



भारतीय मानक ब्यूरो

(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)

**BUREAU OF INDIAN STANDARDS**

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*Draft for comments only.*

ETD 14 () WC  
November 2024

## WIDE CIRCULATION DRAFT

**Our Reference: ETD 14/T-1**

**18 November 2024**

**TECHNICAL COMMITTEE: ELECTRICAL WIRING ACCESSORIES SECTIONAL COMMITTEE, ETD 14**

### ADDRESSED TO:

1. All Members of Electrotechnical Division Council, ETDC
2. All Members of Electrical Wiring Accessories Sectional Committee, ETD 14
3. All others interested.

Dear Sir/ Madam,

Please find enclosed the following draft:

Doc No.	Title
ETD 14 (24538) WC	Socket-Outlets Incorporating USB Power Supply-Specifications

Kindly examine the attached draft and forward your views stating any difficulties which you are likely to experience in your business or profession if this is finally adopted as National Standard.

**Last Date for Comments: 3 December 2024**

Comments if any, may please be made in the enclosed format and emailed at [etd@bis.gov.in](mailto:etd@bis.gov.in) or sent at the above address. Additionally, comments may be sent online through the BIS e-governance portal, [www.manakonline.in](http://www.manakonline.in).

In case no comments are received or comments received are of editorial nature, kindly permit us to presume your approval for the above document as finalized. However, in case comments, technical in nature are received, then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website [www.bis.gov.in](http://www.bis.gov.in).

Thanking you,

**Yours faithfully,**  
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**FORMAT FOR SENDING COMMENTS ON THE DOCUMENT**

[Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/table/figure, etc, be stated on a fresh row. Information/comments should include reasons for comments, technical references and suggestions for modified wordings of the clause. **Comments through e-mail to [eedd@bis.gov.in](mailto:eedd@bis.gov.in) shall be appreciated.**]

**Doc. No.:** ETD 14 (24538) WC

**BIS Letter Ref:** ETD 14/T-1

**Title:** Socket-Outlets Incorporating USB Power Supply- Specifications

Last Date for Comments: 3 December 2024

**Name of the Commentator/ Organization:**

Clause/ Para/ Table/ Figure No. commented	Type of Comment (Technical/ Editorial/ General)	Comments/Modified Wordings	Justification of Proposed Change

*NOTE- Kindly insert more rows as necessary for each clause/table, etc.*

**BUREAU OF INDIAN STANDARDS**

**DRAFT FOR COMMENTS ONLY**

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*Draft Indian Standard*

**SOCKET-OUTLETS INCORPORATING  
USB POWER SUPPLY- SPECIFICATIONS**

**Electrical Wiring Accessories Sectional Committee, ETD 14**

Last Date of Comments:  
3 December 2024

**FOREWORD**

(Formal clauses will be added later)

This standard specifies requirements for socket-outlets incorporating USB for power supply . This standard is to be read in conjunction with IS 1293: 2019 ‘Plugs and socket - Outlets of rated Voltage up to and including 250 Volts and rated current up to and including 16 amperes - Specification (Fourth Revision)’. For the sake of convenience, the clauses of this standard corresponds to those of IS 1293. Wherever possible instead of reproducing full text of each clause, clauses of IS 1293, which are applicable (which means that relevant provisions of the clause apply) or not applicable and the sub-clauses or portion there of which are not applicable are indicated as under:

- a) In case of a clause where it is applicable/Not applicable, the wording used is ‘This clause of IS 1293 is applicable/ not applicable’; and
- b) In case of sub-clause or part there of ‘Not applicable’.

Wherever a sub-clause of IS 1293 is to be replaced by a new text, it has been indicated as under:

‘Replacement or Modification — Followed by the new text.’

Any addition to the existing provision of a sub-clause of IS 1293 has been indicated as under:

‘Addition — Followed by the text of the additional matter’.

Any Deletion to the existing provision of a sub-clause of IS 1293 has been indicated as under

‘Delete- Followed by content to be deleted.’

Clauses/tables which are additional to those of IS 1293 are numbered starting from 101 and additional sub-clauses are numbered with the main clause number followed by 101, 102, etc. for example, **7.101**, Should however, any deviation exist between IS 1293 and this standard, the provision of the latter shall apply.

This standard is based on IEC 60884-3-1:2021 ‘Plugs and socket-outlets for household and similar

purposes – Part 3-1: Particular requirements for socket-outlets incorporating USB power supply’.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test or analysis shall be rounded off in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Draft Indian Standard*

**SOCKET-OUTLETS INCORPORATING  
USB POWER SUPPLY- SPECIFICATIONS**

**1 SCOPE**

Clause 1 of IS 1293 is applicable except as follows:

Replace the first paragraph by the following:

This part of IS 1293 applies to fixed or portable socket-outlets for a.c. only, with or without earthing contact, with a rated voltage greater than 50 V but not exceeding 250V and a rated current not exceeding 16 A, intended for household and similar purposes, either indoors or outdoors, incorporating USB power supply.

This document defines the safety and EMC requirements for socket-outlets incorporating USB power supply.

Specifications, performance and dimensional requirements of the USB technologies are not covered by this document; these are defined in the relevant part(s) of IS/IEC 62680.

**2 REFERENCES**

Standards, necessary adjuncts to this standard are given at Annex BB

**3 TERMS AND DEFINITIONS**

Clause 3 of IS 1293 is applicable except as follows:

Replacement of Note:

**NOTE** — The term "accessory" is used as a general term covering socket-outlets and socket-outlets incorporating a USB for power supply; the term "portable accessory" covers portable socket-outlets and portable socket-outlets incorporating a USB for power supply.

Add the following terms and definitions:

**3.101 Universal Serial Bus USB**

Standardized bus using serial transmission.

**3.102 USB Port**

IS/IEC 62680 series female connector used to supply power to a connected portable device.

### **3.103 USB Power Supply**

Electronic circuit, including connections to the socket-outlet, PCB, connectors, internal wiring and similar that converts mains voltage into a lower voltage with smoothed direct current that is delivered through one or more USB port.

**NOTE** — USB connector types are defined in the IS/IEC 62680 series.

**3.104 SELV** — Electric system in which the voltage cannot exceed the value of extra-low voltage:

- a) under normal conditions and
- b) under single fault conditions, including earth faults in other electric circuits

**NOTE** — SELV is the abbreviation for safety extra-low voltage.

### **3.105 Hazardous Live Part**

Live part with a voltage higher than 25 V AC or 60 V DC ripple free in dry conditions or 12 V AC or 30 V DC in wet conditions.

#### **NOTES**

- 1 Ripple free is conventionally an RMS ripple voltage not more than 10 % of the DC component.
- 2 For the purpose of this document, parts of the USB ports delivering SELV are not considered to be hazardous live parts as the output voltage of the USB remains below the limits of hazardous live parts.

### **3.106 Rated USB Output Voltage**

Voltage assigned by the manufacturer to USB port.

### **3.107 Rated USB Output Current**

Current assigned by the manufacturer to USB port.

### **3.108 Rated USB Output Power**

Electric power output assigned by the manufacturer to USB port.

**NOTE** — The rated output power is expressed in W.

### **3.109 Maximum USB Output Power**

Highest output power attainable from the USB power supply.

#### **NOTES**

- 1 The maximum output power can be different from the rated output power.
- 2 The maximum output power can be shared or cumulated through several ports.

## **4 GENERAL REQUIREMENTS**

Clause 4 of IS 1293 is applicable except as follows:

Add the following at the end of the clause:

Where reference to IS/IEC 62368-1 and IEC 62368-3 is made in this document, the following parameters are to be applied:

- a) Overvoltage category:
  - 1) Portable accessories: Minimum Cat II
  - 2) Fixed accessories: Minimum Cat III
- b) Pollution degree: 2
- c) Material class: min. III a (CTI = 175)
- d) Classification of use: By ordinary persons.

## **5 GENERAL REMARKS ON TESTS**

Clause 5 of IS 1293 is applicable except as follows.

### **5.1 Additional Samples**

5.1 of IS 1293 is applicable except as follows:

Add the following before the last paragraph:

For the test of 17.2.1 b), 17.3, Clause 20, Clause 21 and Clause 22, additional specimens with the USB power supply unit disconnected may be necessary.

For the tests of 24.101 a new set of specimens is required.

For the tests of Clause 101, additional specimens may be necessary

For the tests of 102.3, additional specimens are required.

Replace Table 1 of IS 1293 with the following:

**Table 1 Survey of Specimens Needed for Tests**  
(Clause 5.1)

CLAUSES AND SUBCLAUSES OF THIS DOCUMENT		NUMBER OF SPECIMENS	
		FIXED SOCKET OUTLETS	PORTABLE SOCKET- OUTLETS
6	Ratings	A	A
7	Classification	A	A
8	Marking	A	A
9	Checking of dimensions	ABC	ABC
10	Protection against electric shock <sup>a</sup>	ABC	ABC
11	Provision for earthing	ABC	ABC
12	Terminals and terminations	ABC <sup>b, c</sup>	ABC
13	Construction of fixed socket-outlets	ABC <sup>d, e</sup>	–
14	Construction of plugs and portable socket-outlets	–	ABC <sup>d, e</sup>
15	Interlocked socket-outlets	ABC	ABC
16	Resistance to ageing, to harmful ingress of water and to humidity	ABC <sup>f</sup> GHI <sup>o</sup>	ABC <sup>f</sup> GHI <sup>o</sup>
17	Insulation resistance and electric strength	ABC <sup>g</sup>	ABC <sup>g</sup>
17.2.1 b)	Socket-outlets insulation resistance	GHI <sup>o</sup>	GHI <sup>o</sup>
17.3	Electric strength test	GHI <sup>o</sup>	GHI <sup>o</sup>
18	Operation of earthing contacts	ABC	ABC
19.10 1 a)	Socket-outlets incorporating USB power supply temperature rise	GHI <sup>o</sup>	GHI <sup>o</sup>
19.10 1 b)	Socket-outlets incorporating USB power supply temperature rise	ABC	ABC
19.10 1 c)	Socket-outlets incorporating USB power supply temperature rise	ABC	ABC
20	Breaking capacity	GHI <sup>o</sup>	GHI <sup>o</sup>
21	Normal operation	GHI <sup>o</sup>	GHI <sup>o</sup>
22	Force necessary to withdraw the plug	GHI <sup>o</sup>	GHI <sup>o</sup>
23	Flexible cables and their connection	–	ABC <sup>h</sup>
24	Mechanical strength	ABC <sup>i, k</sup>	ABC
24.1 01	Mechanical tests of USB ports	KLM <sup>q</sup>	KLM <sup>q</sup>
25	Resistance to heat <sup>i</sup>	ABC	ABC



CLAUSES AND SUBCLAUSES OF THIS DOCUMENT		NUMBER OF SPECIMENS	
		FIXED SOCKETOUT LETS	PORTABLE SOCKET OUTLETS
26	Screws, current-carrying parts and connections	ABC	ABC
27	Creepage distances, clearances and distances through sealing compound	ABC	ABC
29	Resistance to rusting	ABC	ABC
28.1	Resistance to abnormal heat and to fire	DEF	DEF
28.2	Resistance to tracking <sup>k</sup>	DEF	DEF
31	EMC Requirements	JP	JP
101	Abnormal conditions <sup>q</sup>	NOP <sup>r</sup>	NOP <sup>r</sup>
102.3	Application of the clauses of IS/IEC 62368-1 and IEC 62368-3 <sup>q</sup>	QRS <sup>t</sup>	QRS <sup>t</sup>
<p>a) One extra set of specimens is required for the test of 10.6.</p> <p>b) One extra set of specimens is needed for each type of conductor for 12.2.6.</p> <p>c) One extra set of specimens can be required for the test of 12.3.10. Five extra screw less terminals are used for the test of 12.3.11 and one extra set of specimens is used for the test of 12.3.12.</p> <p>d) One extra set of membranes is required for each of the tests of 13.22 and 13.23.</p> <p>e) One extra set of specimens can be required to verify that the mechanical strength of the pin does not depend on the plastic material.</p> <p>f) One extra set of specimens is needed for 16.1.</p> <p>g) One extra set of specimens of socket-outlets fitted with pilot lamps may be used for the tests of Clause 17.</p> <p>h) One extra set of specimens is required for the tests of 23.2 and 23.4 for non-rewritable accessories for each type of cable and cross-sectional area.</p> <p>i) One extra set of specimens is required for the tests of 24.9 for shuttered socket-outlets.</p> <p>j) Void.</p> <p>k) One extra set of specimens is required for the tests of 24.13.2 and 24.13.3.</p> <p>l) One extra set of aged specimens can be used for the tests of 25.3 and 25.4.</p> <p>m) One extra set of specimens can be used.</p> <p>n) Void</p> <p>o) One extra set of aged specimens can be used with the USB power supply disconnected. The set of specimens ABC can be used if it is possible to easily disconnect the USB power supply.</p> <p>p) New specimen can be used if the specimen is no longer working.</p> <p>q) For these tests, additional specimens can be necessary.</p> <p>r) For these tests, additional specimens can be necessary.</p> <p>s) For these tests, additional specimens can be necessary.</p> <p>t) For these tests, additional specimens are required.</p>			

**6 RATINGS**

Clause 6 of IS 1293 is applicable except as follows.

Add the following new subclauses:

**6.101 Rated Voltage**

The rated voltage of the accessory shall be selected by the manufacturer according to the nominal voltage of the fixed electrical installation where the accessory is intended to be installed.

**6.102 USB Output Ratings**

The USB power supply shall have a rated output voltage and rated output current or rated output power not exceeding the specifications of the USB connectors, as defined in the relevant part(s) of IS/IEC 62680.

Compliance is checked by inspection of the markings and/or the manufacturer's documentation.

**7 CLASSIFICATION**

Clause 7 of IS 1293 is applicable.

**8 MARKING**

Clause 8 of IS 1293 is applicable except as follows:

**8.1 General**

8.1 of IS 1293 is applicable except as follows:

Add the following paragraphs at the end of the sub clause:

In addition, accessories shall be marked with:

- a) Rated output power of USB port in Watt, unless the output rating is expressed in Volt and Ampere;
- b) Rated input frequency in Hertz, unless the power supply is designed for both 50 Hz and 60 Hz.

**8.2 Symbols**

Add the following items before Note.

Direct Current.....     or DC  
  

Watt.....W

Hertz.....Hz

Add the following Note after Note.

**NOTE** — The following is an example of the marking for current, voltage and nature of USB output:

5V      2.1A, alternatively:  $\frac{5V}{2.1A}$       , alternatively: 5V DC 2100mA

Add the following new sub clauses:

### **8.101 Particular Requirements for Socket-Outlets Incorporating a USB Power Supply**

The following additional information is recommended to be marked on the accessory and/or given in the manufacturer's documentation:

- a) rated input current;
- b) nature of the output voltage;
- c) rated output voltage;
- d) rated output current;
- e) rated output power.

The minimum conductor size used for the connection of a USB power supply with dedicated terminals, according to Clause 12 of this document, shall be marked on the accessories and/or mentioned in the manufacturer's documentation.

Compliance is checked by inspection.

Accessories incorporating a USB power supply are not class II equipment and shall not be marked with the symbol for class II construction.

## **9 CHECKING OF DIMENSIONS**

IS 1293 - Clause 9 is applicable except as follows:

### **9.1 General**

Add the following paragraph at the end of 9.1:

Relevant mechanical dimensions of the USB connectors are given in the associated drawings in the relevant part(s) of IS/IEC 62680.

Mechanical interference between either the relevant plug(s) and the USB port(s) preventing their normal insertion and withdrawal or causing a partial insertion condition shall be prevented when considering basic plugs, and as far as possible when considering the wide diversity of adaptors and plugs shape.

Compliance is checked by inspection and measurement in reference to the relevant standard sheet or USB connectors' design.

### **9.2 Permitted Deviations**

9.2 is not applicable to USB connectors.

## **10 PROTECTION AGAINST ELECTRIC SHOCK**

IS 1293 - Clause 10 is applicable except as follows:

### **10.1** *Addition: In the beginning of the clause:*

Socket-outlets shall be so designed and constructed that when they are mounted and/or wired as for normal use, hazardous live parts are not accessible, even after removal of parts which can be removed without the use of a tool.

### **10.2** *Addition: at the end of clause*

10.2 is not applicable to the accessible metal parts of USB ports.

### **10.4** *Addition: at the end of the clause*

It shall not be possible to introduce a plug making contact between a hazardous live part of the socket-outlet and a conductive part of the USB port(s).

## **11 PROVISION FOR EARTHING**

IS 1293- Clause 11 is applicable.

## **12 TERMINALS AND TERMINATIONS**

IS 1293- Clause 12 is applicable except as follows:

Add the following paragraphs at the end of 12.1:

Dedicated terminals for a USB power supply shall accept at least one conductor of the same type and size as the socket-outlet in which it is incorporated.

If socket-outlet terminals are used for the connection of a USB power supply, the terminal connection capacity requirements of IS 1293- still apply after connection.

In addition, the minimum size of the conductor to be used shall be marked on the accessories and/or mentioned in the manufacturer's documentation.

## **13 CONSTRUCTION OF FIXED SOCKET-OUTLETS**

IS 1293 - Clause 13 is applicable except as follows:

Add the following new sub clauses:

### **13.101 Conductors used in a USB Power Supply**

Internal wiring that is accessible during and/or after installation, if any, shall be secured in such a way that it cannot become loose or detached and impair the safety of the accessory.

Conductor terminations using solder shall be mechanically secured. Hooking the conductor through a hole of the conductive termination and affixing conductors in thermal tubing, sealing compound or glue are examples of acceptable securement.

This requirement is not applicable to internal wiring that cannot be so displaced such that clearances or creepage distances are reduced below the specified values or such that, if it becomes loose, it cannot create hazardous connections between primary and secondary circuits.

Compliance is checked by inspection.

The insulation of conductors shall provide sufficient resistance to the foreseeable temperatures inside the device and/or the enclosure when installed in normal use. In addition, the insulation of conductors running between circuits of different voltage bands shall meet the insulation requirement of the highest voltage present.

The means used for securing the conductor in place shall be selected according to the foreseeable temperature conditions present inside the device/enclosure.

The means used to secure the conductor shall not reduce the clearances and creepage distances.

Compliance is checked by the tests of Clause 25 and Clause 27.

## **14 CONSTRUCTION OF PLUGS AND PORTABLE SOCKET-OUTLETS**

IS 1293 - Clause 14 is applicable except as follows:

### **14.22 Components Incorporated in Accessories**

This sub clause is not applicable.

Add the following new subclauses:

#### **14.101 Conductors Used in a USB Power Supply**

Internal wiring, if any, shall be secured in such a way that it cannot become loose or detached and impair the safety of the product.

Conductor terminations using solder shall be mechanically secured. Hooking the conductor through a hole of the conductive termination and affixing conductors in thermal tubing, sealing compound or glue are examples of acceptable securement.

This requirement is not applicable to internal wiring that cannot be so displaced such that clearances or creepage distances are reduced below the specified values or such that, if it becomes loose, it cannot create hazardous connections between primary and secondary circuits.

Compliance is checked by inspection.

The insulation of conductors shall provide sufficient resistance to the foreseeable temperatures inside the device and/or the enclosure when installed in normal use. In addition, the insulation of conductors running between circuits of different voltage bands shall meet the insulation requirement of the highest voltage present.

Means used for the method to secure the conductor in place shall be selected according to the foreseeable temperature conditions present inside the device enclosure.

Means used to secure the conductor shall not reduce the clearances and creep age distances.

Compliance is checked by the tests of Clause 25 and Clause 27.

## **15 INTERLOCKED SOCKET - OUTLETS**

IS 1293 - Clause 15 is applicable.

## **16 RESISTANCE TO AGEING, PROTECTION PROVIDED BY ENCLOSURES, AND RESISTANCE TO HUMIDITY**

IS 1293 - Clause 16 is applicable.

## **17 INSULATION RESISTANCE AND ELECTRIC STRENGTH**

IS 1293 - Clause 17 is applicable except as follows:

**17.1.1** Replace b) as follows:

b) between each pole in turn and all others, these being connected to the body with a plug in engagement; during this test the USB power supply shall be disconnected;

**NOTE** — For these tests, additional specimens can be necessary.

**17.1.2** Add the following sentence after the first paragraph:

For this test, the USB power supply shall be disconnected.

**NOTE** — For these tests, additional specimens can be necessary.

Add the following new subclauses:

### **17.101 Insulation Resistance Test with the USB Power Supply Connected.**

The test of **17.1.2** is repeated between the following parts with the USB power supply connected, having:

- a) 7 M $\Omega$  between SELV circuits and other circuit(s) having a higher voltage than SELV;
- b) M $\Omega$  between SELV circuits.

### **17.102 Electric Strength Test with the USB Power Supply Connected**

The test of **17.1.1** is repeated between the following parts with the USB power supply connected, having:

- a) 3750 V between SELV circuits and other circuit(s) having a higher voltage than SELV
- b) 500 V between SELV circuits.

The voltage is applied for duration of 1 min.

### **17.103 Internal Wiring Insulation**

Internal wiring shall not reduce the insulation resistance as defined in Clause 17.

Compliance is checked by inspection with the conductors in the most onerous position.

## **18 OPERATION OF EARTHING CONTACTS**

IS 1293 - Clause 18 is applicable.

## **19 TEMPERATURE RISE**

IS 1293 - Clause 19 is applicable except as follows:

Add a new dash to the end of the list in the second paragraph, as follows:

- a) Accessory for which 19.101 applies.

Add the following new subclauses:

### **19.101 Temperature Rise Test for Socket-Outlets Incorporating a USB Power Supply**

Socket-outlets are tested according to the tests described in a), b) and c) below:

- a) According to clause 19 of IS 1293 with the USB power supply connected but not loaded.

**NOTE** — For these tests, additional specimens can be necessary.

For b) and c), the earthing circuit, if any, is not tested.

- b) According to clause 19 of IS 1293 with the socket-outlet loaded at rated voltage and rated current applied until the temperature rise reaches a steady state condition or for 4 h, whichever is shorter. A steady state condition being where the temperature rise does not exceed 1 K/h. The USB power supply is loaded with the most onerous combination of rated output voltage and current.

The test in c) is performed only if the USB power supply has a temperature protection that operates during test b).

a) The test in b) is repeated with the socket-outlet not loaded and the USB power supply loaded with the most onerous combination of rated output voltage and current; the temperature protection shall not operate.

During the tests in b) and c) the temperature rise shall be measured and shall not be higher than the values given in the column concerning 19.101 in Table 101.

After these tests, the accessory shall be in operating condition.

**Table 101 – Permissible Temperature Rise Value**  
(Clause 19.101)

PARTS OF THE SOCKET-OUTLET INCORPORATING USB POWER SUPPLY	PERMISSIBLE TEMPERATURE RISE	
	K	
	SUBCLAU SE 19.101	CLAUSE103
External access		
Metal parts      Rocker, cover or cover-plate, etc.	40	75
Enclosure <sup>a</sup>	50	75
Non-metallic parts      Rocker, cover or cover-plate, etc. <sup>b</sup>	60	75
Enclosure <sup>a, b</sup>	70	75
Inside of enclosures of insulating material	c	c
Windings <sup>d</sup>		
Class A	75	115
Class E	90	130
Class B	95	140
Class F	115	155
Class H	140	175
Class 200	160	195
Class 220	180	215
Class 250	210	245
Core laminations	As for relevant windings	
Other insulations <sup>d, g</sup> except thermoplastic		
Non-impregnated paper	65	80
Non-impregnated cardboard	70	90
Impregnated cotton, silk, paper and textile, urea resins	80	100
Laminates bonded with phenol-formaldehyde resins, phenol-formaldehyde mouldings with cellulose fillers	95	120
Phenol-formaldehyde mouldings with mineral fillers	105	140



Laminates bonded with epoxy resins	130 <sup>i</sup>	160 <sup>h</sup>
Natural rubber	55	110
Thermoplastic materials <sup>e</sup>	f	
Terminals	45	110 <sup>j</sup>
Parts which can come into contact with cable insulation when installed	55	110

- a) The values of the permissible temperature rises are based on an ambient temperature of 25 °C, but the measurements are made under normal conditions.
- b) For areas not exceeding 5 cm<sup>2</sup> and which are not likely to be touched in normal use, temperature rises up to 75 K are allowed under normal operating conditions.
- c) If these temperature rises are higher than those allowed by the class of the relevant insulating material, the nature of the material is the governing factor.
- d) The permissible temperature rises for the inside of enclosures of insulating material are those indicated for the relevant materials.
- e) For the purpose of this document, the permissible temperature rises are based on the recommendations in IS 1271. The materials quoted above are shown only as examples. If materials other than those listed in IS 1271 are used, the maximum temperatures shall not exceed those which have been proved to be satisfactory.
- f) Natural and synthetic rubbers are not considered as being thermoplastic materials.
- g) Owing to the wide variety of thermoplastic materials, it is not possible to specify permissible temperature rises for them. While the matter is under consideration, the following method shall be used.
- h) The softening temperature of the material is determined on a separate specimen, under the conditions specified in IS 13360 (Part 6/Sec 1), modified as follows:
- 1) The depth of penetration is 0,1 mm
  - 2) The total thrust of 10 N is applied before the dial gauge is set to zero or its initial reading noted.
- i) The temperature limits to be considered for determining the temperature rises are:
- 1) Under normal operating conditions, a temperature 10 °C lower than the softening temperature as obtained under list item 1);
  - 2) Under fault conditions, the softening temperature itself.
- j) This Table 101 does not apply to components which comply with relevant IEC International Standards.
- k) The temperature rise can exceed the above value (160 K, for Clause 101) by not more than 100 K for a maximum period of 1 min.
- l) For the test of 19.101 the temperature rise shall not exceed the typical value of the maximum operational temperature (MOT) of the printed circuit board as given in the data sheets.
- m) This value is reduced to 55 K for the test of 101.2.2.3.

## 20 BREAKING CAPACITY

IS 1293 - Clause 20 is applicable.

Add the following paragraphs after the third paragraph:

For this test, at least one pole of the USB power supply shall be disconnected.

**NOTE** — For these tests, additional specimens can be necessary.

## **21 NORMAL OPERATION**

IS 1293 - Clause 21 is applicable, except as follows:

Replace the paragraph before Note 2 (the note that is the penultimate sentence of Clause 21) with the following:

The specimens shall then comply with the requirements of 21.101 a), the test current being equal to the test current required for the normal operation test of this Clause 21 and they shall withstand an electric strength test carried out according to 17.3, the test voltage being reduced to 1 500 V for accessories having a rated voltage of 250 V and to 1 000 V for accessories having a rated voltage of 130 V.

**NOTE** — For these tests, additional specimens can be necessary.

Add the following new subclauses:

### **21.101 Electrical Strength after Normal Operation**

A voltage of 3750 V RMS is applied for 1 min between the primary and the secondary side of the USB power supply.

Initially, not more than half the specified voltage is applied, then it is raised rapidly to the full value.

No flashover or breakdown shall occur during the test.

The high-voltage transformer used for the test should be so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is at least 200 mA.

The overcurrent relay should not trip when the output current is less than 100 mA.

Care is taken that the RMS value of the test voltage applied is measured within  $\pm 3\%$ . Glow discharges without drop in the voltage are neglected.

## **22 FORCE NECESSARY TO WITHDRAW THE PLUG**

IS 1293 - Clause 22 is applicable.

## **23 FLEXIBLE CABLES AND THEIR CONNECTION**

IS 1293 - Clause 23 is applicable.

## **24 MECHANICAL STRENGTH**

IS 1293 - Clause 24 is applicable except as follows:

### **24.10 Test for Multiple Portable Socket-Outlets**

Add the following paragraph after the last paragraph:

After the test of 24.10, the test of 17.102 shall be repeated. Add the following new subclauses:

#### **24.101 Mechanical Tests of USB Ports**

##### **24.101.1 General**

USB ports of socket-outlets shall have adequate mechanical strength to withstand the stresses imposed during installation and use.

Compliance is checked by the tests of 24.101.2, 24.101.3 and 24.101.4, which are carried out on a new set of specimens which have been previously submitted to the tests of 16.1.

Samples are tested with test plugs having the mechanical dimensions complying with the associated drawings in the relevant part(s) of IS/IEC 62680.

The compliance criteria for the tests of **24.101.2**, **24.101.3** and **24.101.4** are as follows:

After the tests, samples shall remain in a safe condition. They shall not be dangerous, in particular, they shall not be damaged in such a way that there is access to hazardous live parts with the test probe B of IEC 61032, no short circuit in the primary circuit shall be detected, creep age and clearances shall still comply with the values given in Table 26 and the USB power supply shall not be displaced from its initial position in the accessory in such a way that the safety is impaired.

Compliance is checked by inspection.

##### **24.101.2 USB Port Lateral Strain Test**

The samples are checked by applying a torque of 0.2 Nm on the USB port.

A test plug of the same type is introduced inside the USB port and a torque of 0.2 Nm is applied on the USB port. The reference point is the engagement face of the metallic shield of the USB connector.

The torque is applied for 60 s + 5 s in a perpendicular direction to the axis of insertion on the plug, downward, and made four times, the accessory being turned through 90° after each engagement.

##### **24.101.3 Resistance to mechanical force on a USB port during insertion**

USB ports shall withstand the mechanical force which can be expected in normal use when inserting a USB plug.

The specimens are tested with the following tests in a) and then b):

- a) A test plug of the same type is introduced and withdrawn manually 50 times.
- b) The test plug is introduced and a force of 40 N is applied for 1 min in the direction of engagement of the plug in the USB port, then the plug is withdrawn.

#### **24.101.4 Impact Test**

The specimens are checked by applying blows by means of the pendulum hammer test apparatus as described in IS 9000 (Part 7/ Sec 7) (test EHA), with an equivalent mass of 250 g.

The accessories are tested in the same conditions as described in 24.1.

Blows are applied on the four sides of the USB plug when inserted and in a direction perpendicular to the axis of insertion.

The blows shall be applied as close as possible to the front surface of the accessory.

The test conditions are as defined in Table 23, condition iii) (80 mm).

#### **25 RESISTANCE TO HEAT**

IS 1293 - Clause 25 is applicable.

#### **26 SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS**

IS 1293 - Clause 26 is applicable.

#### **27 CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH SEALING COMPOUND**

IS 1293 - Clause 27 is applicable except as follows:

Add the following items iv), o), p), q) along with an additional footnote, i.e. "7", to IS 1293— Table 5, as follows:

iv) Creepage distances and clearances that apply to the interface and connections between the socket-outlet and the USB power supply	
o) between hazardous live parts and SELV parts	6 mm <sup>7</sup>
p) between metal frame supporting the main part of socket-outlet and SELV parts	3 mm
q) accessible earthed metal parts and SELV parts	1.5 mm
7) This distance can be reduced to 5.5 mm when reinforced insulation construction is considered.	

## **28 RESISTANCE OF INSULATING MATERIAL TO ABNORMAL HEAT, TO FIRE AND TO TRACKING**

IS 1293 - Clause 28 is applicable except as follows:

**28.1.2** Not applicable.

## **29 RESISTANCE TO RUSTING**

IS 1293 - Clause 29 is applicable.

## **30 ADDITIONAL TESTS ON PINS PROVIDED WITH INSULATING SLEEVES**

IS 1293 - Clause 30 is not applicable.

## **101 EMC REQUIREMENTS**

### **101.1 General**

Accessories shall be designed to operate correctly under the conditions of electromagnetic environment in which they are intended to be used.

Unless otherwise specified, the accessory shall be installed and used according to the manufacturer's documentation.

The tests are carried out with one new specimen.

The test is performed on the complete accessory, the USB power supply being connected as in normal use.

The USB cable shall be connected on one side to the USB port of the USB power supply and on the other side to a representative load with the following characteristics:

- a) A capacitance of  $(1 \pm 0.1) \mu\text{F}$  between the voltage line of the USB interface ( $V_{\text{bus}}$ ) and ground (GND) terminals of the USB port. This capacitance shall have a typical equivalent series resistance (ESR) of  $0.6 \Omega$  at 10 kHz and  $0.01 \Omega$  at 1 MHz;
- b) A variable or switchable resistance between the  $V_{\text{bus}}$  and GND terminals of the USB port to draw 100 % of the rated power of the USB power supply.

USB shielded cable(s) of at least 1 m shall be used when a load is applied to the USB power supply during tests. The USB cable shall have a dedicated power return conductor. The power return shall not go through the shield.

**NOTE** — When testing USB power supply having several ports, it can be necessary to use several cables.

Compliance is checked by the tests of **101.2** and **101.3**.

## 101.2 Immunity

### 101.2.1 General

Accessories shall be designed so that the USB power supply is protected against interference. The accessory shall be tested according to Table 102.

**Table 102 Immunity Tests (Overview)**  
(Clause 101.2.1)

EM phenomena	Test specification given in this document	Test set-up	Subclause in this document
Voltage dips and short interruptions	Table 103	IS 14700 (Part 4/Sec 11)	101.2.2
Surge	Table 104	IS 14700 (Part 4/Sec 5)	101.2.3
Fast transients (burst)	Table 105	IS 14700 (Part 4/Sec 4)	101.2.4
Electrostatic discharge	$\pm 4$ kV contact discharge $\pm 2$ kV, 4 kV and 8 kV air discharge	IS 14700 (Part 4/Sec 2)	101.2.5
Radiated electromagnetic field test	3 V/m	IS 14700 (Part 4/Sec 3)	101.2.6
Radio frequency voltage	3 V RMS	IS 14700 (Part 4/Sec 6)	101.2.7
Power-frequency magnetic field test	3 A/m, 50 Hz	IS 14700 (Part 4/Sec 8)	101.2.8 <sup>a</sup>
<sup>a</sup> This test is applicable only to accessories containing devices susceptible to magnetic fields, for example, Hall elements, electrodynamic microphones, etc.			

For the tests of 101.2.2 to 101.2.5 the following applies:

During the test, the output of the accessory can alter.

The output voltage shall not exceed the upper limits of the voltage of the USB power supply and the polarity shall not become reversed, the absence of output voltage is allowed. This voltage is measured at the USB power supply port. Transients originating from the immunity test are neglected.

After the test, the accessory shall operate as intended.

For the tests of 101.2.6 to 101.2.8, the following applies:

During and after the test, the accessory shall operate as intended.

**101.2.2 Voltage Dips and Short Interruptions**

The accessory shall be tested with the test equipment specified in IS 14700 (Part 4/Sec 11) as specified in 101.1, in accordance with Table 103, with a sequence of three dips/interruptions with intervals of 10 s minimum between each test event.

The test shall be done on the power supply lines of the accessory.

The USB power supply is loaded at its rated output power.

100 % UT is equal to the rated voltage, a test level of 0 % corresponds to a total supply voltage interruption.

**Table 103 Voltage Dip and Short-Interruption Test Values**  
(Clause 101.2.2)

Test level % UT	Voltage dip/interruptions % UT	Duration (number of cycles at rated frequency)
0	100	0.5
0	100	1
70	30	25
0	100	250

**101.2.3 Surge Immunity Test for 1.2/50 Wave Impulses**

Accessories shall be tested for resistance to unidirectional surges caused by overvoltage from switching and lightning transients.

If the accessory has a metallic mounting plate this plate shall be connected to earth. The USB power supply is tested at its rated output power.

The test is carried out according to IS 14700 (Part 4/Sec 5) by applying two positive discharges and two negative discharges at each of the following angles 0°, 90°, 180° and 270°, at a repetition rate of (60 ± 5) s with an open-circuit test voltage according to Table 104.

**Table 104 Surge Immunity Test Voltages**  
(Clause 101.2.3)

Conductors / Terminals	Coupling	Test voltage kv
Mains	Line to line	1

**101.2.4 Electrical Fast Transient/Burst Test**

Accessories shall be tested for resistance to repetitive fast transients/bursts on supply terminals/terminations.

The USB power supply is loaded at its rated output power.

If the equipment under test has a metallic mounting plate (e.g. rails according to IS/ IEC 60715), the test shall be done both with the mounting plate not connected and connected to earth by a HF connection (low inductance).

The test is carried out according to IS 14700 (Part 4/Sec 4) with the following specification:

The levels of the repetitive fast transients consisting of bursts coupled into the supply terminals/terminations of the accessory are specified in Table 105.

**Table 105 Fast Transient Test Values**  
(Clause 101.2.4)

OPEN-CIRCUIT OUTPUT TEST VOLTAGE	
Level	Supply terminals/terminations kV
2	±1

The repetition rate is 5 kHz.

**NOTE** — IEC SC 77B reported repeatability problems with the 100 kHz repetition frequency in IS 14700 (Part 4/Sec 4) and advised to keep testing at 5 kHz for the time being.

The duration of the test shall be  $60^{+5}_0$ s.

### 101.2.5 Electrostatic Discharge Test

Accessories mounted as in normal use shall withstand electrostatic contact and air discharges.

For the test of 31.2.5, the setup of the table-top equipment shall be used.

The static electricity discharges shall be applied only to such points and surfaces of the accessory which are accessible in normal use.

Accessories shall be tested according to IS 14700 (Part 4/Sec 2) by applying 10 positive and 10 negative discharges on each point and with this following sequence:

- a) Air discharges shall be performed on a non-metallic cover, at no load condition and no USB cable is connected.
- b) Contact discharges shall be performed on a metallic cover, at no load condition and no USB cable is connected.
- c) Contact discharges shall be performed to the metallic shield of the load side of any USB cable whilst disconnected from any load.
- d) Air discharges shall be performed on a non-metallic cover at rated output power condition.
- e) Contact discharges shall be performed on a metallic cover at rated output power condition.
- f) Contact discharges shall be performed on coupling planes as described in IS 14700 (Part 4/Sec



2) at rated output power condition.

The following levels apply:

- a) Test voltage of contact discharge: 4 kV,
- b) Test voltage of air discharge: 2 kV, 4 kV and 8 kV.

#### **101.2.6 Radiated Electromagnetic Field Test**

Accessories shall withstand the radiated electromagnetic field test.

The USB power supply is loaded at its rated output power.

The test is carried out according to IS 14700 (Part 4/Sec 3) by applying the requirements in Table 106 with the exception of the exclusion band as defined in the relevant product standard for transmitters, receivers and duplex transceivers.

Accessories with each side dimension below 5 cm shall be tested on front face only with vertical and horizontal polarization. If the accessory has no defined front face, the side with the largest area is tested.

Cables shall run either vertically or horizontally in the field uniform area for at least 1 m.

**Table 106 Values for Radiated Electromagnetic Field Test of IS 14700 (Part 4/Sec 3)**  
(Clause 101.2.6)

<b>Environmental phenomena</b>	<b>Test specification</b>	<b>Units</b>
(1)	(2)	(3)
Radio-frequency Electromagnetic field Amplitude modulated	80 to 1 000 3 80	MHz V/m % AM (1 kHz)
Radio-frequency Electromagnetic field Amplitude modulated	1.4 to 6 3 80	GHz V/m % AM (1 kHz)

#### **101.2.7 Radio-Frequency Voltage Test**

Accessories shall withstand the radio-frequency voltage test. The USB power supply is loaded at its rated output power.

The test is carried out according to IS 14700 (Part 4/Sec 6) by applying a conducted radio-frequency voltage of 3 V RMS on the supply line.

#### **101.2.8 Power-Frequency Magnetic Field Test**

This test is applicable only to accessories susceptible to magnetic fields, for example, Hall elements, electrodynamic microphones, etc.

The USB power supply is loaded at its rated output power.  
The accessory shall withstand the power frequency magnetic field test.

The test is carried out according to IS 14700 (Part 4/Sec 8) by applying a magnetic field of 3 A/m, 50 Hz.

### **101.3 EMISSION**

#### **101.3.1 General**

The accessory is tested loaded at its rated output power and also with the USB power supply unloaded.

#### **101.3.2 Low-Frequency Emission**

Accessories shall be so designed that they do not cause excessive disturbances in the network. Requirements are deemed to be met if the accessory complies with IS 14700 (Part 3/Sec 2).

#### **101.3.3 Radio-Frequency Emission**

Accessories shall be so designed that they do not cause excessive radio interference. The accessory shall comply with the requirements of IS/CISPR 32 class B.

### **102 ELECTROMAGNETIC FIELDS (EMF) REQUIREMENTS**

Socket-outlets incorporating USB power supply are deemed to comply with the requirements for low-power electronic equipment as given in IS/IEC 62479 without need for testing.

### **103 ABNORMAL CONDITIONS**

#### **103.1 General**

A USB power supply shall not create any hazard under abnormal conditions.

If, in the event of failure, the maximum consumption of the USB power supply does not exceed 0.5 W, the requirements of the abnormal conditions are deemed to be met.

Compliance is checked by the tests specified in **101.2** and **101.3**.

**NOTE** — For these tests, additional specimens can be necessary.

#### **103.2 Temperature Rise under Abnormal Conditions**

##### **103.2.1 Overview**

When a USB power supply is operated under abnormal conditions no part shall reach such a temperature that there is danger of fire to its surroundings.

Compliance is checked by subjecting the USB power supply to a heating test under fault conditions, as described in 103.2.2.

During the test, the temperature rises shall not exceed the values given in Table 101, column concerning Clause 103.

### **103.2.2** *General*

#### **103.2.2.1** *Overview*

Unless otherwise specified, the tests are made on an accessory while it is mounted as in normal use.

Each of the abnormal conditions indicated in 103.2.2.2 is applied in turn and then the test of 103.2.2.3 is applied.

**NOTE** — Other faults can occur during the test, which are a direct consequence of the test.

Abnormal conditions can have a long term influence on potentially safety-critical components such as visitors. The effects of ageing of such components shall be taken into consideration during the development of a product.

The abnormal conditions are applied in the order which is the most convenient for testing.

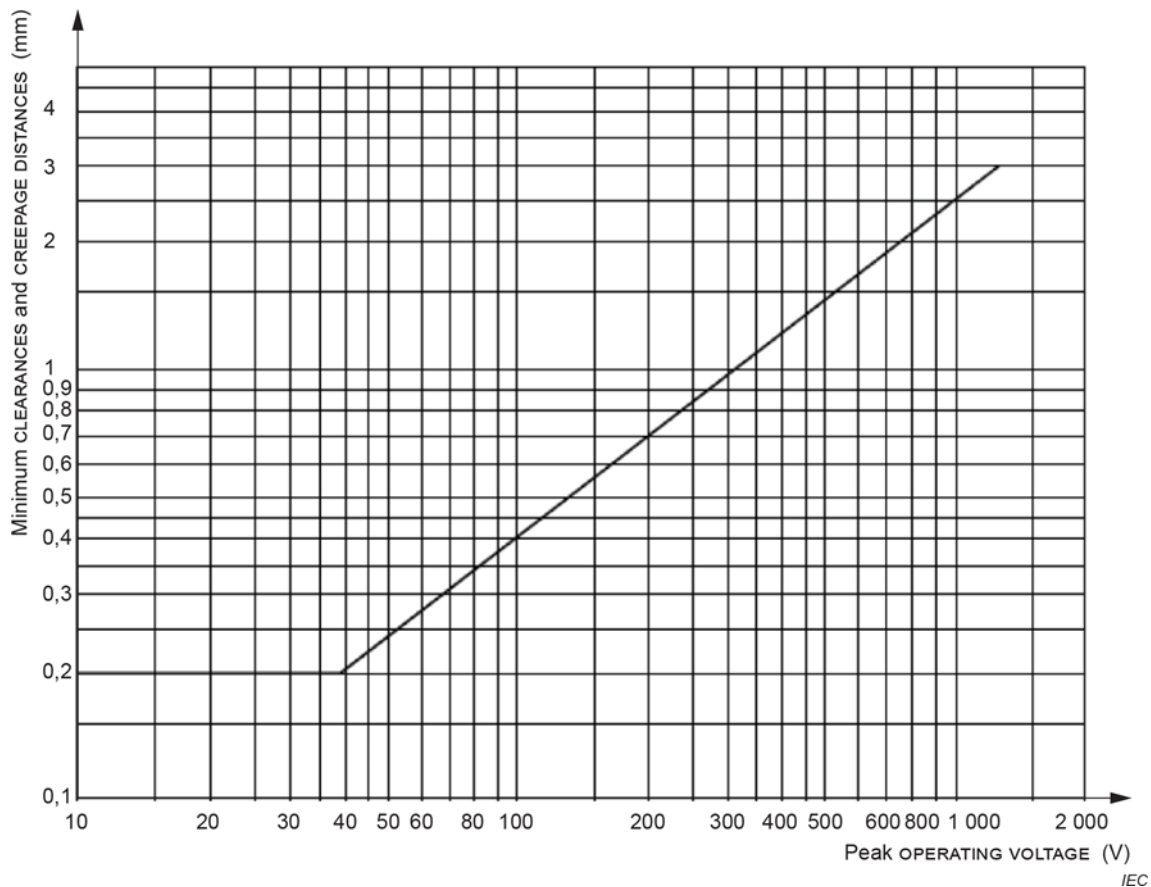
#### **103.2.2.2** *Fault conditions tests*

The following fault conditions shall be applied:

- a) Short circuit across creep age distances and clearances, other than those complying with the requirements in Clause 27, if they are less than the values given in Figure 101;
- b) Short circuit across insulating coating consisting, for example, of lacquer or enamel. Such coatings are ignored in assessing the creep age distances and clearances.

If enamel forms the insulation of a conductor and withstands the voltage test specified for grade 2 in Clause 13 of IS 13730 (Part 0/Sec 1), it is considered as contributing 1 mm to those creepage distances and clearances;

- a) Short circuit or interruption of semiconductor devices;
- b) Short circuit of electrolytic capacitors;
- c) Short circuit or interruption of capacitors or resistors which do not comply with the requirements of Annex G of IS/IEC 62368-1:2018;
- d) Short circuit of output of the USB power supply.



The curve is defined by the formula:  $\log d = 0.78 \log (U/300)$  with a minimum of 0.2 mm where:

d is the distance;

U is the peak voltage (V).

**FIGURE 101 – MINIMUM CREEPAGE AND CLEARANCES ON PRINTED CIRCUIT BOARDS**

If a fault condition simulated during the test influences other fault conditions, all these fault conditions are applied simultaneously.

Clearances, creep age distances, and components providing a reinforced or double insulation such as double insulated transformers, Y1 capacitors, opt couplers or similar shall not be short circuited during the application of abnormal conditions.

If the temperature of the USB power supply is limited by the operation of automatic protective devices (including fuses), the temperature is measured 2 min after the operation of the device.

If the temperature is limited by an automatic protective device or a fuse, in case of doubt, the following additional test is carried out: the fuse is short-circuited and the current under the relevant fault conditions is measured. The USB power supply is then supplied for a duration corresponding to the maximum fusing time of the type of fuse as specified by the IS/IEC 60127 series corresponding to the

current measured above. The temperature is measured 2 min after the end of the period.

#### **103.2.2.2 Overload tests**

Accessories are tested by the following tests in a), and b):

- a) According to 19.101 b) but at 1.1 times the rated voltage and with USB power supply loaded at maximum output power.

The maximum output power of the USB power supply is obtained with the most onerous combination of output voltage and current by increasing progressively the USB port output load until the highest power value is reached.

Depending the construction of the accessory, sometimes the power supply is shared among several ports, sometimes each port has its own power supply, and depending on the number of USB ports incorporated in the accessory, it can be necessary to load several ports simultaneously to obtain the maximum output power.

- b) according to 19.101 b) but with a current applied to the socket-outlet such that, combined with the USB power supply loaded with the most onerous combination of rated output voltage and current, the total current reaches the value as indicated in IS 1293:—, Table 22 for Clause 19.

The tests are applied until the temperature rise reaches the steady state value or for 4 h, whichever is shorter. In practice, steady-state value is reached when the variation of the temperature rise does not exceed 1 K/h.

For these tests of 103.2.2.3, the temperature rise of the terminals shall not exceed 55 K.

### **103.3 Protection against Electric Shock after Fault Conditions Arise**

Protection against electric shock is required, even though an accessory is being used or has been used during fault conditions.

Compliance is checked by carrying out the tests of Clause 10 immediately following the test of 103.2.

## **104 PARTICULAR REQUIREMENTS FOR THE USB POWER SUPPLY**

### **104.1 Capacitors Bridging Insulation between Primary and Secondary Circuits of the USB Power Supply**

When capacitors are used to bridge double or reinforced insulation, at least one Y1 capacitor is required taking into consideration the working voltage across the insulation.

Two or more Y2 capacitors can be used in series in place of the single Y1 capacitor.

The rated voltage of the capacitor Y1 shall be suitable for the mains voltage.

If the measured RMS voltage (working voltage) on capacitor Y1 is higher than the mains voltage, capacitor Y1 shall be suitable for the measured voltage.

For a working voltage above 250 V AC and not exceeding 500 V AC and an overvoltage category III, two Y1 capacitors are required.

The effective value of the voltage shall be measured with equipment with internal resistance equal to or greater than 10 M $\Omega$ .

#### **104.2 Disconnection from the Mains Supply**

The requirement in 4.10.1 of IS/IEC 62368-1:2018 for the provision of a disconnect device shall not apply.

**NOTE** — The disconnect device specified in IS/IEC 62368-1:2018 is for servicing purposes and is achieved by disconnection of the socket-outlet from the low voltage supply for fixed socket-outlets and by disconnection by the plug for portable socket-outlets.

#### **104.3 Additional Requirements for the USB Power Supply**

##### **104.3.1 General**

The USB power supply circuit shall comply with the requirements of the clauses of IS/IEC 62368-1:2018 and IEC 62368-3:2017 listed in 104.3.2 and 104.3.3 respectively.

Compliance is checked by carrying out the listed tests of IS/IEC 62368-1:2018 and IEC 62368-3:2017 in 104.3.2 and 104.3.3 on new samples. In case of doubt the test conditions of Clause 5 of this document apply.

##### **104.3.2 Applicable Clauses of IS/IEC 62368-1:2018**

**4.1.1** Application of requirements and acceptance of materials, components subassemblies; and

**4.1.2** Use of components;

**4.1.3** Equipment design and construction;

**4.10.2** Switches and relays;

**5.3.1** General;

**5.3.2** Accessibility to electrical energy sources and safeguards;

**5.4.1** General;

**5.4.2** Clearances;

**5.4.3** Creep age distances;

**5.4.4** Solid insulation;

**5.4.6** Insulation of internal wire as a part of a supplementary safeguard;

**5.4.7** Tests for semiconductor components and for cemented joints;

**5.4.9** Electric strength test;

**NOTE** — For the tests 5.4.9.2 of IS/IEC 62368-1:2018, see also Annex AA of this document.

**5.5.1** General;

**5.5.2** Capacitors and RC units;

**5.5.3** Transformers;

**5.5.4** Optocouplers;

**5.5.5** Relays;

**5.5.6** Resistors;

**5.5.7** SPDs;

Annex G is applicable with the exception of Clause G.1 and Clause G.7.

#### **104.3.3** *Applicable Clauses of IEC 62368-3:2017*

**5.1** General requirements;

**5.3.2** DC power transfer interconnection to other equipment;

**5.4.1** Requirement for the PSE:

Transient overvoltages for less than 1 s that are less than 200 % are ignored. Annex B (informative) Rationale for 5.4.

#### **104.4 Interoperability for a USB Power Supply**

Requirements defining interoperability for external power supplies used with portable computing devices are given in the following International Standards:

- a) IS 16422 – Interoperability specifications of common external power supplies (EPS) for use with data-enabled mobile telephones.
- b) IEC 63002 – Interoperability specifications and communication method for external power supplies used with computing and consumer electronics devices.

## ANNEXES

The annexes of IS 1293 - are applicable except as follows:

Add the following new annex:

### ANNEX AA (Informative)

#### **Safety-related routine tests for electric strength test control – Electric strength test of the USB power supply**

Routine tests for electric strength shall be carried out between circuits connected to the mains (primary circuits) and the USB port (secondary circuits).

**NOTE** — The tests are based on IEC 62911.

It is permitted to test the USB module or circuit separately, before final assembly, if there is no risk that the insulation is compromised during the final assembly of the accessory.

The insulation of the product shall be checked by the following test:

A test voltage of substantially sine-wave form, having mains frequency, or a DC test voltage or a combination of both with a peak value as specified in Table A.1 is applied.

The test voltages given are the minimum test voltages to be applied. Higher voltages are allowed at the discretion of the manufacturer provided the insulation is not damaged due to overstress by the voltage applied.

**NOTE** — Applying an electrical strength test voltage that is too high can result in deterioration or partial damage of the insulation.

The test voltage is applied between the supply terminals or module conductors connected together and USB port poles (including ground) that can become hazardous live parts in the event of an insulation fault such as, for example, a result of incorrect assembly, faulty components or similar.

**Table AA.1 – Test Voltages**

<b>Test voltage</b> V (peak) AC or DC	
<b>Rated mains voltage</b> ≤ 150	<b>Rated mains voltage</b> > 150
2 120 (1 500 RMS)	3 540 (2 500 RMS)

The voltage applied to the insulation under test can be gradually raised from zero to the specified voltage and maintained at that value for 1 s to 4 s.



No flash-over or breakdown shall occur during the test.

The high-voltage transformer used for the test shall be so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is at least 200 mA.

The overcurrent relay should trip at a minimum tripping current defined by the manufacturer making sure it is high enough to detect breakdown but at the same time taking into account possible operator safety issues.

Care is taken that the RMS value of the test voltage applied is measured within  $\pm 3$  %.

Glow discharges without drop in the voltage are neglected.

The manufacturers shall maintain the following records of tests carried out showing:

- a) Model of the equipment,
- b) Serial number of the equipment or another identifier permitting the identification without ambiguity,
- c) Location of the point tested,
- d) Value of voltage applied during the electric strength test,
- e) Quick-reference information specifying whether the whole set of tests has or has not been successful.

## **ANNEX BB**

### *(Clause 2)*

The reference standards of IS 1293 is applicable except as follows:

*Addition:*

IS 1271 : 2012 Electrical insulation - Thermal evaluation and designation (Second Revision)

IS 1293, Plugs and socket-outlets for household and similar purposes – Part 1: General Requirements.

IS/IEC 60715 : 2017 Dimensions of low - Voltage switchgear and control gear - Standardized mounting on rails for mechanical support of switchgear, control gear and accessories (First Revision)

IS/IEC 62479 : 2010 Assessment of the Compliance of Low-Power Electronic and Electrical Equipment with the Basic Restrictions Related to Human Exposure to Electromagnetic Fields (10 MHz to 300 GHz)

IS/IEC 62680-1-1 : 2015 Universal serial bus interfaces for data and power - Part 1-1: Common components - USB Battery Charging Specification

IS/IEC 62680-1-2 : 2022 Universal Serial Bus Interfaces For Data And Power Part 1-2: Common Components USB Power Delivery Specification

IS/IEC 62680-1-3 : 2022 universal serial bus interfaces for data and power part 1-3: common components usb type-c cable and connector specification

IS/IEC 62680-1-4 : 2018 Universal serial bus interfaces for data and power Part 1-4: Common components USB Type-CTM Authentication Specification

IS/IEC 62680-1-5 : 2019 Universal serial bus interfaces for data and power Part 1-5: Common components USB Audio 30 device class definition

IS/IEC 62680-1-6 : 2019 Universal serial bus interfaces for data and power Part 1-6: Common components USB Audio 30 device class definition basic functions

IS/IEC 62680-1-7 : 2019 Universal serial bus interfaces for data and power Part 1-7: Common components USB Audio 30 device class definition data formats

IS/IEC 62680-1-8 : 2019 Universal serial bus interfaces for data and power Part 1-8: Common components USB Audio 30 device class definition terminal types

IS/IEC 62680-2-1 : 2015 Universal serial bus interfaces for data and power Part 2-1: Universal Serial Bus Specification

IS/IEC 62680-2-2 : 2015 Universal serial bus interfaces for data and power Part 2-2: Micro-USB Cables and Connectors Specification

IS/IEC 62680-2-3 : 2015 Universal serial bus interfaces for data and power Part 2-3: Universal Serial Bus Cables and Connectors Class Document

IS/IEC 62680-3-1: 2017 Universal Serial Bus interfaces for data and power Part 3-1: Universal Serial Bus 31 Specification

IS 16422: 2023 Interoperability specifications of common external power supplies EPS for use with data-enabled mobile telephones (First Revision)

IS 13360 (Part 6/Sec 1): 2018, Plastics - Methods of testing: Part 6 thermal properties section 1 determination of vicat softening temperature of thermoplastic materials (Second Revision)

IS 13730 (Part 0/Sec 1)/IEC 60317-0-1:2013, Specifications for Particular Types of Winding Wires Part 0 General Requirements Section 1 Enamelled round copper wire.

IS 14700 (Part 3/Sec 2): 2020 / IEC61000-3-2, Electromagnetic Compatibility (EMC) Part 3 Limits Section 2 Limits for harmonic current emissions(equipment input current  $\leq 16$  A per phase).

IS 14700 (Part 4/Sec 2) : 2018 /IEC 61000-4-2 ,Electromagnetic Compatibility (EMC) Part 4 Testing and Measurement Techniques Section 2 Electrostatic discharge immunity test.

IS 14700 (Part 4/Sec 3)  
: 2023 /IEC 61000-4-3, Electromagnetic Compatibility (EMC) Part 4 Testing and Measurement Techniques Section 3 Radiated, Radio-Frequency Electromagnetic Field Immunity Test.

IS 14700 (Part 4/Sec 4) : 2018 /IEC 61000-4-4, Electromagnetic Compatibility ( EMC )Part 4: Testing and Measurement Techniques Section 4: Electrical fast transient / burst immunity test.

IS 14700 (Part 4/Sec 5) : 2019 IEC 61000-4-5, Electromagnetic Compatibility (EMC)Part 4 Testing and Measurement Techniques Section 5 Surge immunity test.

IS 14700 (Part 4/Sec 6) : 2016 IEC 61000-4-6, Electromagnetic Compatibility (EMC) Part 4 Testing and Measurement Techniques Section 6 Immunity to conducted disturbances, induced by radio-frequency fields.

IS 14700 (Part 4/Sec 8) : 2018 IEC 61000-4-8, Electromagnetic Compatibility (EMC)Part 4 Testing and Measurement Techniques Section 8 Power frequency magnetic field immunity test.

IS 14700 (Part 4/Sec 11) : 2021 IEC 61000-4-11, Electromagnetic Compatibility ( EMC )Part 4 Testing and Measurement Techniques Section 11 Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase

IEC 62911, Audio, video and information technology equipment – Routine electrical safety testing in production

IS/IEC 62368-1:2018, Audio/video, information and communication technology equipment – Part 1: Safety requirements

IEC 62368-3:2017, Audio/video, information and communication technology equipment – Part 3: Safety aspects for DC power transfer through communication cables and ports

IS/IEC 60127, Miniature Fuses (All parts)

IEC 63002, Interoperability specifications and communication method for external power supplies used with computing and consumer electronics devices

IS/CISPR 32: 2015 Electromagnetic compatibility of multimedia equipment – Emission requirements.