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SIST-TS CLC/TS 50717:2023

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Tehnične zahteve za tokovne odjemnike za prizemno električno napajanje za cestna vozila v obratovanju

Technical Requirements for Current Collectors for ground-level feeding system on road vehicles in operation

Technische Anforderungen an Stromabnehmer für bodennahe Einspeiseanlagen in Straßenfahrzeugen im Betrieb

Exigences techniques relatives aux capteurs de courant pour les systèmes d'alimentation au sol sur les véhicules routiers

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This Technical Specification was approved by CENELEC on 2022-11-07.

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

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CLC/TS 50717:2022 (E)

European foreword

This document (CLC/TS 50717:2022) has been prepared by CLC/TC 9X/WG 30 “Technical Requirements for Current Collectors for ground-level feeding system on road vehicles in operation”.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a Standardization Request given to CENELEC by the European Commission and the European Free Trade Association.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

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Introduction

Road traffic borne carbon dioxide and other emissions create a growing challenge that needs to be overcome to achieve commonly agreed climate targets.

This document is limited to current collector devices used in ground-based conductive feeding system by contact. The dynamic electric power supply of a road vehicle is achieved by the collection of current from the metallic segments at road level by means of one or more current collector devices installed underneath the electric vehicle or coupled traction trailers.

As road traffic is highly internationalized and standardized, Electric Road System (ERS) solutions for dynamic supply of vehicles need to be standardized.

The current collector device interoperability objectives are defined between countries and vehicle types, but not between ground-based conductive feeding system technical solutions.

NOTE Annex A presents the architecture for the whole Electric Road System (ERS) for information.

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CLC/TS 50717:2022 (E)

1 Scope

This document specifies the general characteristics which are to be applied to ground level current collector devices, to enable conductive current collection by road vehicles from a feeding track integrated in the roadway.

It defines the interfaces between the current collector device and its environment as well as the electrical safety concept.

It also specifies the necessary tests for the current collector devices and gives recommendations for their maintenance.

This document is applicable to current collector devices on road vehicles for ground-level feeding operation on electrified public roads and highways.

This document is not applicable to motorcycles (including tricycles and quadricycles).

This document is not applicable to vehicles or electric buses with dynamic or static inductive charging systems and related power supplies.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 50121-1:2017, *Railway applications — Electromagnetic compatibility — Part 1: general*

EN 50121-2:2017, *Railway applications — Electromagnetic compatibility — Part 2: Emission of the whole railway system to the outside world*

EN 50121-5:2017, *Railway applications — Electromagnetic compatibility — Part 5: Emission and immunity of fixed power supply installations and apparatus*

EN 50125-1:2014, *Railway applications — Environmental conditions for equipment — Part 1: Rolling stock and on-board equipment*

EN 50125-2:2002,¹ *Railway applications — Environmental conditions for equipment — Part 2: Fixed electrical installations*

EN 50126-1:2017, *Railway Applications — The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) – Part 1: Generic RAMS process*

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

EN 60529:1991,² *Degrees of Protection Provided by Enclosures (IP Code)*

EN 61373:2010, *Railway applications — Rolling stock equipment — Shock and vibration tests*

IEC 60068-2-64:2008+AMD1:2019, *Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance*

ISO 4892-2:2013, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenonarc lamps*

ISO 7637-2:2011, *Road vehicles — Electrical disturbances from conduction and coupling*

ISO 9227:2017, *Corrosion tests in artificial atmospheres — Salt spray tests*

¹ As impacted by EN 50125-2:2002/corrigendum Jun. 2010.

² As impacted by EN 60529:1991/corrigendum May 1993, EN 60529:1991/A1:2000, EN 60529:1991/A2:2013, EN 60529:1991/AC:2016-12, EN 60529:1991/A2:2013/AC:2019-02.

ISO 10605:2008, *Road vehicles — Test methods for electrical disturbances from electrostatic discharge*

ISO 16750-2:2012, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads*

ISO 16750-3:2012, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 3: Mechanical loads*

ISO 16750-4:2010, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 4: Climatic loads*

ISO 16750-5:2010, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 5: Chemical loads*

ISO 20653:2013, *Road vehicles — Degrees of protection (IP code) — Protection of electrical equipment against foreign objects, water and access*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

electric road system

ERS

system that enables dynamic power transfer to ERS vehicles whilst they are driving

Note 1 to entry: By integrating power transfer technology into existing road infrastructure, an electrified road will be accessible to both vehicles that use power transmission and other vehicles.

3.2

current collector device

CCD

retractable mechanical apparatus mounted underneath the vehicle which is intended to collect by contact the current from ERS segments

Note 1 to entry: CCD is “on” when supplied with ELV and “off” when it is not supplied.

3.3

wearing strip

part of the collector shoe which is the friction and wearing part of the CCD

3.4

collector shoe

part of the current collector device which is lowered to be in contact with the conductive segment and collects power through its wearing strips

3.5

CCD control unit

electronic device responsible for managing the positions of the retractable current collector device

3.6

actuator system

system used to operate the current collector device from one position to another

CLC/TS 50717:2022 (E)**3.7****on rail position**

running position of the collector shoe at which it touches the conductor rail and at which it is able to draw the electrical power dependent upon the track load conditions

[SOURCE: EN 50702:2021, 3.8]

3.8**retracted position**

position where the collector shoe is retracted from the conductor rail by the means of a mechanism system

[SOURCE: EN 50702:2021, 3.9 modified – "(pneumatic or manual)" removed]

3.9**cleared state**

retracted position of the CCD with additional interlocking (e.g. position sensor)

Note 1 to entry: Position of the CCD when the vehicle is not on an electric road.

3.10**feeding track**

continuous insulated track integrated into the roadway and containing the conductive segments

3.11**electrical section**

part of the feeding track that is powered and controlled by a main circuit breaker

3.12**conductive segment**

elementary longitudinal element of the feeding track composed of the metallic parts in interface with the CCD to transfer the current and bring back the return current

3.13**ERS vehicle**

standard vehicle which is compatible with ERS

3.14**ERS vehicle power supply management system**

part of the ERS vehicle which contains all components providing or managing the power transfer from the ERS Traction Power Supply sub-system to the battery or the drive management system, e.g. DC/DC converter, galvanic isolation

3.15**ERS control devices**

part of the ERS vehicle which contains all components providing or managing the interface between the CCD and the vehicle

3.16**rated voltage, <of current collector device>**

voltage at which the current collector device is designed to function

3.17**rated current, <vehicle at standstill>**

average value of the current withstand for a given time by the current collector device at standstill

[SOURCE: EN 50702:2021, 3.12]

3.18**maximum current, <vehicle at standstill>**

maximum value of the current withstand by the current collector device at standstill for a given time

[SOURCE: EN 50702:2021, 3.13]

3.19**rated current, <vehicle running>**

continuous current transfer capacity of the current collector device

[SOURCE: EN 50702:2021, 3.14]

3.20**short circuit current**

maximum current that the current collector device is expected to withstand under abnormal conditions, when there is a fault and the protection system has been operated to protect against fault

Note 1 to entry: Typical fault clearance times varying from a few tens of milliseconds through to half a second dependent upon the protection operation.

[SOURCE: EN 50702:2021, 3.15]

3.21**type test**

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

[SOURCE: IEC 60050-151:2001, 151-16-16]

3.22**routine test**

conformity test made on each individual item during or after manufacture

[SOURCE: IEC 60050-151:2001, 151-16-17]

3.23**gauge, <of the CCD>**

space envelope dedicated for the current collector device, normally defined by the vehicle manufacturer and where all parts of the equipment are bound to remain during operation

3.24**extra-low voltage****ELV**

voltage normally not exceeding 50 V alternating current (AC) or 120 V ripple free direct current (DC) whether between conductors or to earth

Note 1 to entry: This includes SELV, PELV and FELV (see HD 60364-4-41).

[SOURCE: IEC 60050-826:2004, 826-12-30, modified – “the relevant voltage limit of band I specified in IEC 60449” has been replaced by “50 V alternating current (AC) or 120 V ripple free direct current (DC) whether between conductors or to earth”. The note 1 to entry has been added.]]

3.25**low voltage****LV**

voltage normally not exceeding 1 000 V AC or 1 500 V DC

[SOURCE: IEC 60050-195:2021, 195-05-25, modified – The content of the notes 1 and 2 to entry have been merged in the definition.]

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3.26

high voltage**HV**

voltage normally exceeding the conventionally adopted limit for low voltage

[SOURCE: IEC 60050-195:2021, 195-05-26]

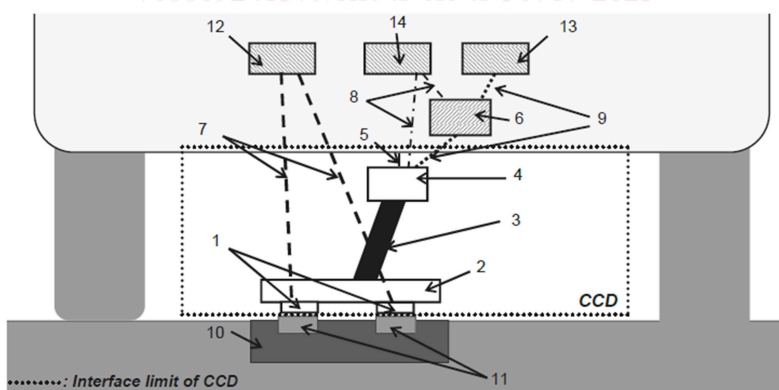
4 Abbreviations

CCD:	Current collector device
ELV:	Extra-Low Voltage
EMC:	Electro Magnetic Compatibility
ERS:	Electric Road System
HV:	High Voltage
IP:	Ingress Protection
LV:	Low Voltage
MRT:	Mean Repair Time
MTBF:	Mean Time Between Failures
RMS:	Root Mean Square
UV:	Ultra-Violet

5 Current collector device main characteristics

The current collector device (CCD) is a retractable mechanical apparatus located underneath the vehicle to collect by contact the current from a feeding track and to transfer it to the vehicle.

The main components of the CCD are described in Figure 1.

**Key**

1	Wearing strips	8	ELV power cable
2	Collector shoe	9	Control and Communication cable
3	Mechanical arm	10	Feeding track
4	Actuator	11	Conductive segments
5	Mechanical interface	12	ERS Vehicle Power Supply Management System
6	CCD Control unit	13	Vehicle control unit
7	Power supply cables	14	Vehicle low voltage battery

Figure 1 — Current collector device main components