



# SLOVENSKI STANDARD

## SIST-TS CLC/TS 50562:2011

01-oktober-2011

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**Železniške naprave - Stabilne naprave električne vleke - Postopki, meritve in prikazovanje varnosti električnih sistemov vleke**

Railway applications - Fixed installations - Process, measures and demonstration of safety for electric traction systems

Bahnanwendungen - Ortsfeste Anlagen - Prozess, Maßnahmen und Nachweisführung für die Sicherheit in der Bahnstromversorgung

Applications ferroviaires - Installations fixes - Processus, mesures et démonstration de la sécurité pour les installations fixes de traction électrique

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**Ta slovenski standard je istoveten z: CLC/TS 50562:2011**

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**ICS:**

29.280	Električna vlečna oprema	Electric traction equipment
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**SIST-TS CLC/TS 50562:2011**

**en**

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TECHNICAL SPECIFICATION  
SPÉCIFICATION TECHNIQUE  
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**CLC/TS 50562**

August 2011

ICS 29.280

English version

**Railway applications -  
Fixed installations -  
Process, measures and demonstration of safety for electric traction  
systems**

Applications ferroviaires -  
Installations fixes -  
Processus, mesures et démonstration de  
la sécurité pour les installations fixes de  
traction électrique

Bahnanwendungen -  
Ortsfeste Anlagen -  
Prozess, Maßnahmen und  
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This Technical Specification was approved by CENELEC on 2011-05-24.

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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 Technical Specification was 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.

It was circulated for vote in accordance with the Internal Regulations, Part 2, Subclause 11.3.3.3 and was approved by CENELEC as CLC/TS 50562 on 2011-05-24.

The following date is proposed:

- latest date by which the existence of the CLC/TS  
has to be announced at national level (doa) 2011-11-24

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## 1 Scope

This Technical Specification defines the process, measures and demonstration of safety for the electric traction systems of

- railways,
- guided mass transport systems,
- trolleybus systems.

The systems can be elevated, at-grade and underground.

It does not apply to

- underground mine traction systems,
- cranes, transportable platforms and similar transportation equipment on rails, temporary structures (e.g. exhibition structures) in so far as these are not supplied directly or via transformers from the contact line system and are not endangered by the traction power supply system,
- suspended cable cars,
- funicular railways,
- magnetic levitated systems,
- railways with inductive power supply without contact system,
- railways with buried contact system that is required to be energised only below the train to ensure safety,

but it can support the safety considerations of such systems as far as applicable.

This Technical Specification refers to standards and common practice to demonstrate safety including the functional aspects.

This Technical Specification applies to the erecting of new lines and to all significant changes of existing lines.

## 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 50110 (all parts), *Operation of electrical installations*

EN 50119:2009, *Railway applications – Fixed installations – Electric traction overhead contact lines*

EN 50122 (all parts), *Railway applications – Fixed installations – Electrical safety, earthing and the return circuit*

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

EN 50123 (all parts), *Railway applications – Fixed installations – D.C. switchgear*

EN 50124 (all parts), *Railway applications – Insulation coordination*

CLC/TR / EN 50126 (all parts), *Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)*

CLC/TR 50126-2:2007, *Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) – Part 2: Guide to the application of EN 50126-1 for safety*

EN 50152 (all parts), *Railway applications – Fixed installations – Particular requirements for a.c. switchgear*

EN 50153, *Railway applications – Rolling stock – Protective provisions relating to electrical hazards*

EN 50163, *Railway applications – Supply voltages of traction systems*

EN 50367, *Railway applications – Current collection systems – Technical criteria for the interaction between pantograph and overhead line (to achieve free access)*

EN 50388, *Railway applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability*

CLC/TR 50488, *Railway applications – Safety measures for personnel working on or near overhead contact lines*

EN 60255 (all parts), *Measuring relays and protection equipment* (IEC 60255, all parts)

EN 60664 (all parts), *Insulation coordination for equipment within low-voltage systems* (IEC 60664, all parts)

EN 62271-1:2008, *High-voltage switchgear and controlgear – Part 1: Common specifications* (IEC 62271-1:2007)

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EN 62305 (all parts), *Protection against lightning* (IEC 62305, all parts)



### 3 Terms and definitions

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

#### 3.1

##### **contact line system**

support network for supplying electrical energy from substations to electrically powered traction units, which covers overhead contact line systems and conductor rail systems; the electrical limits of the system are the feeding point and the contact point to the current collector

NOTE The mechanical system may comprise

- the contact line,
- structures and foundations,
- supports and any components supporting or registering the conductors,
- head and cross spans,
- tensioning devices,
- along-track feeders, reinforcing feeders, and other lines like earth wires and return conductors as far as they are supported from contact line system structures,
- any other equipment necessary for operating the contact line,
- conductors connected permanently to the contact line for supply of other electrical equipment such as lights, signal operation, point control and point heating.

[EN 50119:2009, 3.1.1]

#### 3.2

##### **conventional electric traction system**

system constructed, operated and maintained according to relevant standards and common practice

#### 3.3

##### **current collector zone**

##### **CCZ**

zone whose limits are in general not exceeded by an energized collector no longer in contact with the contact line or broken collector and its fragments

[EN 50122-1:2011, 3.5.10]

#### 3.4

##### **electric traction system**

railway electrical distribution network used to provide energy for rolling stock

NOTE The system may comprise

- contact line systems,
- return circuit of electric traction systems,
- running rails of non electric traction systems, which are in the vicinity of, and conductively connected to the running rails of an electric traction system,
- electrical installations, which are supplied from contact lines either directly or via a transformer,
- electrical installations in substations, which are utilized solely for distribution of power directly to the contact line,
- electrical installations of switching stations.

[EN 50122-1:2011, 3.4.1]

#### 3.5

##### **electrical safety**

freedom from unacceptable risk of harm caused by electrical systems

[EN 50122-1:2011, 3.1.1]

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**3.6****overhead contact line zone****OCLZ**

zone whose limits are in general not exceeded by a broken overhead contact line

[EN 50122-1:2011, 3.5.9]

**3.7****return cable**

conductor connecting the running rails or other parts of the return circuit to the substation

NOTE Similar to IEC 60050-811-35-04.

[EN 50122-1:2011, 3.3.5]

**3.8****return circuit**

all conductors which form the intended path for the traction return current under operation and fault conditions

NOTE The conductors may be

- running rails,
- return conductor rails,
- return conductors,
- return cables.

[EN 50122-1:2011, 3.3.1, mod.]

**3.9****return conductor**

conductor paralleling the track return system and connected to the running rails at periodic intervals

[EN 50122-1:2011, 3.3.3]

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**3.10****switchgear and controlgear**

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures

[EN 62271-1:2008, 3.1.1]

**3.11****(effective) touch voltage**

$U_{te}$

voltage between conductive parts when touched simultaneously by a person or an animal

NOTE 1 The value of the effective touch voltage can be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts.

[IEC 60050-195-05-11]

NOTE 2 The conductive path through the body is conventionally from hand to both feet (horizontal distance of 1 m) or from hand to hand.

[EN 50122-1:2011, 3.1.3]

**3.12****track circuit**

electrical circuit of which the rails of a track section form a part, with usually a source of current connected at one end and a detection device at the other end for detecting whether this track section is clear or occupied by a vehicle

NOTE In a continuous signalling system, the track circuit may be used to transmit information between the ground and the train.

## 4 Safety process

### 4.1 General

The design, construction, operation and maintenance of electric traction systems follow the relevant standards to ensure safety. The safety process itself follows CLC/TR / EN 50126 series over the complete life cycle.

This clause describes how to

- define the subsystem electric traction system and the relevant interfaces,
- identify hazards,
- apply measures,
- demonstrate an acceptable level of safety.

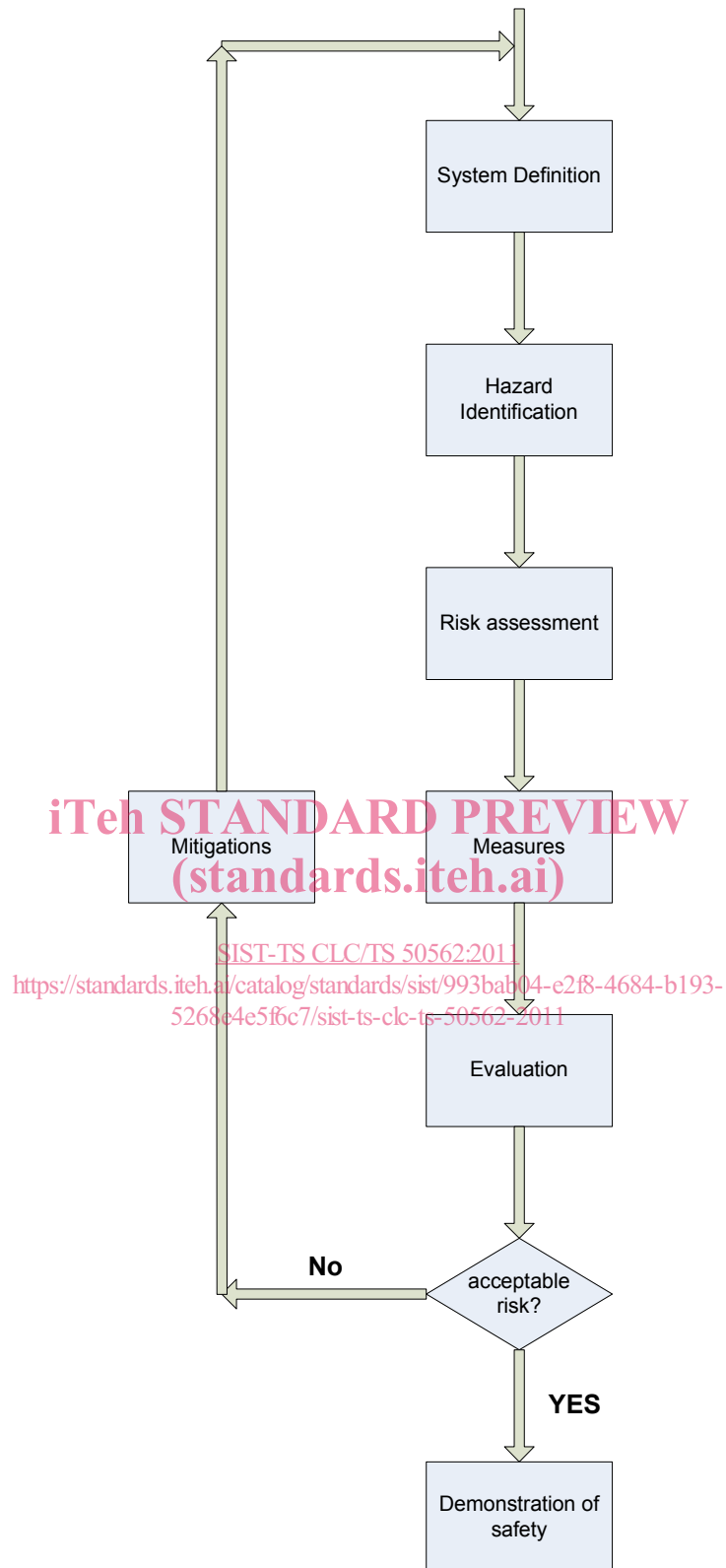
For the application of this Technical Specification, the differences of the system under consideration and the reference system described in Clause 6 shall be analysed. The results in terms of measures that are identified for the reference system shall be evaluated regarding their applicability for the system under consideration. The latest versions of the relevant standards shall be considered.

The generic process, intended to be applied to conventional electric traction systems, is a process tailored from CLC/TR / EN 50126 series and it consists of the following steps as shown in Figure 1.

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**Figure 1 – Safety process for conventional electric traction system**

The steps in the safety process are as follows:

- system definition;
- hazard identification;
- risk assessment;

- measures;
- evaluation;
- mitigations in case of non acceptability;
- demonstration of safety.

## 4.2 System definition

The electric traction system and its interfaces shall be described in a clear and manageable way. The system may be structured in subsystems as far as it is necessary. The main functions and components as well as the interfaces shall be included in the system definition. Application conditions shall be documented and taken into account.

## 4.3 Hazard identification

A hazard identification shall be performed and results in a list of system hazards.

The hazard identification shall start with the following list of top-level hazards (see Table 1), to ensure that the basis for the identification of system hazards is comprehensive.

A top-level hazard describes a generic situation that could lead to an accident and where only fortunate circumstances may prevent an accident. A system hazard describes the reasons, how a top-level hazard reasonably could be caused by the technical system.

**Table 1 – List of foreseeable top-level hazards and accidents**

Top-level hazard	Foreseeable accident	Identification code of foreseeable top-level hazard/accident
Access to voltages exceeding the limits for the touch voltage according to EN 50122-1	Injury due to electric shock	A1
Relative movement between objects and persons in direct vicinity	Injury due to striking / collision	A2
Unexpected or heavy acceleration or deceleration of persons	Injury due to striking / collision with surroundings or due to slipping, tripping and falling	A3
Exposure of persons to heat	Injury due to fire, heat, arcs	A4
Exposure of persons to hazardous amount and duration of smoke or toxic substances (local regulations)	Injury due to smoke, toxic substances	A5
Exposure of persons to severe pressure waves approaching	Injury due to explosion, overpressure	A6
Exposure of persons to electromagnetic fields or interferences (WHO limits, local regulations)	Injury due to electromagnetic fields or interference	A7
Inappropriate design or condition of equipment	Injury due to falling parts, trapping, clamping, cutting	A8
Excessive sound levels	Injury due to reduction or loss of hearing	A9