

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Low-voltage electrical installations –  
Part 7-722: Requirements for special installations or locations – Supplies for  
electric vehicles**

**Installations électriques à basse tension –  
Partie 7-722: Exigences pour les installations et emplacements spéciaux –  
Alimentation des véhicules électriques**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-VOLTAGE ELECTRICAL INSTALLATIONS –****Part 7-722: Requirements for special installations or locations –  
Supplies for electric vehicles**

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International Standard IEC 60364-7-722 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

The text of this standard is based on the following documents:

FDIS	Report on voting
64/1986/FDIS	64/2004/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60364 series, under the general title *Low-voltage electrical installations*, can be found on the IEC website.

The reader's attention is drawn to the fact that Annex A lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- replaced by a revised edition, or
- amended.

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## INTRODUCTION

For the purpose of this part (IEC 60364-7-722) the requirements of the general parts 1 to 6 of IEC 60364 apply.

The IEC 60364-7-7XX parts of IEC 60364 contain particular requirements for special installations or locations which are based on the requirements of the general parts of IEC 60364 (IEC 60364-1 to IEC 60364-6). These IEC 60364-7-7XX parts are considered in conjunction with the requirements of the general parts.

The particular requirements of this part of IEC 60364 supplement, modify or replace certain of the requirements of the general parts of IEC 60364 being valid at the time of publication of this part. The absence of reference to the exclusion of a part or a clause of a general part means that the corresponding clauses of the general part are applicable (undated reference).

Requirements of other 7XX parts being relevant for installations covered by this part also apply. This part may therefore also supplement, modify or replace certain of these requirements valid at the time of publication of this part.

The clause numbering of this part follows the pattern and corresponding references of IEC 60364. The numbers following the particular number of this part are those of the corresponding parts, or clauses of the other parts of the IEC 60364 series, valid at the time of publication of this part, as indicated in the normative references of this document (dated reference).

If requirements or explanations additional to those of the other parts of the IEC 60364 series are needed, the numbering of such items appears as 722.101, 722.102, 722.103 etc.

NOTE In the case where new or amended general parts with modified numbering were published after this part was issued, the clause numbers referring to a general part in this 722 part may no longer align with the latest edition of the general part. Dated references should be observed.



## LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

### Part 7-722: Requirements for special installations or locations – Supplies for electric vehicles

#### 722 Supplies for electric vehicles

##### 722.1 Scope

The particular requirements of this part of IEC 60364 apply to

- circuits intended to supply energy to electric vehicles,
- circuits intended for feeding back electricity from electric vehicles into the supply network.

NOTE The requirements for feeding back electricity from electric vehicles into the supply network are under consideration.

Inductive charging is not covered.

##### 722.2 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.

IEC 60269 (all parts), *Low voltage fuses*

IEC 60309-1:1999, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*

IEC 60309-2, *Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60898 (all parts), *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations*

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-6-2, *Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS)*

IEC 61008-1, *Residual current circuit-breakers without integral overvoltage protection for household and similar uses (RCCBs) – Part 1: General rules*

IEC 61009-1, *Residual current operated circuit-breakers with integral overvoltage protection for household and similar uses (RCBOs) – Part 1: General rules*

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*



IEC 61557-8, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems*

IEC 61557-9, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment insulation fault location in IT systems*

IEC 61558-2-4, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers*

IEC 61851 (all parts), *Electric vehicle conductive charging system*

IEC 62196 (all parts), *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles*

IEC 62196-1, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements*

IEC 62196-2, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62423, *Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses*

## 722.3 Terms and definitions

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

### 722.3.1

#### **electric vehicle**

EV

any vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle such as a residential or public electricity service), which is manufactured primarily for use on public streets, roads or highways

Note 1 to entry: In ISO publications, the term “electric road vehicle” is used for “electric vehicle.”

[SOURCE: IEC 61851-1:2010, 3.8]

### 722.3.2

#### **connecting point**

point where one electric vehicle is connected to the fixed installation

Note 1 to entry: The connecting point is a socket-outlet or a vehicle connector.

Note 2 to entry: The connecting point may be part of the fixed installed electric vehicle supply equipment in accordance with the IEC 61851 series.

**722.3.3****mode 1 charging**

connection of the EV to the a.c. supply network (mains) utilizing standardized socket-outlets not exceeding 16 A and not exceeding 250 V a.c. single-phase or 480 V a.c. three-phase, at the supply side, and utilizing the live and protective earth conductors

[SOURCE: IEC 61851-1:2010, 6.2 "EV charging modes, mode 1 charging"]

**722.3.4****mode 2 charging**

connection of the EV to the a.c. supply network (mains) utilizing standardized single-phase or three-phase socket-outlets not exceeding 32 A and not exceeding 250 V a.c. single-phase or 480 V a.c. three-phase, and utilizing the live and protective earth conductors together with a control pilot function and system of personnel protection against electric shock (RCD) between the EV and the plug or as a part of the in-cable control box

[SOURCE: IEC 61851-1:2010, 6.2 "EV charging modes, mode 2 charging", modified]

**722.3.5****mode 3 charging**

connection of the EV to the a.c. supply network (mains) utilizing dedicated electric vehicle supply equipment where the control pilot function extends to control equipment in the electric vehicle supply equipment permanently connected to the a.c. supply network (mains)

[SOURCE: IEC 61851-1:2010, 6.2 "EV charging modes, mode 3 charging"]

**722.3.6****mode 4 charging**

connection of the EV to the a.c. supply network (mains) utilizing an off-board charger where the control pilot function extends to equipment permanently connected to the a.c. supply

[SOURCE: IEC 61851-1:2010, 6.2 "EV charging modes, mode 4 charging"]

**722.3.7****demand factor**

ratio, expressed as a numerical value or as a percentage, of the maximum demand of a circuit or a group of circuits within a specified period, to the corresponding total installed load of the circuit(s)

Note 1 to entry. In using this term, it is necessary to specify to which level of the system it relates.

[SOURCE: IEC 60050-691:1973, 691-10-05, modified – the word "circuit" has replaced the word "installation"].

**722.30 Assessment of general characteristics****722.31 Purposes, supplies and structure****722.311 Maximum demand and diversity**

*Add the following:*

It shall be considered that in normal use each single connecting point is used at its rated current.

NOTE For this application the demand factor of the final circuit supplying the connecting point (e.g. the socket-outlet) is equal to 1.

Since all the connecting points of the installation can be used simultaneously, the diversity factor of the distribution circuit shall be taken as equal to 1. However, this factor may be reduced where load control is available.

## **722.312 Conductor arrangement and system earthing**

### **722.312.2.1 TN systems**

*Add the following:*

In a TN system, the final circuit supplying a connecting point shall be a TN-S system.

## **722.314 Division of installation**

*Add the following:*

**722.314.101** A dedicated circuit shall be provided for the connection to electric vehicles.

## **722.4 Protection for safety**

### **722.41 Protection against electric shock**

#### **722.413 Protective measure: electrical separation**

##### **722.413.3 Requirements for fault protection**

*Add the following:*

**722.413.3.101** The circuit shall be supplied through a fixed isolating transformer complying with IEC 61558-2-4.

NOTE In mode 4 (d.c. charging), requirements for the isolating transformer are under consideration.

#### **722.41.B Obstacles and placing out of reach**

##### **722.41.B.2 Obstacles**

*Replace the existing text by the following:*

Protection by obstacles shall not be used.

##### **722.41.B.3 Placing out of reach**

*Replace the existing text by the following:*

Protection by placing out of reach shall not be used.

##### **722.41.C.1 Non-conducting location**

*Replace the existing text by the following:*

Protection by non-conducting location shall not be used.

##### **722.41.C.2 Protection by earth-free local equipotential bonding**

*Replace the existing text by the following:*

Protection by earth-free local equipotential bonding shall not be used.

### **722.41.C.3 Electrical separation for the supply of more than one item of current-using equipment**

*Replace the existing text by the following:*

Electrical separation shall not be used for the supply of more than one electric vehicle.

## **722.5 Selection and erection of electrical equipment**

### **722.51 Common rules**

#### **722.511 Compliance with standards**

*Add the following:*

**722.511.101** EV charging stations shall comply with the appropriate parts of the IEC 61851 series.

#### **722.512 Operational conditions and external influences**

##### **722.512.2 External influences**

*Add the following new subclauses:*

###### **722.512.2.101 Presence of water (AD)**

Where the connection point is installed outdoors, the equipment shall be selected with a degree of protection of at least IPX4 in order to protect against water splashes (AD4).

###### **722.512.2.102 Presence of solid foreign bodies (AE)**

Where the connecting point is installed outdoors, the equipment shall be selected or provided with a degree of protection of at least IP4X in order to protect against the ingress of small objects (AE3).

###### **722.512.2.103 Impact (AG)**

Equipment installed in public areas and car park sites shall be protected against mechanical damage (impact of medium severity AG2). Protection of the equipment shall be afforded by one or more of the following:

- the position or location shall be selected to avoid damage by any reasonably foreseeable impact;
- local or general mechanical protection shall be provided;
- equipment shall be installed that complies with a minimum degree of protection against external mechanical impact of IK07 in accordance with the requirements of IEC 62262.

### **722.53 Selection and erection of electrical equipment – Isolation, switching and control**

#### **722.530 Introduction**

### 722.530.3 General and common requirements

*Add the following:*

**722.530.3.101** The requirements of this clause shall be achieved either by the selection and erection of the appropriate equipment in the fixed installation or by the selection of an EV charging station which incorporates the appropriate equipment or a combination of both.

#### 722.530.3.102 Insulation monitoring devices (IMD)

For circuits in IT systems that are intended to supply energy for electric vehicles, for example by an isolating transformer or a battery system, an insulation monitoring device (IMD) according to IEC 61557-8 shall be provided.

An IMD may not be necessary for a circuit that uses automatic disconnection of supply at the first fault.

It is recommended to install an IMD with the following two response values:

– Pre-warning

If the insulation resistance falls below 300  $\Omega/V$  an optical and/or acoustical signal should be issued to the user. An ongoing charging session may continue but a new charging session shall not take place.

– Alarm

If the resistance falls below 100  $\Omega/V$  an optical and/or acoustical signal should be issued to the user. The charging circuit may shut down within 10 s.

#### 722.530.3.103 Insulation fault location system (IFLS)

For circuits described in 722.530.3.102, and if more than one electric vehicle is supplied from the same unearthed supply, it is recommended to use an insulation fault location system (IFLS) according to IEC 61557-9 to detect the faulty circuitry within the shortest possible time.

### 722.531 Devices for protection against indirect contact by automatic disconnection of supply

#### 722.531.2 Residual current protective devices

*Add the following:*

**722.531.2.101** Except for circuits using the protective measure of electrical separation, each connecting point shall be protected by its own RCD of at least type A, having a rated residual operating current not exceeding 30 mA.

Where the EV charging station is equipped with a socket-outlet or vehicle connector complying with the IEC 62196 series, protective measures against d.c. fault current shall be taken, except where provided by the EV charging station. The appropriate measures, for each connection point, shall be as follows:

- RCD type B; or
- RCD type A and appropriate equipment that ensures disconnection of the supply in case of d.c. fault current above 6 mA.

RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 or IEC 62423.

NOTE Requirements for the selection and erection of RCDs in the case of supplies using d.c. vehicle connectors according to the IEC 62196 series are under consideration.

**732.531.2.1.1**

*Replace the existing subclause, including the NOTE, as follows:*

RCDs shall disconnect all live conductors.

**722.533 Devices for protection against overcurrent**

*Add the following:*

**722.533.101** Each connecting point shall be supplied individually by a final circuit protected by an overcurrent protective device complying with IEC 60947-2, IEC 60947-6-2 or IEC 61009-1 or with the relevant parts of the IEC 60898 series or the IEC 60269 series.

NOTE 1 The overcurrent protective device may be part of the switchboard, the fixed installation or the electric vehicle supply equipment.

NOTE 2 The electric vehicle supply equipment may have multiple connecting points.

**722.535 Co-ordination of various protective devices****722.535.3 Discrimination between residual current protective devices**

*Replace the first paragraph as follows:*

Where required for service reasons, selectivity shall be maintained between the RCD protecting a connecting point and an RCD installed upstream.

**722.543 Protective conductors**

*Add the following:*

**722.543.101** Control signals on the protective conductor (PE) shall not flow into the fixed electrical installation; equipment shall be selected accordingly.

NOTE This requirement can be achieved by using a galvanic separation of the control electronics.

The requirements of 7.5.2 of IEC 61140:2001 shall apply.

Such signals, and the related devices, shall not impair the correct functioning of the devices installed to provide the protective measure of automatic disconnection of supply (e.g. RCD).

**722.55 Other equipment**

*Add the following:*

**722.55.101 Socket-outlets and vehicle connectors**

**722.55.101.1** Each connecting point shall be provided with one socket-outlet or vehicle connector complying with an appropriate standard, e.g. IEC 60309-1 or IEC 62196-1, where interchangeability is not required, and IEC 60309-2, IEC 62196-2 or IEC 62196-3 where interchangeability is required. Socket-outlets with a rated current not exceeding 16 A according to the national standard may also be used.

Except where electrical separation is used, each socket-outlet shall have an earthing contact connected to the protective conductor (PE).

**722.55.101.2** Every socket-outlet or vehicle connector shall be located as close as practicable to the EV parking place to be supplied.

**722.55.101.3** Portable socket-outlets are not permitted.

One socket-outlet or vehicle connector shall supply only one electric vehicle.

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