally only used to install apparatus and is in general not sufficiently large to afford protection from weather to staff working on the apparatus.

No climatic or temperature control is provided on cubicles but ventilation or occasionally fan assisted ventilation is required.

Large housings which allow access to personnel but do not have the thermal properties of shelters, should be treated as cubicles

3.4
shelter/container
shelters/containers are normally provided when a larger volume of equipment is to be co-located at a single point or temperature/humidity sensitive equipment is to be installed.

Shelters/containers normally have double walls with insulation material (or an air gap) between them. Shelters/containers also normally have limited facilities for personnel.

Shelters/containers may also be provided with temperature control, especially where temperature sensitive apparatus is installed.

Where shelters/containers are fitted with climatic control (temperature and humidity control), they shall be treated as buildings with climatic control (buildings C.C.)

3.5
building
permanent construction provided with main services (e.g. water, electricity, gas,...) designed to protect equipment against the action of environmental conditions. A building may or may not be provided with climatic control

4 Environmental conditions

4.1 General

In the text, normal environmental conditions for Europe are classified with a suffix 1, 2, and special conditions with a suffix X.

The customer shall specify clearly in his technical specification the required class for each environmental parameter. If no class is specified, the class with suffix 1 shall be assumed.

The severities specified are those which will have a low probability of being exceeded. All specified values are maximum or limit 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 European Standard, but should be considered for any environmental parameter.

They should additionally be specified if applicable.

4.2 Pressure

4.2.1 Altitude

Table 1 gives the different classes of altitude relative to sea level at which the equipment shall perform as specified.

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
AX	more than 1 400

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

Altitude is relevant, in particular for the air pressure level and its consequence on cooling systems. The air pressure shall be considered according to HD 478.2.3.

4.2.2 Pulse pressure

Particular local air pressure conditions may exist due to the effects of trains running through a tunnel.

The typical variation of pressure caused by train entering tunnel is:

$$\Delta P = \pm 5 \text{ kPa}$$

The associated rate of change of pressure is:

$$\Delta P/\Delta t = 0{,}5 \text{ to } 1 \text{ kPa/s}$$

4.3 Temperature

Table 2 shows the overall system air temperature parameters.

Table 2 - Temperature ranges at different sites

Climatic classes	External ambient	In cubicle [a b]	In shelter [a b]		In building [a b]	
			N.T.C. [c]	T.C. [d]	N.C.C. [c]	C.C. [e]
T1	(-25 +40) °C	(-25 +70) °C	(-5 +55) °C	(+15 +30) °C	(0 +45) °C	(+18 +27) °C
T2	(-40 +35) °C	(-40 +65) °C	(-20 +50) °C	(+15 +30) °C	(-5 +40) °C	(+18 +27) °C
TX	(-55 +40) °C	(-55 +70) °C	(-35 +55) °C	(+15 +30) °C	(-5 +45) °C	(+18 +27) °C

[a] The temperatures inside cubicle, shelter or building are values measured in free air not directly adjacent to heat emitting elements.

[b] The maximum temperatures inside a cubicle, a shelter N.T.C. and a building N.C.C. are higher than max. ambient temperatures because of the effects of solar radiation and power dissipation of installed equipment

[c] The higher values of lowest temperatures compared to those for external ambient are due to heat emitting equipment.

[d] 3K2 of EN60721-3-3

[e] 3K1 of EN60721-3-3

C.C. : with climatic control.	T.C. : with temperature control.
N.C.C. : without climatic control	N.T.C. : without temperature control

The above table was derived from HD 478.2.1 where open air temperatures are measured 2 m above ground. All classes have been extended at the lower temperatures to allow for installation of signalling and telecommunications equipment at ground level.

The effects of rapid temperature changes shall be considered. Changes of 0,5 °C/min over a range of 20 °C may be assumed for open air changes.

The designer(s) must consider such factors as equipment power dissipation, surface exposed to solar radiation, ventilation including forced ventilation, use of thermostatic controlled heaters, heat dissipation coefficients of walls.

To enable the customer to verify the supplier compliance with the temperature levels specified in Table 2 and to verify good temperature design of all installed equipment, the relevant data shall be exchanged between customer and supplier, such as:

- geometrical characteristics of sub-assemblies,
- localisation of the main heat emitting elements and their heat dissipation,
- thermal parameters (resistance, capacity, …),
- characteristics of the cooling system.

The effect of the climatic or temperature control operating outside its specified parameters, should be considered for each individual installation.

All signalling and telecommunications system shall operate within the relevant limits of Table 2.

The yearly average temperature of each type of site (for R.A.M.S. calculation) to be used are the following:

- +40 °C for equipment housing, cubicle;
- +30 °C for shelter N.T.C.;
- +25 °C for shelter T.C. and building (N.C.C. and C.C.).

R.A.M.S. calculations shall take into account the real yearly average temperature of each equipment part or sub assembly.

For deviations from the temperatures shown in Table 2, the customer shall specify the temperature levels required.

4.4 Humidity

The equipment shall be designed to withstand the humidity levels in the complete range of the air temperature as defined in 4.3 above and as shown in the climatograms of Figures A.1 to A.6 of Annex A which gives the relationship between humidity and temperature variations for the different climatic classes.

Table 3 below gives the min. and max. values of relative and absolute humidity for the different climatic classes.

Table 3 - Humidity ranges at different sites

Climatic classes	Humidity	External ambient		In cubicle		In shelter				In building			
						N.C.C.		C.C. [a]		N.C.C.		C.C. [b]	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
T1	R %	15	100	5	100	5	100	10	75	5	95	20	75
	A g/m^3	0,55	25 [c]	0,55	25 [c]	0,55	25 [c]	2	22	0,55	25 [c]	4	15
T2	R %	20	100	5	100	5	100	10	75	5	95	20	75
	A g/m^3	0,12	22 [c]	0,12	22 [c]	0,12	22 [c]	2	22	0,12	22 [c]	4	15
TX	R %	15	100	5	100	5	100	10	75	5	95	20	75
	A g/m^3	0,02	25 [c]	0,02	25 [c]	0,02	25 [c]	2	22	0,02	25 [c]	4	15

[a] 3K2 of EN 60721-3-3

[b] 3K1 of EN 60721-3-3

[c] 30 g/m^3 for tunnel

C.C. : with climatic control.

N.C.C. : without climatic control.

R : Relative humidity.

A: Absolute humidity.

NOTE Table 3 has been derived from HD 478.2.1 for calculations, from EN 60721-3-3 and EN 60721-3-4 for values.

On cold surfaces, 100 % relative humidity may occur causing condensation on parts of equipment.

Sudden changes of the air temperature may cause localised condensation of water on parts of equipment.

The yearly average humidity level of the external ambient is 75 % of relative humidity.

On 30 days in the year, continuously, the level of the external ambient relative humidity can be in the range of 75 % to 95 %.

4.5 Wind

Equipment exposed to air movement shall be designed to withstand the stress generated. The stress caused by air movement can be generated by two sources.

1) Natural wind

The force (F_w) produced by natural wind shall be calculated as below:

$$F_w = q \times c \times A$$

where

F_w is the force (N);
q is the pressure head (N/m²);
c is the form factor (without dimension);
A is the equipment surface perpendicular to the direction of the wind (m²).

The formula shown above has been simplified for general signalling and telecommunications applications. For complex installations (e.g. buildings) please refer to ISO 4354.