

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Low voltage surge protective devices –
Part 21: Surge protective devices connected to telecommunications and
signalling networks – Performance requirements and testing methods**

**Parafoudres basse tension –
Partie 21: Parafoudres connectés aux réseaux de signaux et de
télécommunications – Prescriptions de fonctionnement et méthodes d'essais**

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 General.....	8
1.1 Scope.....	8
1.2 SPD configurations.....	8
1.3 Use of this standard.....	10
2 Normative references.....	13
3 Definitions.....	14
4 Service and test conditions.....	17
4.1 Service conditions.....	17
4.1.1 Normal service conditions.....	17
4.1.2 Abnormal service conditions.....	18
4.2 Test temperature and humidity.....	18
4.3 SPD testing.....	18
4.4 Waveform tolerances.....	19
5 Requirements.....	19
5.1 General requirements.....	19
5.1.1 Identification and documentation.....	19
5.1.2 Marking.....	19
5.2 Electrical requirements.....	20
5.2.1 Voltage-limiting requirements.....	20
5.2.2 Current-limiting requirements.....	21
5.2.3 Transmission requirements.....	22
5.3 Mechanical requirements.....	22
5.3.1 Terminals and connectors.....	23
5.3.2 Mechanical strength (mounting).....	24
5.3.3 Resistance to ingress of solid objects and to harmful ingress of water.....	24
5.3.4 Protection against direct contact.....	24
5.3.5 Fire resistance.....	24
5.4 Environmental requirements.....	24
5.4.1 High temperature and humidity endurance.....	24
5.4.2 Environmental cycling with impulse surges.....	25
5.4.3 Environmental cycling with a.c. surges.....	25
6 Type test.....	25
6.1 General tests.....	25
6.1.1 Identification and documentation.....	25
6.1.2 Marking.....	25
6.2 Electrical tests.....	26
6.2.1 Voltage-limiting tests.....	26
6.2.2 Current-limiting tests.....	32
6.2.3 Transmission tests.....	35
6.3 Mechanical tests.....	37
6.3.1 Terminals and connectors.....	37
6.3.2 Mechanical strength (mounting).....	39
6.3.3 Resistance to ingress of solid objects and to harmful ingress of water.....	39
6.3.4 Protection against direct contact.....	39

6.3.5	Fire resistance.....	40
6.4	Environmental tests.....	41
6.4.1	High temperature and humidity endurance.....	41
6.4.2	Environmental cycling with impulse surges.....	41
6.4.3	Environmental cycling with a.c. surges.....	42
6.5	Acceptance tests.....	42
Annex A (informative) Devices with current-limiting components only.....		56
Annex B (Void).....		57
Annex C (Void).....		58
Annex D (informative) Measurement accuracy.....		59
Annex E (informative) Determination of let-through current (I_p).....		60
Bibliography.....		63
Figure 1 – SPD configurations.....		9
Figure 16 – Examples of multi-line SPDs with a common protective element.....		28
Figure 2 – Test circuits for impulse reset time.....		43
Figure 3 – Test circuits for a.c. durability and overstressed fault mode.....		44
Figure 4 – Test circuits for impulse durability and overstressed fault mode.....		45
Figure 5 – Test circuits for rated current, series resistance, response time, current reset time, maximum interrupting voltage and operating duty test.....		46
Figure 6 – Test circuits for a.c. durability.....		47
Figure 7 – Test circuits for impulse durability.....		48
Figure 8 – Test circuits for insertion loss.....		49
Figure 9 – Test circuit for return loss.....		49
Figure 10 – Test circuits for longitudinal balance.....		50
Figure 11 – Test circuit for bit error ratio test.....		51
Figure 12 – Test circuit for near-end crosstalk.....		52
Figure 13 – Test circuits for high temperature/humidity endurance and environmental cycling.....		53
Figure 14 – Environmental cycling schedule A with RH ≥ 90 %.....		54
Figure 15 – Environmental cycling B.....		55
Figure A.1 – Configurations of devices with current-limiting component(s) only.....		56
Figure E.1 – Determination of differential mode let-through current.....		60
Figure E.2 – Determination of common mode let-through current.....		61
Figure E.3 – Determination of differential mode let-through current.....		61
Figure E.4 – Determination of differential mode let-through current.....		61
Figure E.5 – Determination of common mode max. let-through current.....		61
Figure E.6 – Determination of common mode max. let-through current at multi-terminal SPDs.....		62

Table 1 – General SPD requirements.....	11
Table 2 – Waveform tolerances.....	19
Table 3 – Voltage and current waveforms for impulse-limiting voltage.....	27
Table 4 – Source voltages and currents for impulse reset test	29
Table 5 – Preferred values of currents for a.c. durability test	30
Table 6 – Test currents for response time.....	32
Table 7 – Preferred values of current for operating duty tests	34
Table 8 – Preferred values of a.c. test currents.....	34
Table 9 – Preferred values of impulse current.....	35
Table 10 – Standard parameters for figure 8.....	35
Table 11 – Impedance values for longitudinal balance test.....	36
Table 12 – Test times for BER test	37
Table 13 – Connectable cross-sectional areas of copper conductors for screw-type terminals or screwless-type terminals	38
Table 14 – Pulling force (screwless terminals)	38
Table 15 – Preferred values of test-time duration for high temperature and humidity endurance.....	41
Table 16 – Preferred values of temperature and duration for environmental cycling tests.....	42

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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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International Standard IEC 61643-21 has been prepared by subcommittee 37A: Low-voltage surge protective devices, of IEC technical committee 37: Surge arresters.

This consolidated version of IEC 61643-21 consists of the first edition (2000) [documents 37A/101/FDIS and 37A/104/RVD], its amendment 1 (2008) [documents 37A/200/FDIS and 37A/201/RVD] and its corrigendum of March 2001.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 1.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result 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

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INTRODUCTION

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 standard describes tests and requirements which establish methods for testing SPDs and determining their performance.

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 covered in annex A.

An SPD may comprise several overvoltage and overcurrent protection components. All SPDs are tested on a "black box" basis, i.e., the number of terminals of the SPD determines the testing procedure, not the number of components in the SPD. The SPD configurations are described in 1.2. 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 1.3. Whilst this is a performance standard and certain capabilities are demanded of the SPDs, failure rates and their interpretation are left to the user. Selection and application principles are covered in IEC 61643-22.

If the SPD is known to be a single component device, it has to meet the requirements of the relevant standard as well as those in this standard. 2000

LOW VOLTAGE SURGE PROTECTIVE DEVICES –

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

1 General

1.1 Scope

This International Standard is applicable to devices for surge protection of telecommunications and signalling networks against indirect and direct effects of lightning or other transient overvoltages.

The purpose of these SPDs is to protect modern electronic equipment connected to telecommunications and signalling networks with nominal system voltages up to 1 000 V (r.m.s.) a.c. and 1 500 V d.c.

1.2 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.

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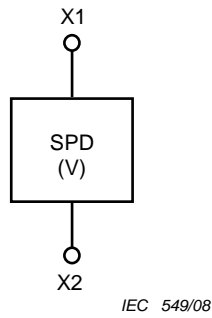


Figure 1a – Two-terminal SPD

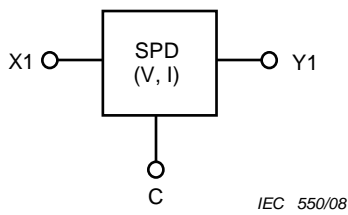


Figure 1b – Three-terminal SPD

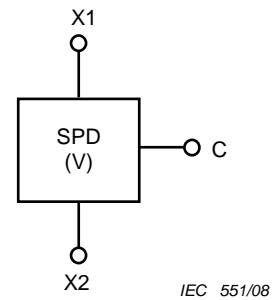


Figure 1c – Three-terminal SPD

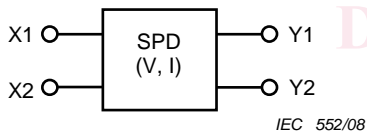


Figure 1d – Four-terminal SPD

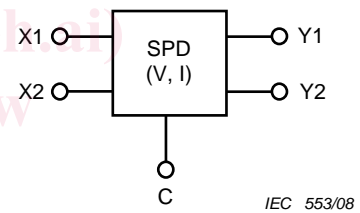


Figure 1e – Five-terminal SPD

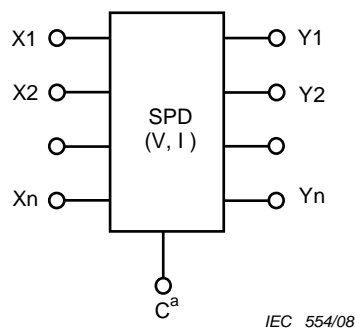


Figure 1f – Multi-terminal SPD

^a The common terminal C may not be provided.

Key

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

Figure 1 – SPD configurations

1.3 Use of this standard

This standard considers two basic types of SPD.

The first type 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 type. These SPDs shall satisfy the requirements of 5.1, 5.2.1 and 5.3 (see 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 5.2.2.

The second type 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 type of SPD shall satisfy the requirements of 5.1, 5.2.1, 5.2.2 and 5.3 (see table 1). Configurations of protective devices having only current-limiting components are covered in annex A.

SPDs may need to satisfy additional requirements depending on the application. The additional requirements are described in 5.2.3 and 5.4 (see table 1).

Subclause 5.2.3 provides transmission tests that SPDs may need to conform to, depending on their communication and signalling application. Selection of the applicable transmission tests from 5.2.3 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 5.4 provides the environmental requirements when the SPDs are intended only for use in uncontrolled environments as described in 4.1. 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.

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Table 1 – General SPD requirements

Test series ⁴	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
1	General test	6.1						
	Identification and documentation	6.1.1	A	A	A	A	A	A
	Marking	6.1.2	A	A	A	A	A	A
	Transmission tests	6.2.3						
	Capacitance	6.2.3.1	A	O	O	O	A	O
	Insertion loss	6.2.3.2	O	A	A	A	O	A
	Return loss	6.2.3.3	O	O	O	A	O	O
	Longitudinal balance	6.2.3.4	O	O	O	A	O	O
	Bit Error Ratio (BER)	6.2.3.5	O	O	O	O	O	O
	Near-end crosstalk (NEXT)	6.2.3.6	O	O	O	A	O	O
	Mechanical tests	6.3						
	Terminals and connectors	6.3.1	A	A	A	A	A	A
	General testing procedure	6.3.1.1	A	A	A	A	A	A
	Terminals with screws	6.3.1.2	A	A	A	A	A	A
	Screwless terminals	6.3.1.3	A	A	A	A	A	A
	Insulating pierced connections	6.3.1.4	A	A	A	A	A	A
	Pull-out-test on SPD terminals designed for single-core conductors	6.3.1.4.1	A	A	A	A	A	A
	Pull-out-test on SPD terminals designed for multi-core cables and cords	6.3.1.4.2	A	A	A	A	A	A
	Mechanical strength (mounting)	6.3.2	A	A	A	A	A	A
	Resistance to ingress of solid objects and to harmful ingress of water	6.3.3	A	A	A	A	A	A
	Protection against direct contact	6.3.4	A	A	A	A	A	A
Fire resistance	6.3.5	A	A	A	A	A	A	

Table 1 (continued)

Test series ⁴	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	6.4						
	High temperature and humidity endurance	6.4.1	O	O	O	O	A	A
	Environmental cycling with impulse surges	6.4.2	O	O	O	O	A	A
	Environmental cycling with a.c. surges	6.4.3	O	O	O	O	A	A
2	Voltage limiting tests	6.2.1						
	Maximum continuous operating voltage (Uc)	6.2.1.1	A	A	A	A	A	A
	Insulation resistance	6.2.1.2	A	A	A	A	A	A
	Impulse durability for voltage limiting function ¹	6.2.1.6	A	A	A	A	A	A
	Impulse-limiting voltage ²	6.2.1.3	A	A	A	A	A	A
	Impulse reset switching types	6.2.1.4	A	A	A	A	A	A
	AC durability for voltage limiting function ¹	6.2.1.5	O	O	O	O	O	O
	Blind spot test multi stage SPD	6.2.1.8	A	A	A	A	A	A
	Overstressed fault mode	6.2.1.7	A	A	A	A	A	A
3	Current limiting tests	6.2.2						
	Rated current	6.2.2.1	N.A.	A	A	A	N.A.	A
	Series resistance	6.2.2.2	N.A.	A	A	A	N.A.	A
	Current response time	6.2.2.3	N.A.	A	N.A.	A ³	N.A.	A ³
	Current reset time	6.2.2.4	N.A.	A	N.A.	A ³	N.A.	A ³
	Maximum interrupting voltage	6.2.2.5	N.A.	A	N.A.	A ³	N.A.	A ³
	Operating duty test	6.2.2.6	N.A.	A	N.A.	A ³	N.A.	A ³
	AC durability for current limiting function ¹	6.2.2.7	N.A.	A	N.A.	A ³	N.A.	A ³
	Impulse durability for current limiting function ¹	6.2.2.8	N.A.	A	N.A.	A ³	N.A.	A ³
4	Acceptance tests	6.5	O	O	O	O	O	O
A	Applicable.							
N.A.	Not applicable.							
O	Optional.							
¹	For each category of test impulse a new set of samples can be used.							
²	It is admissible to measure the impulse-limiting voltage 6.2.1.3 while testing impulse durability 4.2.1.6.							
³	Test not applicable if there is a linear component between its terminals.							
⁴	Each test series is carried out on three samples.							