

SS 702:2024
(ICS 29.120.30; 35.020)

SINGAPORE STANDARD

Specification for smart plugs for homes



SS 702:2024

(ICS 29.120.30; 35.020)

SINGAPORE STANDARD

Specification for smart plugs for homes

Published by Enterprise Singapore

All rights reserved. Unless otherwise specified, no part of this publication 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.

© Enterprise Singapore 2024

ISBN 978-981-5237-33-7

Contents

	Page
Foreword _____	4
1 Scope _____	6
2 Normative references _____	6
3 Definitions _____	7
4 General requirements _____	9
5 Protection from hazards _____	12
6 Physical requirements _____	18
7 Electrical requirements and simulated abnormal conditions _____	37
8 Electromagnetic requirements _____	42
9 Communication security requirements _____	43
10 Cybersecurity _____	43
11 Risk assessment _____	43

Annexes

A Measuring instruments for touch current tests _____	71
B Samples needed for tests _____	73
C Risk assessment _____	74

Tables

1 Permitted temperature rises _____	17
2 Temperature limits, materials and components _____	18
3 Actuator test force _____	27
4 Application of glow-wire test _____	31
5 Maximum current _____	39
C.1 Example of severity of harm _____	76
C.2 Probability of harm _____	77
C.3 Risk category _____	77

Figures

1 Generic circuit for 10 A smart plug _____	45
2 Test pin _____	46
3a Apparatus for mechanical strength test on resilient covers _____	47
3b Hardwood block for Figure 3a _____	48
4a Test apparatus for temperature rise test _____	49
4b Dummy front plate for temperature rise test _____	50
5 Dimensions and disposition of pins _____	51

6	Gauge for smart plug pins _____	53
7	Apparatus for tests on smart plug pins _____	54
8	Apparatus for torsion test on pins _____	55
9	Mounting plate _____	55
10	Plug pin deflection test apparatus for resilient smart plugs _____	56
11	Apparatus for abrasion test on insulating sleeves of plug pins _____	57
12	Apparatus for pressure test at high temperatures _____	58
13	Disposition of socket contacts _____	59
14	GO gauge for socket-outlet _____	60
15	Contact test gauge _____	61
16	Test apparatus and circuit for use with contact and non-contact test gauges _____	62
17	Non-contact test gauge _____	63
18	Withdrawal pull gauges for effectiveness of contact _____	64
19	Simulated plug and cord devices _____	65
20	Apparatus for calibration of turning moment of simulated plug _____	66
21	Turning moment apparatus _____	67
22	Tumbling barrel _____	68
23	Apparatus for pressure test _____	69
24	Apparatus for ball pressure test _____	70
25	Test circuit for touch current of single-phase equipment on a star TN or TT power supply system _____	70
A.1	Measuring instrument _____	71
A.2	Alternative measuring instrument _____	72
C.1	Iterative process of risk assessment and risk reduction _____	74
C.2	Risk reduction _____	76
	Bibliography _____	78

Foreword

This Singapore Standard was prepared by the Working Group on the Safety of Smart Devices appointed by the Technical Committee on Electrical and Electronic Products under the purview of the Electrical and Electronic Standards Committee.

In August 2015, the Working Group was set up to evaluate the potential safety risks posed by smart plugs and identify relevant test clauses to mitigate these risks. A Technical Reference (TR) was then developed and published in 2016.

TR 54:2016, "Smart plugs for homes" was a provisional standard developed with the intent to address demand from the smart home concept. The aim was to use the experience gained from the initial trials to update the Technical Reference before elevating it to a Singapore Standard. TR 54 was reviewed and re-numbered as SS 702.

While TR 54 covers requirements specific to public housing, the scope of SS 702 has been expanded to cover private housing as well.

It is presupposed that in the course of their work, users will comply with all relevant regulatory and statutory requirements. The Singapore Standards Council and Enterprise Singapore shall not be responsible for identifying all of such legal obligations.

In preparing this Singapore Standard, reference was made to the following standards:

1. BS 1363-3:2023 13 A plugs, socket-outlets, adaptors and connection units. Part 3: Adaptors – Specification
2. IEC 60950-1:2005 Information technology equipment – Safety – Part 1: General requirements
3. IEC 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.
4. SS 145-1:2019 Specifications for 13 A plugs, socket-outlets, adaptors and connection units – Part 1: Rewirable and non-rewireable 13 A fused plugs
5. SS 145-3:2020 Specification for 13 A plugs, socket-outlets, adaptors and connection units – Part 3: Adaptors

Permission has been sought from the following organisations for the reproduction of materials from their publications into this standard:

1. BSI Standards Limited

BS 1363-3:2023 13 A plugs, socket-outlets, adaptors and connection units. Part 3: Adaptors – Specification.

Specification is granted by BSI Standards Limited (BSI). No other use of this material is permitted.

2. International Electrotechnical Commission (IEC)

- IEC 60950-1:2005 Information technology equipment – Safety – Part 1: General requirements
- IEC 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.

All such extracts are copyright of IEC, Geneva, Switzerland. All rights reserved. Further information on the IEC is available from www.iec.ch. IEC has no responsibility for the placement and context in which the extracts and contents are reproduced by the author, nor is IEC in any way responsible for the other content or accuracy therein.

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 smart plugs for homes

1 Scope

This Singapore Standard (SS) covers specific safety and performance requirements of a smart plug that is constructed as an integral unit incorporating both a 3-pin plug portion and a shuttered socket-outlet portion. These portions come with built-in functions to facilitate remote controlling or monitoring of home appliances, energy measurement, and other optional functions. Smart plugs, as specified in this SS, are suitable for the connection of most home appliances, portable appliances, sound-vision equipment, luminaires, etc. in a.c. circuits only, operating at voltages not exceeding 250 V r.m.s. at 50 Hz for home usage.

Requirements are specified for the low voltage and extra-low voltage components and the essential tests under normal and abnormal conditions with the smart plug as an assembly for delivering a current not exceeding 10 A and at a nominal voltage of 230 V a.c. The requirements for communication protocol and security standards are also specified in this SS.

Smart plugs specified in this SS are for remote controlling or monitoring of only one home appliance or device at any one time.

The shuttered socket contacts of the smart plug are specified for connection to a 13 A plug with pins configuration complying with SS 145-1.

It is important to note that the smart plug specified in this SS is suitable for home use under the following conditions:

- The smart plug is connected directly to a fixed wall socket-outlet as specified according to SS 145-2;
- At any one time, only a single appliance or device is connected to the shuttered socket-outlet of the smart plug and no adaptor, portable socket-outlet or similar is used;
- The fixed electrical installation is a TT or TN-S earthing system as specified according to SS 638:2018.

Typically, users read the operation manual accompanied with the smart plug before using the product.

The use of the smart plug for controlling medical appliances, portable socket-outlets, cable reels, multi-way adaptors, appliances (such as electric iron or electric kettles) and similar devices, that require attention while in use, is likely to endanger safety to users. Safety instructions are included to warn users of the danger involved.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition (including any amendments) applies.

BS 4662	Boxes for flush mounting of electrical accessories – Requirements, test methods and dimensions
BS 6004	Electric cables – PVC insulated and PVC sheathed cables for voltages up to and including 300/500 V, for electric power and lighting