
Sestavni deli za nizkonapetostne naprave za zaščito pred prenapetostnimi udari - 341. del: Specifikacije za tiristorske prenapetostne omejevalnike (TSS) (IEC 61643-341:2001)

Components for low-voltage surge protective devices -- Part 341: Specification for thyristor surge suppressors (TSS)

Bauelemente für Überspannungsschutzgeräte für Niederspannung -- Teil 341: Festlegungen für Suppressordioden (TSS)

Composants pour parafoudres basse tension -- Partie 341: Spécifications pour les parafoudres à thyristor

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Components for low-voltage surge protective devices
Part 341: Specification for thyristor surge suppressors (TSS)
(IEC 61643-341:2001)

Composants pour parafoudres
basse tension
Partie 341: Spécifications pour
les parafoudres à thyristor
(CEI 61643-341:2001)

Bauelemente für
Überspannungsschutzgeräte
für Niederspannung
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Suppressordioden (TSS)
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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 37B/58/FDIS, future edition 1 of IEC 61643-341, prepared by SC 37B, Specific components for surge arresters and surge protective devices, of IEC TC 37, Surge arresters, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61643-341 on 2001-12-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2002-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2004-12-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A and ZA are normative and annex B is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61643-341:2001 was approved by CENELEC as a European Standard with the following editorial modifications:

Throughout the document, **replace** "a.c." by "AC" and **replace** "d.c." by "DC"

In subclause 3.1.4.1, **replace** "millivolts" by "millivolt" and **replace** "Kelvin" by "kelvin" (twice).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-191	¹⁾	International Electrotechnical Vocabulary (IEV) Chapter 191: Dependability and quality of service	-	-
IEC 60050-702	¹⁾	International electrotechnical vocabulary - Chapter 702: Oscillations, signals and related devices	-	-
IEC 60099-4	¹⁾	Surge arresters Part 4: Metal-oxide surge arresters without gaps for a.c. systems	EN 60099-4	1993 ²⁾
IEC 60721-3-3	¹⁾	Classification of environmental conditions Part 3: Classification of groups of environmental parameters and their severities -- Section 3: Stationary use at weather protected locations	EN 60721-3-3	1995 ²⁾
IEC 60721-3-9	¹⁾	Part 3: Classification of groups of environmental parameters and their severities -- Section 9: Microclimates inside products	EN 60721-3-9	1993 ²⁾
IEC 60747-1	1983	Semiconductor devices - Discrete devices Part 1: General	-	-
IEC 60747-2	1983	Part 2: Rectifier diodes	-	-
IEC 60747-6	1983	Part 6: Thyristors	-	-
IEC 60749	1996	Semiconductor devices - Mechanical and climatic test methods	EN 60749	1999

¹⁾ undated reference.

²⁾ valid edition at date of issue.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-5	1995	Electromagnetic compatibility (EMC) Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	1995
IEC 61083-1 (mod)	1991	Digital recorders for measurements in high-voltage impulse tests Part 1: Requirements for digital recorders	EN 61083-1	1993
ITU-T Recommendation K.20	1996	Resistibility of telecommunication switching equipment to overvoltages and overcurrents	-	-
ITU-T Recommendation K.21	1996	Resistibility of subscriber's terminal to overvoltages and overcurrents	-	-
ITU-T Recommendation K.28	1993	Characteristics of semiconductor arrester assemblies for the protection of telecommunications installations	-	-

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Part 341: Specification for thyristor surge suppressors (TSS)

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International Electrotechnical Commission
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMPONENTS FOR LOW-VOLTAGE SURGE PROTECTIVE DEVICES –**Part 341: Specification for thyristor surge suppressors (TSS)**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61643-341 has been prepared by subcommittee 37B, Specific components for surge arresters and surge protective devices, of IEC technical committee 37: Surge arresters.

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

FDIS	Report on voting
37B/58/FDIS	37B/61/RVD

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 3.

Annex A forms an integral part of this standard.

Annex B is for information only.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

COMPONENTS FOR LOW-VOLTAGE SURGE PROTECTIVE DEVICES –

Part 341: Specification for thyristor surge suppressors (TSS)

1 Scope

This part of IEC 61643 is a test specification standard for thyristor surge suppressor (TSS) components designed to limit overvoltages and divert surge currents by clipping and crowbarring actions. Such components are used in the construction of surge protective devices, particularly as they apply to telecommunications.

This standard contains information on

- terms, letter symbols, and definitions
- basic functions, configurations and component structure
- service conditions and fault modes
- rating verification and characteristic measurement

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61643. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61643 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(191), *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 60050(702), *International Electrotechnical Vocabulary – Chapter 702: Oscillations, signals and related devices*

IEC 60099-4, *Surge arrestors – Part 4: Metal-oxide surge arrestors without gaps for a.c. systems*

IEC 60721-3-3, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 3: Stationary use at weather-protected locations*

IEC 60721-3-9, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 9: Microclimates inside products*

IEC 60747-1:1983, *Semiconductor devices – Discrete devices and integrated circuits – Part 1: General*

IEC 60747-2: 1983, *Semiconductor devices Discrete devices and integrated circuits – Part 2: Rectifier diodes*

IEC 60747-6:1983, *Semiconductor devices – Discrete devices and integrated circuits – Part 6: Thyristors*

NOTE The TSS has substantially different characteristics and usage to the type of thyristor covered by IEC 60747-6. These differences necessitate the modification of some characteristic descriptions and the introduction of new terms. Such changes and additions are indicated in clause 3.

IEC 60749:1996, *Semiconductor devices – Mechanical and climatic test methods*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test*

IEC 61083-1:1991 *Digital recorders for measurements in high-voltage impulse tests – Part 1: Requirements for digital recorders*

ITU-T Recommendation K.20:1996 *Resistibility of telecommunication switching equipment to overvoltages and overcurrents*

ITU-T Recommendation K.21:1996 *Resistibility of subscribers' terminal to overvoltages and overcurrents*

ITU-T Recommendation K.28:1993 *Characteristics of semi-conductor arrester assemblies for the protection of telecommunications installations*

3 Terms, letter symbols and definitions

For the purpose of this part of IEC 61643, the following definitions apply.

3.1 Parametric terms, letter symbols and definitions

Where appropriate, terms, letter symbols and definitions are used from existing thyristor (IEC 60747-6) and rectifier diode (IEC 60747-2) standards.

NOTE 1 IEC 60747-1, chapter V, clause 2.1.1, states "IEC 60027 recommends the letters V and v only as reserve symbols for voltage; however, in the field of semiconductor devices, they are so widely used that in this publication they are on the same plane as U and u ." This standard uses the letters V and v for voltage with the letters U and u as alternatives.

NOTE 2 When several distinctive forms of letter symbol exist, the most commonly used form is given first.

3.1.1

main terminal ratings

listed ratings cover the appropriate requirements of the blocking, conducting and switching quadrants

3.1.1.1

repetitive peak off-state voltage, V_{DRM}

rated maximum (peak) instantaneous voltage that may be applied in the off-state conditions including all d.c. and repetitive voltage components

3.1.1.2

repetitive peak on-state current, I_{TRM}

rated maximum (peak) value of a.c. power frequency on-state current of specified waveshape and frequency which may be applied continuously

3.1.1.3**non-repetitive peak on-state current, I_{TSM}**

rated maximum (peak) value of a.c. power frequency on-state surge current of specified waveshape and frequency which may be applied for a specified time or number of a.c. cycles

3.1.1.4**non-repetitive peak impulse current, I_{PPSM} , I_{TSM}**

rated maximum value of peak impulse current of specified amplitude and waveshape that may be applied

NOTE There are several symbols that are used for this rating. The merits of these symbols are as follows:

I_{PPSM} This is technically correct as it is the maximum or peak (M) non-repetitive (S) value of I_{PP} .

I_{TSM} For short duration impulses this is not technically correct as the maximum (M) value of non-repetitive (S) current may not occur when the device is in the on-state (T) condition.

I_{PPM} The use of this symbol for a non-repetitive value is discouraged. This symbol is the rated maximum (M) repetitive value of I_{PP} .

I_{PP} The use of this symbol for a rated value is discouraged. The term peak impulse current is a circuit parameter and is defined as the peak current for a series of essentially identical pulses.

3.1.1.5**repetitive peak reverse voltage, V_{RRM}**

rated maximum (peak) instantaneous voltage that may be applied in the reverse blocking direction including all d.c. and repetitive voltage components

3.1.1.6**non-repetitive peak forward current, I_{FSM}**

rated maximum (peak) value of a.c. power frequency forward surge current of specified waveshape and frequency which may be applied for a specified time or number of a.c. cycles

3.1.1.7**repetitive peak forward current, I_{FRM}**

rated maximum (peak) value of a.c. power frequency forward current of specified waveshape and frequency which may be applied continuously

3.1.1.8**critical rate of rise of on-state current, di/dt , $(di_T/dt)_{cr}$**

rated value of the rate of rise of current which the device can withstand without damage

3.1.2 Main terminal characteristics**3.1.2.1****off-state voltage, V_D**

d.c. voltage when the device is in the off-state

3.1.2.2**off-state current, I_D**

d.c. value of current that results from the application of the off-state voltage, V_D

3.1.2.3**repetitive peak off-state current, I_{DRM}**

maximum (peak) value of off-state current that results from the application of the repetitive peak off-state voltage, V_{DRM}

3.1.2.4**breakover voltage, $V_{(BO)}$**

maximum voltage across the device in or at the breakdown region measured under specified voltage rate of rise and current rate of rise

NOTE Where a breakdown characteristic has several $V_{(BO)}$ values that need to be referenced, a numeric suffix can be added and the relevant part of the breakdown current range specified, e.g.

$$V_{(BO)1}, 0 < I_{(BR)} < 10 \text{ mA}$$

3.1.2.5**holding current, I_H**

minimum anode, principal, or thyristor current that maintains the thyristor in the on-state

3.1.2.6**off-state capacitance, C_o , C_j**

differential capacitance at the specified terminals in the off-state measured at specified frequency, f , amplitude, V_d and d.c. bias, V_D

3.1.2.7**repetitive peak reverse current, I_{RRM}**

maximum (peak) value of reverse current that results from the application of the repetitive peak reverse voltage, V_{RRM}

3.1.2.8**peak forward recovery voltage, V_{FRM}**

maximum value of forward conduction voltage across the device upon the application of a specified voltage rate of rise and current rate of rise following a zero or specified reverse-voltage condition

3.1.2.9**critical rate of rise of off-state voltage, dv/dt (dv_o/dt)_{cr}**

maximum rate of rise of voltage (below V_{DRM}) that does not cause switching from the off state to the on state

3.1.3 Additional and derived parameters

The following derived and measured parameters may be necessary or useful for comparison, certain applications or statistical process controls.

3.1.3.1**breakdown voltage, $V_{(BR)}$**

voltage across the device in the breakdown region (prior to the switching point) at a specified breakdown current, $I_{(BR)}$

NOTE For positive breakdown slope devices, $V_{(BR)}$ may be used as an alternative to V_{DRM} .

3.1.3.2**breakdown current, $I_{(BR)}$**

current through the device in the breakdown region

3.1.3.3**breakover current, $I_{(BO)}$**

instantaneous current flowing at the breakover voltage, $V_{(BO)}$