

# TECHNICAL REPORT

## RAPPORT TECHNIQUE

**Effects of current on human beings and livestock –  
Part 4: Effects of lightning strokes**

**Effets du courant sur le corps humain et sur les animaux domestiques –  
Partie 4: Effets de la foudre**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**EFFECTS OF CURRENT ON HUMAN BEINGS AND LIVESTOCK –****Part 4: Effects of lightning strokes**

## FOREWORD

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IEC/TR 60479-4, which is a technical report, has been prepared by technical committee No.64: Electrical installations and protection against electric shock.

This second edition cancels and replaces the first edition, published in 2004 and constitutes a technical revision.

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

- the report has been completed with additional information on the influences and effects of natural electricity in the form of lightning strokes during thunderstorms;
- the definitions and technical terms have been updated;

- the explanation of the basic physical mechanisms for the dynamics of lightning where specified;
- the references to the relevant literature and the list of bibliography are updated;
- figures showing the current path during different interactions of lightning with the victim's body are updated.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
64/1772/DTR	64/1804/RVC

Full information on the voting for the approval of this technical report 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 the parts in the IEC 60479 series, under the general title *Effects of current on human beings and livestock*, 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

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## INTRODUCTION

IEC 60479-1, IEC 60479-2 and IEC 60479-3 deal with the effect of electric shock derived from electrical systems on the bodies of human beings and livestock. This part of IEC 60479, which is a technical report, describes the influence and effect of natural electricity in the form of lightning strokes during thunderstorms. Lightning current can consist of several uni-polar and/or bi-polar impulses with different peak values and durations; Clause 6 of IEC/TS 60479-2:2007[24]<sup>1</sup> does not cover these effects.

The interaction of a lightning stroke with the victim's body is quite different from the usual experience with electric shock derived from electrical systems. The pathway often includes the head in lightning accidents. The importance of the cranial orifices as points of entry of lightning current has been noted, and from these the proximity of the pathway to the brainstem. The brain stem includes the respiratory centre, in contrast with pathways of shock current arising from electrical systems. In particular it should be pointed out that differences exist between accidents caused by a direct flash compared with those interactions which are caused by step voltages. Even very short single impulses of lightning can cause cardiopulmonary arrest [5], [6], [15] and [16].

The intense electric interactions with living organisms are very dangerous but, surprisingly in many cases, not always lethal. It is accepted that more than 90 % of lightning accidents involving humans are not fatal [1], [12]. Corresponding reliable data for livestock is not known. There is a large variation in outcome due to different environments, different activities of people and knowledge of first aid and quality of medical care [1], [5].

It has been necessary, therefore, to create a separate standard concerning the special effects of lightning strokes. The physical behaviour of lightning is shown as a basis. The interaction with a living body is then described, followed by the consequences for the life of the victim.

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<sup>1</sup> References in square brackets refer to the bibliography.