IEC PAS 61980-5

Edition 1.0 2024-12

PUBLICLY AVAILABLE SPECIFICATION

colour inside

Electric vehicle wireless power transfer (WPT) systems – Part 5: Interoperability and safety of dynamic wireless power transfer (D-WPT) for electric vehicles

IEC PAS 61980-5:2024-12(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 43.120

ISBN 978-2-8327- 0058-7

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ELECTRIC VEHICLE WIRELESS POWER TRANSFER (WPT) SYSTEMS –

Part 5: Interoperability and safety of dynamic wireless power transfer (D-WPT) for electric vehicles

FOREWORD

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IEC PAS 61980-5 has been prepared by IEC technical committee 69: Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks. It is a Publicly Available Specification.

The text of this Publicly Available Specification is based on the following documents:

Draft	Report on voting
69/975/DPAS	69/1011/RVDPAS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Publicly Available Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

This document is to be read in conjunction with IEC 61980-1:2020.

The clauses of the particular requirements in this document supplement or modify the corresponding clauses in IEC 61980-1:2020. Where the text indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of IEC 61980-1:2020, these changes are made to the relevant text of IEC 61980-1:2020, which then becomes part of the standard. Where no change is necessary, the words "Clause/Subclause xx of IEC 61980-1:2020 is applicable" are used. Additional items to those of IEC 61980-1:2020 are numbered starting 101. Annexes are lettered from A onwards.

A list of all parts in the IEC 61980 series, published under the general title *Electric vehicle wireless power transfer (WPT) systems*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

NOTE In accordance with ISO/IEC Directives, Part 1, IEC PASs are automatically withdrawn after 4 years.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The IEC 61980 series is published in separate parts according to the following structure:

– IEC 61980-1 covers general requirements for electric road vehicle (EV) wireless power transfer (WPT) systems including general background and definitions (e.g. efficiency, electrical safety, EMC, EMF);

– IEC 61980-2 applies to magnetic field wireless power transfer (MF-WPT) for electric road vehicles and covers specific requirements for system activities and communication between the electric road vehicle side and the off-board side, including general background and definitions;

– IEC 61980-3 covers specific power transfer requirements for the off-board side of magnetic field wireless power transfer systems for electric road vehicles (e.g. efficiency, electrical safety, EMC, EMF);

– IEC PAS 61980-4[1] covers specific power transfer requirements for the off-board side of magnetic field high power wireless power transfer (H-WPT) systems for electric road vehicles (e.g. efficiency, electrical safety, EMC, EMF).

– IEC 61980-5 covers specific power transfer requirements for the off-board side of magnetic field dynamic wireless power transfer (MF-D-WPT) systems for electric road vehicles (e.g. efficiency, electrical safety, EMC, EMF). This document is IEC 61980-5 and is under development as a PAS.

– IEC 61980-6[2] applies to magnetic field dynamic wireless power transfer for electric road vehicles (EV) and covers specific requirements for system activities and communication between the electric road vehicle side and the off-board side, including general background and definitions.

Requirements for the on-board side of MF-WPT and MF-D-WPT for electric road vehicles are covered in ISO PAS 5474-6[3].

This document is being published as a PAS for information about how dynamic charging systems can work, as evidenced by demonstration systems described in Annex A to Annex D.

[1] Under preparation. Stage at the time of publication: IEC CD PAS 61980-4:2024.

[2] Under development.

[3] Under preparation. Stage at the time of publication: ISO CD PAS 5474-6:2023.

ELECTRIC VEHICLE WIRELESS POWER TRANSFER (WPT) SYSTEMS –

Part 5: Interoperability and safety of dynamic wireless power transfer (D-WPT) for electric vehicles

1 Scope

This part of IEC 61980 applies to the off-board supply equipment for dynamic wireless power transfer via magnetic field (MF-D-WPT) to electric road vehicles in motion for purposes of supplying electric energy to the RESS (rechargeable energy storage system) and/or other on-board electrical systems.

The system operates at standard supply voltage ratings per IEC 60038 up to 1 000 V AC and up to 1 500 V DC from the supply network. The power transfer takes place primarily while the electric vehicle (EV) is in motion, but can continue to take place under certain conditions while the vehicle is not in motion.

Off-board supply equipment fulfilling the requirements in this document are intended to operate with EV devices fulfilling the requirements of ISO 5474-4[4] and ISO 5474-6.

The aspects covered in this document includes

– the characteristics and operating conditions,
– specific power transfer requirements for the off-board side of magnetic field dynamic wireless power transfer systems for electric road vehicles, and
– the general requirement of electrical safety and EMC for MF-D-WPT.

Examples of D-WPT systems are described in the informative Annex A to Annex D.

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.

IEC 60038, *IEC standard voltages*

IEC 61980-1, *Electric vehicle wireless power transfer (WPT) systems – Part 1: General requirements*

IEC 61980-3, *Electric vehicle wireless power transfer (WPT) systems – Part 3: Specific requirements for magnetic field wireless power transfer systems*

ITU-R Recommendation SM.2110.1:2019, *Guidance on frequency ranges for operation of non-beam wireless power transmission for electric vehicles*

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4 Under preparation. Stage at the time of publication: ISO DIS 5474-4:2024.

3 Terms and definitions

For the purposes of this document, he terms and definitions given in IEC 61980-1, IEC 61980-3 and the following terms and definitions apply, except as follows.

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

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

Additional terms and definitions:

3.101
dynamic wireless power transfer
D-WPT
WPT while vehicle is in motion

3.102
embedded depth
Z_{RS}
distance between the road surface and the top of housing in the primary device

3.103
embedded mounting
mounting of a primary device in such a manner that the top covering of the primary device is buried (embedded) in the pavement.

3.104
inverter
power electronic device or circuitry that changes direct current (DC) to alternating current (AC)

Note 1 to entry: Inverter is a part of a power electronics.

3.105
magnetic gap
vertical (z-direction) distance between the coil of the primary device and the coil of the secondary device

3.106
standby state
state where power transfer is stopped and power electronics is not ready to transfer power for a short period, but communication stays up

3.107
segment
unit of coil(s) and core(s) controlled independently in the primary device

Note 1 to entry: Depending on the system structure, a switch for energization, supply device P2PS controller and supply power electronics might be part of a segment. See Figure 2.

3.108
segment switching
turn on/off function that energizes the primary coil(s) of the segment

3.109
steady state
state of a system at which quasi-constant power is transferred

4 Abbreviated terms

IEC 61980-1:2020, Clause 4, does not apply.

5 General

IEC 61980-1:2020, Clause 5, applies, except as follows.

Replacement of the first paragraph :

The supply device (see Figure 2) shall be rated for one or a range of standard nominal voltages and frequencies as listed in IEC 60038.

6 Classification

Replacement:

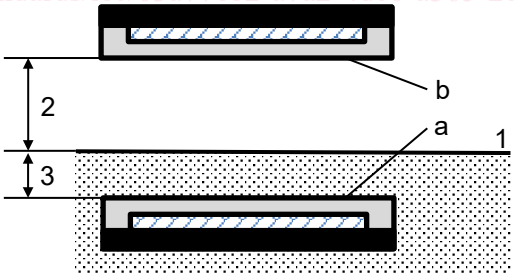
6.1 Compatibility class A and compatibility class B

The supply device is classified according to the compatibility class:

– compatibility class A supply device;
– compatibility class B supply device.

6.2 Installation

For dynamic wireless power transfer, the primary device shall be embedded per Figure 1. Z_{RS} gives the distance under road surface between the road surface and the top of the housing in the primary device as shown in Figure 1.



Key

a primary device
b secondary device
1 top of road surface
2 secondary device ground clearance (Z)
3 embedded depth (Z_{RS})

Figure 1 – Embedded mounting

The magnetic gap is the vertical (z-direction) distance between the coil of the primary device and the coil of the secondary device.

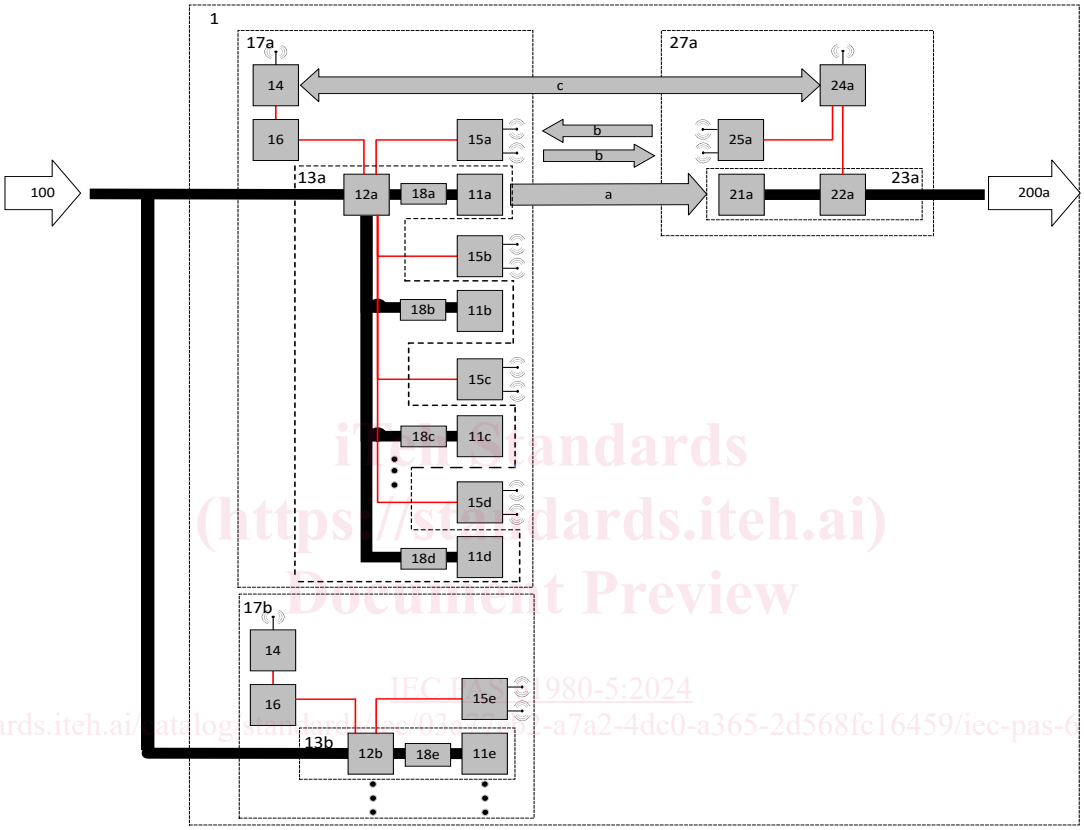
7 General supply device requirements

IEC 61980-1:2020, Clause 7, applies except as follows:

7.1 General architecture

Replacement:

Figure 2 shows an example for the structure of the components referred to in this document.



Key	Name	Key	Name
1	MF-D-WPT system		
11	primary device	21	secondary device
12	supply power electronics	22	EV power electronics
13	supply power circuit	23	EV power circuit (EVPC)
14	dynamic WPT SECC (D-SECC)	24	dynamic WPT EVCC (D-EVCC)
15	supply device P2PS controller	25	EV device P2PS controller
16	D-WPT management unit (DWMM)		
17	supply device	27	EV device
18	switch	200	RESS / motor
100	supply network	b	uni/bi-directional wireless signalling
a	wireless power flow	c	cellular/cloud/Wi-Fi with mobility support
18x+15x+11x	segment		

Figure 2 – Example of MF-D-WPT system