SLOVENSKI STANDARD
SIST EN 50536:2011

01-julij-2011

Zaščita pred delovanjem strele - Naprave za zaznavanje neviht

Protection against lightning - Thunderstorm detection devices

Blitzschutz - Systeme zur Gewittererkennung

Protection contre la foudre - Dispositif de détection d'orage

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EUROPEAN STANDARD

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English version

Protection against lightning - Thunderstorm warning systems

Protection contre la foudre - Dispositif de détection d'orage

Blitzschutz - Gewitterwarnsysteme

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CENELEC

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

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 81X, Lightning protection.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50536 on 2011-02-14.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates are proposed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-02-14
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2014-02-14

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Introduction

Natural atmospheric electric activity and in particular cloud-to-ground lightning poses a serious threat to living beings and property.

Every year severe injuries and even deaths of humans are caused as a direct or indirect result of lightning:

- sport, cultural and political events attracting large concentrations of people may have to be suspended and evacuated in the case of a risk of thunderstorm;
- power outages and unplanned interruptions of production processes;
- the wider use of electrical components that are sensitive to the effects of lightning (in industry, transportation and communication) has led to a steady increase in the number of accidents per year. In order to reduce this number of accidents and important material losses, it may be necessary in some circumstances, to disconnect certain equipment from any incoming installations;
- thunderstorms could interrupt all kinds of traffic (people, energy, information, etc.);
- activities with an environmental risk, for example: handling of sensitive, inflammable, explosive or chemical products.

Lightning is also one of the causes of fires.

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During the last decades, technical systems and systems devoted to real-time monitoring of natural atmospheric electric activity and lightning have experienced an extraordinary development. These systems can provide high quality and valuable information in real-time of the thunderstorm occurrence, making it possible to achieve information which can be extremely valuable if coordinated with a detailed plan of action.

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Although this information allows the user to adopt anticipated temporary preventive measures, it should be noted, however, that all the measures to be taken based on monitoring information are the responsibility of the system user according to the relevant regulations. The effectiveness will depend largely on the risk situation involved and the planned decisions to be taken. This document shows a list of possible actions that is, however, merely of an informative nature.

It should be pointed out that lightning and thunderstorms, as any natural phenomenon, are subject to statistical uncertainty. This means that it is not possible to achieve 100 % precise information on when and where lightning will strike.

Standards dealing with lightning protection methods to limit lightning damages already exist. They do not cover other potentially dangerous situations related to thunderstorms and lightning, that can be dynamically prevented or reduced by temporary measures whose origin is a preventive alert provided by a detection system.

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1 General

1.1 Object

This European Standard provides information on the characteristics of thunderstorm warning systems and information for the evaluation of the usefulness of lightning real time data and/or storm electrification data in order to implement lightning hazard preventive measures.

1.2 Scope

This European Standard provides the basic requirements of sensors and networks collecting accurate data of the relevant parameters informing in real-time about lightning tracking and range. It describes the application of the data collected by these sensors and networks in the form of warnings and historical data.

This European Standard applies to the use of information from thunderstorm warning systems (which are systems or equipment which provide real-time information) on atmospheric electrical activity in order to monitor for preventive means.

The scope of this document is providing:

– a general description of the available lightning and storm electrification hazard warning systems;

– a classification of thunderstorm detection devices and properties;

– guidelines for alarming methods;

– a procedure to determine the thunderstorm information usefulness;

– some examples of possible preventive actions (only for information).

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A non-exhaustive list of activities to which this European Standard might apply is given below:

– people in open areas: maintenance people, labour, sports or other open-air activities, competitions, crowded events, agricultural activities, farms and fisheries;

– wind farms, larger solar power systems, power lines, etc.;

– occupational health and safety prevention;

– safeguard sensitive equipment: computer systems, electric or electronic systems, emergency systems, alarms and safety;

– prevention of losses in operations and industrial processes;

– prevention of serious accidents involving dangerous substances (e.g. flammable, radioactive, toxic, and explosive);

– prevention in determined environments or activities with special danger of electrostatic discharges (e.g. space and flight vehicle operations);

– operations in which the continuity of the basic services is needed to be guaranteed (e.g. telecommunications, the generation, transport and distribution of energy, sanitary services and emergency services);

– infrastructures: ports, airports, railroads, motorways and cableways;

– civil defence of the environment: forest fires, land slide and floods;

– managing traffic (e.g. airplanes) or wide networks (e.g. power lines, telecommunication lines) may also benefits from having early detection of thunderstorms.

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The following enumerated aspects are outside of this European Standard:

a) lightning protection systems. Such systems are covered by EN 62305 standards series;

b) other thunderstorm related phenomena such as rain, hail, wind, etc.;

c) satellite and radar thunderstorm detection techniques.

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.

EN 62305 series, *Protection against lightning* (IEC 62305 series)

3 Terms and definitions

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

3.1
alarm
information indicating that the target is potentially subject of being affected by thunderstorms and the accompanying lightning related events

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3.2
cloud flash
lightning flash that never reaches the ground

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NOTE 1 It can be an intra-cloud, a cloud-to-cloud or a cloud-to-air flash.

NOTE 2 By extension the term “intra-cloud” (IC) lightning sometimes encompasses the whole cloud flash family.

3.3

lightning flash to earth
CG flash
electrical discharge of atmospheric origin between cloud and earth consisting of one or more strokes

[EN 62305-1:2011]

3.4
coverage area
CA
area where a given warning equipment has a sufficient detection efficiency and/or accuracy to elaborate a warning

3.5
detection efficiency
DE
percentage of actual lightning discharges that are detected and located by a sensor or a network

NOTE As cloud to ground flashes are often composed of several strokes there is a difference between flash detection efficiency (DE_f) and stroke detection efficiency (DE_s). A flash is reported (detected) if at least one stroke (first or subsequent) is detected and therefore DE_f is always equal or higher than DE_s.

3.6
dwell time
DT
time that an alarm is sustained after all warning criteria are no longer met

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3.7
effective alarm
EA
alarm where a lightning related event occurs in the surrounding area during the total alarm duration

3.8
excessive alarm duration
EAD
time after the last lightning related event occurred in the target waiting for the alarm to be released

3.9
failure to warn
FTW
occurrence of a lightning related event in the target for which no alarm was raised

3.10
failure to warn ratio
FTWR
ratio of failure to warn with respect to the total number of situations with lightning related events in target

3.11
false alarm
FA
alarm never followed by lightning related events in neither the target nor the surrounding area

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3.12
false alarm ratio
FAR
ratio of false alarms with respect to the total number of alarms

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NOTE False alarm ratio is also known as false alarm rate.

3.13
field strength meter
FSM
device for continuous monitoring of the atmospheric electrostatic field associated with thunderstorms (e.g. field mill)

3.14
intra cloud flash
IC
see cloud flash

3.15
lead time
LT
time between the start of an alarm and the effective occurrence of the first lightning related event in the target

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3.16
lightning flash
electrical discharge produced by a thunderstorm

NOTE This discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground or between the ground and a cloud.

3.17
dangerous event
LRE
lightning flash to or near the structure to be protected, or to or near a line connected to the structure to be protected that may cause damage

[EN 62305-2:2006]

3.18
lightning stroke
single electrical discharge in a lightning flash to earth

[EN 62305-1:2011]

3.19
location accuracy
LA
statistical measure of the position difference between the actual strike point and the estimated location

NOTE Typically given as a median (50 %) location error.

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3.20
monitoring area
MA
geographic area where the lightning activity or other parameters associated with the thunderstorms is monitored in order to elaborate a warning valid for the target

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3.21
physical damage
damage to a structure (or to its contents) or to a service due to mechanical, thermal, chemical or explosive effects of lightning

3.22
preventive actions
actions of a temporary nature, taken on the basis of the preventive information and framed within the emergency plans of each activity, service or collective

3.23
relevant alarm duration
RAD
time between the occurrence of the first and last lightning related event in the surrounding area while the alarm was raised

3.24
return stroke
see lightning stroke

3.25
point of strike
point where a lightning flash strikes the earth or protruding objects (e.g. structure, lightning protection system, line, tree, etc.)

[EN 62305-1:2011]

NOTE A lightning flash may have more than one point of strike.

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3.26
surrounding area
SA
geographic area that surrounds and includes the target

NOTE Any lightning related event occurring in the surrounding area is potentially dangerous. This area is used when evaluating a thunderstorm warning system to determine the false alarm ratio and other performance parameters.

3.27
target
geographic area where a warning is needed in order to facilitate decision making and to activate preventive actions before a lightning related event occurs in that area

3.28
thunderstorm
local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder

3.29
thunderstorm detectors
equipment capable of evaluating one or more parameters associated with the electric mechanism of the thunderstorm

NOTE Thunderstorm detectors may consist of a single detector or of a network of connected detectors.

3.30
thunderstorm warning system
TWS
system composed by thunderstorm detectors able to monitor the thunderstorm activity in the monitoring area and some ways of processing to elaborate a valid warning related to the lightning related events for a defined target

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3.31
total alarm duration
TAD
time between triggering and the release of an alarm

3.32
warning
see alarm

3.33
warning level
current status of the alarm

4 Thunderstorm phases and detectable phenomena for alarming

4.1 Introduction

Four distinct stages can be identified during the thunderstorm life time cycle regarding detectable phenomena: the initial phase, the growth phase, the mature phase and the dissipation phase.

4.2 Phase 1 – Initial phase (Cumulus stage)

Phase of cloud electrification by means of electrical charge separation within the cloud. The charges are distributed in regions within the cloud and produce a measurable electrostatic field at ground level. It is considered the first detectable phenomenon precursory of a thunderstorm.

NOTE Electrostatic fields may produce potential dangers such as electrostatic discharges (ESD) even in case of no lightning activity.