

TECHNICAL SPECIFICATION



BASIC SAFETY PUBLICATION

AMENDMENT 1

**Effects of current on human beings and livestock –
Part 1: General aspects**

IEC TS 60479-1:2005/AMD1:2016

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**Effects of current on human beings and livestock –
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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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FOREWORD

This amendment has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

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

Enquiry draft	Report on voting
64/2095/DTS	64/2113/RVC

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website 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- withdrawn,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.

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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.

FOREWORD

Add, after the sentence "The main changes with respect to the previous edition are listed below:" and the existing dashed list items, the following new text:

- Extension of the applicability of the total body impedance to a frequency range up to 150 kHz;
- Clarification of the difference in anodic versus cathodic d.c. pulses;
- Extension of the ventricular fibrillation threshold of single pulses down to 1 μ s pulse width;
- Addition of informative annexes:
 - Annex E: Theories of ventricular fibrillation;
 - Annex F: Quantities ULV and LLV;
 - Annex G: Circuit simulation methods in electric shock evaluation.

INTRODUCTION

Replace the existing introduction with the following new introduction:

INTRODUCTION

This basic safety publication is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51. It is not intended for use by manufacturers or certification bodies.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications.

This technical specification provides basic guidance on the effects of shock current on human beings and livestock, for use in the establishment of electrical safety requirements.

In order to avoid errors in the interpretation of this technical specification, it should be emphasized that the data given herein is mainly based on experiments with animals as well as on information available from clinical observations. Only a few experiments with shock currents of short duration have been carried out on living human beings.

On the evidence available, mostly from animal research, the values are so conservative that this document applies to persons of normal physiological conditions including children, irrespective of age and weight.

There are, however, other aspects to be taken into account, such as probability of faults, probability of contact with live or faulty parts, ratio between touch voltage and fault voltage, experience gained, technical feasibilities, and economics. These parameters should be considered carefully when fixing safety requirements, for example, operating characteristics of protective devices for electrical installations.

The form of the document as has been adopted summarizes results so far achieved which are being used by technical committee 64 as a basis for fixing requirements for protection against shock. These results are considered important enough to justify an IEC publication which may serve as a guide to other IEC committees and countries having need of such information.

This technical specification applies to the threshold of ventricular fibrillation which is the main cause of deaths by electric current. The analysis of results of recent research work on cardiac physiology and on the fibrillation threshold, taken together, has made it possible to better appreciate the influence of the main physical parameters and, especially, of the duration of the current flow.

IEC TS 60479-1 contains information about body impedance and body current thresholds for various physiological effects. This information can be combined to derive estimates of a.c. and d.c. touch voltage thresholds for certain body current pathways, contact moisture conditions, and skin contact areas.

This technical specification refers specifically to the effects of electric current. When an assessment of the harmful effects of any event on human beings and livestock is being made, other non-electric phenomena, including falls, heat, fire, or others should be taken into account. These matters are beyond the scope of this technical specification, but may be extremely serious in their own right.

Further experimental data are under consideration, such as recent ongoing experimental work on "current induced heart fibrillation by excitation with discrete Fourier spectra" which is intended to contribute to frequency factor data.

4.5.3 Sinusoidal alternating current with frequencies up to 150 kHz

Replace the existing fourth paragraph with the following new text:

Figure 11 shows the frequency dependence of the total body impedance Z_T for a current path hand to hand and large surface areas of contact for a touch voltage of 25 V and frequencies from 25 Hz to 150 kHz. From the results, curves have been derived giving the dependence of the total body impedance Z_T of a population for the 50th percentile rank for touch voltages from 10 V to 1 000 V and a frequency range from 50 Hz to 150 kHz for a current path hand to hand or hand to foot for large surface areas of contact in dry condition. The curves are shown in Figure 12.

5 Effects of sinusoidal alternating current in the range of 15 Hz to 100 Hz

Replace the existing title with the following new title:

5 Effects of sinusoidal alternating current in the range of 15 Hz to 150 kHz

Replace the existing first paragraph with the following new text:

Clause 5 describes the effects of sinusoidal alternating current passing through the human body within the frequency range 15 Hz to 150 kHz.

6.6 Heart factor

Replace the existing Figure 12 with the following new Figure 12:

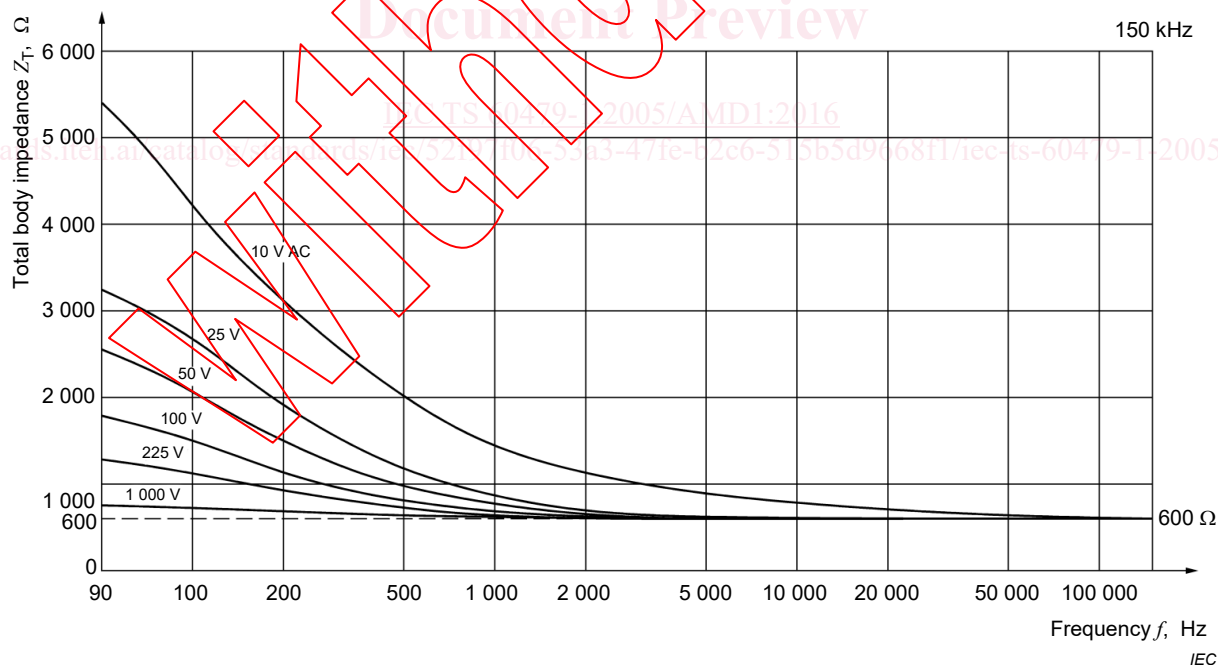


Figure 12 – Frequency dependence of the total body impedance Z_T of a population for a percentile rank of 50 % for touch voltages from 10 V to 1 000 V and a frequency range from 50 Hz to 150 kHz for a current path hand to hand or hand to foot, large surface areas of contact in dry conditions