

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Switches for appliances –  
Part 2-1: Particular requirements for cord switches**

**Interrupteurs pour appareils –  
Partie 2-1: Règles particulières pour les interrupteurs  
pour câbles souples**



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**SWITCHES FOR APPLIANCES –****Part 2-1: Particular requirements for cord switches**

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International Standard IEC 61058-2-1 has been prepared by subcommittee 23J: Switches for appliances, of IEC technical committee 23: Electrical accessories.

This second edition cancels and replaces the first edition published in 1992 and its amendment 1 (1995) and constitutes a technical revision.

The main changes from the first edition are as follows:

Scope, Definitions; Protection against electric shock; Provision for earthing; Construction; Fire hazard; Abnormal operation and fault conditions for electronic switches; Components for electronic switches; EMC requirements.

The text of this standard is based on the following documents:

CDV	Report on voting
23J/326/CDV	23J/337/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is to be read in conjunction with the IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*, and its amendments 1 (2001) and 2 (2007).

This Part 2-1 supplements or modifies the corresponding clauses in IEC 61058-1, so as to convert that publication into the IEC standard: *Particular requirements for cord switches*.

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

In this standard:

- 1) the following print types are used:
  - requirements proper: in roman type;
  - *test specifications: in italic type;*
  - notes/explanatory matters: in small roman type.
- 2) subclauses, notes, figures and tables which are additional to those in Part 1 are numbered starting from 101. Annexes which are additional to those in Part 1 are lettered AA, BB, etc.

A list of all the parts in the IEC 61058 series, under the general title *Switches for appliances*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

## SWITCHES FOR APPLIANCES –

### Part 2-1: Particular requirements for cord switches

#### 1 Scope

This clause of Part 1 is applicable except as follows:

##### 1.1 *Replacement:*

1.1 This International Standard applies to cord switches (mechanical or electronic) for appliances actuated by hand, by foot or by other human activity, to operate or control electrical appliances and other equipment for household or similar purposes with a rated voltage not exceeding 250 V and a rated current not exceeding 16 A.

These switches are intended to be operated by a person, via an actuating member or by actuating a sensing unit. The actuating member or sensing unit can be integral or arranged separately from the switch. The transmission of a signal between the actuating member or sensing unit and the switch may be made either physically or electrically (for example electrical, optical, acoustic or thermal).

Switches which incorporate additional control functions governed by the switch function are within the scope of this standard.

This standard also covers the indirect actuation of the switch when the operation of the actuating member or sensing unit is provided by a remote control or a part of an appliance or equipment such as a door.

NOTE 1 Electronic switches may be combined with mechanical switches giving full disconnection or micro-disconnection.

NOTE 2 Electronic switches without a mechanical switch in the supply circuit provide only electronic disconnection. Therefore, the circuit on the load side is always considered to be live.

NOTE 3 For switches used in tropical climates, additional requirements may be necessary.

NOTE 4 Attention is drawn to the fact that the standards for appliances may contain additional or alternative requirements for switches.

NOTE 5 Throughout this standard, the word "appliance" means "appliance or equipment".

##### 1.2 *Replacement:*

1.2 This standard applies to switches intended to be connected to a flexible cable."

NOTE In this document, the word "cable" means "cable or cord".

1.3 This subclause applies.

1.4 This subclause does not apply.

#### 2 Normative references

This clause of Part 1 is applicable except as follows:

## 2.1 Addition:

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60227-5:1997, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*<sup>1</sup>  
Amendment 1 (1997)  
Amendment 2 (2003)

IEC 60245 (all parts), *Rubber insulated cables - Rated voltages up to and including 450/750 V*

IEC 60335-2-17:2002, *Household and similar electrical appliances - Safety - Part 2-17: Particular requirements for blankets, pads and similar flexible heating appliances*<sup>2</sup>  
Amendment 1 (2006)  
Amendment 2 (2008)

## 3 Definitions

This clause of Part 1 is applicable except as follows:

### 3.3 Definitions relating to the different types of switches

*Addition:*

#### 3.3.101 cord switch

separately enclosed switch intended to be connected to a supply and/or to an appliance or equipment by means of a flexible cable(s)

NOTE The flexible cable(s) may enter the switch enclosure in any direction and may be in line with the enclosure.

### 3.5 Definitions relating to connections to the switch

*Addition:*

#### 3.5.101 rewirable switch

switch in which the opening of the enclosure provides access to the terminals of the switch and external conductors can be replaced

#### 3.5.102 non-rewirable switch

switch being so constructed that it forms a constructional unit with the flexible cable after connection and assembly, and that the external conductors cannot be replaced without making the switch permanently inoperable

<sup>1</sup> There exists a consolidated version of IEC 60227-5 (2003) comprising the second edition (1997) and its amendments 1 (1997) and 2 (2003).

<sup>2</sup> There exists a consolidated version of IEC 60335-2-17 (2009) comprising the second edition (2002) and its amendments 1 (2006) and 2 (2008).



## 4 General requirement

This clause of Part 1 is applicable.

## 5 General notes on tests

This clause of Part 1 is applicable except as follows:

*Addition:*

**5.101** For non-rewirable switches, special test specimens may be provided for the tests according to Clauses 16 and 17, and for both 12.3.101 and 12.3.102 a further three test specimens each shall be used.

## 6 Rating

This clause of Part 1 is applicable except as follows:

### 6.1 Replacement:

The maximum rated voltage is 250 V.

NOTE Preferred values are 50 V, 130 V and 250 V. Rated voltages differing from the preferred values are allowed.

### 6.3 Replacement:

The maximum rated current is 16 A.

*Compliance with the requirements of 6.1 to 6.3 is checked by inspection of marking and documentation.*

NOTE Preferred values are 1 A, 2 A, 4 A, 6 A, 10 A, 16 A.

## 7 Classification

This clause of Part 1 is applicable except as follows:

**7.1.15.2** This subclause does not apply.

*Addition:*

**7.1.101** According to the connection to the switch

**7.1.101.1** rewirable switch;

**7.1.101.2** non rewirable switch.

**7.1.102** According to the means of suspension

**7.1.102.1** with means of suspension;

**7.1.102.2** without means of suspension.

**7.1 .103** According to the type of cord for which the switch is suitable

**7.1.103.1** switches suitable for the connection of round cords;

**7.1.103.2** switches only suitable for the connection of flat cords;

**7.1.103.3** switches suitable for the connection of both round and flat cords.

## 8 Marking and documentation

This clause of Part 1 is applicable except as follows:

**Table 3 – Switch information**

*Addition:*

No.	Characteristic	Subclause	Means of information	
			Common type reference C.T.	Unique type reference U.T.
<b>5</b>	<b>TERMINALS/CONDUCTORS</b>			
5.101	If a cord switch is non rewirable, this shall be documented.	7.1.101.2	Do	Do
5.102	If a cord switch is suitable only for use with flat cords, this shall be documented.	7.1.103.2	Do	Do
<b>101</b>	<b>CATEGORY OR TYPE OF APPLIANCE WITH WHICH THE SWITCH MAY BE USED</b>			
101.1	Cord switch intended exclusively for controlling luminaires.		Do	Do
101.2	Category or type of appliance according to IEC 60335-2-17 with which the switch may be used		Do	Do

*Addition:*

**8.101** For cord switches intended exclusively for controlling luminaires, no “OFF”- marking is required.

## 9 Protection against electric shock

This clause of Part 1 is applicable except as follows:

**9.1** *Addition at the end of the subclause:*

*For cord switches, the test is made when the switch is fitted with cords either of the smallest or of the largest nominal cross-sectional area specified in Table 4, whichever is more unfavourable.*

**9.1.2** *Replacement:*

**9.1.2** If a cover or cover-plate or a fuse can be removed without the use of a tool, the protection against contact with live parts shall be assured even after removal of the cover or cover-plate.

If there is a marking outside on the switch showing that a fuse is inside and the cover or cover-plate has to be removed with a tool the protection against contact with live parts shall be assured even after removal of the cover or cover-plate.

If there is no marking outside on the switch but the instruction sheet shows that a fuse is inside and the cover or cover-plate has to be removed with a tool, either the protection against contact with live parts shall be assured even after removal of the cover or cover-plate, or the instruction sheet shall state that the disconnection from the supply before opening shall be performed.

*Compliance is checked with the standard test finger, test probe B according to IEC 61032.*

*Addition:*

**9.101** Non rewirable switches are tested with the cords as fitted by the manufacturer.

## 10 Provision for earthing

This clause of Part 1 is applicable except as follows:

**10.1** *Addition at the end of the subclause:*

Terminals provided for earthing continuity are permitted if they are separated from live parts by basic insulation and from accessible parts by supplementary insulation.

NOTE An example of the insulation system for earthing continuity is given in Figure 105.

**10.3** This subclause does not apply.

*Addition:*

**10.101** The printed conductors of printed circuit boards may be used to provide earthing continuity under the following conditions:

- at least two tracks are used with independent soldering points and the switch complies with 10.4 for each track;
- the material of the printed circuit board consists of epoxide woven glass fabric copper-clad laminated sheet;
- the printed conductors withstand the short circuit test according to 23.3.

## 11 Terminals and terminations

This clause of Part 1 is applicable except as follows:

*Replacement:*

**Table 4 – Resistive current carried by the terminal and related cross-sectional areas of terminals for unprepared conductors**

Resistive current carried by the terminal A	Flexible conductors			
	Cross-sectional areas mm <sup>2</sup>			Terminal size
	Minimum	Medium	Maximum	
Over 0 and including 3	-	0,5	0,75	-

Over 3 and including 6	0,5	0,75	1,0	0
Over 6 and including 16	0,75	1,0	1,5	1

**11.1.2** Not applicable for rewirable cord switches.

## 12 Construction

This clause of Part 1 is applicable except as follows:

### 12.1.2 Addition:

- short rigid wires are not regarded as liable to come away from a terminal, if they remain in position when the terminal screw is loosened.

### Addition:

**12.1.101** If solder terminals are classified according to 7.2.12, additional provisions for securing the conductors shall be provided.

**12.3.101** Cord switches shall have cord anchorages such that the conductors are relieved from strain, including twisting, where they are connected to the terminals, and that the sheath of the cord is protected from abrasion and kept in position.

**12.3.102** It shall be clear how the relief from strain and the prevention of twisting is intended to be effected.

**12.3.103** Makeshift methods such as tying the cord into a knot, or tying the ends with string shall not be used.

**12.3.104** Cord anchorages of cord switches shall be of insulating material, or, if of metal, be insulated from accessible metal parts or accessible insulating surfaces, by insulation complying with the requirements for supplementary insulation.

**12.3.105** For rewirable cord switches the cord anchorages shall be so designed that their parts do not fall out when the cover of the switch is removed, even if the switches are not fitted with their cords.

**12.3.106** Cord anchorages shall be so designed that

- for any attachment method, the cord is not fixed by penetration of its insulation in such a way that the insulation of the cord is cut or otherwise significantly damaged;

NOTE A soft deformation of the insulation in such a way that the insulation of the cord is not cut or otherwise significantly damaged is allowed.

- the cord cannot touch clamping screws of the cord anchorage if these screws are accessible or electrically connected to accessible metal parts;
- the cord is not clamped by a screw which bears directly on the cord, except where the screw is made of insulating material;
- for rewirable switches at least one part is securely fixed to the switch;
- for rewirable switches replacement of the cord does not require the use of a special purpose tool;
- for rewirable switches they are suitable for the different types of cords which may be connected.

**12.3.107** Cord anchorages for rewirable switches shall be so designed and located that replacement of the cord is easy.

*Compliance with the requirements of 12.3.101 to 12.3.107 is checked by inspection and by a pull test in an apparatus similar to that shown in Figure 101, followed by a torque test in an apparatus similar to that shown in Figure 104:*

- *non rewirable switches are tested with the cord as delivered and three new test specimens shall be used for the tests;*
- *three new rewirable switches are tested with PVC sheathed cords having the smallest and largest cross-sectional area as shown in Table 101. Before the test, the free length of the cord shall be cut to 150 mm ± 5 mm;*
- *rewirable switches provided with entries specially designed for the connection of PVC insulated flat cords (IEC 60227) are tested with flat cords only.*

**Table 101 – Rated currents for resistor loads and related type of cords**

Rated current for resistor load A	Number of cores	Nominal cross-section mm <sup>2</sup>	Types of cord according to IEC 60227 fl = flat	Overall diameter	
				Minimum mm	Maximum mm
Over 0,2 and including 3	2	0,5	52 52 (fl)	4,8	6,0
		0,75	52 52 (fl)	5,2 3,2 × 5,2	6,4 3,9 × 6,4
	3	0,5	52	5,0	5,2
		0,75	52	5,4	6,8
Over 3 and including 6	2	0,75	52	5,2	6,4
			52 (fl)	3,2 × 5,2	3,9 × 6,4
			53 53 (fl)	6,0 3,8 × 6,0	7,6 5,2 × 7,6
	2	1	53 53 (fl)	5,9 3,9 × 6,2	7,5 4,7 × 7,5
	3	0,75	52	5,4	6,8
			53	6,4	8,0
4	0,75	53	7,6	9,4	
		1,0	53	7,6	9,4
Over 6 and including 16	2	0,75	52	5,2	6,4
			52 (fl)	3,2 × 5,2	3,9 × 6,4
			53 53 (fl)	6,0 3,8 × 6,0	7,6 5,2 × 7,6
	3	0,75	53	6,4	8,0
			53	7,4	9,0
			53	7,6	9,4
	4	1,0	53	7,6	9,4
			53	9,0	11,0

Conductors of the cord are introduced into the terminals of rewirable switches, and the terminal metal screws are tightened just sufficient/y to prevent the conductors from easily changing their position.

The cord anchorage is used in the normal way, clamping screws being tightened with two thirds of the torque specified in 19.2 and insulating material screws with two-thirds of the torque specified in Table 103. After reassembly of the switch, its component parts shall fit snugly and it shall not be possible to push the cord into the switch to any appreciable extent.

The switch is first fixed in the test apparatus according to Figure 101 so that the axis of the cord is vertical where it enters the specimen. The cord is then subjected 100 times to a pull of 60 N. The pulls are applied without jerks, each time for 1 s.

Immediately after this test, the cord is subjected for 1 min to a torque with an apparatus similar to that shown in Figure 104 of

- 0,15 Nm for cords having a nominal cross-sectional area of up to and including 0,75 mm<sup>2</sup>;
- 0,25 Nm for cords having a nominal cross-sectional area of 1 mm<sup>2</sup> and 1,5 mm<sup>2</sup>.

The torque is applied as near as possible to the switch.

For switches for blankets, pads and similar flexible heating appliances according to IEC 60335-2-17, the pull and torque tests are performed with a pull force of 100 N and a torque of 0,15 Nm.

During the tests, the cord shall not be damaged. After the tests, the cord shall not have been displaced longitudinally by more than 2 mm, and there shall be no appreciable strain at the connection. Creepage distances and clearances shall not have been reduced below the value specified in Clause 20. For non rewirable switches, there shall be no break in the electrical connections.

For the measurement of the longitudinal displacement a mark is made on the cord while it is subjected to the first pull. After the tests the displacement of the mark on the cord in relation to the specimen is measured while the cord is subjected to an additional pull.

**12.3.108** Non rewirable switches shall be provided with a cord complying with either IEC 60227-5 or IEC 60245.

*Compliance is checked by inspection.*

**12.3.109** Screws, if any, which have to be operated when replacing the cord, shall not serve to fix any other component, unless either the switch is rendered inoperable or manifestly incomplete if they are omitted or incorrectly replaced, or the component intended to be fixed cannot be removed without the aid of a tool when replacing the cord.

NOTE This does not exclude that the cover may serve as a cord anchorage or as a part of a cord anchorage.

*Compliance is checked by inspection.*

**12.3.110** Cord-switches shall be designed so that the cords are capable of withstanding the bending likely to occur in normal use. The inlet or bushing shall have no sharp edges.

If a cord-guard is provided to meet this requirement it shall not be integral with the cord except for switches with terminals classified according to 7.2.3 where special cords with for

example moulded-on cord guards can be fixed but where it is not possible to fit a standard cord without a cord guard during servicing.

*Compliance is checked by subjecting the switch, fitted with the cord, or range of cords, for which it is designed, to the following tests.*

*The switch is mounted in the flexing apparatus shown in Figure 102. For the purpose of the test, the following conditions apply:*

- a) *the test is performed only once with a cord of the maximum dimension attached;*
- b) *for switches having a rated current over 3 A, a cord of type IEC 60227-5 shall be used;*
- c) *if the switch is classified according to 7.1.103.3, the test shall be done with both types of cords;*
- d) *if the switch is classified according to 7.1.103.2, then the flat type shall be used;*
- e) *for non rewirable switches, further test specimens shall be used.*

*The axis of oscillation is so chosen that the weight attached to the cord, and the cord itself, make the minimum lateral movement during the test. Specimens with flat cords are mounted so that the major axis of the cross-section is parallel to the axis of oscillation.*

*Each cord passing through the inlet opening is loaded with a weight having a mass of 1 kg. A current equal to the rated current passing through that particular core when the switch is operated at rated voltage is passed through each core, the voltage between the cores being maximum rated voltage. The oscillating member is moved backwards and forwards through an angle of 22,5° (on either side of the vertical), the number of flexings (that is 1 movement through 45°) being 5 000, and the rate of the flexing being 60 flexings per minute.*

*For switches for blankets, pads and similar flexible heating appliances according to IEC 60335-2-17, the movement of the oscillating member is through an angle of 45° (on either side of the vertical) and the load on the cord is 0,5 kg.*

*Rewirable switches are subjected to 10 000 flexings and non rewirable switches to 20 000 flexings.*

*During the test there shall be no interruption of the test current and no short circuit between conductors.*

*After the test, the specimens shall show no damage within the meaning of this publication.*

**12.3.111** For rewirable cord switches the space for the external conductors inside the switch shall be adequate to allow the conductors to be easily introduced and connected, and the cover, if any, fitted without risk of damage to the conductors or their insulation.

It shall be possible to check that the conductors are correctly connected and positioned before the cover is fitted.

*Compliance is checked by inspection and by connecting cords of the maximum cross-sectional area according to Table 4.*

**12.3.112** Rewirable single-pole cord switches shall be provided with an additional terminal or terminals which will allow the connection of the non switched conductor or conductors.

This terminal or terminals shall allow the connection of both the incoming and the outgoing ends of the non switched conductor or conductors.