
Železniške naprave - Železniška vozila - Konektorji, zahteve in preskusne metode

Railway applications - Rolling stock - Electrical connectors, requirements and test methods

Bahnanwendungen - Fahrzeuge - Elektrische Steckverbinder, Bestimmungen und Prüfverfahren

Applications ferroviaires - Matériel roulant - Connecteurs électriques, exigences et méthodes d'essai

iTeh STANDARD PREVIEW

(standards.itih.ai)

[SIST-TS CLC/TS 50467:2008](https://standards.itih.ai/catalog/standards/sist/9556012e-8580-43c9-8212-292874d007cc/sist-ts-clc-ts-50467-2008)

Ta slovenski standard je istoveten z: CLC/TS 50467:2008

ICS:

31.220.10	Ходящие аппараты	Plug-and-socket devices. Connectors
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

SIST-TS CLC/TS 50467:2008**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST-TS CLC/TS 50467:2008](#)

<https://standards.iteh.ai/catalog/standards/sist/f656012e-8580-43c9-8212-292874d667cc/sist-ts-clc-ts-50467-2008>

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CLC/TS 50467

April 2008

ICS 71.080.60

English version

**Railway applications -
Rolling stock -
Electrical connectors,
requirements and test methods**

Applications ferroviaires -
Matériel roulant -
Connecteurs électriques,
exigences et méthodes d'essai

Bahnanwendungen -
Fahrzeuge -
Elektrische Steckverbinder,
Bestimmungen und Prüfverfahren

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This Technical Specification was approved by CENELEC on 2008-02-15.
<https://standards.iteh.ai/catalog/standards/sist/1656012e-8580-43c9-8212-292874d667cc/sist-ts-clc-ts-50467-2008>

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the 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

This Technical Specification was prepared by SC 9XB, Electromechanical material on board rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to vote in accordance with the Internal Regulations, Part 2, Subclause 11.3.3.3 and was approved by CENELEC as CLC/TS 50467 on 2008-02-15.

The following date was fixed:

- latest date by which the existence of the CLC/TS
has to be announced at national level (doa) 2008-08-15

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST-TS CLC/TS 50467:2008](https://standards.iteh.ai/catalog/standards/sist/f656012e-8580-43c9-8212-292874d667cc/sist-ts-clc-ts-50467-2008)
<https://standards.iteh.ai/catalog/standards/sist/f656012e-8580-43c9-8212-292874d667cc/sist-ts-clc-ts-50467-2008>

Contents

Introduction	5
1 Scope	6
2 Normative references	6
3 Definitions	9
4 Technical information (electrical ratings)	14
5 Classification	14
5.1 General.....	14
5.2 Severity of service conditions in different rolling stock technologies.....	14
5.3 Intended use of rolling stock.....	15
5.4 Location of connector on board rolling stock.....	15
6 Requirements	16
6.1 General.....	16
6.2 Marking and identification.....	17
6.3 Provision against incorrect mating (non-intermateable).....	18
6.4 Protection against electric shock.....	18
6.5 Provisions for earthing.....	18
6.6 Terminations and connection methods.....	18
6.7 Resistance to ageing.....	19
6.8 General design.....	19
6.9 Design of a free connector.....	20
6.10 Interlock.....	20
6.11 Degree of protection IP.....	20
6.12 Dielectric strength.....	20
6.13 Mechanical and electrical durability.....	20
6.14 Cable strain relief.....	21
6.15 Mechanical strength.....	21
6.16 Vibration and shock.....	21
6.17 Insulation coordination.....	21
6.18 Temperature classes.....	21
6.19 Temperature rise.....	22
6.20 Protection against corrosion.....	22
6.21 Electromagnetic compatibility (EMC) requirements.....	22
6.22 Fire behaviour of materials and components.....	22
6.23 Resistance to chemically active substances and to contaminating fluids.....	23
6.24 Resistance to ozone.....	23
6.25 Resistance to UV.....	23
7 Tests	23
7.1 General.....	23
7.2 Test schedule.....	25
7.3 Tests on raw materials.....	31
7.4 Visual examination.....	31
7.5 Durability of marking.....	31
7.6 Interlock.....	32
7.7 Protection against electric shock.....	32
7.8 Temperature rise.....	32
7.9 Mechanical operation.....	33

7.10	Vibration and shock.....	33
7.11	Measurement of clearances and creepage distances	33
7.12	Dielectric strength.....	33
7.13	Resistance between accessible metal parts and the protective earthing contact	34
7.14	Corrosion test.....	34
7.15	Ozone resistance (ISO 1431-1)	34
7.16	Resistance to UV (EN ISO 4892-2).....	34
7.17	Resistance to fluids (EN 60512-19-3)	34
Annex A (informative) Additional characteristics to be agreed by the manufacturer and the user		35
Annex B (informative) Severity of the service conditions in different rolling stock locations		37
Bibliography		38

Figures

Figure 1	– Typical examples of connections	9
Figure 2	– Multipole connectors	10
Figure 3	– Typical connector locations on board rolling stock.....	15
Figure 4	– Test sample for temperature rise test	32

iTeh STANDARD PREVIEW (standards.iteh.ai)

Tables

Table 1	– Example of typical connector locations on board rolling stock.....	16
Table 2	– Preferred number of operating cycles.....	20
Table 3	– Preferred test temperatures.....	22
Table 4	– Plan of specimens required for tests	24
Table 5	– Mechanical test group A	25
Table 6	– Service life test group B.....	26
Table 7	– Thermal test group C	26
Table 8	– Climatic test group D	27
Table 9	– Degree of protection, test group E	28
Table 10	– Vibration and shock test group F.....	29
Table 11	– Resistance to fluids test group G	30
Table 12	– Shielding effectiveness test group H	31
Table 13	– Tests on raw materials	31
Table 14	– Test voltages	34
Table B.1	– Minimum severity of service conditions in different rolling stock locations	37

Introduction

This Technical Specification provides performance requirements and tests for low-voltage electrical connectors deemed to be installed on board railway rolling stock, either indoors or outdoors. Safety requirements and tests for electrical connectors are already covered in general by EN 61984. The additional requirements and testing of specific characteristics demanded by rolling stock applications are set out in this Technical Specification. One goal of this Technical Specification is to avoid retesting of electrical connectors already in compliance with EN 61984 for those characteristics that have been assessed suitable also for use on board rolling stock.

Among the additional requirements for use on board rolling stock, those that can be verified by documentation of tests on the raw materials, are distinguished from those to be assessed by tests on the component.

Due to the wide spectrum of existing and future specific rolling stock applications of electrical connectors, this Technical Specification does not select any particular geometric configuration of connectors, nor establish any particular values for electrical ratings such as voltage and current, or for any other characteristic. All such details should be selected and agreed between the parties involved (e.g. manufacturer and user) depending on the electrical, mechanical and environmental conditions expected in the intended use. Annexes A and B of this Technical Specification provide guidance.

Upon agreement between the parties involved, this Technical Specification may be used in conjunction with existing connector detail specifications for interchangeability purposes.

Other standards may be developed in future under the umbrella format of this specification, for particular connector designs for applications on board rolling stock, to fix dimensions for interchangeability and to set the additional requirements for specific applications that, due to complexity and variety, are left here to agreement between parties involved.

<https://standards.iteh.ai/catalog/standards/sist/856012e-8580-43c9-8212-2c097d667cc/sist-ts-clc-ts-50467-2008>

This Technical Specification does not cover

- *connectors with breaking capacity (CBCs)* as defined in EN 61984, 3.2, because on board rolling stock connectors are not deemed to be operated (i.e. connected or disconnected) under load or when live, either by means of procedures or by the presence of interlocks, as required by EN 50153,

NOTE For the purpose of this Technical Specification connectors on board rolling stock are therefore considered as being always without breaking capacity, therefore where needed for safety reasons, adequate procedures or interlocks (i.e. locking devices that cannot be opened without the aid of a special tool) shall be provided in the end application;

- *non-rewirable connectors* as defined in EN 61984, 3.5,
- *automatic couplers*, due to their additional mechanical complexity and the need for more specific requirements and testing,
- *inter-vehicle jumpers*, as they are connector and cable assemblies whose characteristics depend on those of both elements. Inter-vehicle connectors within the limits set in the scope of this Technical Specification are therefore covered by the agreed choice of suitable mechanical and environmental characteristics as suggested by Annex B.

1 Scope

This Technical Specification retains EN 61984 as the minimum performance requirements for railway rolling stock electrical connectors.

It identifies additional terms, test methods and performance requirements for single-pole and multipole connectors with rated voltages up to 1 000 V, rated currents up to 125 V per contact and frequencies below 3 MHz used for indoor and outdoor applications in railway rolling stock.

This Technical Specification identifies the application levels for electrical connectors based on:

- the severity of the service conditions in different rolling stock technologies;
- the intended use of the rolling stock;
- the location of the connector in the rolling stock system.

This Technical Specification is not applicable to internal connections of electronic devices such as connectors for printed boards and rack-and-panel connectors.

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 + A2:2005	Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment
EN 50125-1:1999	Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock
EN 50153:2002	Railway applications – Rolling stock – Protective provisions relating to electrical hazards
EN 50264-1:2002	Railway applications – Railway rolling stock cables having special fire performance – Standard wall – Part 1: General requirements
EN 50264-2:2002	Railway applications – Railway rolling stock cables having special fire performance – Standard wall – Part 2: Single core cables
EN 50264-3:2002	Railway applications – Railway rolling stock cables having special fire performance – Standard wall – Part 3: Multicore cables
EN 50306-1:2002	Railway applications – Railway rolling stock cables having special fire performance – Thin wall – Part 1: General requirements
EN 50306-2:2002	Railway applications – Railway rolling stock cables having special fire performance – Thin wall – Part 2: Single core cables
EN 50306-3:2002	Railway applications – Railway rolling stock cables having special fire performance – Thin wall – Part 3: Single core and multicore cables (pairs, triples and quads) screened and thin wall sheathed
EN 50306-4:2002	Railway applications – Railway rolling stock cables having special fire performance – Thin wall – Part 4: Multicore and multipair cables standard wall sheathed

EN 50382-1:2008	Railway applications – Railway rolling stock high temperature power cables having special fire performance – Part 1 – General requirements
EN 50382-2:2008	Railway applications – Railway rolling stock high temperature power cables having special fire performance – Part 2: Single core silicone rubber insulated cables for 120 °C or 150 °C
EN 60068-1:1994	Environmental testing – Part 1: General and guidance (IEC 60068-1:1988 + corrigendum Oct. 1988 + A1:1992)
EN 60068-2-70:1996	Environmental testing – Part 2-70: Tests – Test Xb: Abrasion of marking and letterings caused by rubbing of fingers and hands (IEC 60068-2-70:1995)
EN 60309-1:1999	Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements (IEC 60309-1:1999)
EN 60352-1:1997	Solderless connections – Part 1: Wrapped connections – General requirements, test methods and practical guidance (IEC 60352-1:1997)
EN 60352-2:2006	Solderless connections – Part 2: Crimped connections – General requirements, test methods and practical guidance (IEC 60352-2:2006)
EN 60352-3:1994	Solderless connections – Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance (IEC 60352-3:1993)
EN 60352-4:1994 + A1:2000	Solderless connections – Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance (IEC 60352-4:1994 + A1:2000)
EN 60352-5:2001 + A1:2003	Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance (IEC 60352-5:2001 + A1:2003)
EN 60352-6:1997	Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance (IEC 60352-6:1997)
EN 60352-7:2002	Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance (IEC 60352-7:2002)
EN 60512-1:2001	Connectors for electronic equipment – Tests and measurements – Part 1: General (IEC 60512-1:2001)
EN 60512-1-1:2002	Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: Visual examination (IEC 60512-1-1:2002)
EN 60512-4-1:2003	Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof (IEC 60512-4-1:2003)
EN 60512-5-1:2002	Connectors for electronic equipment – Tests and measurements – Part 5-1: Current-carrying capacity tests – Test 5a: Temperature rise (IEC 60512-5-1:2002)
EN 60512-11-6:2002	Connectors for electronic equipment – Tests and measurements – Part 11-6: Climatic tests – Test 11f: Corrosion, salt mist (IEC 60512-11-6:2002)
EN 60512-11-7:2003	Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic tests – Test 11g: Flowing mixed gas corrosion test (IEC 60512-11-7:2003)
EN 60512-19-3:1997	Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 19: Chemical resistance tests – Section 3: Test 19c: Fluid resistance (IEC 60512-19-3:1997)

EN 60512-23-3:2001	Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 23-3: Test 23c: Shielding effectiveness of connectors and accessories (IEC 60512-23-3:2000)
EN 60512-23-4:2001	Connectors for electronic equipment – Test and measurement – Part 23-4: screening and filtering tests – Test 23d: Transmission line reflections in the time domain (IEC 60512-23-4:2001)
EN 60529:1991 + A1:2000	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999)
EN 60664-1:2007	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests (IEC 60664-1:2007)
EN 60999-1:2000	Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm ² up to 35 mm ² (included) (IEC 60999-1:1999)
EN 60999-2:2003	Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm ² up to 300 mm ² (included) (IEC 60999-2:2003)
EN 61210:1995	Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements (IEC 61210:1993, mod.)
EN 61373:1999	Railway applications – Rolling stock equipment – Shock and vibration tests (IEC 61373:1999)
EN 61984:2001	Connectors – Safety requirements and tests (IEC 61984:2001)
EN ISO 4892-2:1999	Plastics – Methods of exposure to laboratory light sources – Xenon arc sources (ISO 4892-2:1994)
EN ISO 6988:1994	Metallic and other non-organic coatings – Sulfur dioxide test with general condensation of moisture (ISO 6988:1985)
HD 588.1 S1:1991	High-voltage test techniques – Part 1: General definitions and test requirements (IEC 60060-1:1989 + corrigendum Mar. 1990)
IEC 60050-581:1978 + A1:1998	International Electrotechnical Vocabulary (IEV) – Chapter 581: Electromechanical components for electronic equipment
IEC 60050-811	International Electrotechnical Vocabulary (IEV) – Chapter 811: Electric traction
IEC 60050-826	International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations
IEC 60417-DB	Graphical symbols for use on equipment
IEC 60512-9:1992	Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 9: Miscellaneous tests
IEC 60760	Flat, quick-connect terminations
IEC/TS 60536	Classification of electrical and electronic equipment with regard to protection against electric shock
ISO 1431-1:2004	Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Part 1: Static and dynamic testing

3 Definitions

For the purposes of this document, the following terms and definitions apply in addition of those given in IEC 60050-581.

3.1

connection

two mated connectors or contacts

EXAMPLES See Figure 1.

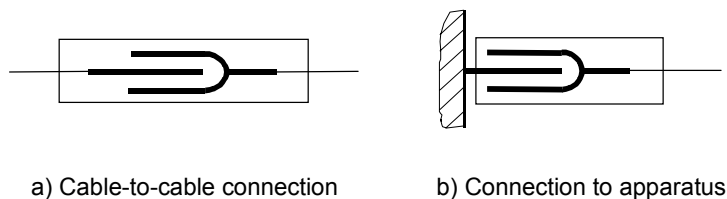


Figure 1 – Typical examples of connections

3.2

connector

component which terminates conductors for the purpose of providing connection to and disconnection from a suitable mating component, and which are not intended to be connected and disconnected under electrical load

[IEC 60050 (581) 06-01, modified]

3.3

free connector

connector for attachment to the free end of a wire or cable

[IEC 60050 (581) 06-12]

3.4

fixed connector

connector for attachment to a rigid surface

[IEC 60050 (581) 06-10]

3.5

enclosed connector

connector where protection against electric shock is provided by its enclosures

3.6

unenclosed connector

connector where protection against electric shock is provided by the enclosure of the equipment, in which the connector is mounted, in accordance with the applicable product safety standard

3.7

inter-vehicle connector

a connector deemed to be assembled with proper cable to form a cable assembly for inter-vehicle electrical connection

3.8

contact

conductive element in a connector (including means for cable termination) that mates with a corresponding element to provide an electrical path

3.9 male contact

contact (including means for cable termination) designed for electrical engagement on its outer surface and to enter a female contact, thus forming an electrical connection

EXAMPLES Tab, pin, blade.

3.10 female contact

contact (including means for cable termination) designed for electrical engagement on its inner surface, and to accept entry of a male contact, thus forming an electrical connection

EXAMPLES Receptacle, sleeve.

3.11 cable termination

any joining of cable to contact

EXAMPLES Crimp, insulation displacement, screwing, spring clamp.

3.12 multipole connector

a connector with more than one contact

EXAMPLE See Figure 2.

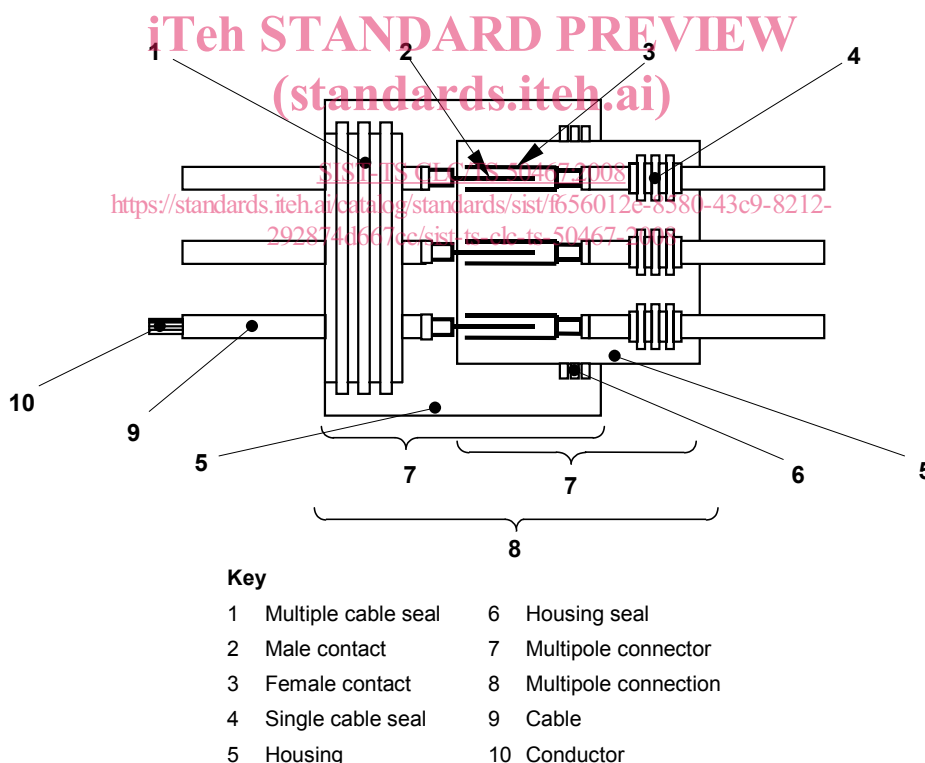


Figure 2 – Multipole connectors

3.13 connector coding

device, either visual, or mechanical or sensitive, or a combinations of these, preventing connection of connectors from the same family and having the same number of contacts but with different coding

3.14**intended use**

application conditions of connectors which are included within the permissible rated values and environmental conditions and characteristic assigned by the manufacturers specification

3.15**interlock**

device, either electrical or mechanical, which prevents the contacts of a connector from becoming live before it is in proper engagement with its counterpart, and which either prevents the connector from being withdrawn while its contacts are live or makes the contacts dead before separation

[EN 60309-1, 2.9 modified]

3.16**cycle of mechanical operation** (mating cycles)

one insertion and one withdrawal of the connector halves

[EN 61984, 3.9]

3.17**clamping unit**

part(s) of the terminal necessary for the mechanical clamping and the electrical connection of the conductor(s), including the parts which are necessary to ensure the correct contact pressure

[EN 60999-1, 2.1]

3.18**upper limiting temperature**

maximum permissible temperature of a connector assigned by the manufacturer at which the connector may still be operated. It takes into consideration the temperature rise due to heating of the contacts by current flow plus the ambient temperature

iTeh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/f656012e-8580-43c9-8212-292874d667cc/sist-ts-clc-ts-50467-2008>

3.19**lower limiting temperature**

minimum permissible temperature of a connector assigned by the manufacturer at which the connector may still be operated

3.20**clearance**

shortest distance in air between two conductive parts

[EN 60664-1, 1.3.2]

3.21**creepage distance**

shortest distance along the surface of the insulating material between two conductive parts

[EN 60664-1, 1.3.3]

3.22**over voltage category**

numeral defining a transient over voltage condition

[EN 60664-1, 1.3.10]

3.23**pollution**

any addition of foreign matter, solid, liquid, or gaseous (ionised gases), that can result in a reduction of electrical strength or specific surface resistivity of the insulation

[EN 60664-1, 1.3.11]