

SS 358 : Part 3 : 2019
IEC 60227-3:1993+A1:1997, MOD
(ICS 29.060.20)

SINGAPORE STANDARD

**Polyvinyl chloride insulated cables of rated
voltages up to and including 450/750 V**

– Part 3 : Non-sheathed cables for fixed wiring

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Published by Enterprise Singapore

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ISBN 978-981-48-3556-5

The content of this Singapore Standard was approved on 11 January 2019 by the Electrical and Electronic Standards Committee (EESC) under the purview of the Singapore Standards Council.

First published, 1991
First revision, 1996
Second revision, 2019

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	Mr Andrew Yap	<i>Enterprise Singapore</i>
	Mr Nelson Yeap	<i>Singapore Electrical Trades Association</i>

EESC sets up the Technical Committee on Electrical & Electronic Products to oversee the preparation of this standard. The Technical Committee consists of the following members:

	Name	Representation
Chairman	: Er. Lim Say Leong	<i>Individual Capacity</i>
Deputy Chairman	: Mr Andrew Yap	<i>Enterprise Singapore</i>
Secretary	: Mr Jason Low	<i>Enterprise Singapore</i>
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	Er. Ken Jung Gee Keong*	<i>Singapore Electrical Contractors and Licensed Electrical Workers Association</i>
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	Mr Tan Boon Chong	<i>Singapore Manufacturing Federation</i>
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	CPT Tan Ping Hao	<i>Singapore Civil Defence Force</i>
	Dr Teo Tee Hui	<i>The Institution of Engineers, Singapore</i>

* Till 15 August 2018

The Technical Committee sets up the Working Group on Electric Cables to prepare this standard. The Working Group consists of the following experts who contribute in their *individual capacity*:

	Name
Convenor	: Er. Joseph Michael
Members	: Mr Baghel Bhim Singh
	Er. Chan Heng Lim
	Er. Chong Li Li
	Mr Chia Song Khoon
	Mr Alfred Chia Yeow Kok
	Mr James Jia
	Mr Lu Changzhi
	Er. Rao Yimin
	Mr Ridzwan Mustapa
	CPT Tan Ping Hao
	Mr Tan Wei Liang
	Mr James Teng
	Mr Yap Kong Fui

The organisations in which the experts of the Working Group are involved are:

Association of Consulting Engineers Singapore

Housing & Development Board

Huatong Cables (S) Pte Ltd

JTC Corporation

Keystone Cable (S) Pte Ltd

Land Transport Authority

Marian Energy Pte Ltd

Sigma Cable Co. (Pte) Ltd

Singapore Cables Manufacturers Pte Ltd

Singapore Civil Defence Force

Singapore Electrical Contractors and Licensed Electrical Workers Association

Tai Sin Electric Limited

TÜV SÜD PSB Pte Ltd

Wilson Cables Private Limited

CONTENTS

	Page
National Foreword	6
Foreword	8
Clause	
1 General	10
2 Single-core non-sheathed cable with rigid conductor for general purposes	11
3 Single-core non-sheathed cable with flexible conductor for general purposes	13
4 Single-core non-sheathed cable with solid conductor for internal wiring for a conductor temperature of 70 °C	15
5 Single-core non-sheathed cable with flexible conductor for internal wiring for a conductor temperature of 70 °C	17
6 Single-core non-sheathed cable with solid conductor for internal wiring for a conductor temperature of 90 °C	19
7 Single-core non-sheathed cable with flexible conductor for internal wiring for a conductor temperature of 90 °C	21

National Foreword

This Singapore Standard was prepared by the Working Group on Electric Cables set up by the Technical Committee on Electrical & Electronic Products under the purview of EESC.

SS 358 comprises the following four parts under the general title, “Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V”:

- Part 1: General requirements
- Part 2: Test methods
- Part 3: Non-sheathed cables for fixed wiring
- Part 5: Flexible cables (cords)

Part 3 is a modified adoption of IEC 60227-3:1993+A1:1997, “Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring” including its Amendment 1, published by the International Electrotechnical Commission.

In this standard, certain modifications due to national requirements and the particular needs of the local industry have been made. These technical deviations and additional information have been added directly to the clauses to which they refer, and are marked by a margin on the left of the standard. A complete list of modifications, together with their justifications, is given as follows:

**Clause/
Subclause**

Modifications

Table 1 *Added* new data points for nominal cross-sectional area of conductor nominal of 500mm², 630mm², 800mm² and 1000mm².

1	2	3	4	5	6
Nominal cross-sectional area of conductor mm ²	Class of conductor IEC 60228	Thickness of insulation Specified value mm	Mean overall diameter		Minimum insulation resistance at 70 °C MΩ·km
			Lower limit mm	Upper limit mm	
500	2	2,8	30,5	36,9	0,003 0
630	2	2,8	34,0	41,1	0,002 7
800	2	2,8	37,8	45,7	0,002 4
1000	2	3,0	42,1	51,0	0,002 3

Explanation: To provide data for PVC cables of larger sizes.

NOTE 1 – Reference to International Standards are replaced by applicable Singapore Standards.

NOTE 2 – Where numerical values are expressed as decimals, the comma is read as a full point.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

- 1. Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "Mature standards". Mature Standards will not be subject to further review, unless there are requests to review such standards.*
- 2. An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.*
- 3. Compliance with a SS or TR does not exempt users from any legal obligations.*

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POLYVINYL CHLORIDE INSULATED CABLES
OF RATED VOLTAGES UP TO AND
INCLUDING 450/750 V –**

Part 3: Non-sheathed cables for fixed wiring

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.
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- 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.

This part of International Standard IEC 60227 has been prepared by sub-committee 20B: Low-voltage cables, of IEC technical committee 20: Electric cables.

This consolidated version of IEC 60227-3 consists of the second edition (1993) [documents 20B(CO)115 and 20B(CO)124] and its amendment 1 (1997) [documents 20B/226/FDIS and 20B/250/RVD].

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 2.1.

IEC 60227 consists of the following parts, under the general title: Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V:

Part 1: General requirements

Part 2: Test methods

Part 3: Non-sheathed cables for fixed wiring

Part 4: Sheathed cables for fixed wiring

Part 5: Flexible cables (cords)

Part 6: Lift cables and cables for flexible connections

Part 7: Flexible cables screened and unscreened with two or more conductors.

This part, in conjunction with parts 1 and 2, forms the complete standard for non-sheathed cables for fixed wiring.

**POLYVINYL CHLORIDE INSULATED CABLES
OF RATED VOLTAGES UP TO AND
INCLUDING 450/750 V –**

Part 3: Non-sheathed cables for fixed wiring

1 General

1.1 Scope

This part of IEC 60227 details the particular specifications for polyvinyl chloride insulated single-core non-sheathed cables for fixed wiring of rated voltages up to and including 450/750 V.

All cables shall comply with the appropriate requirements given in IEC 60227-1 and the individual types of cables shall each comply with the particular requirements of this part.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60227. At the time of publication, the editions indicated were valid. All normative documents are subject to revision and parties to agreements based on this part of IEC 60227 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60227-1:1993, *Polyvinyl chloride insulated cables of rated voltage up to and including 450/750 V – Part 1: General requirements**

IEC 60227-2:1979, *Polyvinyl chloride insulated cables of rated voltage up to and including 450/750 V – Part 2: Test methods**

IEC 60228:1978, *Conductors of insulated cables*
First supplement 60228A (1982), amendment 1 (1993)

IEC 60332-1:1979, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

IEC 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section One: Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*
Amendment 1 (1988). Amendment 2 (1989)

IEC 60811-1-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Two: Thermal ageing methods*
Amendment 1 (1989)

* Revised edition to be published.

IEC 60811-1-4:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four: Tests at low temperature*

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section One: Pressure test at high temperature – Tests for resistance to cracking*

IEC 60811-3-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section Two: Loss of mass test – Thermal stability tests*