



SLOVENSKI STANDARD

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Railway applications - Fixed installations - D.C. surge arresters and voltage limiting devices - Part 1: Surge arresters

Bahnanwendungen - Ortsfeste Anlagen - Überspannungsableiter und Niederspannungsbegrenzer - Teil 1: Überspannungsableiter

Applications ferroviaires - Installations fixes - Parafoudres et limiteurs de tension pour systèmes à courant continu - Partie 1: Parafoudres

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EUROPEAN STANDARD
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English version

**Railway applications -
Fixed installations -
D.C. surge arresters and voltage limiting devices -
Part 1: Surge arresters**

Applications ferroviaires -
Installations fixes -
Parafoudres et limiteurs de tension pour
systèmes à courant continu -
Partie 1: Parafoudres

Bahnanwendungen -
Ortsfeste Anlagen -
Überspannungsableiter und
Niederspannungsbegrenzer -
Teil 1: Überspannungsableiter

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CENELEC

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

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Foreword

This document (EN 50526-1:2012) has been prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations), of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-10-10
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2014-10-10

This document supersedes EN 50123-5:2003.

The existing standard EN 50123-5:2003 covers the case of the old technologies of the gapped arresters with SiC resistors and of the low voltage limiters (LVL) with gaps. These technologies at present are superseded. The present standard deals with the new technologies of the gapless metal-oxide arresters and of the LV limiters for application in the electric railway d.c. fixed installations. Guidance for selection and application of SA and LVL is missing in the old standard while it is added in the third part of the new standard.

As there is no standard available at the moment for surge arrester on rolling stock it seems convenient for the WG to note that the same electrical requirements apply for arresters on rolling stock, taking into account other specific requirements.

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Introduction

This European Standard is in three parts:

- Part 1 deals with metal-oxide arresters without gaps for d.c. railway traction systems (fixed installations) and is based on EN 60099-4:2004 + A1:2006 + A2:2009;
- Part 2 deals with voltage limiting devices for specific use in d.c. railway traction systems (fixed installations);
- Part 3 deals with a Guide of application of metal-oxide arresters and of voltage limiting devices.

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1 Scope

This European Standard applies to non-linear metal-oxide resistor type surge arresters without spark gaps designed to limit voltage surges on d.c. systems with nominal voltage up to 3 kV.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 50124-1:2001, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

EN 50125-2:2002, *Railway applications – Environmental conditions for equipment – Part 2: Fixed electrical installations*

EN 60060-1:2010, *High-voltage test techniques - Part 1: General definitions and test requirements (IEC 60060-1:2010)*

EN 60270:2001, *High-voltage test techniques – Partial discharge measurements (IEC 60270:2000)*

EN 61109:2008, *Insulators for overhead lines – Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria (IEC 61109:2008)*

EN ISO 4287:1998, *Geometrical Product Specifications (GPS) - Surface texture: Profile method - Terms, definitions and surface texture parameters (ISO 4287:1997)*

EN ISO 4892-1:2000, *Plastics - Methods of exposure to laboratory light sources - Part 1: General guidance (ISO 4892-1:1999)*

EN ISO 4892-2:2006, *Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2:2006)*

EN ISO 4892-3:2006, *Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps (ISO 4892-3:2006)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

nominal voltage U_n

designated value for a system

[EN 50163:2004]

3.2

highest permanent voltage U_{max1}

maximum value of the voltage likely to be present indefinitely

[EN 50163:2004]

3.3

highest non-permanent voltage U_{max2}

maximum value of the voltage likely to be present for a limited period of time

NOTE Adapted from EN 50163:2004.

3.4

rated insulation voltage U_{Nm}

d.c withstand voltage value assigned by the manufacturer to the equipment or a part of it, characterising the specified permanent (over five minutes) withstand capability of its insulation

NOTE Adapted from EN 50124-1:2001.

3.5

rated impulse withstand voltage U_{Ni}

impulse voltage value assigned by the manufacturer to the equipment or a part of it, characterising the specified withstand capability of its insulation against transient overvoltages

NOTE Adapted from EN 50124-1:2001.

3.6

overvoltage

voltage having a peak value exceeding the corresponding peak value of the highest non-permanent voltage U_{max2}

3.7

transient overvoltage

short duration overvoltage of a few (up to 20 ms) milliseconds or less associated with a transient regime. Two particular transient overvoltages are defined: switching overvoltage and lightning overvoltage

NOTE Adapted from EN 50124-1:2001.

3.8

switching overvoltage

transient overvoltage at any point of the system due to specific switching operation or fault

[EN 50124-1:2001]

3.9

lightning overvoltage

transient overvoltage at any point of the system due to a lightning discharge

[EN 50124-1:2001]

3.10 surge arrester

device intended to limit the transient overvoltages to a specified level

3.11 metal-oxide surge arrester

arrester having non-linear metal-oxide resistors connected in series and/or in parallel without any integrated series or parallel spark gaps

3.12 continuous operating voltage of an arrester U_c

designated permissible d.c. voltage value that may be applied continuously between the arrester terminals

NOTE Adapted from EN 60099-4:2004.

3.13 rated voltage of an arrester U_r

voltage by which the arrester is designated

NOTE Because of the particular nature of the d.c. electrical installation dealt with, the rated voltage of a d.c. arrester coincides with the continuous operating voltage.

3.14 elevated continuous operating voltage U_c^*

test voltage U_c^* that, when applied to new metal-oxide resistor, gives the same power losses as the voltage U_c when applied to aged metal-oxide resistors

3.15 lightning impulse protection level U_{pl}

the maximum residual voltage for the nominal discharge current

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3.16 switching impulse protection level U_{ps}

maximum residual voltage at the specified switching impulse current

3.17 charge transfer capability Q_t

maximum charge per impulse that can be transferred during the charge transfer test and during the operating duty test

3.18 discharge current of an arrester

impulse current which flows through the arrester

3.19 nominal discharge current of an arrester I_n

peak value of lightning current impulse which is used to classify an arrester

[EN 60099-4:2004]

3.20 high current impulse of an arrester

peak value of discharge current having a 4/10 μ s impulse shape which is used to test the stability of the arrester on direct lightning strokes

[EN 60099-4:2004]

3.21**steep current impulse**

current impulse with a virtual front time of 1 μs with limits in the adjustment of equipment such that the measured values are from 0,9 μs to 1,1 μs and the virtual time to half-value on the tail is not longer than 20 μs

NOTE Adapted from EN 60099-4:2004.

3.22**lightning current impulse**

8/20 current impulse with limits on the adjustment of equipment such that the measured values are from 7 μs to 9 μs for the virtual front time and from 18 μs to 22 μs for the time to half-value on the tail

[EN 60099-4:2004]

3.23**direct lightning current impulse**

impulse defined by the charge Q and the peak value of the current impulse I_{imp}

3.24**switching current impulse of an arrester I_{sw}**

peak value of discharge current having a virtual front time greater than 30 μs but less than 100 μs and a virtual time to half value on the tail of roughly twice the virtual front time

[EN 60099-4:2004]

3.25**reference current of an arrester I_{ref}**

d.c. current defined by the manufacturer used to determine the reference voltage of the arrester

NOTE Adapted from EN 60099-4:2004

3.26**reference voltage of an arrester U_{ref}**

d.c. voltage across the arrester when the reference current is flowing through it

NOTE Adapted from EN 60099-4:2004.

3.27**residual voltage of an arrester U_{res}**

peak value of voltage that appears between the terminals of an arrester during the passage of discharge current

[EN 60099-4:2004]

3.28**rated short circuit current of an arrester I_s**

maximum current that may flow in case of an arrester failure for a specified time

3.29**shed**

insulating part projecting from the housing, intended to increase the creepage distance

[EN 60099-4:2004]

3.30**porcelain-housed arrester**

arrester using porcelain as housing material, with fittings and sealing systems

[EN 60099-4:2004]

3.31**polymer-housed arrester**

arrester using polymeric and/or composite materials for housing

NOTE Adapted from EN 60099-4:2004.

3.32 bending moment

horizontal force acting on the arrester housing multiplied by the vertical distance between the mounting base (lower level of the flange) of the arrester housing and the point of application of the force

[EN 60099-4:2004]

3.33 torsional loading

horizontal force at the top of a vertical mounted arrester housing which is not applied to the longitudinal axis of the arrester

NOTE Adapted from EN 60099-4:2004.

3.34 breaking load

force perpendicular to the longitudinal axis of a porcelain-housed arrester leading to mechanical failure of the arrester housing

[EN 60099-4:2004]

3.35 mean breaking load MBL

the average breaking load for porcelain arresters determined from tests

NOTE Adapted from EN 60099-4: A2:2009.

3.36 specified long-term load SLL

force perpendicular to the longitudinal axis of an arrester, allowed to be continuously applied during service without causing any mechanical damage to the arrester

[EN 60099-4: A2: 2009]

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3.37 specified short-term load SSL

greatest force perpendicular to the longitudinal axis of an arrester, allowed to be applied during service for short periods and for relatively rare events (for example, short-circuit current loads, extreme wind gusts) without causing any mechanical damage to the arrester

[EN 60099-4: A2: 2009]

3.38 non-linear metal-oxide resistor

part of the surge arrester which, by its non-linear voltage versus current characteristic, acts as a low resistance to overvoltages, thus limiting the voltage across the arrester terminals, and as a high resistance at normal operating voltage

NOTE Adapted from EN 60099-4:2004.

3.39 pressure-relief device of an arrester

means for relieving internal pressure in an arrester and preventing violent shattering of the housing following prolonged passage of fault current or internal flashover of the arrester

[EN 60099-4:2004]

3.40 internal part

metal-oxide resistor element with supporting structure

[EN 60099-4:2004]

**3.41
seal (gas/water tightness)**

ability of an arrester to avoid ingress of matter affecting the electrical and/or mechanical behaviour into the arrester

[EN 60099-4:2004]

**3.42
disruptive discharge**

phenomena associated with the failure of insulation under electric stress, which include a collapse of voltage and the passage of current

NOTE 1 The term applies to electrical breakdowns in solid, liquid and gaseous dielectric, and combinations of these.

NOTE 2 Adapted from EN 60099-4:2004.

**3.43
puncture (breakdown)**

disruptive discharge through a solid

[EN 60099-4:2004]

**3.44
flashover**

disruptive discharge over a solid surface

[EN 60099-4:2004]

**3.45
impulse**

unidirectional wave of voltage or current which without appreciable oscillations rises rapidly to a maximum value and falls, usually less rapidly, to zero with small, if any, excursions of opposite polarity

NOTE The parameters which define a voltage or current impulse are polarity, peak value, front time and time to half value on the tail.

[EN 60099-4:2004]

**3.46
type test (design test)**

conformity test made on one or more items representative of the production

[IEV 151-16-16]

**3.47
routine test**

conformity test made on each individual item during or after manufacture

[IEV 151-16-17]

**3.48
acceptance test**

contractual test to prove to the customer that the item meets certain conditions of its specification

[IEV 151-16-23]

**3.49
prospective short circuit current**

current which would flow in a circuit if it were short-circuited by a link of negligible impedance

NOTE Adapted from EN 60099-4:2004.

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