

ISBN 978-0-626-28438-1

**SANS 60479-3:1998**

Edition 1 and nat. amdt 1

**IEC 60479-3:1998**

Edition 1

Any reference to SABS IEC 60479-3 is deemed  
to be a reference to this standard  
(Government Notice No. 1373 of 8 November 2002)

# **SOUTH AFRICAN NATIONAL STANDARD**

## **Effects of current on human beings and livestock**

### **Part 3: Effects of currents passing through the body of livestock**

This national standard is the identical implementation of IEC 60479-3:1998 and is adopted with the permission of the International Electrotechnical Commission.

**SANS 60479-3:1998**

Edition 1 and nat. amdt 1

**IEC 60479-3:1998**

Edition 1

**Table of changes**

<b>Change No.</b>	<b>Date</b>	<b>Scope</b>
Nat. amdt 1	2007	Amended to change the designation from SABS to SANS, with no technical changes.

**National foreword**

This South African standard was approved by National Committee SABS TC 68, *Security systems*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This SANS document was published in August 2007.

This SANS document supersedes SABS IEC 60479-3:1998 (first edition).

**Reaffirmed and reprinted in January 2013.  
This document will be reviewed every five years  
and be reaffirmed, amended, revised or withdrawn.**

**RAPPORT  
TECHNIQUE – TYPE 2  
TECHNICAL  
REPORT – TYPE 2**

**CEI  
IEC**

**60479-3**

Première édition  
First edition  
1998-09

---

---

PUBLICATION FONDAMENTALE DE SÉCURITÉ  
BASIC SAFETY PUBLICATION

---

---

**Effets du courant sur l'homme  
et les animaux domestiques –**

**Partie 3:  
Effets de courants passant par le corps  
d'animaux domestiques**

**Effects of current on human beings  
and livestock –**

**Part 3:  
Effects of currents passing through  
the body of livestock**

© IEC 1998 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

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 the publisher.

International Electrotechnical Commission  
Telefax: +41 22 919 0300

e-mail: [inmail@iec.ch](mailto:inmail@iec.ch)

3, rue de Varembe Geneva, Switzerland  
IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

CODE PRIX  
PRICE CODE

**N**

*Pour prix, voir catalogue en vigueur  
For price, see current catalogue*

## CONTENTS

	Page
FOREWORD .....	5
INTRODUCTION .....	9
Clause	
1 General.....	11
1.1 Scope .....	11
1.2 General remarks .....	11
1.3 Normative references.....	13
1.4 Definitions.....	13
2 Characteristics of the impedance of the body of livestock .....	15
2.1 Internal impedance of animals ( $Z_i$ ).....	17
2.2 Impedance of the hide and skin ( $Z_P$ ).....	17
2.3 Impedance (resistance) of the hoof ( $Z_h, R_h$ ) .....	17
2.4 Total body impedance ( $Z_T$ ) .....	19
2.5 Initial body resistance ( $R_o$ ) .....	19
3 Values of the total body impedance ( $Z_T$ ) .....	19
4 Values of the initial resistance of the body ( $R_o$ ).....	21
5 Effects on livestock of sinusoidal alternating current in the range from 15 Hz to 100 Hz.	23
5.1 Threshold of reaction .....	23
5.2 Threshold of immobilization.....	23
5.3 Threshold of ventricular fibrillation.....	23
 Bibliography .....	 29
Figures	
Figure 1 – Current flow and impedances of the relevant parts of the body of a cow for current path from the nose to the legs.....	15
Figure 2 – Diagrams for an animal, for a current path from the nose to the four legs (path A) and from the forelegs to the hindlegs (path B).....	15
Figure 3 – Diagram for the total body impedance for cattle for a percentage of 5 % of the population .....	21
Figure 4 – Ventricular fibrillation for sheep .....	25
Figure 5 – Minimum fibrillating currents of sheep as a function of weight for a shock duration of 3 s .....	27
Figure 6 – Minimum fibrillating currents (average) of various species of livestock as a function of weight for a shock duration of 3 s.....	27
Tables	
Table 1 – Impedance (resistance) of the hooves of cattle ( $Z_h, R_h$ ) for a.c. voltages up to 230 V, 50/60 Hz .....	17
Table 2 – Total body impedances $Z_T$ for a.c. 50/60 Hz for cattle for touch voltages up to 230 V.....	19
Table 3 – Initial body resistance $R_o$ for cattle .....	21
Table 4 – Threshold of ventricular fibrillation for a.c. 50/60 Hz for different species of livestock, for a shock duration of 3 s .....	25

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

### EFFECTS OF CURRENT ON HUMAN BEINGS AND LIVESTOCK –

#### Part 3: Effects of currents passing through the body of livestock

#### FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but no immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

Technical reports of types 1 and 2 are subject to review within three years of publication to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.