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TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

BASIC SAFETY PUBLICATION
PUBLICATION FONDAMENTALE DE SÉCURITÉ

Use of conventional touch voltage limits – Application guide

Utilisation des tensions limites conventionnelles de contact – Guide d'application

IEC/TS 61201:2007

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

USE OF CONVENTIONAL TOUCH VOLTAGE LIMITS – APPLICATION GUIDE

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC/TS 61201, which is a technical specification, has been prepared by IEC technical committee 64: Electrical installations and protection against electrical shock.

This second edition cancels and replaces the first edition which was issued as a technical report in 1992. It constitutes a technical revision and now has the status of a technical specification.

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The main changes with respect to the previous edition are listed below:

– proposal of maximum contact areas for various conventional touch voltage limit;
– introduction of different current pathways through the human body for the selection of conventional touch voltage limit;
– introduction of conventional touch voltage limit corresponding to the startle reaction current threshold, the inability of let-go current threshold and the ventricular fibrillation current threshold;
– possibility of interpolation on contact area for other conventional touch voltage limits.

It has the status of a basic safety publication in accordance with IEC Guide 104 and ISO/IEC Guide 51.

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

Enquiry draft	Report on voting
64/1584/DTS	64/1605/RVC

Full information on the voting for the approval of this technical specification 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.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This technical specification replaces the first edition of IEC/TR 61201 and provides voltage limits which are intended to be used by IEC technical committees as conventional touch voltage limits with regard to protection against electric shock. Its purpose is to facilitate harmonization and consistency among different IEC publications.

The values proposed in this specification are derived from IEC/TS 60479-5. IEC 60479-5 gives the methodology used for the determination of touch voltage from the application of the Ohm's law between different current thresholds corresponding to different physiological effects and body impedances corresponding to various current paths through the human body, contact areas, skin moisture at this contact area and on the type of current. Current thresholds and body impedances are provided by IEC/TS 60479-1.

This specification discusses 50/60 Hz sinusoidal alternating voltage and pure direct voltage having no significant alternating component. Higher frequency alternating voltage is not included in this type of analysis as this would require a more complex body impedance model and would require the use of frequency factors for the current thresholds for the unwanted physiological effects. As this technical specification does not cover frequencies higher than 50/60 Hz, technical committees are requested to inform IEC/TC 64 about experience gained on this subject. Suggestions for modifications and additions to the technical specification should be submitted to IEC/TC 64.

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USE OF CONVENTIONAL TOUCH VOLTAGE LIMITS – APPLICATION GUIDE

1 Scope

IEC/TS 61201, which is a technical specification, provides guidance on the use of conventional touch voltage limits with reference to thresholds given in IEC 60479-5. Consideration is given to different physiological effects, environmental conditions, contact conditions, etc.

This specification only discusses voltages for sinusoidal a.c. at 50/60 Hz and pure d.c. having no significant a.c. component.

This specification does not consider immersion of body parts or medical applications.

Touch voltage limits are for use by technical committees as guidance for the determination of their own specific limits.

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. The requirements, test methods or test conditions of this basic safety publication will not apply unless specifically referred to or included in the relevant publications.

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.

IEC/TS 60479-1:2005, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC/TS 60479-2:2007, *Effects of current on human beings and livestock – Part 2: Special aspects*

IEC/TR 60479-5, *Effects of current on human beings and livestock – Part 5: Touch voltage threshold values for physiological effects*

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/IEC Guide 51:1999, *Safety aspects – Guidelines for their inclusion in standards*

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3 Use of this technical specification

As voltage thresholds of IEC/TR 60479-5 are fully derived from current thresholds of IEC/TS 60479-1, differences between normal conditions and fault conditions are not considered in this specification.

Technical committees may use these voltage values in conjunction with appropriate risk factors to set their own voltage limits in their product standards. Such risk factors will consider other aspects such as probability of faults, probability of contact with live or faulty parts, ratio between touch voltage and fault voltage, etc.

Product committees should carry out risk assessment for their products based on the information in this specification. For example, product committees may specify the maximum touch area. Where touch areas are unknown, conservative figures need to be used.

4 Conditions and values of thresholds

4.1 Physiological effects of body current

Thresholds for the physiological effects associated with electric current through a human body are reported in IEC/TS 60479-1.

This specification addresses the following physiological effects:

– startle reaction from current;
– strong involuntary muscular reaction (such as inability to let-go from an electrode for a.c.);
– ventricular fibrillation.

Other effects, such as perception, might be important for some applications but are not addressed in this specification.

For the purposes of this specification, the values corresponding to physiological effects of greatest interest are curves a, b and c_1 as described in IEC/TS 60479-1.

4.2 Body impedance

Touch voltage limit is a function of the body impedances as described in IEC/TS 60479-1. The appropriate value of body impedance to use is a function of many factors. The selection of the proper value should include consideration of the following:

– the type of power source (a.c. or d.c.); and
– the magnitude of the touch voltage; and
– the pathway of the current through the body (hand-to-hand, or both-hands-to-both feet or one-hand-to-seat);

NOTE These different pathways have been selected for their characteristics. The reason comes from the body impedance model described in Annex A of IEC/TR 60479-5. The voltage thresholds determined for the current path both-hands-to-feet may be generally considered conservative compared to the current path one-hand-to-both-feet.

and

– the area of contact with the skin; and
– the condition of the skin contact area (saltwater-wet, water-wet, dry).

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5 Voltage thresholds and limits

5.1 Voltage threshold as a function of contact area

The following figures (Figures 1 to 6) show threshold touch voltage versus contact area. It is assumed that since the plotted points are close to being in line when plotted on a log-log scale, the best fit curve to represent points between those actually calculated will be on a line joining the calculated points on the log-log scale.

These threshold figures are intended to document the effect of contact area which might be used in products as a key design parameter for limiting the effect of touch voltage. It should be noted that contact area may be affected by contact with other conductive parts such as tools or interconnected equipment.

NOTE 1 Tables 1 and 2 illustrate examples of maximum contact areas for traditional accessible voltages.

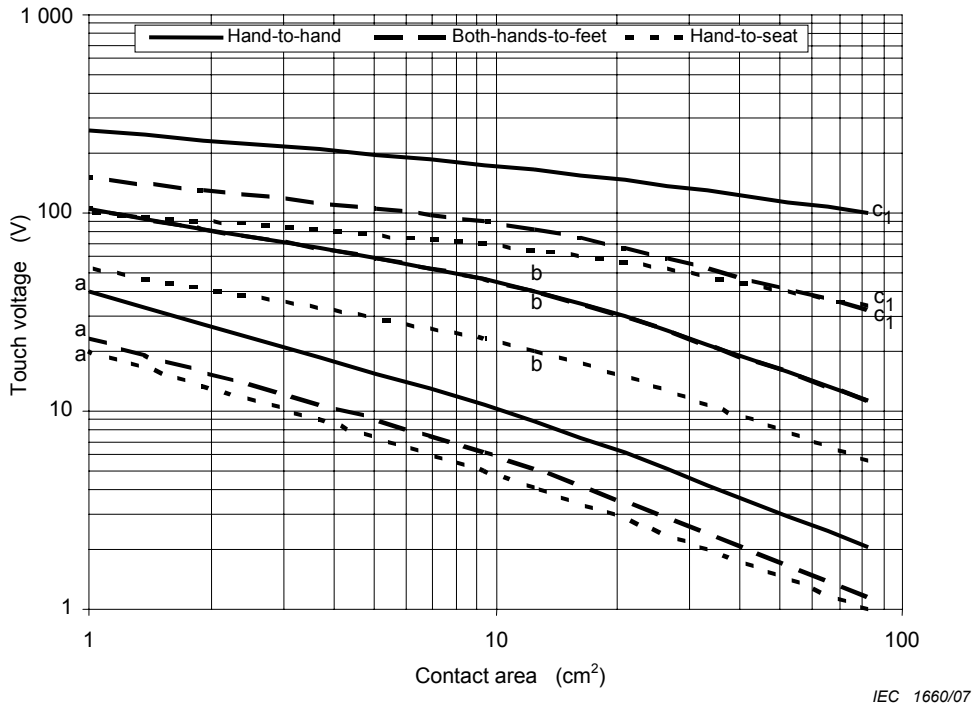

Figure 1 – Minimum touch voltage threshold corresponding to a.c. and dry conditions for current startle reaction (a), muscular reaction (b) and ventricular fibrillation (c_1)

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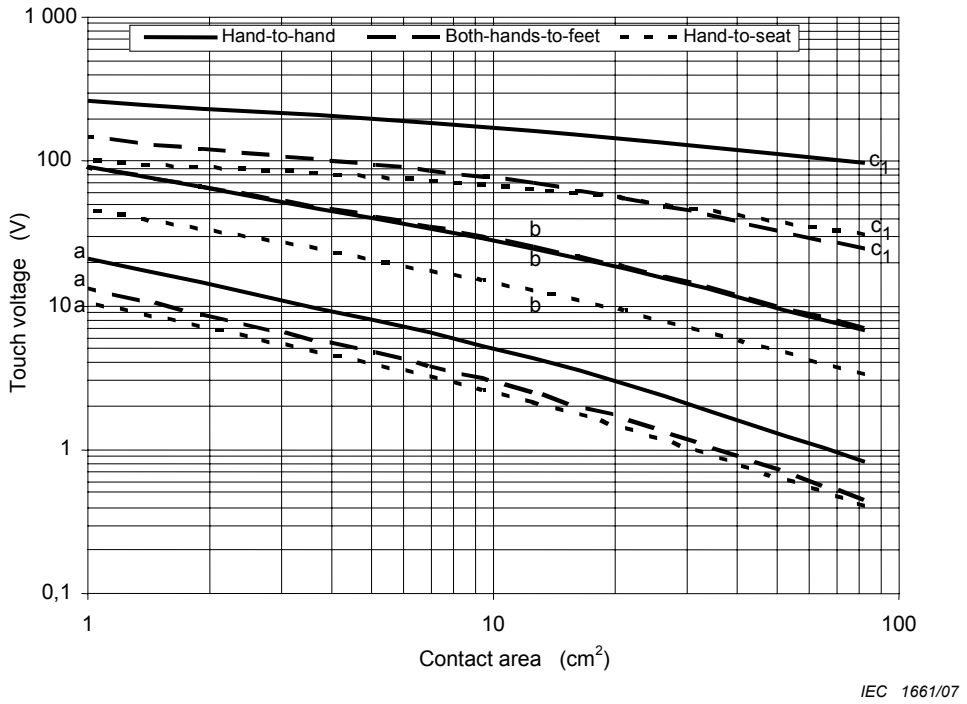

Figure 2 – Minimum touch voltage threshold corresponding to a.c. and water-wet conditions for current startle reaction (a), muscular reaction (b) and ventricular fibrillation (c_1)

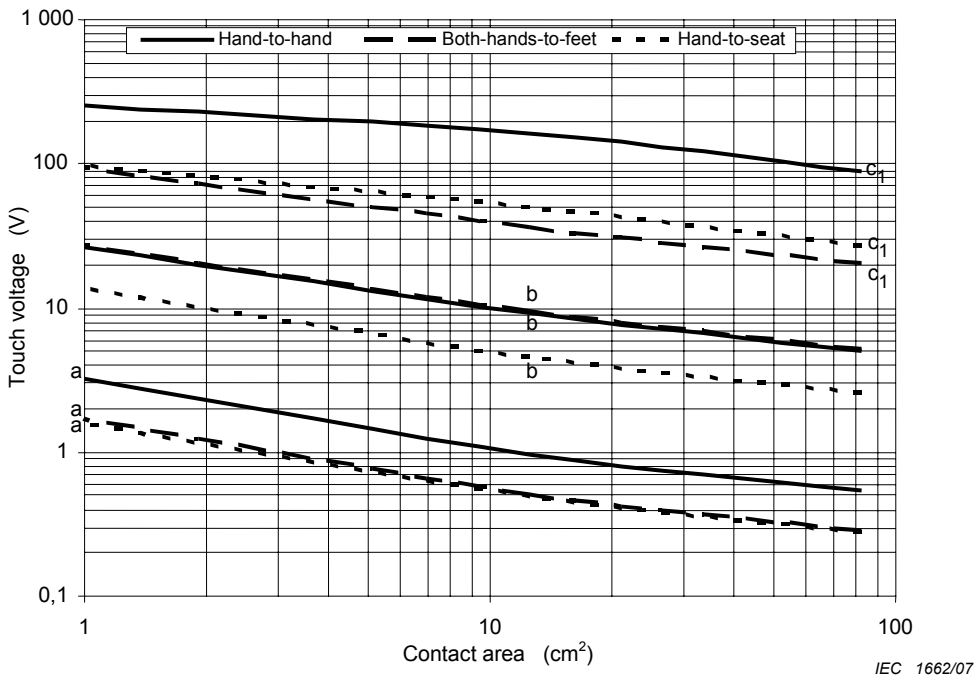

Figure 3 – Minimum touch voltage threshold corresponding to a.c. and saltwater-wet conditions for current startle reaction (a), muscular reaction (b) and ventricular fibrillation (c_1)

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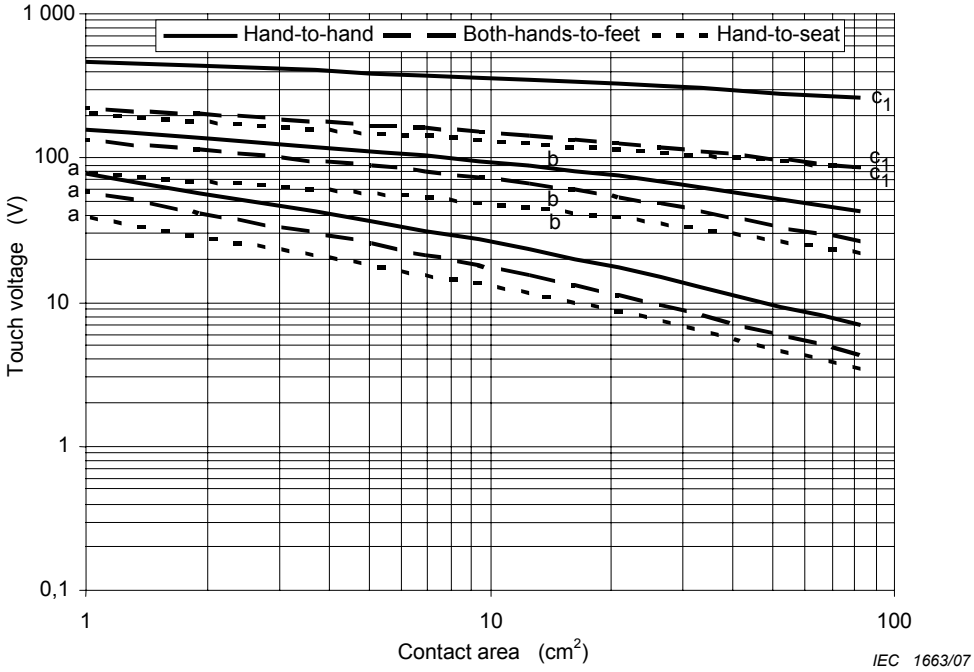

Figure 4 – Minimum touch voltage threshold corresponding to d.c. and dry conditions for current startle reaction (a), muscular reaction (b) and ventricular fibrillation (c_1)

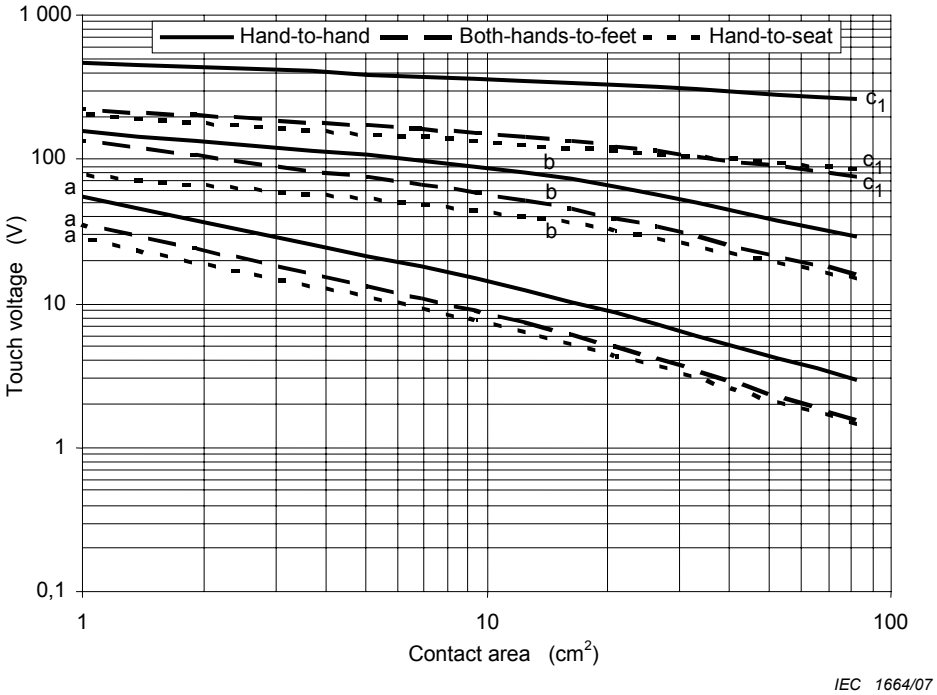

Figure 5 – Minimum touch voltage threshold corresponding to d.c. and water-wet conditions for current startle reaction (a), muscular reaction (b) and ventricular fibrillation (c_1)

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