

SS 145 : Part 1 : 2019
BS 1363-1:2016+A1:2018, MOD
(ICS 29.120.30)

SINGAPORE STANDARD

**Specification for 13 A plugs, socket-outlets,
adaptors and connection units**

– Part 1 : Rewirable and non-rewirable 13 A fused plugs



SS 145 : Part 1 : 2019
BS 1363-1:2016+A1:2018, MOD
(ICS 29.120.30)

SINGAPORE STANDARD

**Specification for 13 A plugs, socket-outlets,
adaptors and connection units**

– Part 1 : Rewirable and non-rewirable 13 A fused plugs

Published by Enterprise Singapore

All rights reserved. Unless otherwise specified, no part of this Singapore Standard may be reproduced or utilised in any form or by any means, electronic or mechanical, including photocopying and microfilming, without permission in writing from Enterprise Singapore. Request for permission can be sent to: standards@enterprisesg.gov.sg.

© BS 2016 – All rights reserved
© Enterprise Singapore 2019

ISBN 978-981-48-9457-9

The content of this Singapore Standard was approved on 12 December 2019 by the Electrical and Electronic Standards Committee (EESC) under the purview of the Singapore Standards Council.

First published, 1976
First revision, 1985
Second revision, 1997
Third revision, 2010
Fourth revision, 2020

EESC consists of the following members:

	Name	Representation
Chairman	: Er. Peter Leong Weng Kwai	<i>Individual Capacity</i>
Deputy Chairmen	: Mr Andrew Chow Dr Kang Cheng Guan	<i>Individual Capacity</i> <i>Energy Market Authority</i>
Advisor	: Mr Renny Yeo Ah Kiang	<i>Individual Capacity</i>
Secretary	: Mr Jason Low	<i>Enterprise Singapore</i>
Members	: Dr Ashwin Khambadkone Dr Chua Sze Wey Mr Michael Goh Chye Soon Assoc Prof Gooi Hoay Beng Er. Hashim Bin Mansoor Er. Kwang Cheok Sen Mr Cedric Lee Say Teck Mr Lee Wee Keong Er. Lim Say Leong Er. Ling Shiang Yun Er. Kenneth Liu Mr Ng Soon Lee Mr Sim Wee Meng Mr Tan Beng Koon Er. Tan Hak Khoon Mr Roland Tan Er. Joseph Toh Siaw Hui Mr Andrew Yap Mr Nelson Yeap	<i>National University of Singapore</i> <i>Agency for Science, Technology and Research</i> <i>Singapore Electrical Contractors and Licensed Electrical Workers Association</i> <i>Nanyang Technological University</i> <i>Building and Construction Authority</i> <i>Housing & Development Board</i> <i>SP Group</i> <i>Singapore Civil Defence Force</i> <i>Individual Capacity</i> <i>Association of Consulting Engineers Singapore</i> <i>Individual Capacity</i> <i>TÜV SÜD PSB Pte Ltd</i> <i>Land Transport Authority</i> <i>Singapore Manufacturing Federation</i> <i>Individual Capacity</i> <i>National Environment Agency</i> <i>The Institution of Engineers, Singapore</i> <i>Enterprise Singapore</i> <i>Singapore Electrical Trades Association</i>

EESC set up the Technical Committee on Electrical and 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>
Members	: Mr Ang Wee Seng	<i>Singapore Semiconductor Industry Association</i>
	Er. Thomas Cheang	<i>Association of Consulting Engineers Singapore</i>
	Er. Chia Soo Ping	<i>Singapore Polytechnic</i>
	Er. Choong Po Siong	<i>Housing & Development Board</i>
	Mr Steven Ho	<i>JTC Corporation</i>
	Mr Sunny Lee Chwee Thiam	<i>Maritime & Port Authority of Singapore</i>
	Er. Ken Liew Kean Thiam	<i>Singapore Electrical Contractors and Licensed Electrical Workers Association</i>
	Er. Eric Lim	<i>Singapore Electrical Trades Association</i>
	Mr Francis Lim	<i>Land Transport Authority</i>
	Mr Seow Swee Lee	<i>PSA Corporation Limited</i>
	Dr Shan Yueyan	<i>National Metrology Centre</i>
	Assoc Prof So Ping Lam	<i>Nanyang Technological University</i>
	Mr Tan Boon Chong	<i>Singapore Manufacturing Federation</i>
Ms Tan Lay Hua	<i>SP Group</i>	
CPT Tan Ping Hao	<i>Singapore Civil Defence Force</i>	
Dr Teo Tee Hui	<i>The Institution of Engineers, Singapore</i>	

The Technical Committee sets up the Working Group on Plugs, Socket-outlets and Switches to prepare this standard. The Working Group consists of the following experts who contribute in their *individual capacity*:

	Name
Convenor	: Mr Tan Boon Chong
Secretary	: Ms Aruna Charukesi Palaninathan
	Mr Koh Lian Chong
Members	: Mr Andrew Chua Kian Chong*
	Mr Goh Sheng Sze
	Mr Vincent Loo
	Mr Daniel Ng**
	Mr Ong Ah Keong
	Mr Phua Kim Suah
	Mr Kenneth Seow
	Mr James Tan
	Mr Ting Chiong Seng
	Mr Wong Chee Kian
	Er. Yeo Kok Beng
Mr Sebastian Yeo	

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

ABB Pte Ltd

Ace Approvals Consultancy

Energy Market Authority

Enterprise Singapore

Hager Electro Systems Pte Ltd

Housing & Development Board

Intertek Testing Services (S) Pte Ltd

Land Transport Authority

Legrand (S) Pte Ltd

MK Electric (S) Pte Ltd

Singapore Electrical Testing Services

Singapore Manufacturing Federation

SP Group

TÜV SÜD PSB Pte Ltd

* Served until May 2019

** Served until April 2019

Contents

	Page
National Foreword _____	8
1 Scope _____	10
2 Conditions of use _____	10
3 Terms and definitions _____	11
4 General _____	15
5 General conditions for type testing _____	15
<i>Table 1 – Schedule of tests</i> _____	15
6 Classification _____	17
7 Marking and labelling _____	17
<i>Table 2 – Rated current and maximum fuse rating in normal use, and load for flexing and cable grip tests related to size of flexible cable</i> _____	19
8 Clearances, creepage distances and solid insulation _____	19
<i>Table 3 – Minimum clearances for basic insulation</i> _____	20
<i>Table 4 – Minimum creepage distances (mm) for basic insulation</i> _____	22
<i>Table 5 – Withstand voltages for insulation types</i> _____	22
9 Accessibility of live parts _____	23
10 Provision for earthing _____	24
<i>Table 6 – Torque values for screws and nuts</i> _____	24
11 Terminals and terminations _____	25
12 Construction of plugs _____	27
<i>Table 7 – Actuator test force</i> _____	35
13 <i>Not Used</i> _____	36
14 Resistance to ageing and to humidity _____	36
15 Insulation resistance and electric strength _____	37
16 Temperature rise _____	38
<i>Table 8 – Permitted temperature rises</i> _____	39
17 Breaking capacity of switches incorporated in fused plugs _____	39
18 Normal operation of switches _____	39
19 Connection of flexible cables and cable anchorage _____	40
<i>Table 9 – Connection of flexible cables</i> _____	42
20 Mechanical strength _____	42
21 Screws, current-carrying parts and connections _____	43
22 Resistance to heat _____	44
23 Resistance to abnormal heat and fire _____	45
<i>Table 10 – Application of glow-wire test</i> _____	46
24 Resistance to excessive residual stresses and to rusting _____	46

	Page
25	Electrical and thermal stress on clamp type (screwless) terminals _____ 47
26	Overload tests _____ 48
27	<i>Text deleted</i>
	<i>Figure 1 – Test pin (see Clause 12) _____ 49</i>
	<i>Figure 2a – Apparatus for mechanical strength test on resilient covers (see Clause 9) ____ 50</i>
	<i>Figure 2b – Hardwood block for Figure 2a _____ 51</i>
	<i>Figure 4a – Dimensions and disposition of pins (see Clause 12) _____ 52</i>
	<i>Figure 4b – Concave shrinkage allowance for ISODs _____ 54</i>
	<i>Figure 5 – Gauge for plug pins (see Clause 12, Clause 20 and Clause 22) _____ 55</i>
	<i>Figure 6 – Apparatus for testing plug cover fixing screws (see Clause 12) _____ 56</i>
	<i>Figure 7 – Mounting plate (see Clause 12) _____ 57</i>
	<i>Figure 8 – Plug pin deflection test apparatus for resilient plugs (see Clause 12) _____ 58</i>
	<i>Figure 9 – Apparatus for abrasion test on insulating sleeves of plug pins (see Clause 12)_ 60</i>
	<i>Figure 10 – Apparatus for pressure test at high temperature (see Clause 12) _____ 61</i>
	<i>Figure 11 – GO gauge for socket-outlet (see Clause 13) _____ 62</i>
	<i>Figure 17a – Test apparatus for temperature rise test (see Clause 16) _____ 63</i>
	<i>Figure 17b – Dummy front plate for temperature rise (see Clause 16) _____ 64</i>
	<i>Figure 18 – Apparatus for flexing test (see Clause 19) _____ 65</i>
	<i>Figure 19 – Solid link for test on fuse clips (see Clause 20) _____ 66</i>
	<i>Figure 20 – Tumbling barrel (see Clause 20) _____ 66</i>
	<i>Figure 23 – Apparatus for pressure test (see Clause 22) _____ 67</i>
	<i>Figure 24L – Apparatus for ball pressure test (see Clause 22) _____ 69</i>
	<i>Figure 28 – Calibrated link (see A.1) _____ 70</i>
	<i>Figure 29 – Calibration jig for calibrated link (see A.2) _____ 71</i>
	<i>Figure 32a – Apparatus for tests on plug pins: A plug pin under test (see Clause 12) ____ 72</i>
	<i>Figure 32b – Apparatus for tests on plug pins: Details of anvils (see Clause 12) _____ 73</i>
	<i>Figure 33 – Apparatus for torsion test on pins (see Clause 12) _____ 73</i>

Annexes

A	(normative) The construction and calibration of a calibrated link _____ 74
B	(normative) Measurement of clearances and creepage distances _____ 76
	<i>Table B.1 – Minimum values of width X _____ 76</i>
C	(normative) Determination of the Comparative Tracking Index (CTI) and Proof Tracking Index (PTI) _____ 81
D	(normative) Relation between rated impulse withstand voltage, rated voltage and overvoltage category _____ 82

	Page
<i>Table D.1 - Rated impulse withstand voltage for plugs energised directly from the low-voltage mains</i> _____	82
E (normative) Pollution degree _____	83
F (normative) Impulse voltage test _____	84
<i>Table F.1 – Test voltages for verifying clearances at sea level</i> _____	84
G (normative) Requirements for incorporated electronic components _____	86
H (informative) Specific structure of BS EN 50525 and its derivation from British Standards and from HD 21 and HD 22 (BS EN 50525-1:2011, National Annex NA) _____	89
<i>Table H.1 – Specific structure of BS EN 50525 and its derivation from British Standards and from HD 21 and HD 22 (BS EN 50525-1:2011, National Annex NA)</i> _____	89
I (informative) Recommendations for products that incorporate SS 145-1 plug pins _____	90
<i>Table I.1 – List of clauses</i> _____	90
J (informative) Dimensions for plug profiles _____	91
<i>Figure J.1 – Normal plug profile</i> _____	91
<i>Figure J.2 – Compact plug profile</i> _____	92
Bibliography _____	93

National Foreword

This Singapore Standard was prepared by the Working Group on Plugs, Socket-outlets and Switches set up by the Technical Committee on Electrical and Electronic Products under the purview of EESC.

This standard is a revision of SS 145 : Part 1 : 2010, "Specification for 13 A plugs and socket-outlets – Part 1: Rewirable and non-rewirable 13 A fused plugs". It is a modified adoption of BS 1363-1:2016+A1:2018, "13 A plugs, socket-outlets, adaptors and connection units – Part 1: Specification for rewirable and non-rewirable 13 A fused plugs" and is implemented with the permission of the British Standards Limited.

The following deviations have been made to suit local conditions, practices and requirements:

- Changed the ambient temperature under conditions of use for fused plugs from "-5 °C to +40 °C with the average value over 24 h not exceeding 25 °C" to "-5 °C to +40 °C with the average value over 24 h not exceeding +35 °C".
- Changed the ambient temperature of "20 °C ± 5 °C" used for test condition for fused plugs to "27 °C ± 5 °C".
- Under Clause 22.2.1,
 - Amended the test temperature for parts of insulating material not necessary to retain current-carrying parts in position, to be 75 °C ± 5 °C.
 - Amended the test temperature for parts of insulating material necessary to retain current-carrying parts in position, to be 125 °C ± 5 °C.
- For Table 1:
 - Shifted Annex C from sequence 10 to sequence 11.
 - Deleted sequence 14 on cyclic loading (plugs for electrical vehicle) as 13 A plug is prohibited for Mode 1 or Mode 2 EV charging under the local requirements on electrical vehicle charging system.
- Added local requirements in Clause 22 (see 22.2.2L) and Figure 24L. The letter "L" which follows immediately after the clause/figure number indicates a local requirement.
- Deleted clauses on electrical vehicle charging [Clauses 1, 6 (item 4), 7.1(h), 20.1.3(d) and 27] as they are preceded by local requirements on electric vehicle charging system.

To facilitate identifications, the affected texts of the British Standard which were changed within this standard are marked by a margin bar on the left.

NOTE 1 – References to BS or BS EN are replaced by applicable Singapore Standards.

NOTE 2 – Where BS EN is an adoption of IEC standard, the IEC standard should be referred to.

NOTE 3 – The numbering of the clauses, tables, figures and annexes follows that of BS 1363-1.

NOTE 4 – Texts marked as "Not used" are from the original BS 1363-1; texts marked as "Text deleted" indicate that the texts in the original BS 1363-1 are deemed not applicable and are removed for this standard.

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.*

Specification for 13 A plugs, socket-outlets, adaptors and connection units – Part 1 : Rewirable and non-rewirable 13 A fused plugs

1 Scope

This part of SS 145 specifies requirements for 13 A fused plugs having insulating sleeves on line and neutral pins, for household, commercial and light industrial purposes, with particular reference to safety in normal use. The plugs are suitable for the connection of portable appliances, sound-vision equipment, luminaries, etc. in a.c. circuits only, operating at voltages not exceeding 250 V r.m.s. at 50 Hz.

Requirements are specified for plugs incorporating a fuse link conforming to SS 167. The plugs may be rewirable or non-rewirable complete with flexible cord. Two categories of plugs are specified covering normal and rough use. Rewirable plugs are intended for use with flexible cables conforming to SS 358-5 or IEC 60227-5 having conductor cross-sectional areas from 0.5 mm² to 1.5 mm² inclusive.

NOTE 1 – See 19.1.

Non-rewirable plugs are intended for use with flexible cables having conductor cross-sectional areas not exceeding 1.5 mm².

NOTE 2 – See 19.4.

This standard also applies to non-rewirable 13 A plugs which have the earth pin replaced with a similarly dimensional protrusion made of insulating material designated as an insulated shutter opening device (ISOD) designed to operate the shutter mechanism of a socket-outlet conforming to SS 145-2.

A plug is mechanical by nature of construction. The product is therefore immune from electromagnetic interference.

Plugs incorporating switches and indicator lamps are included within the scope of this part of SS 145.

Plugs incorporating electronic components detailed in Annex G are included within the scope of this part of SS 145.

Recommendations for plug in equipment incorporating SS 145-1 plug pins are given in Annex I.

This standard does not cover plug incorporating remote control switching and remote energy monitoring functions.

NOTE 3 – The titles of the publications referred to in this part of SS 145 are listed in the bibliography.