

ICS 13.200; 29.020
CCS K 09



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 13870.5-2016

**Effects of current on human beings and livestock -- Part 5:
Touch voltage threshold values for physiological effects
(English Translation)**

Issued on: April 25, 2016

Implemented on: November 1, 2016

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China**

Table of Contents

Preface

Introduction

1 Scope

2 Normative reference document

3 Terms and definitions

4 Conditions and thresholds

4.1 Overview

4.2 Physiological effects of contact current

4.3 Human body impedance

4.4 External impedance of the body

4.5 Other factors that affect the voltage threshold

4.6 The contact voltage threshold is a function of duration

4.7 Contact voltage threshold for long duration contact

5 Contact voltage threshold --- voltage - time curve Figure

Appendix A (informative) Human body impedance

Appendix B (informative) contact voltage --- with GB/T 13870.1-2008 in the list of human body impedance and human current limit

Foreword

GB/T 13870 "The effect of current on people and livestock" is divided into the following five parts.

- Part 1. General section;
- Part 2. special circumstances;
- Part 3. Effect of current flowing through the livestock body;
- Part 4. Effect of lightning current through the body of the human body and livestock;
- Part 5. Physiological effects of contact voltage thresholds.

This part is part 5 of GB/T 13870.

This part is drafted in accordance with the rules given in GB/T 1.1-2009 and GB/T 20000.2-2009.

This part uses the translation method equivalent to the use of IEC/T R60479-5..2007 "The

effect of current on humans and livestock Part 5. Physiological effects of the contact voltage threshold ".

And this part of the normative reference to the international documents are consistent with the relationship between China's documents are as follows.

GB/T 2900.73-2008 Electrical terminology Grounding and electric shock protection (IEC 60050-195.:1998, IDT) Methods of measurement for contact current and protective conductor currents (IEC 60990.:1999, IDT) GB/T 12113-2003 this section is identical to IEC/T R60479-5.:2007, and the technical contents are identical, but the following editorial modify.

--- use the decimal point symbol "." Instead of the decimal point symbol ",";

--- deleted the IEC standard "preface".

This part of the National Building Electrical Equipment Standardization Technical Committee (SAC/TC205) proposed and centralized.

This part is responsible for the drafting of the unit. China Central Electric Design and Research Institute Co., Ltd., China Construction Design Group Co., Ltd. (Direct headquarters), the State Power Engineering Co., Ltd.

This part of the main drafters. Han Zhanqiang, Feng Zongheng.

Introduction

This part of GB/T 13870 provides a set of voltage thresholds for the selection and application of the shock protection voltage limits to guide.

In order to estimate the magnitude and type of physiological effects that may be caused by energization, it is necessary to determine the magnitude and path of the current flowing through the body.

However, from the point of view of device design, in order to predict whether the desired physiological effect may occur or its probability of occurrence, it is better the approach is to give information about the voltage level on the accessible conductive surface. In the expected environmental conditions, if it is achievable the maximum voltage is small, can not produce enough contact current caused by the undesirable physiological effects, then you can reduce or cancel the normal state Requires protection measures that avoid undesirable physiological effects. Than below is unlikely to produce dangerous critical voltage values, commonly referred to as Special low voltage (ELV).

The purpose of this section is to derive the contact voltage threshold according to the time/current region corresponding to the physiological effect of GB/T 13870.1-2008 (See Figures 20 and 22 of GB/T 13870.1-2008). The introduction of such techniques for designers is more widely combined than previously identified Under the conditions of the

environment, the type of more numerous circuits to provide the level of user protection level.

And the physiological threshold corresponding to the voltage threshold should be the same as the physiological effect corresponding to the contact current in GB/T 13870.1-2008. This part the physiological effects studied include the shock response of current, the physiological effects associated with muscle contraction such as inability to escape, and ventricular fibrosis Quiver. The current threshold is based on the curves a, b and c1 in GB/T 13870.1-2008, which is still the basic part. According to ohm the law of the contact voltage threshold is related to the contact current threshold and the associated human impedance. However, in this case it is not simply straightforward Apply Ohm's law. Human body impedance is a function of many variables, including voltage, current paths, skin and conductive sheets that cross the body the contact area between the faces, the degree of water wetting of the contact surface, and the duration of the voltage across the body (or the current flowing through the human body). When electricity when the pressure is applied to the human body and the current begins to flow, the resistive component of the skin impedance decreases to a lower value in tens of milliseconds.

This part discusses the 50Hz/60Hz sine wave AC voltage and no significant AC component of the pure DC voltage. Higher frequency the flow voltage is not included in the analysis of this class because it will require a more complex impedance model and the need for an unwanted physiological effect Flow thresholds applied frequency coefficients.

The effect of current on people and livestock Part 5. contact voltage threshold for physiological effects

1 Scope

This part of GB/T 13870 is passed through the current threshold data of the human body impedance and physiological effects in GB/T 13870.1-2008.

Row analysis, provides a contact voltage-duration combination threshold curve. These combined threshold curves are shown with specific environmental conditions and contact bars the relationship between the body impedance of a particular current path is determined.

This section studies only the following.

- (I) 50Hz/60Hz sinusoidal AC voltage without any other frequency component or significant DC component;
- (li) DC voltage without significant AC component.

Due to the uncertainties in the values in GB/T 13870.1-2008, the voltage calculated in this part on the basis of the calculated voltage Thresholds are also subject to uncertainty.

This section does not take into account the situation of the body immersed in water and medical applications.

The contact voltage-duration combination threshold curve can be used as a guide for determining the contact voltage and duration under various environmental conditions Time limit.

Determining limits requires a risk assessment as a basis. Factors to consider for risk assessment include the voltage thresholds provided in this section (consider) the contact area, skin moist conditions, current flow through the human body path), and other factors not covered. E.g.

--- Reduce the possibility of contact (through obstacles, shelter, warning signs, placed outside the range of protective measures, personnel training Training, etc.); or - reduce the contact voltage relative to the fault voltage (eg by equipotential bonding); or

--- and the body in series with additional resistance (such as gloves, shoes, carpets, etc.).

2 Normative reference documents

The following documents are indispensable for the application of this document. For dated references, only the dated edition applies to this article Pieces. For undated references, the latest edition (including all modifications) applies to this document.

IEC 60050-195 Electrotechnical terminology - Part 195. Earthing and electrical shock protection (International Electrotechnical Vocabulary-Part 195.

Earthing and protection against electric shock) IEC 60990 Measurement of contact current and protection conductor current (Methods of measurement of touch current and

protective conductor current GB/T 13870.1-2008 Effects of current on humans and livestock Part 1. General section (IEC/T S60479-1..2005, IDT)

3 Terms and definitions

Contact current touch current when a person or animal touches one or more accessible parts of an electrical device or electrical device, the current through its body.

[IEC 60050-195]