SINGAPORE STANDARDS COUNCIL

SS 146 : Part 2 : 8 : 2007
(ICS 13.120; 91.140.65)

SINGAPORE STANDARD

Specification for household and similar electrical appliances – Safety

– Part 2 : 8 : Particular requirements for storage water heaters

Published by
SPRING singapore
Enabling Enterprise

SS 146 : Part 2 : 8 : 2007
(ICS 13.120; 91.140.65)

SINGAPORE STANDARD

Specification for household and similar electrical appliances – Safety

– Part 2 : 8 : Particular requirements for storage water heaters

Standards
SPRING Singapore
1 Fusionopolis Walk,
#01-02 South Tower, Solaris
Singapore 138628
Email : standards@spring.gov.sg

ISBN 981-4154-53-9

This Singapore Standard was approved by Electrical and Electronic Standards Committee on behalf of the Standards Council of Singapore on 6 June 2007.

First published, 1989
First revision, 1999
Second revision, 2007

The Electrical and Electronic Standards Committee appointed by the Standards Council consists of the following members:

		Name	Capacity
Chairman	:	Mr Renny Yeo Ah Kiang	*Standards Council*
Deputy Chairman	:	Mr Lim Say Leong	*Standards Council*
Secretary	:	Mr Ong Chih Hsing	*SPRING Singapore*
	:	Mr Hu Renwei Terence	*SPRING Singapore*
Members	:	Assoc Prof Chan Tat Wai	*Nanyang Technological University*
		Mr Chong Weng Hoe	*TÜV SÜD PSB Pte Ltd*
		Mr Chua Kok Yong	*SP PowerGrid Ltd*
		Mr Ho Fui Chan	*Housing & Development Board*
		Er. Adeline Koh	*Association of Consulting Engineers Singapore*
		Assoc Prof Koh Liang Mong	*Nanyang Technological University*
		Mr Peter Leong	*Singapore International Chamber of Commerce*
		Prof Liew Ah Choy	*National University of Singapore*
		Mr Kenneth Liu	*Association of Consulting Engineers Singapore*
		Er. Ng Eng Kiong	*Individual Capacity*
		Mr Ng Kim Leong	*Institution of Engineers Singapore*
		Mr Ng Kin Ming	*Singapore Electrical Contractors and Licensed Electrical Workers Association*
		Mr Michael Ong	*SPRING Singapore*
		Er. Ong Ser Huan	*Institution of Engineers Singapore*
		Mr K Seshadri	*Singapore Manufacturers' Federation*
		Mr Sim Wee Meng	*Land Transport Authority*
		Mr Tan Boon Chong	*Singapore Manufacturers' Federation*
		Mr Tan Hak Khoon	*Energy Market Authority*
		Mr Jimi Wong Yick Chee	*Singapore Electrical Trades Association*
		Prof Yeo Tat Soon	*National University of Singapore*

The Technical Committee on Safety of Household and Similar Electrical Appliances appointed by the Electrical and Electronic Standards Committee and responsible for the preparation of this standard consists of representatives from the following organisations:

		Name	Capacity
Chairman	:	Mr Michael Ong	*Member, Electrical and Electronic Standards Committee*
Secretary	:	Mr Tan Boon Chong	*Singapore Electrical Trades Association*
Members	:	Mr Terence Hu Renwei	*SPRING Singapore*
		Mr Chia Eng Giap	*TÜV SÜD PSB Pte Ltd*
		Mr Foo Chee Yan	*Infocomm Development Authority of Singapore*
		Assoc Prof Lee Tat Man	*Nanyang Technological University*
		Er. Lim Beng Hwee	*Institution of Engineers, Singapore*
		Mr Lawrence Low Keng Chiew	*Singapore Manufacturers' Federation*
		Mr Joseph Michael	*Energy Market Authority*
		Er. Ng Kim Leang	*Housing & Development Board*
		Ms Michelle Ng Yan Mun	*TÜV SÜD PSB Pte Ltd*

The Working Group appointed by the Technical Committee to assist in the preparation of this standard comprises the following experts who contribute in their *individual capacity*:

		Name
Convenor	:	Mr Joseph Michael
Members	:	Ms Bernice Lau Wee Nee
		Mr Lawrence Low Keng Chiew
		Mr Daniel Ng
		Er. Ng Kim Leang
		Mr Tan Boon Chong
		Mr Wong Chee Kian
		Mr Rudy Wong Chee Leng

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

Clipsal International Pte Ltd
Energy Market Authority
Faco Electric Co. Pte Ltd
General Electric Pacific Pte Ltd
Housing & Development Board
Singapore Electrical Testing Services
SPRING Singapore
TÜV SÜD PSB Pte Ltd

(blank page)

CONTENTS

National Foreword

This Singapore Standard is prepared by the Technical Committee on Safety of Household and Similar Electrical Appliances under the purview of the Electrical and Electronic Standards Committee.

SS 146 : Part 2 : 8 : 2007 is a modified adoption of International Standard IEC 60335-2-21 : 2004 (Edition 5.1) – Safety of household and similar electrical appliances – Particular requirements for storage water heaters, published by the International Electrotechnical Commission. To facilitate identification, the affected text of the International Standard which is to be changed is indicated by a left marginal bar adjacent to it. The modifications are specified below:

Clause/ Subclause	Modifications
6.1	*Insert* the following text at the beginning of the subclause : "Bare element water heaters are not allowed. " *Explanation*: For compliance with local electrical installation code.
22.106	*Add* a footnote, "Thermal cut-out shall provide all-pole disconnection."

SS 146 : Part 2 : 8 : 2007 is to be used in conjunction with SS 146 : Part 1 : 2004 and its amendment. It supplements or modifies the corresponding clauses of SS 146 : Part 1 : 2004 so as to convert it into the Singapore Standard : Safety requirements for electric storage water heaters.

Where a particular subclause of Part 1 is not mentioned in this Part 2, that subclause applies as far as is reasonable. Where this standard states 'addition', 'modification', or 'replacement', the relevant text in Part 1 is to be adapted accordingly.

In this standard, the following print types are used:

- requirements : in roman type;
- test specifications : in italic type;
- notes : in small roman type;

Words in bold in the text are defined in Clause 2. When a definition of Part 1 concerns an adjective, the adjective and associated noun are also in bold.

Subclauses and figures which are additional to those in Part 1 are numbered starting from 101.

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

NOTE

1. *Singapore Standards are subject to periodic review to keep abreast of technological changes and new technical developments. The changes in Singapore Standards are documented through the issue of either amendments or revisions.*
2. *Compliance with a Singapore Standard does not exempt users from legal obligations.*

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-21: Particular requirements for storage water heaters

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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 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 IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This consolidated version of IEC 60335-2-21 is based on the fifth edition (2002) [documents 61/2135/FDIS and 61/2160/RVD] and its amendment 1 (2004) [documents 61/2683/FDIS and 61/2719/RVD].

It bears the edition number 5.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

The French version of this standard has not been voted upon.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for electric storage water heaters.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states "addition", "modification", or "replacement", the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type*;

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of the base publication and its amendments 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The following differences exist in the countries indicated below.

– 6.1: Class 0I appliances are allowed (Japan).

– 6.2: IPX0 water heaters are allowed (France, Portugal, United Kingdom and USA).

– 7.1: Additional markings are required (Australia, New Zealand and South Africa).

– 7.1: The rated pressure is to be marked in pounds per square inch (USA).

– 7.1: Open outlet water heaters are not required to be marked with rated pressure (USA).

– 7.12.1: Additional instructions are required (South Africa).

– 11.7: The test is different (USA).

– 19.1: Water heaters that have all four features and are not liable to be emptied in normal use are not subjected to the test of 19.101 (South Africa).

– 19.1: Appliances incorporating sheathed heating elements are not required to have an outer enclosure of metal but their rated power input is limited to 12 kW (USA).

– 19.101: The test is different (USA).

– 22.101: Pressure reducing valves have to be designed for an inlet pressure of 2 MPa (South Africa).

– 22.101: The minimum rated pressure is 1,0 MPa (Denmark, Finland, Norway and Sweden).

– 22.102: The minimum pressure is 2,1 MPa. The test is not carried out on water heaters having a capacity less than 2 l or on appliances having containers open to the atmosphere (USA).

– 22.103: Closed water heaters have to incorporate a pressure-relief device (Norway).

– 22.103: Closed water heaters have to incorporate a pressure-relief device sensitive to both pressure and temperature that operates before the water temperature reaches 99 °C (Australia and New Zealand).

– 22.103: Closed water heaters having a capacity exceeding 50 l or a rated power input exceeding 2 kW have to incorporate a pressure-relief device sensitive to both pressure and temperature that operates before the water temperature reaches 99 °C (South Africa).

– 22.103: Closed water heaters have to incorporate a temperature relief valve or a combined temperature and pressure-relief valve that operates before the water temperature reaches 100 °C (United Kingdom).

– 22.106: All water heaters have to incorporate a thermal cut-out (India).

– 22.106: The thermal cut-out of single-phase closed water heaters need only provide single-pole disconnection (Japan).

– 22.106: For all closed water heaters, the thermal cut-out is to provide all-pole disconnection (France, Netherlands, Norway and Switzerland).

– 22.109: A tool is not required for draining the appliance (Canada and USA).

– 22.110: Additional requirements apply to plastic or resin-based containers (South Africa).

– 22.112: The temperature limit is 95 °C (South Africa).

– 22.112: The temperature limit is 85 °C (USA).

– 24.101: Thermal cut-outs are required to have a trip-free switching mechanism (USA).

– 24.102: The maximum water temperature is 90 °C (Australia and New Zealand).

– 24.102: The maximum water temperature is 99 °C (Japan, Norway, Portugal, United Kingdom and USA)

– 24.102: The temperature limit of 130 °C is only allowed for closed water heaters having a rated pressure of at least 0,4 MPa (South Africa).