

# INTERNATIONAL STANDARD

## Thunderstorm warning systems – Protection against lightning



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.



IEC 62793

Edition 2.0 2020-09

# INTERNATIONAL STANDARD



---

## Thunderstorm warning systems – Protection against lightning

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 29.020; 91.120.40

ISBN 978-2-8322-8725-5

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD .....	4
INTRODUCTION .....	6
1 Scope .....	7
2 Normative references .....	7
3 Terms, definitions and abbreviated terms .....	8
3.1 Terms and definitions .....	8
3.2 Abbreviated terms .....	11
4 Thunderstorm phases and detectable phenomena for alarming .....	12
5 Description of thunderstorm detectors and their properties .....	13
6 Alarm method .....	14
6.1 General .....	14
6.2 Areas .....	14
6.2.1 Target (TA) .....	14
6.2.2 Surrounding area (SA) .....	15
6.2.3 Monitoring area (MA) .....	15
6.2.4 Coverage area (CA) .....	15
6.3 Alarm triggering and clearing .....	16
6.4 Alarm information delivery .....	18
7 Installation .....	18
8 Maintenance .....	19
9 Performance evaluation .....	19
9.1 General .....	19
9.2 Evaluation of a TWS by cross-correlation with other sources of information .....	20
10 TWS application .....	21
Annex A (informative) Overview of the lightning phenomena .....	22
A.1 Origin of thunderclouds and electrification .....	22
A.2 Lightning phenomena .....	22
A.3 Electric thunderstorm and lightning characteristics useful for prevention .....	24
A.3.1 Electrostatic field .....	24
A.3.2 Electromagnetic fields .....	24
A.3.3 Other parameters useful in lightning detection .....	24
Annex B (informative) Thunderstorm monitoring techniques .....	26
B.1 General .....	26
B.2 Single sensor detection techniques .....	26
B.2.1 Generalities .....	26
B.2.2 Detector based on electrostatic field .....	26
B.2.3 Detector based on electromagnetic field .....	26
B.3 Multi-sensor location techniques .....	27
B.3.1 Generalities .....	27
B.3.2 Magnetic direction finder (MDF) .....	27
B.3.3 Time of arrival (TOA) .....	27
B.3.4 Interferometry .....	27
Annex C (informative) Recommended preventive actions .....	28
Annex D (informative) Example of TWS evaluation .....	29

D.1	Example of TWS evaluation on a wind turbine site .....	29
D.2	Evaluation of TWS efficiency using LLS .....	30
Annex E	(normative) How to test thunderstorm detectors .....	32
E.1	General.....	32
E.2	Laboratory tests .....	32
E.2.1	General .....	32
E.2.2	Resistance to UV radiation tests (for non-metallic sensor housing) .....	32
E.2.3	Resistance tests to corrosion (for metallic parts of sensor) .....	33
E.2.4	Mechanical tests.....	33
E.2.5	Index of protection confirmation (IP Code) .....	33
E.2.6	Electric tests.....	34
E.2.7	Marking test.....	35
E.2.8	Electromagnetic compatibility (EMC) .....	35
E.3	Optional tests on an open air platform under natural lightning conditions .....	35
Annex F	(informative) Application guide .....	38
F.1	General.....	38
F.2	Examples of application of a TWS.....	39
F.2.1	Golf course .....	39
F.2.2	Oil storage facility .....	39
F.2.3	Crane .....	39
F.3	Selection of parameters of TWS.....	40
Bibliography	.....	43
Figure 1	– Examples of different target and surrounding areas.....	15
Figure 2	– Principles of the coverage area (CA), the monitoring area (MA), the surrounding area (SA) and the target (TA) .....	16
Figure 3	– Example of an alarm .....	18
Figure A.1	– Standard lightning classifications .....	23
Figure D.1	– Lightning activity in the target (TA) in red and surrounding area (SA) in orange for a period of fifteen years (2000-2014) .....	29
Figure E.1	– Difference in electric field measurement during one thunderstorm event.....	36
Figure F.1	– Human risk calculated for a crane with LPS at level I .....	40
Figure F.2	– Example of the alarms given by a TWS based on an EFS with three different field thresholds .....	41
Figure F.3	– Example of the alarms given by a TWS based on an LLS with three different radii of the monitoring area .....	42
Table 1	– Parameters related to sensor technologies.....	13
Table 2	– Local sensor characteristics .....	14
Table 3	– Alarms related to LRE .....	18
Table D.1	– Performance results of a TWS evaluation based on archived lightning data for a 15-year period (2000-2014), related to some of the key parameters.....	30
Table D.2	– Example of delivered alarms evaluation .....	31
Table F.1	– Identification of typical hazardous situations where a TWS improves safety .....	38
Table F.2	– Example of effect of settings on alarm performance .....	41

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**THUNDERSTORM WARNING SYSTEMS –  
PROTECTION AGAINST LIGHTNING**

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62793 has been prepared by IEC technical committee 81: Lightning protection.

This second edition cancels and replaces the first edition, published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- portable devices are no longer covered by this standard;
- in Clause 5, classes of TWS have been deleted;
- in Clause 6, updated figures and more detailed text are provided to better illustrate the alarm timeline;
- in Clause 9, the text has been summarized and refers now to the application guide given in Annex F;
- annexes have been reorganized;
- Annex E is normative.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
81/640/FDIS	81/641/RVD

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

Natural atmospheric electric activity and, in particular, cloud-to-ground lightning poses a serious threat to living beings and properties. Every year severe injuries and deaths of humans are caused as a result of direct or indirect lightning strikes.

Lightning:

- may affect sport, cultural and political events attracting large concentrations of people, when in the open field; events may have to be suspended and people evacuated in the case of a thunderstorm;
- may affect industrial activities by creating power outages and unplanned interruptions of production processes;
- may interrupt all kinds of traffic (people, energy, information, etc.);
- has led to a steady increase in the number of accidents and losses per year due to the wider use of electronic components that are sensitive to the effects of lightning (in industry, transportation and communication);
- may be a hazard for activities with an environmental risk, for example handling of sensitive, inflammable, explosive or chemical products;
- may be a cause of fire.

During the last decades, technical systems including 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.

Although this information allows the user to adopt anticipated temporary preventive measures, it should be noted 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 to a large extent on the risk involved and the planned decisions to be taken. This document gives an informative list of possible actions (see Annex C).

Lightning and thunderstorms, as many natural phenomena, are subject to statistical uncertainties. It is therefore not possible to achieve precise information on when and where an individual lightning will strike but statistical parameters are defined in this document to help the user in selecting proper measures.