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Interested committees:

Title: BS EN 61643-21 Ed.2.0 Low voltage surge protective devices

Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



37A/369/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 61643-21 ED2	
DATE OF CIRCULATION: 2022-03-11	CLOSING DATE FOR COMMENTS: 2022-07-01
SUPERSEDES DOCUMENTS: 37A/350/RR	

IEC SC 37A : LOW-VOLTAGE SURGE PROTECTIVE DEVICES	
SECRETARIAT: United States of America	SECRETARY: Mr Casey Granata
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 37	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☒ SAFETY	

This document is still under study and subject to change. It should not be used for reference purposes.

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TITLE:

Low voltage surge protective devices - Part 21: Surge protective devices connected to telecommunications and signalling networks - Requirements and test methods

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CONTENTS

1		
2		
3	FOREWORD.....	7
4	INTRODUCTION.....	9
5	1 Scope.....	11
6	2 Normative references	11
7	3 Terms, definitions and abbreviated terms Clause 3 from part 01 applies with the	
8	following additions:.....	11
9	3.1 General.....	11
10	3.2 Terms and definitions.....	11
11	3.3 Acronyms / Symbols	14
12	4 Classification.....	14
13	4.1 General.....	14
14	4.2 up to 4.4 of part 01 does not apply.....	14
15	4.5 Location.....	14
16	4.6 Accessibility.....	14
17	4.7 and 4.8 of part 01 does not apply.....	14
18	4.9 Degree of protection provided by enclosures according to IEC 60529 (IP	
19	code)	14
20	4.10 Temperature and humidity range.....	14
21	4.11 and 4.12 of part 01 does not apply.....	14
22	4.100 SPD configurations	15
23	4.101 Variants of SPDs	15
24	4.102 Type test requirements for SPDs	17
25	5 This clause of part 01 does not apply	20
26	6 Marking and other product information.....	20
27	6.1 General.....	20
28	6.2 List of items	20
29	6.2.100 Information which shall be provided with the products to be delivered	21
30	6.2.101 Information which shall be provided in the product documentation (e.g.	
31	Web)	21
32	6.3 This clause of part 01 does not apply.....	21
33	7 Service conditions	21
34	7.100.1 storage range	21
35	8 Requirements	21
36	8.1 General requirements	21
37	8.2 Marking.....	21
38	8.3 Electrical requirements	21
39	8.3.1 Protection against electric shock	21
40	8.3.2 Continuous current I_C	22
41	8.3.3 Protective conductor current I_{PE}	22
42	8.3.4 Voltage protection level U_P	22
43	8.3.5 and 8.3.6 of part 01 does not apply.....	22
44	8.3.7 Insulation resistance.....	22
45	8.3.8 up to 8.3.10 of part 01 does not apply.....	23

46	8.3.100	Impulse durability and voltage protection level	23
47	8.3.101	Impulse reset	23
48	8.3.102	AC durability, if declared by the manufacturer	23
49	8.3.103	Blind spot	23
50	8.3.104	Current-limiting requirements	23
51	8.3.105	Transmission requirements	24
52	8.4	Mechanical requirements	25
53	8.4.1	Mounting	25
54	8.4.2	Screws, current carrying parts and connections	25
55	8.4.3	External connections	25
56	8.4.4	Air clearances and creepage distances	25
57	8.4.5	Mechanical strength	25
58	8.5	Environmental and material requirements	25
59	8.5.1	Protection provided by enclosure (IP code)	25
60	8.5.2	This clause of part 01 does not apply	25
61	8.5.3	Resistance to abnormal heat and fire	25
62	8.5.4	and 8.5.5 of part 01 does not apply	25
63	8.5.6	Electromagnetic compatibility	25
64	8.6	Additional requirements for specific SPD designs	25
65	8.6.1	Two port SPDs and one port SPDs with separate input/output connections	25
67	8.6.2	This clause of part 01 does not apply	26
68	8.6.3	This clause of part 01 does not apply	26
69	8.6.4	Total discharge current test for multipole SPDs	26
70	8.6.5	and 8.6.6 of part 01 does not apply	26
71	8.6.100	High temperature and humidity endurance	26
72	8.6.101	Environmental cycling with impulse surges	26
73	8.6.102	Environmental cycling with AC surges	26
74	8.6.103	Protective provisions of SPDs installed in powerful application	27
75	9	Tests	28
76	9.1	Type testing procedures	28
77	9.1.1	General testing procedures	29
78	9.1.2	to 9.1.5 of part 01 does not apply	33
79	9.1.100	Waveform tolerances	33
80	9.2	Indelibility of markings	33
81	9.3	Electrical tests	33
82	9.3.1	Protection against direct contact	33
83	9.3.2	Continuous current I_C	34
84	9.3.3	up to 9.3.6 of part 01 does not apply	34
85	9.3.7	Insulation resistance	34
86	9.3.8	up to 9.3.10 of part 01 does not apply	34
87	9.3.100	Impulse durability and voltage protection level	34
88	9.3.101	Impulse reset	37
89	9.3.102	AC durability	38
90	9.3.103	Blind spot test	40
91	9.3.104	Current-limiting tests	41

92	9.3.105	Transmission tests.....	47
93	9.4	Mechanical tests	51
94	9.4.1	General	51
95	9.4.2	Reliability of screws, current-carrying parts and connections	52
96	9.4.3	Tests for external connections.....	52
97	9.4.4	Verification of air clearances and creepage distances.....	53
98	9.4.5	Mechanical strength	57
99	9.5	Environmental and material tests	57
100	9.5.1	Resistance to ingress of solid objects and to harmful ingress of water	57
101	9.5.2	This clause of part 01 does not apply	57
102	9.5.3	Resistance to abnormal heat and fire.....	57
103	9.5.4	and 9.5.5 of part 01 does not apply.....	58
104	9.6	Additional tests for specific SPD designs	58
105	9.6.1	Tests for two-port SPDs and one-port SPDs with separate input/output	
106		connections	58
107	9.6.2	and 9.6.3 of part 01 does not apply.....	60
108	9.6.4	Total discharge current test for multipole SPDs	60
109	9.6.5	and 9.6.6 of part 01 does not apply.....	61
110	9.6.100	High temperature and humidity endurance.....	61
111	9.6.101	Environmental cycling with impulse surges	62
112	9.6.102	Environmental cycling with AC surges	64
113	9.6.103	Protective provisions of SPDs installed in powerful application	66
114	Annex A (normative)	Application of annexes from IEC 61643-01	72
115	Annex B (informative)	Devices with current-limiting components only	73
116	Annex C (informative)	Example configurations for measuring U_P	74
117	Annex D (informative)	Special resistibility in telecommunication systems.....	75
118	Annex E (informative)	Bit error ratio (BER)	76
119	Annex F (informative)	Example of transmission test methods for SPDs connected to	
120		LAN	78
121	F.1	Abbreviations	78
122	F.2	Requirements	78
123	F.3	Test methods	79
124	F.3.1	Measurement circuit	79
125	F.3.2	Insertion loss	79
126	F.3.3	NEXT, power sum NEXT.....	79
127	F.3.4	Return loss	80
128	Bibliography.....		81
129			
130	Figure 1 – SPD configurations		15
131	Figure 2 – Test circuits for Voltage-limiting tests and impulse durability		35
132	Figure 3 – Test circuits for impulse reset time and environmental cycling with impulse		
133	surges		37
134	Figure 4 – Test circuits for AC durability		39
135	Figure 5 – Test circuits for rated current, series resistance, response time, current		
136	reset time, maximum interrupting voltage and operating duty test		42

137	Figure 6 – Test circuits for AC durability	45
138	Figure 7 – Test circuits for impulse durability	46
139	Figure 8 – Test circuits for insertion loss.....	48
140	Figure 9 – Test circuit for return loss	49
141	Figure 10 – Test circuits for longitudinal balance	50
142	Figure 11 – Test circuit for near-end crosstalk	51
143	Figure 12 – Examples for a test arrangement of the rated load current test I_L	59
144	Figure 13 – Examples of multi-terminal SPDs with a common current path	60
145	Figure 14 – Test circuits for Total discharge current	61
146	Figure 15 – Test circuits for high temperature/humidity endurance and environmental	
147	cycling	63
148	Figure 16 – Environmental cycling	65
149	Figure 17 – Examples for appropriate test circuits of the load side short-circuit test(s).....	71
150	Figure B.1 – Configurations of devices with current-limiting component(s) only	73
151	Figure C.1 – Differential Mode U_p measurement of Figure 1 SPDs	74
152	Figure C.2 – ITU-T test setup for SPD Common Mode U_p measurement to C terminal.....	74
153	Figure E.1 – Test circuit for bit error ratio test.....	77
154	Figure F.1 – Measurement circuit of a channel link with up to two SPDs	79
155		
156	Table 1 – General SPD requirements.....	17
157	Table 2 – Pass criteria for type tests	32
158	Table 3 – Waveform tolerances.....	33
159	Table 4 – Voltage and current waveforms for impulse-limiting voltage and impulse	
160	durability.....	36
161	Table 5 – Source voltages and currents for impulse reset test	38
162	Table 6 – Preferred values of currents for AC durability test	40
163	Table 7 – Test currents for response time	43
164	Table 8 – Preferred values of current for operating duty tests	44
165	Table 9 – Preferred values of impulse current.....	47
166	Table 10 – Typical parameters for Figure 8 and Figure 9	48
167	Table 11 – Typical impedance values for longitudinal balance test.....	50
168	Table 12 – Cross-sections of copper conductors for screw-type or screwless terminals	52
169	Table 13 – altitude correction factors for calculating the air clearances.....	54
170	Table 14 – Rated impulse withstand voltages for air clearances for SPDs.....	54
171	Table 15 – Air clearances for SPDs	55
172	Table 16 – Creepage distances for SPDs.....	56
173	Table 17 – Relationship between material groups and classifications.....	57
174	Table 18 – Preferred values of test-time duration for high temperature and humidity	
175	endurance	61
176	Table 19 – Preferred values of temperature and duration for environmental cycling	
177	tests	64

178	Table A.1 – Application of annexes from IEC 61643-01.....	72
179	Table E.1 – Test times for BER test	76
180	Table F.1 – List of Abbreviations.....	78
181	Table F.2 – Typical Tests for an SPD.....	78
182		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SURGE PROTECTIVE DEVICES –**Part 21: Surge protective devices connected to telecommunications
and signalling networks –
Requirements and test methods****FOREWORD**

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- International Standard IEC 61643-21 has been prepared by subcommittee 37A: Low-voltage surge protective devices, of IEC technical committee 37: Surge arresters.
- This second edition cancels and replaces the first edition including the amendments published in 2000, 2008 and 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) New structure of IEC 61643-21 based on IEC 61643-01 Ed.1

b) *To be completed at CDV stage*

The text of this International Standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

The National Committees are requested to note that for this document the stability date is .

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of SPDs when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of SPDs.

The purpose of this International Standard is to identify the requirements for Surge Protective Devices (SPDs) used in protecting telecommunication and signalling systems, for example, low-voltage data, voice, and alarm circuits. All of these systems may be exposed to the effects of lightning and power line faults, either through direct contact or induction. These effects may subject the system to overvoltages or overcurrents or both, whose levels are sufficiently high to harm the system. SPDs are intended to provide protection against overvoltages and overcurrents caused by lightning and power line faults.

This part of the IEC 61643 series addresses safety and performance tests for surge protective devices (SPDs) for telecommunication and signalling systems in conjunction with part 01.

The SPDs addressed in this International Standard may contain overvoltage protection components only, or a combination of overvoltage and overcurrent protection components. Protection devices containing overcurrent protection components only are not within the coverage of this standard. However, devices with only overcurrent protection components are shown in Annex B.

An SPD may comprise several overvoltage and overcurrent protection components. All SPDs are tested on a "black box" basis, i.e., the number of connections of the SPD determine the testing procedure, not the number of components in the SPD. The SPD configurations are described in 4.100. In the case of multiple line SPDs, each line may be tested independently of the others, but there may also be a need to test all lines simultaneously.

This standard covers a wide range of testing conditions and requirements; the use of some of these is at the discretion of the user. How the requirements of this standard relate to the different types of SPD is described in 4.101 and 4.102. Whilst this is a performance standard and certain capabilities are demanded of the SPDs, failure rates are covered by 9.1.1. Selection and application principles are covered in IEC 61643-22.

If the intended applications of an SPD are covered by different parts of the IEC 61643 series, all relevant parts are applied, as far as is reasonable.

NOTE to entry: Throughout this publication, when "part 01" is mentioned, it refers to IEC 61643-01.

SPDs containing additional features or functions not addressed in this standard and the relevant subsequent part(s) may require additional consideration and tests to ensure the main SPD function is not adversely affected and no hazards may arise from these additional features or functions. If appropriate standards exist to cover such functions they should be applied.

The requirements of this part of IEC 61643 supplement, modify or replace certain of the general requirements contained in part 01 and are to be read and applied together with the latest edition of IEC 61643-01, as indicated by the undated normative reference in the normative references of this document.

Numbering of clauses follows the numbering of part 01, but, dependent on the application of clauses from part 01, does not necessarily follow sequentially.

If a clause in part 01 is not explicitly called up or referred to in this part 21 of the IEC 61643 series of standards, then this clause does not apply to SPDs covered by this part 21.

The numbering of additional subclauses to part 01 in this document starts with the number 100 in the last section of the subclauses added (e.g. 4.100 or 4.1.100)

For powerful SPD's (continuous power > 100 VA, see paragraph 8.6.103) IEC 61643-21 is to be applied if at least one of the following criteria is met:

- Criteria 1: Application in the context of a **telecom and/or signalling network** (e.g., control systems, instrumentation and safety technology)
- Criteria 2: Application in a local AC/DC supply application with reference to information technology equipment but **no direct connection to supply networks**.
- Criteria 3: Devices that provide **data transfer and optional DC supply** on a common electrical circuit (e.g. PoE, signal circuits with remote supply, ...)

LOW-VOLTAGE SURGE PROTECTIVE DEVICES –

Part 21: Surge protective devices connected to telecommunications and signalling networks – Requirements and testing methods

1 Scope

This part of the IEC 61643 series is applicable to devices for surge protection against indirect and direct effects of lightning or other transient overvoltages.

These devices are intended to be connected to telecommunications and signalling networks, and equipment rated up to 1 000 V RMS and 1 500 V DC. Performance characteristics, standard methods for testing and ratings are established. These devices contain at least one voltage-limiting component (clamping or switching) and are intended to limit surge voltages and divert surge currents.

2 Normative references

For the purposes of this document normative reference given in part 01 with the following additions apply.

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61643-01, *Low-voltage surge protective devices – Part 01: General requirements and test methods*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5 – Surge immunity test*

3 Terms, definitions and abbreviated terms

Clause 3 from part 01 applies with the following additions:

3.1 General

Clause 3.1 from part 01 applies.

3.2 Terms and definitions

Clause 3.2 from part 01 applies with the following additions:

3.2.100

AC durability

characteristic of an SPD which allows it to conduct alternating current of a specific magnitude and duration for a specified number of times

3.2.101**blind spot**

situation where voltages above the maximum continuous operating voltage U_c may cause incomplete operation of the SPD

NOTE 1 to entry: Incomplete operation of the SPD means not all of the stages in a multi-stage SPD have operated during the impulse test. This may result in overstressing of components in the SPD.

3.2.102**current limiting**

action of an SPD, containing at least one non-linear current-limiting component, that causes currents exceeding a predetermined value to be restricted

3.2.103**current reset time**

time required for a self-resettable current limiter to revert to its normal or quiescent state

3.2.104**current response time**

time required for a current-limiting component to operate at a specified current and a specified temperature

3.2.105**impulse durability**

characteristic of an SPD which allows it to conduct impulse current of a specified waveform and peak value for a specified number of time

3.2.106**insertion loss**

loss resulting from the insertion of an SPD into a transmission system

NOTE 1 to entry: It is the ratio of the power delivered to that part of the system following the SPD, before insertion of the SPD, to the power delivered to that same part after insertion of the SPD. The insertion loss is generally expressed in decibels.

[IEV 726-06-07, modified]

3.2.107**insulation resistance**

resistance between designated connections of an SPD when U_c is applied to those connections

3.2.108**longitudinal balance (analogue voice frequency circuits)**

electrical symmetry of the two wires comprising a pair with respect to ground

3.2.109**longitudinal balance (communication and control cables)**

ratio of the disturbing common mode (longitudinal) RMS voltage (V_s) to ground and the resulting differential mode (metallic) RMS voltage (V_m) of the SPD, expressed in decibels (dB)

NOTE 1 to entry: The longitudinal balance in dB is given by the formula: $20 \log_{10} V_s/V_m$
where V_s and V_m are measured at the same frequency.

3.2.110**longitudinal balance (data transmission)**

measure of the similarity of impedance to ground (or common) for the two or more conductors of a balanced circuit

NOTE 1 to entry: This term is used to express the degree of susceptibility to common mode interference

3.2.111**longitudinal balance (telecommunications)**

ratio of the disturbing common mode (longitudinal) voltage V_s and the resulting differential mode (metallic) voltage V_m of the SPD, expressed in decibels (dB)

3.2.112**maximum interrupting voltage**

maximum voltage (DC or RMS) that can be applied to the current-limiting components of an SPD without degradation of the SPD

NOTE 1 to entry: This voltage may be equal to the U_C of the SPD or may be a higher value depending on the arrangement of the current-limiting component(s) within the SPD

3.2.113**multi-stage SPD**

SPD which has more than one voltage-limiting component

NOTE 1 to entry: These voltage-limiting components may or may not be electrically separated by a series component. The voltage-limiting components may be either switching or clamping types

3.2.114**near-end crosstalk (NEXT)**

crosstalk that is propagated in a disturbed channel in the direction opposite to the direction of propagation of the current in the disturbing channel

NOTE 1 to entry: The terminal of the disturbed channel at which the near-end crosstalk is present is ordinarily near to, or coincides with, the energized terminal of the disturbing channel

3.2.115**overstressed fault mode**

mode 1 condition wherein the voltage-limiting part of the SPD has been disconnected

NOTE 1 to entry: The voltage-limiting function is no longer present, but the line is still operable

mode 2 condition wherein the voltage-limiting part of the SPD has been short-circuited by a very low impedance within the SPD

NOTE 2 to entry: The line is inoperable, but the equipment is still protected by a short circuit

mode 3 situation wherein the SPD has undergone an internal open circuit on the network side of the voltage-limiting part of the SPD

NOTE 3 to entry: The line is inoperable, but the equipment is still protected by an open line

3.2.116**preferred values**

values for the parameters listed in the tables for the various tests, preferred in the sense that their use promotes uniformity and provides a means of comparison among various protective devices

NOTE 1 to entry: They also provide a common engineering language beneficial to the user and manufacturer of surge protectors used in telecommunications and signalling networks. However, specific applications may require values other than the preferred values of the tables.

3.2.117**resettable current limiting**

action of an SPD that limits current and can be manually reset after operating

3.2.118**return loss**

modulus of the reciprocal of the reflection factor, generally expressed in decibels (dB)

NOTE 1 to entry: When impedances can be defined, the return loss in dB is given by the formula:

$$20 \log_{10} \text{MOD} [(Z1+Z2)/(Z1-Z2)]$$

where $Z1$ is the characteristic impedance of the transmission line ahead of the discontinuity, or the impedance of the source, and $Z2$ is the impedance after the discontinuity or load impedance seen from the junction between the source and the load [IEV 702-07-25, modified]

3.2.119**self-resetting current limiting**

action of an SPD that limits current and will self-reset after the disturbing current is removed

3.2.120**voltage clamping SPD**

SPD that has high shunt impedance and will have a continuous reduction in impedance with increasing current in response to a voltage surge exceeding the threshold level of the SPD

NOTE 1 to entry: Examples of components used in voltage clamping SPDs: varistors (e.g. MOV) and avalanche breakdown diodes (ABD).

3.3 Acronyms / Symbols

Clause 3.3 from part 01 applies

4 Classification**4.1 General**

Clause 4.1 from part 01 applies.

4.2 up to 4.4 of part 01 does not apply**4.5 Location**

Clause 4.5 from part 01 applies.

4.6 Accessibility

Clause 4.6 from part 01 applies.

4.7 and 4.8 of part 01 does not apply**4.9 Degree of protection provided by enclosures according to IEC 60529 (IP code)**

Clause 4.9 from part 01 applies.

4.10 Temperature and humidity range

Clause 4.10 from part 01 applies.

4.11 and 4.12 of part 01 does not apply

4.100 SPD configurations

The SPD configurations described in this standard are shown in **Figure 1**. Each SPD configuration is composed of one or more voltage-limiting components and may include current-limiting components.

Figure 1a – Two-terminal SPD

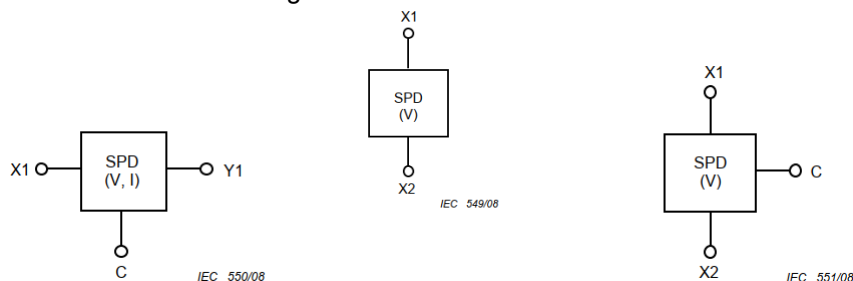


Figure 1b – Three-terminal SPD

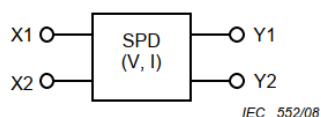


Figure 1c – Three-terminal SPD

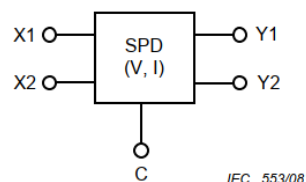
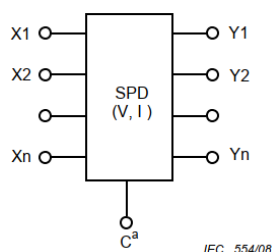


Figure 1d – Four-terminal SPD

Figure 1e – Five-terminal SPD



^a The common terminal C may not be provided.

Figure 1f – Multi-terminal SPD

Key

V	voltage-limiting component
V, I	voltage-limiting components or a combination of voltage-limiting and current-limiting components
X1, X2....Xn	line connections
Y1, Y2...Yn	protected line connections
C	common connection

Figure 1 – SPD configurations

4.101 Variants of SPDs

This standard considers two basic variants of SPD.

The first variant of SPD contains at least one voltage-limiting component and no current-limiting component(s) in a housing. All the SPD configurations of Figure 1 can be of this variant. These

SPDs shall satisfy the requirements listed in [Table 1](#). The SPDs shown in Figures 1b, 1d, 1e and 1f may contain a linear component between the line terminal and the corresponding protected line terminal. These SPDs shall also satisfy the applicable requirements of 8.3.104.

The second variant of SPD contains both voltage-limiting and current-limiting components in a housing. SPD configurations shown in Figures 1b, 1d, 1e, and 1f are applicable for SPDs with both voltage-limiting and current-limiting components. This variant of SPD shall satisfy the requirements listed in Table 1. Configurations of protective devices having only current-limiting components are shown in [annex B for information](#).

SPDs may need to satisfy additional requirements depending on the application. The additional requirements are described in 8.3.105 and 8.6.10x (see [Table 1](#)).

Subclause 8.3.105 provides transmission tests that SPDs may need to conform to, depending on their communication and signalling application. Selection of the applicable transmission tests from 9.3.105 shall be made, based on the intended application of the SPDs. [Table 1](#) provides general guidance on how to select the applicable transmission tests.

Subclause 9.6.100 – 9.6.102 provides the environmental requirements when the SPDs are intended only for use in uncontrolled environments as described in 7. SPDs shall satisfy these requirements after an agreement between the user and the manufacturer. [Table 1](#) provides examples of what requirements different types of SPD shall satisfy.

4.102 Type test requirements for SPDs

Table 1 – General SPD requirements

Requirement – Test	Sub-clause	Type of SPD					
		SPD with only voltage-limiting function	SPD with both voltage-limiting and current-limiting functions	SPD with voltage-limiting function and linear component between its terminals	SPD having both voltage-limiting and current-limiting functions with enhanced transmission capabilities	SPD having only voltage-limiting function but intended for use in extended range environment	SPD having both voltage-limiting and current-limiting functions but intends for use in extended range environment
General test							
Identification and documentation	6	A	A	A	A	A	A
Marking	8.2 / 9.2	A	A	A	A	A	A
Transmission tests							
Capacitance	8.3.105.1 / 9.3.105.1	A	O	O	O	A	O
Insertion loss	8.3.105.2 / 9.3.105.2	O	A	A	A	O	A
Return loss	8.3.105.3 / 9.3.105.3	O	O	O	A	O	O
Longitudinal balance	8.3.105.4 / 9.3.105.4	O	O	O	A	O	O
Near-end crosstalk (NEXT)	8.3.105.5 / 9.3.105.5	O	O	O	A	O	O
Mechanical tests							
Mounting	8.4.1 / 9.4.1	A	A	A	A	A	A
Reliability of screws	8.4.2 / 9.4.2	A	A	A	A	A	A
Tests for external connections	8.4.3 / 9.4.3	A	A	A	A	A	A
Verification of air clearances and creepage distances	8.4.4 / 9.4.4	A	A	A	A	A	A
Mechanical strength	8.4.5 / 9.4.5	A	A	A	A	A	A
Resistance to ingress of solid objects and to harmful ingress of water	8.5.1 / 9.5.1	A	A	A	A	A	A
Resistance to abnormal heat and fire	8.5.3 / 9.5.3	A	A	A	A	A	A
Protection against direct contact	8.3.1 / 9.3.1	A	A	A	A	A	A

523

Table 1 (continued)

Requirement – Test	Sub-clause	Type of SPD					
		SPD with only voltage-limiting function	SPD with both voltage-limiting and current-limiting functions	SPD with voltage-limiting function and linear component between its terminals	SPD having both voltage-limiting and current-limiting functions with enhanced transmission capabilities	SPD having only voltage-limiting function but intended for use in extended range environment	SPD having both voltage-limiting and current-limiting functions but intends for use in extended range environment
Environmental tests							
High temperature and humidity endurance	8.6.100 / 9.6.100	O	O	O	O	A	A
Environmental cycling with impulse surges	8.6.101 / 9.6.101	O	O	O	O	A	A
Environmental cycling with AC surges	8.6.102 / 9.6.102	O	O	O	O	A	A
Voltage limiting tests							
Insulation resistance	8.3.7 / 9.3.7	A	A	A	A	A	A
Impulse durability and voltage protection level ^a	8.3.100 / 9.3.100	A	A	A	A	A	A
Impulse reset	8.3.101 / 9.3.101	A	A	A	A	A	A
AC durability for voltage limiting function ^a	8.3.102 / 9.3.102	O	O	O	O	O	O
Blind spot test	8.3.103 / 9.3.103	A	A	A	A	A	A

524

Table 1 (continued)

Requirement – Test	Sub-clause	Type of SPD					
		SPD with only voltage-limiting function	SPD with both voltage-limiting and current-limiting functions	SPD with voltage-limiting function and linear component between its terminals	SPD having both voltage-limiting and current-limiting functions with enhanced transmission capabilities	SPD having only voltage-limiting function but intended for use in extended range environment	SPD having both voltage-limiting and current-limiting functions but intends for use in extended range environment
Current limiting tests							
Rated load current ^c	8.6.1.1 / 9.6.1.1	A	A	A	A	A	A
Series resistance	8.3.104.2 / 9.3.104.2	N.A.	A	A	A	N.A.	A
Current response time	8.3.104.3 / 9.3.104.3	N.A.	A	N.A.	A ^b	N.A.	A ^b
Current reset time	8.3.104.4 / 9.3.104.4	N.A.	A	N.A.	A ^b	N.A.	A ^b
Maximum interrupting voltage	8.3.104.5 / 9.3.104.5	N.A.	A	N.A.	A ^b	N.A.	A ^b
Operating duty test for current limiting function	8.3.104.6 / 9.3.104.6	N.A.	A	N.A.	A ^b	N.A.	A ^b
AC durability for current limiting function ^a	8.3.104.7 / 9.3.104.7	N.A.	A	N.A.	A ^b	N.A.	A ^b
Impulse durability for current limiting function ^a	8.3.104.8 / 9.3.104.8	N.A.	A	N.A.	A ^b	N.A.	A ^b
Additional tests for SPDs in powerful applications							
Protective provisions of SPDs	8.6.103.1 / 9.6.103.1	A	A	A	A	A	A
Temperature withstand	8.6.103.2 / 9.6.103.2	A	A	A	A	A	A
Thermal protection	8.6.103.3 / 9.6.103.3	A	A	A	A	A	A
Overstress behaviour	8.6.103.4 / 9.6.103.4	A	A	A	A	A	A
Load-side short-circuit rating	8.6.103.5 / 9.6.103.5	A	A	A	A	A	A
A Applicable. N.A Not applicable. O Optional. ^a For each category of test impulse, a new set of samples can be used. ^b Test not applicable if there is a linear component between its terminals. ^c Applicable only for 3/4/5 multi terminal SPD (see Figure 1b,1d, 1e and 1f). These are SPDs with X and Y connections.							

5 This clause of part 01 does not apply**6 Marking and other product information**

Clause 6 from part 01 applies with the following additions.

6.1 General

Clause 6.1 from part 01 applies with the following modifications:

The required markings to be placed on the SPD, are a1), a4) and a5); Other required markings shall appear on the installation instructions or on the packaging, or included in the product documentation (e.g. Web). Details are listed in 6.2.100 and 6.2.101.

The location can be also under a cover of the enclosure but shall be easily accessible by the end user (e.g. no tools). Any notes for special handling shall be included in the documentation or on the packaging.

Compliance is checked by visual inspection.

An SPD may be classified to more than one test category according to 6.2, a101) (e.g. C1 and C2).

6.2 List of items

Clause 6.2 from part 01 applies with the following change and additions:

a5) Maximum continuous operating voltage U_C for each mode of protection (if U_C is different for each mode of protection declared by the manufacturer)

NOTE: U_C is not valid for RF SPDs with quaterwave technology.

a101) SPD category and discharge parameters (e.g. C2: 2 kV / 1 kA)

a102) Impulse reset time and corresponding U/I parameter

a103) AC durability and parameter for ac durability, if declared by the manufacturer

a104) Overstressed fault mode

a105) Transmission characteristics (capacitance, Insertion loss, return loss, longitudinal balance and near-end crosstalk), appropriate to the intended SPD use.

a106) Additional information, where applicable:

- replaceable components,
 - surge currents as, I_n , I_{imp} , I_{Total}
 - Values for high temperature and humidity endurance test
- a107) Series resistance
- a108) Current limiting parameter
- Current response time for each test current
 - Current reset time
 - Maximum interrupting voltage for resettable current-limiting components (voltage, current and application)
 - AC durability for current-limiting components (current, duration and applications)
 - Impulse durability for current-limiting components

a109) insulation resistance

NOTE: For insulation resistance a25) or a26) can be used instead.

a110) website address

6.8.100 Information which shall be provided with the products to be delivered

The information indicated in a8) (if connections are not interchangeable) and a17) shall be on or included in the packaging.

6.2.1 Information which shall be provided in the product documentation (e.g. Web)

The information indicated in a6), a9), a12), a15), a19), a20), a23), a24), a101) shall be included in the documentation. If applicable, the information indicated in a102) to a110) shall be included in the documentation.

6.3 This clause of part 01 does not apply**7 Service conditions**

Clause 7 from part 01 applies with the following addition:

7.100.1 storage range

storage range: –40 °C to +70 °C

NOTE: Temperature ranges exceeding the above may be declared by the manufacturer.

8 Requirements

Clause 8 from part 01 applies with the following additions:

8.1 General requirements

Clause 8.1 from part 01 will be replaced by the following:

For telecommunication applications ITU-T gives requirements in the K-series for protection holders (K.65) and termination modules (K.55).

SPDs of Figures 1c, 1e and 1f may have a common current path (including protective components or just internal connections) that conducts the total discharge current I_{Total} . The manufacturer shall state the maximum value of impulse current for this current path. This value of impulse current may be less than n times the maximum current capability of each line terminal, where n equals the number of line terminals.

Table 1 shows the requirements based on the type of SPD.

8.2 Marking

Clause 8.2 from part 01 applies.

8.3 Electrical requirements

Clause 8.3 from part 01 applies with the following modifications:

8.3.1 Protection against electric shock

Clause 8.3.1 from part 01 applies with the following modifications:

8.3.1.1 Protection against direct contact**Secretary's note:**

National committees are requested to carefully consider the below alternatives 1 and 2 for the required structure in part -21 if a clause of part -21 has few differences compared with part 01. In this case, alternative 1 shows the complete text including the changes. Alternative 2 shows only the changes.

We need your preference for one of these alternatives together with their relevant arguments.

(Alternative 1)

Clause 8.3.1.1 from part 01 will be replaced by the following:

The following requirements are valid for accessible SPDs where the U_C is above 50 V RMS or 60 V DC

For protection against direct contact (inaccessibility of hazardous live parts), SPDs shall be designed in such a way that live parts cannot be touched when the SPD is installed for the intended use.

SPDs, except SPDs classified inaccessible, shall be so designed that, when they are wired and mounted 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.

After installation according to the manufacturer's installation instructions the protection against touching of hazardous live parts for SPDs, which may be accessible for uninstructed persons, shall at least comply with the requirements for IP2X according IEC 60529.

The connection between the earthing connections and all accessible conductive parts shall be of low resistance.

Compliance is checked by the tests in accordance with IEC 60529 and according 9.3.1.

(Alternative 2)

Clause 8.3.1.1 from part 01 applies with the following exemptions:

This requirement only applies to accessible SPDs having a U_C above 50 V AC and/or 60 V DC.

Replace the requirement of IP2XC by IP2X.

8.3.2 Continuous current I_c

Clause 8.3.2 from part 01 applies.

8.3.3 Protective conductor current I_{PE}

This clause from part 01 does not apply.

8.3.4 Voltage protection level U_P

Clause 8.3.4 from part 01 is replaced by 8.3.100:

8.3.5 and 8.3.6 of part 01 does not apply**6.8.7 Insulation resistance**

Clause 8.3.7 from part 01 applies with the following additions:

This characteristic shall be stated by the manufacturer. However, I_{PE} or I_C can be stated instead.

NOTE: Insulation resistance is not valid for RF SPDs with quarterwave technology.

8.3.6 up to 8.3.10 of part 01 does not apply

6.8.100 Impulse durability and voltage protection level

The SPD shall be tested using one impulse type selected from Category C of Table 4. This impulse shall be used to perform the impulse-limiting voltage. The current level shall be selected based on the current carrying capability of the SPD. Additional tests may be performed using other impulses selected from Categories A1, B, C and D as well as those listed in the SPD documentation. However, these tests are optional. The measured limiting voltage of the SPDs determined from a category "C" impulse voltage when tested at the specified test conditions of Table 4 shall not exceed the voltage protection level that is specified by the manufacturer.

NOTE: Testing of the Impulse limiting voltage " U_p " is optional for test categories A, B and D.

Compliance is checked by the test in accordance with 9.3.100.

8.3.7 Impulse reset

This requirement is applicable only to switching-type SPDs and combination (combination of switching and clamping components) SPDs. The SPD, shall self-extinguish, any follow current and return to its high-impedance state after an impulse application under energised conditions within its specified reset time. Unless otherwise specified, the SPD shall return to its high impedance state in 30 ms or less.

Compliance is checked in accordance with 9.3.101.

8.3.8 AC durability, if declared by the manufacturer

The SPD shall be capable of withstanding the specified AC durability without unacceptable changes in its characteristics.

Compliance is checked in accordance with 9.3.102.

8.3.9 Blind spot

If no information regarding blind spots is available from the manufacturer, or verification of the manufacturer's information is desired, the testing of multi-stage SPDs shall be.

Compliance is checked in accordance with 9.3.103.

8.3.10 Current-limiting requirements

8.3.10.1 General

SPDs having a linear component (e.g. resistor, inductance, etc.) between its input and output connection shall comply with the requirements according to 8.3.104.2 and 8.6.1.1.

SPDs containing additionally a current-limiting function shall comply with all of the following requirements.

8.3.10.2 Series resistance

The series resistance between the input (X_n) and output connections (Y_n) of the SPDs shall be within the specified values.

Compliance is checked in accordance with 9.3.104.2.

8.3.10.3 Current response time

The response time of the current-limiting component shall not exceed the specified value.

Compliance is checked in accordance with 9.3.104.3.

Additional information is given in ITU-T Recommendation K.82

8.3.10.4 Current reset time

This requirement only applies to SPDs having self-resettable current limiting components. The current reset time of the current-limiting component shall not exceed the specified value.

The reset time, or time required for the current-limiting component(s) to return to their quiescent state, shall be less than 120 s, unless otherwise specified.

Compliance is checked in accordance with 9.3.104.4.

8.3.10.5 Maximum interrupting voltage

This requirement only applies to SPDs containing self-resettable or manually resettable current-limiting component(s). The current-limiting component shall withstand the specified maximum interrupting voltage without unacceptable changes in its characteristics.

Compliance is checked in accordance with 9.3.104.5.

8.3.10.6 Operating duty test for current limiting function

This requirement only applies to SPDs containing self-resettable or manually resettable current-limiting component(s). The current-limiting component shall withstand the specified applications of maximum interrupting voltage without unacceptable changes in its characteristics.

Compliance is checked in accordance with 9.3.104.6.

8.3.10.7 AC durability for current-limiting function

The current-limiting component shall withstand the specified applications of AC durability for current-limiting function without unacceptable changes in its characteristics.

Compliance is checked in accordance with 9.3.104.7.

8.3.10.8 Impulse durability for current limiting function

The current-limiting component shall withstand the specified impulse durability for current-limiting function without unacceptable changes in its characteristics.

Compliance is checked in accordance with 9.3.104.8.

8.3.11 Transmission requirements

8.3.11.1 Capacitance

The capacitance between specified connections of the SPDs shall not exceed the specified value.

Compliance is checked in accordance with 9.3.105.1.

8.3.11.2 Insertion loss

The SPD shall be tested for insertion loss to determine whether the insertion of the SPD into the test system results in a voltage reduction between the generating and the measuring equipment.

Compliance shall be checked in accordance with 9.3.105.2.

8.3.11.3 Return loss

The return loss of the SPDs shall not exceed the specified value.

Compliance is checked in accordance with 9.3.105.3.