SLOVENSKI STANDARD
SIST EN 50526-2:2014

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Železniške naprave - Stabilne naprave električne vleke - Enosmerni prenapetostni odvodniki in omejilniki napetosti - 2. del: Naprave za omejevanje napetosti

Railway Applications - Fixed Installations - D.C. surge arresters and voltage limiting devices - Part 2: Voltage limiting devices

Bahnanwendungen - Ortsfeste Anlagen - Überspannungsableiter und Niederspannungsbegrenzer - Teil 2: Spannungsbegrenzer

Applications ferroviaires - Installations fixes - Parafoudres et limiteurs de tension - Partie 2:Limiteurs de tension

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ICS:

29.120.50	Varovalke in druga medtokovna zaščita	Fuses and other overcurrent protection devices
29.280	Električna vlečna oprema	Electric traction equipment

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Railway applications - Fixed installations - D.C. surge arresters and voltage limiting devices - Part 2: Voltage limiting devices

Applications ferroviaires - Installations fixes - Parafoudres et limiteurs de tension pour systèmes à courant continu - Partie 2: Limiteurs de tension

Bahnanwendungen - Ortsfeste Anlagen - Überspannungsableiter und Spannungsbegrenzungseinrichtungen - Teil 2: Spannungsbegrenzungseinrichtungen

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CENELEC

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

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Foreword

This document (EN 50526-2:2014) has been prepared by CLC/SC 9XC "Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations)".

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)	2014-12-30
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2016-12-30

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This European Standard, *Railway applications — Fixed installations — D.C. surge arresters and voltage limiting devices*, is in three parts:

— *Part 1: Surge arresters* deals with metal oxide arresters without gaps for d.c. railway traction systems (fixed installations) and is based on EN 60099-4, Ed. 2.2, 2009-5;

— *Part 2: Voltage limiting devices* [the present text] deals with voltage limiting devices for specific use in d.c. railway traction systems (fixed installations);

— *Part 3 Application guide* [currently at Enquiry stage] deals with a guide of application of metal-oxide arresters and of voltage limiting devices.

1 Scope

This European Standard applies to Voltage Limiting Devices (VLDs) to be applied in d.c. traction systems in order to comply with protective provisions against electric shock from d.c., and mixed a.c. – d.c. voltages, in accordance with the EN 50122 series, taking into account stray current provisions.

VLDs operate in such a way as to connect the track return circuit of d.c. railway systems to the earthing system or to conductive parts within the overhead contact line zone or current collector zone.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50122-1:2011, *Railway applications — Fixed installations — Electrical safety, earthing and the return circuit — Part 1: Protective provisions against electric shock*

EN 50122-3:2010, *Railway applications — Fixed installations — Electrical safety, earthing and the return circuit — Part 3: Mutual Interaction of a.c. and d.c. traction systems*

EN 50123-1:2003, *Railway applications — Fixed installations — D.C. switchgear — Part 1: General*

EN 50123-7 (all parts), *Railway applications — Fixed installations — D.C. switchgear — Part 7-x: Measurement, control and protection devices for specific use in d.c. traction systems*

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

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

EN 50163:2004, *Railway applications — Supply voltages of traction systems*

EN 50526-1:2012, *Railway applications — Fixed installations — D.C. surge arresters and voltage limiting devices — Part 1: Surge arresters*

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

EN 60085, *Electrical insulation — Thermal evaluation and designation (IEC 60085)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61643-311, *Components for low-voltage surge protective devices — Part 311: Performance requirements and test circuits for gas discharge tubes (GDT) (IEC 61643-311)*

EN ISO 4287, *Geometrical product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287)*

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

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50526-1:2012 and the following apply.

3.1
voltage-limiting device
VLD
protective device whose function is to prevent existence of an impermissible high touch voltage

[SOURCE: EN 50122-1:2011, 3.1.20]

3.2
recoverable VLD
VLD that recovers after triggering

3.3
non-recoverable VLD
VLD remaining in its low resistance state permanently after triggering

3.4
welding shut spark gap
voltage fuse
VLD which triggers by electrical discharge across a gap causing a permanent short-circuit by welding shut of metallic parts

3.5
rated current
I_r
maximum value of the direct current that may flow for the specified long term through the VLD in specified environmental conditions without exceeding the temperature rise limits

3.6
short time withstand current
I_W
current that a VLD can carry in closed status, during a specified short time under prescribed conditions of use and behavior

3.7
making capacity
I_{NSS}
value of prospective making current that a switching device is capable of making at a stated voltage under prescribed conditions of use and behavior

Note 1 to entry: The conditions to be prescribed are dealt with in the relevant specifications.

[SOURCE: IEV 441-17-09, modified — The beginning of the Note has been changed.]

3.8
breaking capacity
maximum current that a recoverable VLD can interrupt at a stated voltage

3.9
leakage current
I_L
current which flows through the terminals when the VLD is in open status

3.10
lightning current impulse
I_{imp-n}
8/20 µs 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

[SOURCE: EN 60099-4:2004]

3.11
high current impulse
$I_{imp-high}$
peak value of discharge current having a 4/10 µs or 8/20 µs impulse shape which is used to test the ability of the VLD to withstand direct lightning strikes from the dielectric point of view

3.12
high charge impulse
I_{imp-hc}
peak value of high charge impulse having a 10/350 µs shape, or a waveshape with the same charge drained and similar duration, which is used to test the ability of the VLD to withstand direct lightning strikes from the energy capability point of view

3.13
triggering voltage
U_T
voltage at which a VLD becomes conductive

3.14
nominal triggering voltage
U_{Tn}
voltage at which the VLD becomes conductive when a d.c. voltage is applied for long term

Note 1 to entry: This voltage is used to identify the VLD.

3.15
instantaneous triggering voltage
U_{Ti}
minimum triggering voltage at which the VLD becomes conductive shortly after its application

Note 1 to entry: A maximum delay of 5 ms is taken in this standard.

3.16
non-triggering voltage
U_W
maximum voltage below which the VLD will not trigger for any duration of the applied voltage

3.17
residual voltage
U_{res}
value of voltage that appears between the terminals of the VLD during the passage of a specified current

3.18
mixed voltage
voltage having significant a.c. and d.c. components

3.19
response time
T_R
time between the application of a voltage until VLD becomes conductive

4 Classes of VLD

This European Standard identifies the properties and the technology of a VLD using the classes of VLD which are defined in Table 1.

Table 1 — Classes of voltage-limiting device

Class	Method for switching between the high and low resistance status	Auxiliary power supply necessary for normal operation	Polarity	Maximum response time T_R	Recoverable or not	Able to interrupt the current in the VLD
1	Welding shut of metallic parts	No	Bidirectional	5 ms	Can be recoverable in some conditions[a]	No
2.1	Triggering of thyristors	No	Unidirectional	5 ms (for voltages equal to or higher than U_{TI})	Yes	Passive at natural zero crossing of current
2.2	Triggering of thyristors	No	Bidirectional	5 ms (for voltages equal to or higher than U_{TI})	Yes	Passive at natural zero crossing of current
3.1	Contactor only	Yes	Bidirectional	Voltage dependent and not exceeding the limits given in EN 50122-1:2011, 9.3.2.2 or EN 50122-3:2010, 7.2 through 7.5	Yes	Yes
3.2	Contactor only	Yes	Bidirectional	Voltage dependent and not exceeding the limits given in EN 50122-1:2011, 9.3.2.3, EN 50122-3:2010, 7.6	Yes	Yes
3.3	Contactor only	Yes	Bidirectional	Specified by the manufacturer	Yes	Yes
4.1	Combination of thyristors and contactor	Yes	Bidirectional	For voltages up to U_{TI}, voltage dependent and not exceeding the limits given in EN 50122-1:2011, 9.3.2.2 or EN 50122-3:2010, 7.2 through 7.5. For voltages equal to or higher than U_{Ti} 5 ms.	Yes	Yes
4.2	Combination of thyristors and contactor	Yes	Bidirectional	For voltages up to U_{TI} , voltage dependent and not exceeding the limits given in EN 50122-1:2011, 9.3.2.3, EN 50122-3:2010, 7.6. For voltages equal to or higher than U_{Ti} 5 ms	Yes	Yes
4.3	Combination of thyristors and contactor	Yes	Bidirectional	Specified by the manufacturer	Yes	Yes

NOTE EN 50122-1 defines two functionalities for VLDs, VLD-O and VLD-F. In this European Standard a discrimination is not necessary; the functionalities will be described in prEN 50526-3.

[a] For transient low currents associated with low energy dissipation no welding shut may occur.

5 Characteristics and requirements of the VLDs

5.1 Marking

VLDs shall be identified by the following minimum information which shall appear on the rating plate (nameplate):

- manufacturer's name or trademark and manufacture type designation;
- class of VLD according to EN 50526-2 (optional);
- rated current I_r in A;
- short time withstand current I_w in kA;
- nominal triggering voltage U_{Tn};
- year of manufacture;
- serial number.

The terminals of unidirectional devices shall be marked with the symbols + and -.

In case of small VLDs not having space for a rating plate with all information, the devices shall be marked with the manufacturer's name or trademark, the type designation and the nominal triggering voltage. The remaining information shall be given in a data-sheet.

5.2 Service requirements

5.2.1 Normal outdoor service conditions

VLDs which conform to this part of the standard shall be suitable for operation under the following normal service conditions:

- ambient temperature within the range of -40 °C to +40 °C;
- solar radiation lower than 1 120 W/m^2 as given in EN 50125-2;
- altitude not exceeding 1 400 m (from Annex B in EN 50123-1:2003);
- any pollution not exceeding PD 4 as given in EN 50124-1.

The equipment shall be suitable for installation in the vicinity of a rail track on foundations designed so as to damp the main effects of the passage of the trains. Nevertheless a limited vibration or limited shocks may affect the equipment, which shall be capable of operating satisfactorily when subjected to the following conventional accelerations separately applied:

- g_v: vertical acceleration:5 m/s^2;
- g_h : horizontal acceleration:5 m/s^2.

5.2.2 Normal indoor service conditions

VLDs which conform to this standard shall be suitable for operation under the following normal service conditions:

- ambient temperature within the range of -5 °C to +40 °C (from Annex B in EN 50123-1:2003);

– altitude not exceeding 1 400 m (from Annex B in EN 50123-1:2003);

– any pollution not exceeding PD3 as given in EN 50124-1.

5.2.3 Abnormal service conditions

The following are examples of abnormal service conditions which require special consideration in the manufacture or application of VLD and should be brought to the attention of the supplier:

– temperature in excess of +40 °C or below -5 °C for indoor installations or below -40 °C for outdoor installations;

– application at altitudes higher than 1 400 m; in this case the temperature-rise tests and dielectric tests (for VLDs inside a cabinet), carried out at laboratories at lower levels, shall take into account a correction in the temperature-rises and dielectric test values to be agreed between the involved parties;

– all excessive environmental conditions that may degrade insulating surface or mounting hardware: fumes, vapours dirt, salt spray or other conducting materials; moisture, humidity, dropping water or steam;

– explosive mixtures of dust, gases or fumes;

– special mechanical requirements (earthquakes, vibrations, high ice loads, high cantilever stresses);

– unusual transportation or storage;

– heat sources near the VLD.

5.3 General characteristics

The following characteristics shall be defined to identify each VLD:

– the class of VLD;

– if relevant, the auxiliary power supply voltage, with its tolerances.

The manufacturer shall specify whether the device is recoverable or non-recoverable at defined currents and durations.

5.4 Minimum requirements

5.4.1 Response time

A VLD shall become conductive in a time not greater than the specified response time depending on the applied voltage. The response time of the VLD shall be stated as function of the applied voltage.

For VLDs of Classes 2, 3 and 4 the triggering may be delayed intentionally in order that unwanted triggering will not take place due to switching transients and similar phenomena.

5.4.2 Additional requirements for VLDs of class 1

If gas discharge tubes are used in VLDs, they shall comply with EN 61643-311.

5.4.3 Additional requirements for VLDs of classes 3 and 4

The VLD shall not open if the current through it exceeds its breaking capacity.

The VLD shall open at an adjustable time after it has closed unless the breaking capacity is exceeded. The range of variation of this time setting shall be specified.