ICS 43.120

# 中華民國國家標準

# C N S

## 電動車輛傳導式充電系統－第 23 部：DC EV 供電設備

## Electric vehicle conductive charging system − Part 23: DC electric vehicle supply equipment

**CNS 15511-23 草-修 1140098:2025**

中華民國 102 年 11 月 28 日制定公布
**Date of Promulgation:2013-11-28**

中華民國　年　月　日修訂公布
**Date of Amendment:　-　-**

本標準非經經濟部標準檢驗局同意不得翻印

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## 前言

本標準係依據 2023 年發行之第 2 版 IEC 61851-23，修訂成為中華民國國家標準者。

本標準係依標準法之規定，經國家標準審查委員會審定，由主管機關公布之中華民國國家標準。CNS 15511-23:2013 已經修訂並由本標準取代。

依標準法第四條之規定，國家標準採自願性方式實施。但經各該目的事業主管機關引用全部或部分內容為法規者，從其規定。

本標準並未建議所有安全事項，使用本標準前應適當建立相關維護安全與健康作業，並且遵守相關法規之規定。

本標準之部分內容，可能涉及專利權、商標權與著作權，主管機關及標準專責機關不負責任何或所有此類專利權、商標權與著作權之鑑別。

## 1. 適用範圍(Scope)

本標準適用於電動車(EV)與電網間之電能傳輸的 EV 供電設備，A 側額定最高電壓達 1,000 V AC 或 1500 V DC 且及 B 側額定最高電壓達 1500 V DC。

This part of IEC 61851 applies to the EV supply equipment to provide energy transfer between the supply network and electric vehicles (EVs), with a rated maximum voltage at side A of up to 1 000 V AC or up to 1 500 V DC and a rated maximum voltage at side B up to 1 500 V DC.

本標準規定 A、B 及 C 系統之 EV 供電設備，分別規定於附錄 AA、BB 及 CC，其他系統仍在研議中。

This document specifies the EV supply equipment of system A, system B and system C as defined in Annex AA, Annex BB and Annex CC. Other systems are under consideration.

本標準提供針對系統 A 之雙向電力傳輸（bidirectional power transfer, BPT）EV 供電設備的要求，其 A 側額定最高電壓達 1,000 V AC 或 1,500 V DC。

This document provides the requirements for bidirectional power transfer (BPT) EV supply equipment for system A, with a rated maximum voltage at side A up to 1 000 V AC or 1 500 V DC.

系統 B 及系統 C 之反向電力傳輸（reverse power transfer, RPT）及 BPT 的要求仍在研議中且未規定於本標準。

The requirements for reverse power transfer (RPT) and BPT for system B and system C are under consideration and are not specified in this document.

附錄 DD 提供關於 BPT 的資訊。

Annex DD provides information about BPT.

本標準不涵蓋涉及維護之所有的安全資訊。

This document does not cover all safety aspects related to maintenance.

A 側與 B 側間未提供簡單之隔離或保護性隔離的系統要求，仍在研議中。

Requirements for systems not providing simple separation or protective separation between side A and side B are under consideration.

EV 供電設備與 EV 間作為電能傳輸控制之數位通訊要求，規定於 CNS 15511-24。

The requirements for digital communication between EV supply equipment and the EV to control energy transfer are defined in IEC 61851-24.

電能傳輸使用之自動連接裝置(automated connection device, ACD)的要求，提供於 IEC 61851-23-1。

Requirements for energy transfer with an automated connection device are given in IEC 61851-23-1.

具有多個車輛端插頭之 EV 供電設備的特定要求，提供於附錄 FF。

Specific requirements for EV supply equipment with multiple vehicle connectors are provided in Annex FF.

關於電能傳輸控制、傳訊及數位通訊之一般資訊，提供於附錄 GG。

General information about energy transfer control, signalling and digital communication is provided in Annex GG.

對於接觸電流及接觸脈衝電流之一般資訊，提供於附錄 HH。

General information on the touch current and touch impulse current is provided in Annex HH.

關於沒有電流、電壓及/或功率控制之 EV 供電設備的要求，仍在研議中。

Requirements for EV supply equipment without current, voltage and/or power control are under consideration.

符合本標準要求之 EV 供電設備，不預期使用相同 EV 供電設備之多個車端插頭或多個 EV 供電設備傳輸電能傳輸予單獨的 EV。

EV supply equipment in compliance with this document are not intended to provide energy transfer to a single EV with

- 相同之 EV 供電設備具有多個車輛端插頭，或
- multiple vehicle connectors of the same EV supply equipment, or
- 多個 EV 供電設備
- multiple EV supply equipment.

針對此使用情形下之要求仍研議中

Requirements for such use case are under consideration.

**2. 引用標準(Normative references)**

下列標準因本標準所引用，成為本標準之一部分。有加註年分者，適用該年分之版次，不適用於其後之修訂版(包括補充增修)。無加註年分者，適用該最新版(包括補充增修)。

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|---|---|
| IEC 60038:2009 | IEC standard voltages |
| IEC 60068-2-75:2014 | Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests |
| IEC 60068-2-78 | Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state |
| IEC 60227-1:2007 | Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements |
| IEC 60245-1:2003 | Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements |
| IEC 60245-1:2003/AMD1:2007 | |
| IEC 60320-1 | Appliance couplers for household and similar general purposes – Part 1: General requirements |
| IEC 60364-4-43:2008 | Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent |
| IEC 60364-5-53:2019 | Low-voltage electrical installations – Part 5-53: |

Selection and erection of electrical equipment – Devices for protection for safety, isolation, switching, control and monitoring

IEC 60364-5-54:2011 Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors

IEC 60364-5-54:2011/AMD1:2021

IEC 60384-14 Fixed capacitors for use in electronic equipment – Part 14:Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

IEC 60479-1:2018 Effects of current on human beings and livestock – Part 1: General aspects IEC 60479-2:2019, Effects of current on human beings and livestock – Part 2: Special aspects IEC 60529, Degrees of protection provided by enclosures (IP Code)

IEC 60664-1:2020 Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests

IEC 60811-501 Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds

IEC 60812:2018 Failure modes and effects analysis (FMEA and FMECA)

IEC 60990:2016 Methods of measurement of touch current and protective conductor current

IEC 61008-1:2010 Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules

IEC 61008-1:2010/AMD1:2012

IEC 61008-1:2010/AMD2:2013

IEC 61009-1:2009 Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules

IEC 61009-1:2009/AMD1:2012

IEC 61009-1:2009/AMD2:2013

IEC 60947-2:2016 Low-voltage switchgear and controlgear – Part 2: Circuit-breakers

IEC 60947-2:2016/AMD1:2019

| | |
|---|---|
| IEC 61140:2016 | Protection against electric shock – Common aspects for installation and equipment |
| IEC 61439-1:2020 | Low-voltage switchgear and controlgear assemblies – Part 1: General rules |
| IEC 61439-7:2022 | Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations |
| IEC 61540:1997 | Electrical accessories – Portable residual current devices without integral overcurrent protection for household and similar use (PRCDs) |
| IEC 61540:1997/AMD1:1998 | |
| IEC 61557-8:2014 | Electrical safety in low voltage distribution systems up to 1,000 V AC and 1,500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems |
| IEC 61558-1:2017 | Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests |
| IEC 61558-2-4:2021 | Safety of transformers, reactors, power supply units and combinations thereof – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers for general applications |
| IEC 61643 (all parts) | Low-voltage surge protective devices |
| IEC 61643-11 | Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods |
| IEC 61643-21 | Low voltage surge protective devices – Part 21: Surge protective devices connected to telecommunications and signalling networks – Performance requirements and testing methods |
| IEC 61851-1:2017 | Electric vehicle conductive charging system – Part 1: General requirements |
| IEC 61851-21-2:2018 | Electric vehicle conductive charging system – Part 21-2: Electric vehicle requirements for conductive connection to an AC/DC supply – EMC requirements for off-board electric vehicle charging systems |
| IEC 61851-24:2023 | Electric vehicle conductive charging system – Part 24: Digital communication between a DC EV charging station and an electric vehicle for control of DC charging |

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| IEC 62196-1:2022 | Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements |
| IEC 62196-3:2022 | Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3: Dimensional compatibility and interchangeability requirements for DC and AC/DC pin and contact-tube vehicle couplers |
| IEC TS 62196-3-1:2020 | Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3-1: Vehicle connector, vehicle inlet and cable assembly for DC charging intended to be used with a thermal management system |
| IEC 62368-1:2023 | Audio/video, information and communication technology equipment – Part 1: Safety requirements |
| IEC 62423:2009 | Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses |
| IEC 62262 | Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) |
| IEC 62477-1:2022 | Safety requirements for power electronic converter systems and equipment – Part 1: General |
| IEC 62893-4-1:2020 | Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV – Part 4-1: Cables for DC charging according to mode 4 of IEC 61851-1 – DC charging without use of a thermal management system |
| IEC Guide 115 | Application of measurement uncertainty to conformity assessment activities in the electrotechnical sector |
| ISO 2719:2016 | Determination of flash point – Pensky-Martens closed cup method |
| ISO 6469-3:2018 | Electrically propelled road vehicles – Safety specifications – Part 3: Electrical safety |
| ISO 7000 | Graphical symbols for use on equipment, available at http://www.graphical- symbols.info/equipment |
| ISO 7010 | Graphical symbols – Safety colours and safety signs – Registered safety signs, available at https://www.iso.org/obp |
| ISO 15118-2:2014 | Road vehicles – Vehicle-to-grid communication interface – Part 2: Network and application protocol requirements |

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|---|---|
| ISO 15118-3 | Road vehicles – Vehicle to grid communication interface – Part 3: Physical and data link layer requirements |
| ISO 17409:2020 | Electrically propelled road vehicles – Conductive power transfer – Safety requirements |
| DIN SPEC 70121:2014 | Electromobility – Digital communication between a DC EV charging station and an electric vehicle for control of DC charging in the combined charging system |
| OECD 301 B | OECD Guideline for testing of chemicals |

**3. 用語及定義(Terms and definitions)**

除下列所述，CNS 15511-1 給出的用語及定義適用本標準之目的。

For the purposes of this document, the terms and definitions given in IEC 61851-1:2017 apply, except as follows.

備考：包含於本標準之定義在此為一般性應用的定義。

適用於隔離變壓器、安全隔離變壓器、切換式電源及其構造的定義包括於 IEC 61558-1。

NOTE The definitions included in this document are those having general application herein. Definitions applying to isolating transformers, safety isolating transformers, switch mode power supplies, and their construction are included in IEC 61558-1.

**3.1 供電設備(Electric supply equipment)**

追加用語及定義：

Additional terms and definitions:

**3.1.101 隔開式 EV 供電設備(separated EV supply equipment)**

自所有其他電路隔開 B 側電路之 EV 供電設備。

EV supply equipment where the side B circuit is separated from all other circuits

備考：各電路間之隔離要求參照第 8 節。

Note 1 to entry: See Clause 8 for the requirements of separation between each circuit.

**3.1.102 非隔開式 EV 供電設備(non-separated EV supply equipment)**

未自一或多個其他電路隔開 B 側電路之 EV 供電設備。

EV supply equipment where the side B circuit is not separated from one or more other circuits

備考：各電路間之隔離要求參照第 8 節。

Note 1 to entry: See Clause 8 for the requirements of separation between each circuit.

**3.1.103 電能傳輸(energy transfer)、電力傳輸(power transfer)**

刪除：充電

(DEPRECATED: charging)

系统之部件間，任一方向能量的傳輸。

delivery of energy, in either direction, between parts of a system

備考：電能傳輸方向依應用方式定義。

Note 1 to entry: The direction of the energy transfer is defined by the application.

**3.2 絕緣(Insulation)**

**3.2.1 基本絕緣(basic insulation)**

追加：

Addition:

備考：此概念不適用專用於功能性目的之絕緣。

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

**3.2.8 絕緣(insulation)**

取代：

Replacement:

用於隔離一裝置之導電性元件的所有材料及部件。

all the materials and parts used to insulate conductive elements of a device [SOURCE: IEC 60050-151:2001, 151-15-41]

追加用語及定義：

Additional terms and definitions:

**3.2.101 非對稱絕緣故障(asymmetrical insulation faults ) 非對稱故障(asymmetrical faults)**

電氣設備或設備的缺陷，對保護性導體產生一電阻式路徑，因帶電導體對保護性導體有不同的電阻。

defect in the insulation of an electric installation or equipment creating a resistive path to protective conductor having different resistances from the live conductors to protective conductor

[SOURCE: IEC 61557-8:2014, 3.1.20, modification – Words "phase conductors" replaced with "live conductors", and "earth" with "protective conductor".]

**3.2.102 不帶電，形容詞(dead, adj) 不通電，形容詞(de-energized, adj)**

限定未通電時之傳導性部件。

qualifies a conductive part when it is not energized

[SOURCE: IEC 60050-151:2001, 151-15-59, modified – Term "de-energized" added.]

**3.2.103 帶電，形容詞(live, adj) 通電，形容詞(energized, adj)**

表示相對於相關參考點具有電位差之導電部件。

qualifies a conductive part having an electric potential difference with respect to a relevant reference

備考 1：參考電位通常是大地或等電位框架。

Note 1 to entry: The reference potential is usually the Earth or an equipotential frame.

備考 2：帶電部分於未通電時，可能暫時呈現不帶電狀態。中性導體被視為帶電部分，但接地導體則不被視為帶電部分。

Note 2 to entry: A live part may be temporarily dead when it is not energized. A

neutral conductor is considered as live but earthing conductors are not.

備考 3：當一部分與電氣連接電源時，則為通電(帶電)。若為電荷及/或受電場或磁場影響之作用下時，其亦可通電（帶電）。

Note 3 to entry: A part is energized (live) when it is electrically connected to a source of electric energy. It can also be energized (live) when it is electrically charged and/or under the influence of an electric or magnetic field.

備考 4：參照 IEC 60050-651：2014 之 651-21-085。

Note 4 to entry: See IEC 60050-651:2014, 651-21-08.

[SOURCE: IEC 60050-151:2001, 151-15-58, modified – Term "live" added, as well as Notes 2 and 3 to entry.]

**3.2.104 洩漏電流監測裝置(leakage current monitoring device)**

刪除：洩漏量測裝置

DEPRECATED: leakage measuring device

藉量測各 DC 系統帶電部件與暴露之導電性部件或保護性導體間的洩漏電流，作為監測絕緣電阻之被動電氣裝置。

passive electrical device for monitoring insulation resistance of separated DC system by measuring leakage current between live parts and exposed conductive part or the protective conductor

**3.2.105 強化保護規定(enhanced protective provision)**

具有不低於由兩個獨立保護必需品提供保護可靠度之保護規定。

protective provision having a reliability of protection not less than that provided by two independent protective provisions

[SOURCE: IEC 60050-195:2021, 195-06-27]

**3.2.106 故障保護(fault protection)**

在單一故障條件下之電擊防護。

protection against electric shock under single-fault conditions

[SOURCE: IEC 60050-195:2021, 195-06-02]

**3.2.107 絕緣(insulation)**

具絕緣能力特徵之一組性質本身提供的功能。

set of properties which characterize the ability of insulation to provide its function

備考：關於特性範例：電阻、擊穿電壓。

Note 1 to entry: Examples of relevant properties are: resistance, breakdown voltage.

[SOURCE:IEC 60050-151:2001, 151-15-42]

**3.2.108 絕緣監測裝置(insulation monitoring device,IMD)**

永久監測隔離 AC IT 系統保護性導體之絕緣電阻的裝置，電氣連接 DC 電路之 AC IT 系統標稱電壓不大於 1000 V AC，以及監測電壓不大於 1500 V DC 的隔離 DC IT 系統絕緣電阻，與量測方法無關。

device which permanently monitors the insulation resistance to protective conductor of separated AC IT systems, AC IT systems with galvanically connected DC circuits

having nominal voltages less than or equal to 1 000 V AC, as well as monitoring the insulation resistance of a separated DC IT systems with voltages less than or equal to 1 500 V DC, independent from the method of measuring

[SOURCE: IEC 61557-8:2014, 3.1.14, modified – Word "earth" replaced with "protective conductor" and "unearthed" with "separated".]

**3.2.109 帶電部件(live part)**

於正常操作條件下欲通電包括中性導體及中間導體之導電部件，但不包括保護接地中性導體(PEN)、保護接地中間導體(PEM)及保護接地導體(PEL)。

<in electrical installations and equipment> conductive part intended to be energized under normal operating conditions, including the neutral conductor and mid-point conductor, but excluding the PEN conductor, PEM conductor and PEL conductor

備考：此概念不意味電擊風險。

Note 1 to entry: This concept does not necessarily imply a risk of electric shock.

[SOURCE: IEC 60050-195:2021, 195-02-19, modified – Note to entry added.]

**3.2.110 PELV 系統(PELV system)**

電壓不大於超低電壓值之電力系統：

electric system in which the voltage cannot be more than the value of extra low voltage:

- 在正常操作條件下，且
- under normal conditions; and
- 在單一故障條件下，除了其他電路之接地故障。
- under single fault conditions, except earth faults in other electric circuits

備考：PELV 為保護性超低電壓(protective extra low voltage)之縮寫。

Note 1 to entry: PELV is the abbreviation for protective extra low voltage.

[SOURCE: IEC 60050-826:2022, 826-12-32]

**3.2.111 保護性導體(protective conductor PE)**

為安全目的提供之導體，例：電擊防護。

conductor provided for purposes of safety, for example, protection against electric shock

例：用於電擊防護之保護性搭接導體、保護性接地導體及接地導體。

EXAMPLE Protective bonding conductor, protective earthing conductor and an earthing conductor when used for protection against electric shock.

[SOURCE: IEC 60050-826:2022, 826-13-22, modified – Word "electrical" deleted and example added in the definition. The Note to entry 1 has been deleted, and the example added.]

**3.2.112 保護性等電位搭接(protective-equipotential-bonding)**

針對安全目的之等電位搭接。

equipotential bonding for purposes of safety

例：電擊防護。

EXAMPLE Protection against electric shock.

[SOURCE: IEC 60050-826:2022, 826-13-20, modified – Word "electrical" deleted in the definition and example added.]

**3.2.113 保護性遮蔽(protective screening)**

保護性遮蔽<電氣>

protective shielding <electrically> US

<電氣>

藉電氣保護遮蔽將電路及/或導體自危害帶電部件隔離，連接到保護性等電位搭接系統並提供電擊防護。

<electrically> separation of electric circuits and/or conductors from hazardous-live-parts by an electrically protective screen connected to the protective equipotential bonding system and intended to provide protection against electric shock

[SOURCE: IEC 60050-195:2021, 195-06-18]

**3.2.114 保護隔離(protective separation)**

<電氣> 一電路藉雙重絕緣，或基本絕緣與電氣保護遮蔽，或強化絕緣等與其他電路隔離之措施。

<electrically> separation of one electric circuit from another by means of:

- 雙重絕緣，或
- double insulation, or
- 基本絕緣及電氣保護性遮蔽，或
- basic insulation and electrically protective screening, or
- 強化絕緣。
- reinforced insulation

[SOURCE: IEC 60050-826:2022, 826-12-29]

**3.2.115 額定 DC 耐受電壓(rated DC withstand voltage)**

由製造商宣告具有隔離性能特徵之突波保護裝置(SPD)的直流耐受電壓值。

value of a DC withstand voltage declared by the manufacturer to characterize the isolating behaviour of a surge protective device (SPD)

[SOURCE: IEC 62561-3:2017, 3.8, modified – Words "an ISG" replaced with "a surge protective device (SPD)".]

**3.2.116 單一故障條件(single fault condition)**

非強化保護規定之單一保護性必需品的故障條件。

condition in which there is a fault of a single protective provision that is not an enhanced protective provision

備考：若單一故障條件導致一或多個其他故障狀態，該等視為單一故障條件。

Note 1 to entry: If a single fault condition results in one or more other fault conditions, all those are considered as one single fault condition.

**3.2.117 驚嚇反應(startle reaction)**

對人而言，由於最低接觸電壓值導出通過身體之電流，其足以造成電流穿過肌肉的非自主性肌肉收縮生理反應。

physiological reaction due to a minimum derived value of touch voltage for a population for which a current flowing through the body is just enough to cause involuntary muscular contraction to the person through which it is flowing

**3.2.118 接觸脈衝電流(touch impulse current)**

人或動物觸及帶電部件或危害帶電部件，或在特定條件下，暴露於裝置或設備之導電性部件時，耗散在人體或穿過動物之脈衝電流、或相當的電荷或能量。

impulse current, or the corresponding charge or energy, dissipated in a human body or through livestock when it touches either a live part, or a hazardous-live-part or an exposed-conductive part of an installation or of equipment under certain conditions

備考 1：有 RMS 大小之脈衝電流且關聯的持續時間符合 IEC 60479-2：2019 第 11 節。

Note 1 to entry: The impulse current has an RMS magnitude and duration associated with it in accordance with IEC 60479-2:2019, Clause 11.

備考 2：B 側帶電部件與保護性導體間之電容性耦合，用於電磁相容性的理由，通常起因於 Y-電容器或寄生電容性耦合。

Note 2 to entry: Capacitive coupling between side B live parts and protective conductor usually results from Y- capacitance, used for electromagnetic compatibility reasons, or from parasitic capacitive coupling.

**3.2.119 接觸電壓(touch voltage)**

<效應>

人或動物同時觸及導電性部件時，導電性部件間之電壓。

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

備考：人或動物接觸此等導電部件之電力，因阻抗可能會有明顯影響的有效接觸電壓值。

Note 1 to entry: The value of the effective touch voltage may be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts.

[SOURCE: IEC 60050-826:2022, 826-11-05, modified – Words "a human being or a livestock" replaced with "a person or an animal, and note to entry added.]

**3.2.120 安全超低電壓(SELV system)**

在正常操作且包括其他電路接地故障之單一故障條件下，電壓不大於超低電壓值之電力系統。

electric system in which the voltage cannot be more than the value of extra-low voltage:

－ 在正常操作條件下，且

－ under normal conditions; and

－ 在單一故障條件下，包括其他電路之接地故障。

－ under single fault conditions, including earth faults in other electric circuits

備考：SELV 為安全超低電壓(safety extra low voltage)之縮寫。

Note 1 to entry: SELV is the abbreviation for safety extra-low voltage.

[SOURCE: IEC 60050-195:2021, 195-06-28]

**3.2.121 突波保護裝置(surge protective device,SPD)**

作為保護電氣設備免於瞬態過電壓，並將突波電流轉移之電氣設備。

device that is intended to protect the electrical apparatus from transient overvoltages and to divert surge currents

備考：突波保護裝置包含至少一個非線性元件。

Note 1 to entry: A surge protective device contains at least one non-linear component.

[SOURCE: IEC 60050-614:2016, 614-03-48]

**3.2.122 對稱性絕緣故障(symmetrical insulation fault) 對稱性故障(symmetrical fault)**

電力裝置或設備之絕緣產生對保護性導體的電阻性路徑缺陷，有約相當於所有帶電導體對保護性導體的電阻。

defect in the insulation of an electric installation or equipment creating a resistive path to protective conductor having approximately the same resistance from all live conductors to protective conductor

[SOURCE: IEC 61557-8:2014, 3.1.19, modified – Words “symmetrical fault” added in the term and “phase” is replaced by “live”]

**3.2.123 Y-電容(Y-capacitance)**

橋接絕緣障壁 B 側 DC+及 DC-至其他電路及保護性導體之總電容。

total capacitance bridging the insulation barriers of the DC+ and DC– of side B to other circuits and protective conductor

備考 1：適合使用於電容器失效時可能導致電擊情況之電容器的型式。

Note 1 to entry: The capacitors are of a type suitable for use in situations where failure of the capacitor could lead to electric shock.

備考 2：總電容通常平均分佈在帶電導體上。

Note 2 to entry: The total capacitance is commonly distributed equally over the live conductors.

備考 3：更多資訊參照 IEC 60384-14。

Note 3 to entry: For more information, see IEC 60384-14.

**3.3 功能(Functions)**

**3.3.1 控制導引導體(control pilot conductor)**

取代：

Replacement:

控制導引導體(CP)

control pilot conductor

CP

控制導引電路之一部分，與保護性導體一起結合於纜線組的導體。

conductor incorporated in a cable assembly, which, together with the protective conductor, is part of the control pilot circuit

**3.3.5 近接功能(proximity function)**

取代：

Replacement:

PP 近接功能

proximity function PP

刪除：近接導引

DEPRECATED: proximity pilot

指示 EV 車輛端插頭在 EV 車輛端插座，及/或指示 EV 電源端插頭在 EV 充電設備之 EV 電源端的電氣或機械措施。

electrical or mechanical means to indicate the insertion state of the vehicle connector in the vehicle inlet of the EV and/or to indicate the insertion state of the EV plug in the EV socket- outlet of the EV supply equipment

備考：" plug present " 縮寫為 PP。

Note 1 to entry: The acronym PP is based on "plug present".

追加用語及定義:

Additional terms and definitions:

**3.3.101 耦合期間(coupling session)**

刪除：

DEPRECATED:

充電會談(CNS 16193-20)

charging session

刪除：

DEPRECATED:

供電時間

supply session

車輛端插頭搭接車輛端插座時開始，至車輛端插頭從車輛端插座拔出終止時的時間。

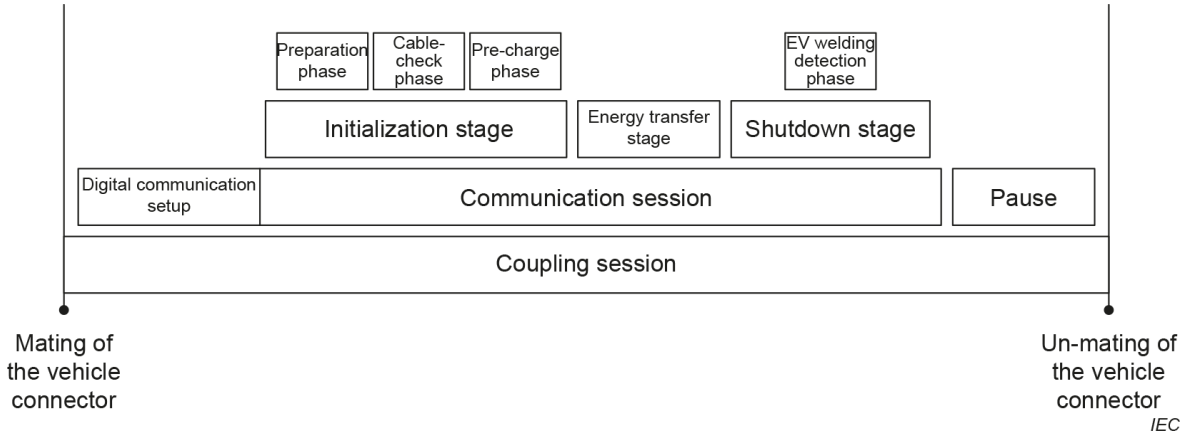
session that starts when the vehicle connector is mated to the vehicle inlet and terminates when the vehicle connector is un-mated from the vehicle inlet

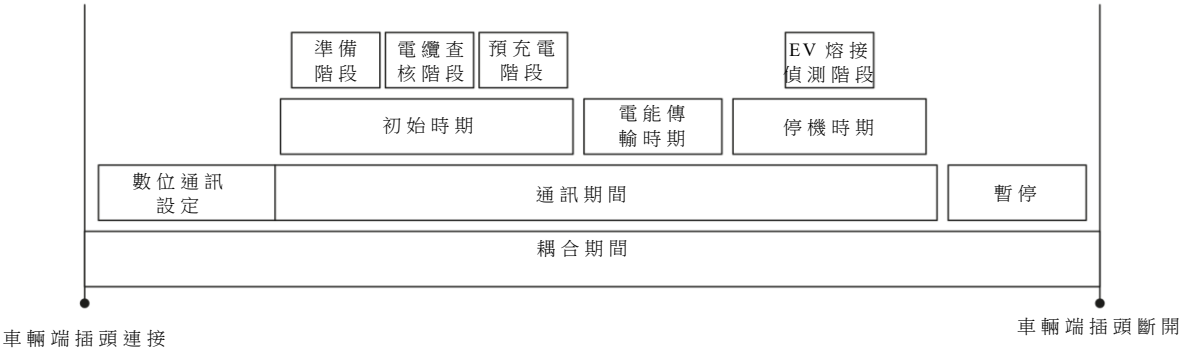
備考 1：一個耦合期間能零、一或多個通訊期間。

Note 1 to entry: A coupling session can have zero, one or multiple communication sessions.

備考 2：參照圖 101。

Note 2 to entry: See Figure 101.




備考 1：圖 101 表示期間、時期及階段的命名，此非時序或順序圖。順序圖規定在每一系統各別之附錄。

NOTE 1 Figure 101 shows the naming of the sessions, stages and phases. This is not a timing or sequence diagram. Sequence diagrams are specified for each system in the respective annex.

備考 2：關於數位通訊設定之細節，規定於 CNS 15511-24。

NOTE 2 Details about the digital communication setup are specified in IEC 61851-24.

圖 101 耦合期間之範例

Figure 101 – Example of a coupling session

**3.3.102 通訊期間(communication session)**

耦合期間包括初始化時期、電能傳輸時期及停機時期。

session that includes the initialization stage, energy transfer stage, and the shutdown stage

備考 1：耦合期間可發生多個連續的通訊期間。

Note 1 to entry: Multiple consecutive communication sessions can occur in a

coupling session.

備考 2：若 EV 供電設備無法進行電能傳輸，通訊期間僅包括初始化時期和關機時期。

Note 2 to entry: A communication session can include only the initialization stage and shutdown stage, if the EV supply equipment is unable to perform energy transfer.

**3.3.103 暫停(pause)**

通訊期間之間，EV 供電設備不執行電能傳輸的的時段。

period of time between communication sessions where the EV supply equipment does not perform energy transfer

備考 1：暫停期間，EV 供電設備及/或 EV 可啟用睡眠模式。

Note 1 to entry: The EV supply equipment and/or the EV may enable sleep mode during a pause.

**3.3.104 睡眠模式(sleep mode)**

裝置或設備降低能耗之狀態。

state of a device or equipment to reduce energy consumption

**3.3.105 初始時期(initialization stage)**

針對電能傳輸目的，通訊期間開始以設定、查核及確認電能傳輸參數的時期。

stage at the beginning of a communication session to set, check and confirm parameters for the purpose of energy transfer

備考 1：初始化時期可由使用者觸發、由 EV 或休眠、暫停或停電後之 EV 供電設備觸發喚醒/重新初始化。

Note 1 to entry: An initialization stage can be triggered by the user, wake-up/re-initialization triggered by the EV or EV supply equipment after sleep, a pause or a power outage.

**3.3.106 電能傳輸時期(energy transfer stage)**

EV 與 EV 供電設備之間執行電能傳輸的時期。

stage to perform energy transfer between the EV and the EV supply equipment

**3.3.107 停機時期(shutdown stage)**

通訊期間結束至達到安全狀態的時期。

stage at the end of a communication session to reach a safe state

例：正常停機、錯誤停機及緊急停機。

EXAMPLE Normal shutdown, error shutdown and emergency shutdown.

**3.3.108 準備階段(preparation phase)**

EV 與 EV 供電設備之間互動，以設定、查核並確認參數及工作條件期間的階段。

phase during which an EV and EV supply equipment interact to set, check and confirm parameters and working conditions

例：執行相容性查核，智慧充電條件查證。

EXAMPLE Perform compatibility check, verification of smart charging conditions.

**3.3.109 電纜檢查階段(cable-check phase)**

藉基本傳訊及數位通訊，查核 B 側基於參數交換可安全成為帶電之階段。

phase to check if the side B can safely become live, based on the parameters exchanged by basic signalling and digital communication

**3.3.110 預充電階段(pre-charge phase)**

限制 B 側之 EV 供電設備或 EV 湧浪電流的階段。

phase for the EV supply equipment or EV to limit the inrush current at side B

**3.3.111 EV 熔接偵測階段(EV welding detection phase)**

針對 EV 查核 EV 斷開裝置未熔接之階段。

phase for the EV to check if the EV disconnection device is not welded

備考：EV 熔接偵測階段為選項。

Note 1 to entry: EV welding detection phase is optional.

**3.3.112 正常停機(normal shutdown)**

由使用者、EV 或 EV 供電設備啟動終止電能傳輸。

termination of the energy transfer initiated by the user, by the EV or by the EV supply equipment

**3.3.113 錯誤停機(error shutdown)**

由 EV 供電設備或 EV 偵測到失效，而造成電能傳輸之終止。

termination of the energy transfer caused by a failure detected by the EV supply equipment or the EV

**3.3.114 緊急停機(emergency shutdown)**

因 EV 供電設備或 EV 偵測到失效，而造成電能傳輸之緊急終止。

urgent termination of the energy transfer caused by a failure detected by the EV supply equipment or the EV

備考：緊急停機可藉自電網斷開 EV 供電設備執行。

Note 1 to entry: An emergency shutdown may be performed by disconnecting the EV supply equipment from the supply network.

**3.3.115 控制電流模式(controlled current mode ,CCM)**

刪除：CCC

DEPRECATED: CCC

刪除：CCCM

DEPRECATED: CCCM

<EV 供電設備>

在 B 側依 EV 供電設備之目標電流控制當下電流的 EV 供電設備控制模式。

<EV supply equipment> control mode of the EV supply equipment to control the present current at side B according to the target current of the EV supply equipment

**3.3.116 控制電壓模式(controlled voltage mode ,CVM)**

刪除：CVC

DEPRECATED: CVC

刪除：CVCM

DEPRECATED: CVCM

<EV 供電設備>

在 B 側依 EV 供電設備之目標電壓控制當下電壓的 EV 供電設備控制模式。

<EV supply equipment> control mode of the EV supply equipment to control the present voltage at side B according to the target voltage of the EV supply equipment

**3.3.117 控制功率模式(controlled power mode ,CPM)**

刪除：CPCM

DEPRECATED: CPCM

<EV 供電設備>EV 供電設備的控制方式，依 EV 供電設備之目標功率控制 B 側當下功率。

<EV supply equipment> control mode of the EV supply equipment to control the present power at side B according to the target power of the EV supply equipment

**3.3.118 熱交換(thermal exchange)**

散逸熱傳之熱能的功能。

function dissipating thermal energy from the thermal transport

[SOURCE: IEC TS 62196-3-1:2020, 3.105, modified – Words "method for cooling and" replaced with "function".]

**3.3.119 熱交換裝置(thermal exchange device)**

散逸熱傳之熱能的措施。

means for dissipating thermal energy from the thermal transport

[SOURCE: IEC TS 62196-3-1:2020, 3.106, modified – Words "cooling and" removed.]

**3.3.120 熱感測(thermal sensing)**

獲得纜線組或部件之溫度數據以提供訊號或量測的功能。

function to provide a signal or measurement for obtaining temperature data of cable assemblies or parts thereof

[SOURCE: IEC TS 62196-3-1:2020, 3.101, modified – Word "method" replaced with "function to provide a signal or measurement", and "accessories" removed.]

**3.3.121 熱感測裝置(thermal sensing device)**

感測熱之措施。

means for thermal sensing

[SOURCE: IEC TS 62196-3-1:2020, 3.102, modified – Words "providing temperature data of accessories, cable assemblies or parts thereof" replaced with "thermal sensing".]

**3.3.122 熱傳(thermal transport)**

管理纜線組或部件藉熱傳管理其熱能散逸的功能。

function for managing the thermal energy dissipation of cable assemblies or parts

thereof by heat transfer

[SOURCE: IEC TS 62196-3-1:2020, 3.103, modified – Word "method" replaced with "function", "heat dissipation of accessories" replaced with "thermal energy dissipation of", and "independent of changing the current" replaced with "by heat transfer".]

**3.3.123 熱傳裝置(thermal transport device)**

管理纜線組或部件之熱能散逸的措施。

means for managing thermal energy dissipation of cable assemblies or parts thereof

[SOURCE: IEC TS 62196-3-1:2020, 3.104, modified – Words "the heat dissipation of accessories" replaced with "thermal energy dissipation of", and "independent of changing the current" removed.]

**3.3.124 正向功率傳送(forward power transfer)**

正向電能傳輸 FPT。

forward energy transfer FPT

刪除：充電

DEPRECATED: charging

由電網對 EV 配電。

distribution of electricity from the supply network to an EV

**3.3.125 反向功率傳送(reverse power transfer)**

反向電能傳輸 RPT。

reverse energy transfer RPT

由 EV 對電網或負載配電。

distribution of electricity from an EV to the supply network or to a load

備考 1：家用用電器具涵蓋於 IEC 60335 系列。

Note 1 to entry: Household appliances are covered by the IEC 60335 series.

備考 2：依 IEC 60050-151:2001 之 151-15-15，負載是指用於吸收由另一設備或電力系統所供應電力的裝置。

Note 2 to entry: Load according to IEC 60050-151:2001, 151-15-15, means a device intended to absorb power supplied by another device or an electric power system.

**3.3.126 雙向電力傳輸(bidirectional power transfer, BPT)**

雙向電能傳輸。

bidirectional energy transfer

刪除：雙向功率傳輸

DEPRECATED: bi-directional power transfer

正向功率傳輸及反向功率傳輸之結合。

combination of forward power transfer (FPT) and reverse power transfer (RPT)

備考 1：BPT 僅能是 FPT、RPT 或於 FPT 與 RPT 間之（自由）浮動，取決於與 DSO/CSO 的協議或要求。

Note 1 to entry: BPT can only be FPT, RPT or (free) floating between FPT and RPT,

depending on the agreement with or request of DSO/CSO.

**3.4 車輛(Vehicle)**

**3.4.1 電動車輛(electric vehicle EV)**

**電動道路車輛(electric road vehicle)**

追加：

Replacement:

電動推進車輛

electrically propelled vehicle

車輛推進：具有一個或多個電力驅動的車輛。

vehicle with one or more electric drive(s) for vehicle propulsion [SOURCE: ISO 6469-3:2021, 3.15]

**3.4.3 可充電儲能系統(rechargeable energy storage system, RESS)**

取代：

Replacement:

電池系統

battery system

刪除：RESS

DEPRECATED: RESS

刪除：EV 電池

DEPRECATED: EV battery

刪除：車輛電池

DEPRECATED: vehicle battery

刪除：車輛/牽引電池

DEPRECATED: vehicle/traction battery

刪除：牽引電池

DEPRECATED: traction battery

<EV>

包括電池、電池組合或電池組，以及電路及電子裝置之儲能裝置。

<EV> energy storage device that includes cells, cell assemblies or battery pack(s) as well as electrical circuits and electronics

備考 1：電池系統組件亦可分佈於車輛內之不同裝置（電池組）。

Note 1 to entry: Battery system components can also be distributed in different devices (battery packs) within the vehicle.

備考 2：電子裝置如電池控制單元及接觸器。

Note 2 to entry: Examples of electronics are the battery control unit and contactors.

追加用語及定義:

Additional terms and definitions:

**3.4.101 EV 斷接裝置(EV disconnection device)**

位於車輛端插頭與 EV 電池系統間之車輛電路，作為電能傳輸專用斷接或相當的裝置。

dedicated disconnect or equivalent device(s) for energy transfer located in the vehicle power supply circuit between the vehicle inlet and the EV battery system

備考 1:EV 斷接裝置於通訊期間依 EV 供電設備與 EV 間之系統特定序列圖控制。

Note 1 to entry:The EV disconnection device is controlled during the communication session in accordance with the system specific sequence diagram between the EV supply equipment and the EV.

**3.4.102 車輛供電電路(vehicle power supply circuit)**

B 類電壓電路包括固定在 EV 以連接車輛端插座之所有導電性部件，且於電能傳輸期間通電。

voltage class B electric circuit which includes all parts that are conductively connected to the vehicle inlet that are mounted on the EV and that is energized during the energy transfer

備考：該定義異於 ISO 17409:2020。ISO 5474 系列之車輛供電電路不包括非 EV 車載之任何部件。

Note 1 to entry: The definition is different from that in ISO 17409:2020. In the ISO 5474 series, the vehicle power supply circuit does not include anything off-board of the EV.

[SOURCE: ISO 5474-1:—, 3.2.21, modified – Definition reformulated and Note 1 to entry added.]

**3.5 電線、纜線及連接措施(Cords, cables and connection means)**

3.5.13

取代：

Replacement:

車輛端插頭

vehicle connector

電動車輛端插頭

electric vehicle connector

與一可撓性纜線整合或附接於一可撓性纜線之部件。

part integral with, or intended to be attached to, one flexible cable [SOURCE: IEC 62196-1:2022, 3.56]

**3.5.14 車輛端插座(vehicle inlet)**

電動車輛端插座。

electric vehicle inlet

取代：

Replacement:

車輛端插座

vehicle inlet

EV 端插座

electric vehicle inlet

結合或固定於 EV 之部件。

part incorporated in, or fixed to, the EV

備考：車輛端插頭插入車輛端插座時產生之總成，稱為「車輛耦合器」。

Note 1 to entry: The resulting assembly when a vehicle connector is inserted into a vehicle inlet is called a "vehicle coupler".

[SOURCE: IEC 62196-1:2022, 3.57, modified – Words "electric vehicle" replaced with "EV".]

追加用語及定義:

Additional terms and definitions:

**3.5.101 纜線組(cable assembly)**

<B 側>包含可繞性電纜及車輛端插頭之總成，並用於連接 EV 與 EV 供電設備。

<side B> assembly consisting of flexible cable fitted with a vehicle connector, and that is used to connect the EV to the EV supply equipment

**3.6 服務及使用(Service and usage)**

**3.6.10 使用者(user)**

取代：

Replacement:

使用或獲利來自裝置、系統或服務，或使用及獲利來自裝置、系統或服務的人。

person who uses or benefits from, or uses and benefits from, devices, systems or services

例：裝置或系統可為人機介面(HMI)、EV 或 EV 供電設備；服務可為 EV 與 EV 供電設備間之電能傳輸。

EXAMPLE Device or system may be HMI, EV or EV supply equipment; service may be energy transfer between EV and EV supply equipment.

[SOURCE: IEC 60050-871:2018, 871-02-05, modified – Term "active assisted living user" removed, abbreviated term "AAL" removed in the entry, and example added.]

**3.6.111 一般人員(ordinary person)**

既非專業亦非經訓練之人員。

person who is neither a skilled person nor an instructed person

備考：一般人員包括 EV 供電設備使用者，可進入 EV 供電設備且可在 EV 供電設備附近者。在正常操作條件下，一般人員不宜暴露在會造成驚嚇反應、痛或傷害之能量源。

Note 1 to entry: Ordinary persons include users of the EV supply equipment, persons who may have access to the EV supply equipment, and who may be in the vicinity of the EV supply equipment. Under normal operating conditions, ordinary persons should not be exposed to energy sources causing startle reaction, pain or injury.

[SOURCE: IEC 60050-826:2022, 826-18-03, modified – Note 1 to entry added.]

**3.6.112 專業人員(skilled person)**

<電氣>具有相關教育及經驗，理解風險並避免電可產生危害之人員。

<electrically> person with relevant education and experience to perceive risks and to avoid hazards which electricity can create

[SOURCE: IEC 60050-826:2022, 826-18-01, modified – Second preferred term "electrically skilled person" removed.]

**3.6.113 經訓練人員(instructed person)**

<電氣>

經電之專業人員充分告知或指導，理解風險並避免電可產生危害之人員。

<electrically> person adequately advised or supervised by electrically skilled persons to perceive risks and to avoid hazards which electricity can create

[SOURCE: IEC 60050-826:2021, 826-18-02, modified – Second preferred term "electrically instructed person" removed.]

**3.6.114 人機介面(human machine interface,HMI)**

刪除：使用者介面

DEPRECATED: user interface

允許使用者互動的裝置／方式，作為操作人員、作業人員或最終使用者及連接至EVCC／EMS 之儀表及電腦系統間的介面。

device/means that allows user interaction, interface between operator, operating staff or end user and the instrumentation and computer systems connected to the EVCC/EMS

例：顯示器或用戶通訊系統，行動電話介面。

EXAMPLE Display or user communication system, mobile phone interface.

備考：HMI 可連接 EVCC、EMS 或其他控制器，視使用之通訊系統而定。

Note 1 to entry: The HMI can be connected to an EVCC, an energy management system or another controller depending on the communication system used.

**3.7 一般用語(General terms)**

追加用語及定義:

Additional terms and definitions:

**3.7.101 防火外殼(fire enclosure)**

作為防止火焰從外殼內部蔓延至外部之保護性外殼。

enclosure intended as protection against the spread of fire from within the enclosure to outside the enclosure

備考：某些標準使用"安全防護〃取代保護。

Note 1 to entry: Some standards use the term "safeguard" instead of "protection".

[SOURCE: IEC 60050-903:2014, 903-04-10]

**3.7.102 A 側(side A)**

電網側。

supply network side

刪除：輸入

DEPRECATED: input

刪除：一次側電路

DEPRECATED: primary circuit

電網連接 EV 供電設備側。

side of the EV supply equipment connected to the supply network

**3.7.103 B 側(side B)**

EV 側。

EV side

刪除：輸出

DEPRECATED: output

刪除：DC 輸出電路

DEPRECATED: DC output circuit

刪除：二次側電路

DEPRECATED: secondary circuit

EV 連接 EV 供電設備側。

side of the EV supply equipment connected to the EV

**3.7.104 B 側電路(side B circuit)**

B 側電路包括所有傳導連接車端插頭之 DC+或 DC-的 EV 供電設備部件。

electrical circuit at side B which includes all parts of the EV supply equipment that are conductively connected to the DC+ or DC– of the vehicle connector

**3.7.105 電網(supply network)**

連接 A 側配電之系統。

system for the distribution of electricity connected to side A

備考：內容亦經常用以下用語：公共配電網、公共電網、產銷者之電氣設備(prosumer’s electrical installatio, PEI)、分散式能源資源(DER)、電池組、PV 設備、發電機、配電盤或電網等。

Note 1 to entry: The following terms are also used frequently in this context: system for distribution of electricity to the public, public distribution network, public network, prosumer’s electrical installation (PEI), distributed energy resources (DER), battery bank, PV installation, generator, mains or electric grid, etc.

**3.7.106 負載突降(load dump)**

於電能傳輸時期，連接 B 側之電池系統或其他負載之自發性斷接。

spontaneous disconnection, during the energy transfer stage, of the battery system or other loads connected to side B

備考：負載突降會因保護目的或故障而引起。

Note 1 to entry: Load dump can be caused by the load for the purpose of protection,

or by a fault.

**3.7.107 電力電子轉換器(power electronics converter,PEC)**

刪除：電力電子轉換器系統

DEPRECATED: power electronic converter system

用於電力電子轉換目的之裝置或部件。

device or part thereof for the purpose of electronic power conversion

備考：針對電力轉換功能之必需性，PEC 可包括傳訊、量測、控制電路及其他部件。

Note 1 to entry: PEC can include signalling, measurement, control circuitries and other parts, if essential for the power conversion function.

**3.7.108 漣波(ripple)**

<電壓或電流>

相對於量測或供電量之平均值，一組不要的週期性偏差。

<current or voltage> set of unwanted periodic deviations with respect to the average value of the measured or supplied quantity

例：發生漣波與電網或其他確定源之頻率有關。

EXAMPLE Ripple occurring at frequencies which can be related to that of the supply network, or of some other definite source, such as a power-electronics converters (PECs).

備考：在規定條件，及部件週期性及/或隨機偏差(PARD)下決定漣波（PARD），參照 IEC 60050-312:2001, 312-07-01。

Note 1 to entry: Ripple is determined under specified conditions and is a part of periodic and/or random deviation (PARD) – IEC 60050-312:2001, 312-07-01.

[SOURCE: IEC 60050-312:2001, 312-07-02, modified – Example added, which comes from the definition, and note clarified.]

**3.7.109 暫態，形容詞(transient, adj)**

關於透過一穩態為另一個連續穩態之現象或量。

pertaining to a phenomenon or quantity which passes from one steady state to another consecutive steady state

備考：「暫態」用語亦作為名詞使用，係指暫態現象或暫態量。

Note 1 to entry: The term "transient" is also used as a noun to mean a transient phenomenon or quantity.

[SOURCE: IEC 60050-312:2009, 103-05-02]

**3.7.110 暫態，名詞(transient, noun)**

<電壓或電流>

相較於比關注時幅短之時間間隔期間，兩個連續穩態間變化的現象或量。

<current or voltage> phenomenon or quantity which varies between two consecutive steady states during a time interval short compared to the timescale of interest

[SOURCE: IEC 60050-702:2019, 702-07-781]

**3.7.111 可用最大電流(適用之最大電流) (applicable maximum current)**

於電能傳輸時期使用之電流上限值，且整個電能傳輸時期可能動態變更。

upper limit of the current that is used during the energy transfer stage, and which may dynamically be changed throughout the energy transfer stage

備考 1：於 B 側，EV 及 EV 供電設備有可用最大電流。

Note 1 to entry: On side B, there is an applicable maximum current of the EV supply equipment as well as an applicable maximum current of the EV.

備考 2：於 B 側，此限制值可藉數位通訊變更。

Note 2 to entry: On side B, this limit may be changed by digital communication.

**3.7.112 可用最大功率(適用之最大功率) (applicable maximum power)**

於電能傳輸時期使用之功率上限值，且整個電能傳輸時期可能動態變更。

upper limit of the power that is used during the energy transfer stage, and which may dynamically be changed throughout the energy transfer stage

備考 1：於 B 側，EV 及 EV 供電設備有可用最大功率。

Note 1 to entry: On side B, there is an applicable maximum power of the EV supply equipment as well as an applicable maximum power of the EV.

備考 2：於 B 側，此限制值可藉數位通訊變更。

Note 2 to entry: On side B, this limit may be changed by digital communication.

**3.7.113 可用最高電壓(適用之最高電壓)(applicable maximum voltage)**

於電能傳輸時期，用於帶電部件間之電壓上限值，且整個電能傳輸時期可能動態變更。

upper limit of the voltage between live parts that is used during the energy transfer stage, and which may dynamically be changed throughout the energy transfer stage

備考 1：於 B 側，EV 及 EV 供電設備有可用最高電壓，EV 本身亦具有可用最高電壓。

Note 1 to entry: On side B, there is an applicable maximum voltage of the EV supply equipment as well as an applicable maximum voltage of the EV.

備考 2：於 B 側，此限制值可藉數位通訊變更。

Note 2 to entry: On side B, this limit may be changed by digital communication.

備考 3：直流電係 DC+與 DC-間之電壓。交流電為 L1、L2、L3 與 N 間依需求配置的電壓。

Note 3 to entry: For DC, the voltage between DC+ and DC–. For AC, the voltage between L1, L2, L3 and N as needed by the configuration.

**3.7.114 可用最小電流(適用之最小電流) (applicable minimum current)**

於電能傳輸時期使用之電流下限值，且整個電能傳輸時期可能動態變更。

lower limit of the current that is used during the energy transfer stage, and which may dynamically be changed throughout the energy transfer stage

備考 1：於 B 側，EV 及 EV 供電設備有可用最小電流。

Note 1 to entry: On side B, there is an applicable minimum current of the EV supply equipment as well as an applicable minimum current of the EV.

備考 2：於 B 側，此限制值可藉數位通訊變更。

Note 2 to entry: On side B, this limit may be changed by digital communication.

**3.7.115 可用最小功率(適用之最小功率) (applicable minimum power)**

於電能傳輸時期使用之功率下限值，且整個電能傳輸時期可能動態變更。

lower limit of the power that is used during the energy transfer stage, and which may dynamically be changed throughout the energy transfer stage

備考 1：於 B 側，存在適用的電動車供電設備最小功率以及適用的電動車最小功率。

Note 1 to entry: On side B, there is an applicable minimum power of the EV supply equipment as well as an applicable minimum power of the EV.

備考 2：於 B 側，此限制值可藉數位通訊變更。

Note 2 to entry: On side B, this limit may be changed by digital communication.

**3.7.116 可用最低電壓(適用之最低電壓) (applicable minimum voltage)**

於電能傳輸時期使用於帶電部件間之電壓下限值，且整個電能傳輸時期可能動態變更。

lower limit of the voltage between live parts that is used during the energy transfer stage, and which may dynamically be changed throughout energy transfer

備考 1：於 B 側，EV 及 EV 供電設備有可用最低電壓。

Note 1 to entry: On side B, there is an applicable minimum voltage of the EV supply equipment as well as an applicable minimum voltage of the EV.

備考 2：於 B 側，此制值可藉數位通訊變更。

Note 2 to entry: On side B, this limit may be changed by digital communication.

備考 3：直流電係 DC+與 DC-間之電壓。交流電為 L1、L2、L3 與 N 間依需求配置之電壓。

Note 3 to entry: For DC, the voltage between DC+ and DC–. For AC the voltage between L1, L2, L3 and N as needed by the configuration.

**3.7.117 量測電流(measured current)**

於某些量測條件下，量測當下電流之結果。

result of a measurement of the present current measured under certain measurement conditions

備考：量測條件能包括有量測不確定度之濾波器等。

Note 1 to entry: Measurement conditions can be applying a filter, having an uncertainty in measurement, etc.

**3.7.118 量測電壓(measured voltage)**

於某些量測條件下，量測當下電壓之結果。

result of a measurement of the present voltage measured under certain measurement

conditions

備考：量測條件能包括有量測不確定度之濾波器等。

Note 1 to entry: Measurement conditions can be applying a filter, having an uncertainty in measurement, etc.

**3.7.119 量測功率(measured power)**

於某些量測條件下，量測當下功率之結果。

result of a measurement of the present power measured under certain measurement conditions

備考：量測條件能包括有量測不確定度之濾波器等。

Note 1 to entry: Measurement conditions can be applying a filter, having an uncertainty in measurement, etc.

**3.7.120 協議最大電流(negotiated maximum current)**

<於 B 側> EV 與 EV 供電設備間之初始化時期，協議操作範圍的電流上限值。

<at side B> upper limit of the current operating range agreed upon during the initialization stage between the EV supply equipment and the EV

備考：於 B 側，此限制值係 EV 與 EV 供電設備間藉數位通訊協議，且其可於新的初始化時期變更。

Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital communication and can be changed in a new initialization stage.

**3.7.121 協議最大功率(negotiated maximum power)**

<於 B 側> EV 與 EV 供電設備間於初始化時期，協議操作範圍的功率上限值。

<at side B> upper limit of the power operating range agreed upon during the initialization stage between the EV supply equipment and the EV

備考：於 B 側，限制值係由 EV 與 EV 供電設備間透過數位通訊協議，且可於新的初始化時期變更。

Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital communication and can be changed in a new initialization stage.

**3.7.122 協議最高電壓(negotiated maximum voltage)**

<於 B 側> EV 與 EV 供電設備間於初始化時期協議電壓操作範圍之上限值。

<at side B> upper limit of the voltage operating range between live parts agreed upon during the initialization stage between the EV supply equipment and the EV

備考：於 B 側，限制值係由 EV 與 EV 供電設備間透過數位通訊協議，且可於新的初始化時期變更。

Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital communication and can be changed in a new initialization stage.

**3.7.123 協議最小電流(negotiated minimum current)**

<於 B 側> EV 與 EV 供電設備間於初始化時期協議電流操作範圍之下限值。

<at side B> lower limit of the current operating range agreed upon during the

initialization stage between the EV supply equipment and the EV

備考：於 B 側，限制值係由 EV 與 EV 供電設備間透過數位通訊協議，且可於新的初始化時期變更。

Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital communication, and can be changed in a new initialization stage.

**3.7.124 協議最小功率(negotiated minimum power)**

<於 B 側> EV 與 EV 供電設備間於初始化時期協議功率操作範圍之下限值。

<at side B> lower limit of the power operating range agreed upon during the initialization stage between the EV supply equipment and the EV

備考：於 B 側，限制值係由 EV 與 EV 供電設備間透過數位通訊協議，且可以於新的初始化時期變更。

Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital communication, and can be changed in a new initialization stage.

**3.7.125 協議最低電壓(negotiated minimum voltage)**

<於 B 側> EV 與 EV 供電設備間於初始化時期協議電壓操作範圍之下限值。

<at side B> lower limit of the voltage operating range between live parts agreed upon during the initialization stage between the EV supply equipment and the EV

備考：於 B 側，限制值係由 EV 與 EV 供電設備間透過數位通訊協議，且可以於新的初始化時期變更。

Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital communication, and can be changed in a new initialization stage.

**3.7.126 當下電流(present current)**

電流瞬間實體值

instantaneous physical value of the current

備考：當下電流係指藉理想或完美之量測裝置對單一樣本擷取的電流瞬間值，且無任何濾波及量測許可差/誤差。

Note 1 to entry: The present current is the instantaneous value of the current which would be acquired by an ideal/perfect measurement device in a single sample without any filtering and without any measurement tolerance/error.

**3.7.127 當下電壓(present voltage)**

電壓之瞬間實體值

instantaneous physical value of the voltage

備考：當下電壓係指藉理想或完美之量測裝置對單一樣本擷取的電壓瞬間值，且無任何濾波及量測許可差/誤差。

Note 1 to entry: The present voltage is the instantaneous value of the voltage which would be acquired by an ideal/perfect measurement device in a single sample without

any filtering and without any measurement tolerance/error.

**3.7.128 當下功率(present power)**

功率瞬間實體值

instantaneous physical value of the power

備考：當下功率藉理想或完美之量測裝置對單一樣本擷取的功率瞬間值，且無任何濾波及量測許可差/誤差。

Note 1 to entry: The present power is the instantaneous value of the power which would be acquired by an ideal/perfect measurement device in a single sample without any filtering and without any measurement tolerance/error.

**3.7.129 額定提高電流(rated boost current)**

<B 側>在受限時間之時段，操作設計之 EV 供電設備達到由製造商指定的電流上限值。

<side B> upper limit of the current specified by the manufacturer up to which the EV supply equipment has been designed to operate for a limited period of time

備考 1：額定提高電流不小於額定連續電流。

Note 1 to entry: The rated boost current is more than or equal to the rated continuous current.

備考 2：IEC 62196-1、IEC 62196-3、IEC 62196-3-1 研議於 B 側纜線組額定提高電流。更多訊息參照 101.3。

Note 2 to entry: The rated boost current of the side B cable assembly is under consideration in IEC 62196-1, IEC 62196-3 and IEC 62196-3-1. For more information, see 101.3.

**3.7.130 額定電流(rated current)**

<A 側>在正常操作條件下，由製造商指定之電流值。

<side A> current under normal operating conditions assigned by the manufacturer

**3.7.131 額定連續電流(rated continuous current)**

<B 側>連續操作設計之 EV 供電設備達到由製造商指定之電流上限值。

<side B> upper limit of the current specified by the manufacturer up to which the EV supply equipment has been designed to operate continuously

備考：IEC 62196 (2023 年前發行)系列將額定連續電流稱為"額電電流〃

Note 1 to entry: In the IEC 62196 (published before 2023) series, the rated continuous current is called "rated current".

**3.7.132 額定提高功率(rated boost power)**

<B 側>由製造商規定 EV 供電設備於有限時間內操作之功率上限值。

<side B> upper limit of the power specified by the manufacturer up to which the EV supply equipment has been designed to operate for a limited period of time

備考：額定提高功率不小於額定連續功率。

Note 1 to entry: The rated boost power is greater than or equal to the rated continuous

power.

**3.7.133 額定連續功率(rated continuous power)**

<B 側>由製造商規定 EV 供電設備連續操作的功率上限值。

<side B> upper limit of the power specified by the manufacturer up to which the EV supply equipment has been designed to operate continuously

**3.7.134 額定最大功率(rated maximum power)**

<A 側>操作 EV 供電設備達到由製造商規定之功率上限值。

<side A> upper limit of the power specified by the manufacturer up to which the EV supply equipment has been designed to operate

**3.7.135 額定最高電壓(rated maximum voltage)**

<A 側或 B 側>操作設計之 EV 供電設備達到由製造商指定帶電部件間的電壓上限值。

<side A or side B> upper limit of the voltage between live parts specified by the manufacturer up to which the EV supply equipment has been designed to operate

**3.7.136 額定最小電流(rated minimum current)**

<A 側或 B 側>操作設計之 EV 供電設備降到由製造商指定的電流下限值。

<side A or side B> lower limit of the current specified by the manufacturer down to which the EV supply equipment has been designed to operate

**3.7.137 額定最小功率(rated minimum power)**

<A 側或 B 側>操作設計之 EV 供電設備降到由製造商指定的功率下限值。

<side A or side B> lower limit of the power specified by the manufacturer down to which the EV supply equipment has been designed to operate

**3.7.138 額定最低電壓(rated minimum voltage)**

<A 側或 B 側>操作設計之 EV 供電設備降到由製造商指定帶電部件間的電壓下限值。

<side A or side B> lower limit of the voltage between live parts specified by the manufacturer down to which the EV supply equipment has been designed to operate

**3.7.139 目標電流(target current)**

<EV> 要求 EV 供電設備之電流，其可藉數位通訊動態變更。

<EV> requested current to the EV supply equipment, which may dynamically be changed by digital communication

備考：於 B 側，僅由 EV 要求此目標電流。

Note 1 to entry: On side B, this target current is requested by the EV only.

**3.7.140 目標功率(target power)**

<EV> 要求 EV 供電設備之功率，其可藉數位通訊動態變更。

<EV> requested power to the EV supply equipment, which may dynamically be changed by digital communication

備考： 於 B 側，僅由 EV 要求此目標功率。

Note 1 to entry: On side B, this target power is requested by the EV only.

**3.7.141 目標電壓(target voltage)**

<EV> 要求 EV 供電設備之電壓，其可藉數位通訊動態變更。

<EV> requested voltage to the EV supply equipment, which may dynamically be changed by digital communication

備考：於 B 側，僅由 EV 要求此目標電壓。

Note 1 to entry: On side B, this target voltage is requested by the EV only.

**3.7.142 目標電流(target current)**

<EV 供電設備>

EV 供電設備欲達到之電流值。

<EV supply equipment> value of current that the EV supply equipment attempts to reach

備考 1：B 側，EV 供電設備之目標電流係基於某些值動態計算，例：EV 目標值、B 側協議限制值，或 A 側或 B 側可適用限制值。

Note 1 to entry: The target current of the EV supply equipment at side B is dynamically calculated based on certain values, for example, the target values of the EV, the negotiated limits of side B or applicable limits of side B or of side A.

備考 2：EV 供電設備 B 側目標電流不會經由數位通訊知會 EV。

Note 2 to entry: The target current of the EV supply equipment at side B is not communicated to the EV by digital communication.

備考 3：A 側之 EV 供電設備目標電流依循 DSO 的電網規則。

Note 3 to entry: The target current of the EV supply equipment at side A is following the grid code of the DSO.

**3.7.143 目標功率(target power)**

<EV 供電設備>EV 供電設備欲達到之功率值。

<EV supply equipment> value of power that the EV supply equipment attempts to reach

備考 1：EV 供電設備 B 側目標功率係基於某些數值動態計算出來，例：EV 目標值、B 側協議限制值，或 A 側、B 側可適用限制值。

Note 1 to entry: The side B target power of the EV supply equipment is dynamically calculated based on certain values, for example, the target values of the EV, the negotiated limits of side B or applicable limits of side B or of side A.

備考 2：B 側之 EV 供電設備目標電流不會經由數位通訊知會 EV。

Note 2 to entry: The side B target power of the EV supply equipment is not communicated to the EV by digital communication.

備考 3：A 側之 EV 供電設備目標功率依循 DSO 的電網規則。

Note 3 to entry: The side A target power of the EV supply equipment is following

the grid code of the DSO.

**3.7.144 目標電壓(target voltage)**

<EV 供電設備> EV 供電設備欲達到之電壓值。

<EV supply equipment> value of voltage that the EV supply equipment attempts to reach

備考 1：EV 供電設備 B 側目標功率係基於某些數值動態計算出來，例：EV 目標值、B 側協議限制值，或 A 側或 B 側可適用限制值。

Note 1 to entry: The side B target voltage of the EV supply equipment is dynamically calculated based on certain values, for example, the target values of the EV, the negotiated limits of side B or applicable limits of side B or of side A.

備考 2：B 側之 EV 供電設備目標電壓不會經由數位通訊知會 EV。

Note 2 to entry: The side B target voltage of the EV supply equipment is not communicated to the EV by digital communication.

備考 3：A 側之 EV 供電設備目標電壓依循 DSO 的電網規則。

Note 3 to entry: The side A target voltage of the EV supply equipment is following the grid code of the DSO.

**3.7.145 輔助電路(auxiliary circuit)**

輔助電源。

auxiliary power supply

分別具有≤ 30Vac(RMS)或≤ 60Vdc 之最大工作電壓的電力元件或電路分類。

classification of an electric component or circuit with a maximum working voltage of ≤ 30 V AC (RMS) or ≤ 60 V DC, respectively

備考：作為傳訊、數位通訊、電能傳輸管理及控制之電路。

Note 1 to entry: Circuit(s) for signalling, digital communication, and for the management and control of energy transfer.

**3.7.146 EV 通訊控制器(EV communication controller,EVCC)**

刪除：車輛充電控制功能

DEPRECATED: vehicle charging control function

刪除：VCCF

DEPRECATED: VCCF

刪除：車輛充電/放電控制功能

DEPRECATED: vehicle charging/discharging control function

刪除：VCDCF

DEPRECATED: VCDCF

EV 內為支援特定功能之嵌入式系統，實施 EV 與 SECC 間之通訊。

embedded system, within the EV, which implements the communication between the EV and the SECC in order to support specific functions

備考：例：此特定功能可為控制輸入輸出通道、加密，或 EV 與 SECC 間的數據傳輸。

Note 1 to entry: Such specific functions could be, for example, controlling input and output channels, encryption, or data transfer between EV and SECC.

**3.7.147 供電設備通訊控制器(supply equipment communication controller,SECC)**

實施對一或多個 EVCC(s)通訊之實體。

entity which implements the communication to one or multiple EVCC(s)

備考 1：可能框架之更多細節參照 ISO 15511-1：2019 附錄 A。

Note 1 to entry: Further details regarding possible architectures are given in Annex A of ISO 15118-1:2019.

備考 2：供電設備通訊控制器之功能可包括控制輸入及輸出通道、數據加密，或 EVCC 與 SECC 間的數位通訊。

Note 2 to entry: Functions of a supply equipment communication controller may control input and output channels, data encryption, or digital communication between EVCC and SECC.

[SOURCE: ISO 15118-1:2019,3.1.68, modified – Words "and which may be able to interact with secondary actors" deleted, Note 1 to entry deleted, and word "vehicle" replaced with EVCC in Note 3 to entry.]

**3.7.148 數位通訊(digital communication)**

數位編碼資訊之交換。

exchange of digitally encoded information

備考 1：SAE J1772、SAE 2836、SAE 2847、SAE 2931 符合 ISO 15118 系列之 HLC 數位通訊條件。

Note 1 to entry: HLC in the ISO 15118 series is compliant with the term digital communication in SAE J1772, SAE 2836, SAE 2847 and SAE 2931.

備考 2：關於 EV 供電設備與一 EV 間數位通訊交換之追加資訊，亦參照 CNS 15511-24。

Note 2 to entry: See also IEC 61851-24 for additional information about digital communication exchanged between EV supply equipment and an EV.

[SOURCE: ISO 15118-1:2019, 3.1.47, modified, Note 2 to entry added]

**3.7.149 工作電壓(working voltage)**

EV 供電設備 A 側於最高額定電壓供電，且 EV 供電設備 B 側在最高額定電壓下操作時，會發生 AC 或 DC 跨接任一絕緣之最高 RMS 值。

highest RMS value of the AC or DC voltage across any particular insulation which can occur when the equipment is supplied at rated maximum voltage of the EV supply equipment at sideA and operated at the rated maximum voltage of the EV supply equipment at side B

備考 1：忽略暫態過電壓。

Note 1 to entry: Transient overvoltages are disregarded.

備考 2：考慮開路條件及正常工作條件。

Note 2 to entry: Both open-circuit conditions and normal operating conditions are taken into account.

[SOURCE: IEC 60050-851:2008, 851-12-31, modified – Words "rated voltage" replaced with the end of the definition starting with "rated maximum voltage".]

**4. 一般要求(General requirements)**

除以下之外，CNS 15511-1 第 4 節適用。

IEC 61851-1:2017, Clause 4, is applicable, except as follows.

以下句子不適用：

The following sentence is not applicable:

作為 EV 供電設備組合件，除第 13 節指明排除或追加者外，應符合 IEC 61439-7。

Assemblies for EV supply equipment shall comply with IEC 61439-7 with the exceptions or additions as indicated in Clause 13.

追加：

Addition:

~~備考：以下國家，EV 供電設備之設計用於海拔≤ 1,000 米下使用：JP。~~

NOTE In the following countries, the EV supply equipment is designed to be used at an altitude ≤ 1 000 m according to the national standard: JP.

**5. 分類(Classification)**

除以下之外，CNS 15511-1 第 5 節適用。

IEC 61851-1:2017, Clause 5, is applicable, except as follows.

追加子節：

Additional subclauses:

**5.101 EV 供電設備之特性 Characteristics of EV supply equipment**

**5.101.1 分離型(Separation type)**

EV 供電設備應依 A 側及 B 側間之分離型式分類：

The EV supply equipment shall be classified according to the type of separation between side A and side B:

- 分離型 EV 供電設備；
- separated EV supply equipment;
- 非分離型 EV 供電設備（研議中）
- non-separated EV supply equipment (under consideration)

**5.101.2 控制系統(Control system**

EV 供電設備應依控制系統之型式分類：

The EV supply equipment shall be classified according to the type of control system:

- 調節式 EV 供電設備：
- regulated EV supply equipment:

(a) 控制電流模式。

(a) controlled current mode;

(b) 控制電壓模式。

(b) controlled voltage mode;

(c) (a)與(b)之組合。

c)combination of a) and b);

- 非調節式 EV 供電設備(研議中)

- non-regulated EV supply equipment (under consideration).

**5.101.3 系統 System**

EV 供電設備應依系統分類:

The EV supply equipment shall be classified according to the system:

- 系統 A (參照附錄 AA)。

- system A (see Annex AA);

- 系統 B (參照附錄 BB)。

- system B (see Annex BB);

- 系統 C (參照附錄 CC)。

- system C (see Annex CC).

**5.101.4 熱管理系統(Thermal management system)**

EV 供電設備應依 B 側纜線組之熱管理系統分類：

The EV supply equipment shall be classified according to the thermal management system of the side B cable assembly:

- 使用熱感測。

- using thermal sensing;

- 使用熱感測及熱傳輸。

- using thermal sensing and thermal transport;

- 無。

- none.

**5.101.5 配電系統(Power distribution system)**

EV 供電設備應依 EV 供電設備在其最終應用欲連接之配電系統分類：

The EV supply equipment shall be classified according to the power distribution system to which the EV supply equipment is intended to be connected in its final application:

- 星形 TN 或 TT 系統之單相設備。

- single-phase equipment on star TN or TT system;

- 中心接地之 TN 或 TT 系統的單相設備。

- single-phase equipment on centre-earthed TN or TT system;

- 連接星形 TN 或 TT 系統之線間的單相設備。

- single-phase equipment connected line-to-line on star TN or TT system;

- 連接星形 IT 系統之線與中性點間的單相設備。

- single-phase equipment connected line-to-neutral on star IT system;

－連接星形 IT 系統之線間的單相設備。

－single-phase equipment connected line-to-line on star IT system;

－連接星形 TN 或 TT 系統之三相設備。

－three-phase equipment on star TN or TT system;

－星形 IT 系統之三相設備。

－three-phase equipment on star IT system;

－未接地之Δ(delta)系統的三相設備。

－three-phase equipment on unearthed delta system;

－中心接地之Δ(delta)系統的三相設備。

－three-phase equipment on centre-earthed delta system.

**6. 充電模式及功能(Charging modes and functions)**

除以下之外，CNS 15511-1 之第 6 節適用。

IEC 61851-1：2017, Clause 6, is applicable, except as follows.

**6.2.1 模式 1(Mode 1)**

CNS 15511-1 之 6.2.1 不適用。

IEC 61851-1:2017, 6.2.1, is not applicable.

**6.2.2 模式 2(Mode 2)**

CNS 15511-1 之 6.2.2 不適用。

IEC 61851-1:2017, 6.2.2, is not applicable.

**6.2.3 模式 3 (Mode 3)**

CNS 15511-1 之 6.2.3 不適用。

IEC 61851-1:2017, 6.2.3, is not applicable.

**6.3 模式 2、3 及 4 提供之功能(Functions provided in Modes 2, 3 and 4)**

取代本節之標題：

Replacement of the title of this subclause:

**6.3 模式 4 提供之功能(Functions provided in Mode 4)**

**6.3.1 模式 2、3 及 4 之強制性功能(Mandatory functions in Modes 2, 3 and 4)**

取代本節之標題：

Replacement of the title of this subclause:

**6.3.1 模式 4 之強制性功能(Mandatory functions in Mode 4)**

**6.3.1.1 一般(General)**

取代：

Replacement:

EV 供電設備應依 EVCC 要求，供應 DC 電流及電壓予 EV 電池系統。

The EV supply equipment shall supply a DC current and voltage to the EV battery system according to an EVCC request.

EV 供電設備應提供以下功能：

The following functions shall be provided by EV supply equipment:

－依 6.3.1.2，持續查核保護性導體之連續性。

– continuous continuity checking of the protective conductor according to 6.3.1.2;

－依 6.3.1.3 ，EV 正確連接 EV 供電設備之查證。

– verification that the EV is properly connected to the EV supply equipment according to 6.3.1.3;

－依 6.3.1.4，電源對 EV 通電。

– energization of the power supply to the EV according to 6.3.1.4;

－依 6.3.1.5，電源對 EV 斷電。

– de-energization of the power supply to the EV according to 6.3.1.5;

－依 6.3.1.6 之最大容許電流。

– maximum allowable current according to 6.3.1.6;

－依 6.3.1.101， EV 之 DC 電源。

– DC supply for EV according to 6.3.1.101;

－依 6.3.1.102，量測電流及電壓。

– measuring current and voltage according to 6.3.1.102;

－依 6.3.1.103，車輛耦合器之閂鎖。

– latching of the vehicle coupler according to 6.3.1.103;

－依 6.3.1.104，查核相容性。

– compatibility check according to 6.3.1.104;

－依 6.3.1.105，查核電能傳輸前之絕緣電阻。

– insulation resistance check before energy transfer according to 6.3.1.105;

－依 6.3.1.106，DC+與 DC－間之過電壓防護。

– protection against overvoltage between DC+ and DC– according to 6.3.1.106;

－依 6.3.1.107，車輛端插頭之閂鎖的查證。

– verification of vehicle connector latching according to 6.3.1.107;

－依 6.3.1.108，控制電路供電之完整性。

– control circuit supply integrity according to 6.3.1.108;

－依 6.3.1.109，電能傳輸前之短路查核。

– short-circuit check before energy transfer according to 6.3.1.109;

－依 6.3.1.110，使用者觸發停機。

– user initiated shutdown according to 6.3.1.110;

－依 6.3.1.111，並聯導體(有條件的功能)之過載保護。

– overload protection for parallel conductors (conditional function) according to 6.3.1.111;

－依 6.3.1.112，B 側帶電部件(DC+及 DC-)與保護性導體間之電壓限制。

– voltage limitation between side B live parts (DC+ and DC–) and protective

conductor according to 6.3.1.112;

依 6.3.1.113 ，EV 供電設備之停機。

– shutdown of EV supply equipment according to 6.3.1.113.

EV 製造商宜依本標準及 ISO 17409 考量過電壓及過電流之要求。

The EV manufacturer should consider the requirements for overvoltage and overcurrent according to this document and ISO 17409.

若 EV 供電設備可同時為多輛 EV 供電，EV 供電設備應為每一車輛端插頭單獨提供上述所列全部功能。

If the EV supply equipment can supply more than one EV simultaneously, the EV supply equipment shall provide all functions listed above independently at each vehicle connector.

**6.3.1.2 持續保護性導體之連續性查核(Continuous continuity checking of the protective conductor)**

取代：

Replacement:

應監測 EV 供電設備與 EV 間之保護性導體的連續性。

依 6.3.1.113.4，於 EV 供電設備與 EV 間之保護性導體喪失連續性後，EV 供電設備應觸發並完成緊急停機，及依：

The protective conductor continuity between the EV supply equipment and the EV shall be monitored continuously. The EV supply equipment shall trigger and complete an emergency shutdown according to 6.3.1.113.4 and according to:

– 系統 A 參照附錄 AA 之 3.8.2。

– AA.3.8.2 for system A;

– 系統 B 參照附錄 BB 之 5.1。

– BB.5.1 for system B;

– 系統 C 參照附錄 CC 之 4.7。

– CC.4.7 for system C;

在 EV 及 EV 供電設備間之保護導體失去電氣連續性後。

after a loss of electrical continuity of the protective conductor between the EV supply equipment and EV.

備考：由控制導引功能監測保護性導體連續性。

NOTE Protective conductor continuity is monitored by the control pilot function.

依以下試驗查核系統 A 及系統 B 之符合性，系統 C 之符合性依 CC.7.5.5 查核。

Compliance for system A and system B is checked by the following test. Compliance for system C is checked by CC.7.5.5.

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 連接 EV 供電設備於針對每一系統具有專用試驗負載之 EV 模擬器。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for each system.

(2) 持續量測 $V_T8$ 及 $A_T1$。

2) Measure VT8 and AT1 continuously.

(3) 依 EV 供電設備製造商指定程序開始通訊期間。

3) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(4) 依圖 133 規定，於 OP4 確認 B 側。

4) Confirm that side B is at OP4, specified in Figure 133.

(5) 斷開 ST15。

5) Open ST15.

(6) 觸發 EV 供電設備並完成緊急停機之查核。

6) Check that the EV supply equipment triggered and completed an emergency shutdown.

(7) 查核結果示於表 101。

(7) Check the result in Table 101.

表 101 查證準則

Table 101 – Verification criterion

| 系統<br>System | 查證準則<br>Verification criterion |
|---|---|
| A | 參照表AA.8。<br>See Table AA.8. |
| B | 保護性導體喪失連續性後，B側(AT1)於 tpe或以下之當下電流≤ 5 A dc。<br>tpe包括電流之偵測時間及衰減時間(fall time)，特定時間參照表BB.3。<br>The present current at side B (AT1) is ≤ 5 A DC in tpe or less after the loss of protective conductor continuity. The tpe includes the detection time and fall time of the current. See Table BB.3 for the specific time. |

確認 VT8 ≤ 60 V DC

Confirm that VT8 ≤ 60 V DC.

**6.3.1.3 EV 供電設備正確連接 EV 之查證(Verification that the EV is properly connected to the EV supply equipment)**

此節適用 CNS 15511-1。

This subclause of IEC 61851-1:2017 is applicable.

**6.3.1.4 供電(EV Energization of the power supply to the EV)**

追加：

Addition:

系統 C 正常啟動之更多要求，規定於附錄 CC.3.2。

Further requirements for normal startup are given in CC.3.2 for system C.

依以下試驗查核符合性。

Compliance is checked by the following test.

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

系統 C 試驗裝置如圖 131 所示。

The test setup for system C is shown in Figure 131.

驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 針對每一系統，連接 EV 供電設備於具有專用試驗負載之 EV 模擬器。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for each system.

(2) 持續量測 VT8。

2) Measure VT8 continuously.

(3) 針對以下所示系統，透過開關斷開模擬控制導引之開路。

3) Simulate the open circuit of the control pilot by opening the switch for each system shown below:

系統 A：ST5

– system A: ST5;

系統 B：ST4

– system B: ST4;

系統 C：ST3

– system C: ST3;

(4) 依 EV 供電設備製造商指定程序開始通訊期間。

4) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(5) 確認 VT8 ≤ 60 V dc

5) Confirm that VT8 ≤ 60 V DC.

**6.3.1.5 斷電(EV De-energization of the power supply to the EV)**

取代:

Replacement:

若導引訊號中斷，每一系統之 EV 供電設備應依指示執行關機。

If the pilot signal is interrupted, the EV supply equipment shall perform a shutdown as indicated for each system.

符合性查核，系統 A 依 AA.3.2 試驗、系統 B 依 BB.5.5 試驗及系統 C 依 CC.7.5.8

試驗。

Compliance is checked for system A by the test in AA.3.2, for system B by the test in BB.5.5, and for system C by the test in CC.7.5.8.

追加子節：

Additional subclause:

**6.3.1.5.101 若控制電路失效之斷電(De-energization in case of failure in control circuit)**

若 EV 供電設備之控制電路失效，如短路、接地漏電流、SECC 失效或過溫，EV 供電設備應終止供應 B 側電流。

In case of failure in the control circuit of the EV supply equipment, such as short-circuit, earth leakage current, SECC failure or excess temperature, the EV supply equipment shall terminate the supply of current at side B.

EV 供電設備製造商應依 IEC 60812(有 CNS)執行失效模式及效益分析(Failure Mode and Effects Analysis, FMEA)，以展現前述要求之符合性。

The EV supply equipment manufacturer shall perform a failure modes and effects analysis (FMEA) according to IEC 60812 to show conformity with the above requirement.

依檢驗查核符合性。

Compliance is checked by inspection.

**6.3.1.6 最大容許電流(Maximum allowable current)**

取代:

Replacement:

應提供 EV 供電設備 B 側通知 EV 可用最大電流的方式。

EV 供電設備 B 側可用最大電流應通訊且應不大於 EV 供電設備 B 側的額定提高電流(boost current)。

A means shall be provided to inform the EV of the value of the applicable maximum current of the EV supply equipment at side B. The value of the applicable maximum current of the EV supply equipment at side B shall be communicated and shall be less than or equal to the rated boost current of the EV supply equipment at side B.

通訊之值可變更至適合之電力限制值，而不超過 EV 供電設備 B 側額定提高電流，例：負載管理。

The communicated value may change, without being more than the rated boost current of the EV supply equipment at side B, to adapt to power limitations, for example, for load management.

系統 A、系統 B 及系統 C 依設計審查查核符合性。

Compliance is checked by design review for system A, system B and system C.

追加子節：

Additional subclauses:

**6.3.1.101 EV 之 DC 電源(DC supply for the EV DC supply for the EV)**

EV 供電設備應依 EVCC 要求，供應 EV 受控制之 DC 電壓或電流(非同時，但依 EV 通訊期間要求)。

經調節之 DC 電壓或電流的性能要求，提供於 101.1.1、101.1.2、101.1.3、101.1.4、101.1.5 及 101.1.6。

The EV supply equipment shall supply controlled DC voltage or current (not simultaneously, but as requested by the EV during the communication session) to the EV according to the EVCC requests. Requirements for energy transfer performance of regulated DC voltage or current are given in 101.1.1, 101.1.2, 101.1.3, 101.1.4, 101.1.5, and 101.1.6.

在上述提及之任一情況下，供應的調節值應不大於 EV 供電設備最大定額。

In either case mentioned above, the supplied regulated values shall be less than or equal to the maximum ratings of the EV supply equipment.

依 101.1.1 至 101.1.6 可適用之試驗查核符合性。

Compliance is checked by the applicable tests in 101.1.1 through 101.1.6.

EV 可變更 EV 之目標電流及/或目標電壓。

The EV can change the target current of the EV and/or the target voltage of the EV.

備考：EV 配備不同技術及不同電壓之電池系統。

為避免電能傳輸期間任何失誤，並保證 EV 供電設備電能傳輸能量至全部既有及未來的電池系統，任何通訊期間皆由車輛控制。任何連接 EV 供電設備之 EV，要配備通訊期間作為控制的 EVCC。

NOTE EVs are equipped with different technologies and battery systems with different voltages. In order to avoid any error during energy transfer and to guarantee that the EV supply equipment will be able to transfer energy to all existing and future battery systems, any communication session is controlled by the EV. Any EV that is to be connected to a EV supply equipment is equipped with an EVCC for controlling the communication session.

**6.3.1.102 電流及電壓量測(Measuring current and voltage)**

EV 供電設備應量測 B 側當下之電流及電壓，此等量測值之準確度應滿足各系統於 AA.4.4、BB.4.2 及 CC.6.3 定義的準確度。

The EV supply equipment shall measure the present current and the present voltage at side B. The accuracy of these measurements shall meet the defined accuracy for each system in AA.4.4, BB.4.2 and CC.6.3.

EV 供電設備透應過數位通訊提供 B 側當下之電壓及電流量測值予 EV。

The measured values of present voltage and present current at side B shall be provided by the EV supply equipment to the EV through digital communication.

系統 A 及系統 B 之依以下試驗查核符合性，系統 C 依 CC.7.5.11、CC.7.5.12 及 CC.7.5.19 查核符合性。

Compliance for system A and system B is checked by the following test. Compliance

for system C is checked by CC.7.5.11, CC.7.5.12, and CC.7.5.19.

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

對於系統 A：

For system A:

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

備考 1：除有其他規定外，試驗負載如圖 132 所示。

NOTE 1 Test load indicated in Figure 132 unless otherwise specified.

(2) 依 EV 供電設備製造商指定程序開始通訊期間。

2) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(3) 設定 EV 模擬器之目標電流為 EV 供電設備的 $I_{EVSE_rated_boost_sideB}$、 $I_{Avg}$及 $I_{Min}$，其定義如下：

3) Set the target current of the EV simulator at $I_{EVSE_rated_boost_sideB}$, $I_{Avg}$ and $I_{Min}$ of the EV supply equipment which are defined as:

$I_{EVSE_rated_boost_sideB}$ = EV 供電設備 B 側之額定提高電流

$I_{EVSE_rated_boost_sideB}$ = rated boost current of the EV supply equipment at side B

$I_{Avg} = I_{EVSE_rated_boost_sideB} / 2$

$I_{Min}$ = 5 A

(4) 設定 EV 模擬器之目標電流為 EV 供電設備的 $V_{EVSE_rated_max_sideB}$、$V_{Avg}$及 $V_{EVSE_rated_min_sideB}$，其定義如下：

$V_{EVSE_rated_max_sideB}$ = EV 供電設備 B 側之額定最高電壓

$V_{Avg} = (V_{EVSE_rated_max_sideB} + V_{EVSE_rated_min_sideB}) / 2$

$V_{EVSE_rated_min_sideB}$ =EV 供電設備 B 側之額定最低電壓

4)Set the target voltage of the EV simulator at $V_{EVSE_rated_max_sideB}$, $V_{Avg}$ and $V_{EVSE_rated_min_sideB}$ of the EV supply equipment which are defined as:

$V_{EVSE_rated_max_sideB}$ = rated maximum voltage of the EV supply equipment at side B

$V_{Avg} = (V_{EVSE_rated_max_sideB} + V_{EVSE_rated_min_sideB}) / 2$

$V_{EVSE_rated_min_sideB}$ = rated minimum voltage of the EV supply equipment at side B

藉以下措施之一量測 B 側設定之 EV 供電設備的 $V_{EVSE_rated_max_sideB}$, $V_{Avg}$ 及 $V_{EVSE_rated_min_sideB}$電壓：

The side B voltage is set to $V_{EVSE_rated_max_sideB}$, $V_{Avg}$ and $V_{EVSE_rated_min_sideB}$ of the EV

supply equipment by one of the following measures:

– 應調整 $A_T1$ 以設定為 $V_T8$ 為 EV 供電設備之 $V_{EVSE_rated_max_sideB}$、$V_{Avg}$及 $V_{Min}$，不論是在電子負載 $U_T5$ 操作固定電阻，或使用電阻 $R_T10$ 及 $R_T11$ 設定電壓點。

– $A_T1$ shall be adjusted to set $V_T8$ at $V_{EVSE_rated_max_sideB}$, $V_{Avg}$ and $V_{Min}$ of the EV supply equipment with either the electronic load UT5 operating at constant resistance or using the resistors $R_T10$ and $R_T11$ to set the voltage point;

— 電子負載 $U_T5$ 應於定電壓模式下操作。

– electronic load $U_T5$ shall be operated under the constant voltage mode.

(5) $V_T8$ 及 $A_T1$ 之趨勢圖。

5) Trend a chart of $V_T8$ and $A_T1$.

(6) 查核 EV 供電設備 B 側量測之電流及電壓與 $V_T8$ 及 $A_T1$ 量側值間之差異，介於 AA.4.4 規定規定的限制值內。

6) Check that the difference between the measured current and voltage of the EV supply equipment at side B and the values measured with $V_T8$ and $A_T1$ are between the limits specified in AA.4.4.

對於系統 B：

For system B:

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

備考 2：除有其他規定外，試驗負載說明於圖 132。

NOTE 2 Test load indicated in Figure 132 unless otherwise specified.

(2) 依 EV 供電設備依製造商指定程序開始通訊期間。

2) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(3) 設定 EV 模擬器之目標電流為 EV 供電設備的 $I_{EVSE_rated_boost_sideB}$、$I_{Med}$及 $I_{Min}$，其定義如下：

3) Set the target current of the EV simulator at $I_{EVSE_rated_boost_sideB}$, $I_{Med}$ and $I_{Min}$ of the EV supply equipment which as defined as:

$I_{EVSE_rated_boost_sideB}$ = EV 供電設備 B 側之額定提高電壓

$I_{EVSE_rated_boost_sideB}$ = rated boost current of the EV supply equipment at side B

$I_{med} = (I_{EVSE_rated_boost_sideB} + I_{Min}) / 2$

$I_{Min}$ = EV 供電設備 B 側之額定最小電流及 5A 間最高值

$I_{Min}$ = the higher value between 5 A and rated minimum current specified of the EV supply equipment at side B

(4) 設定 EV 模擬器目標電壓為 EV 供電設備之 $V_{EVSE_rated_max_sideB}$，$V_{Med}$ 及 $V_{EVSE_rated_min_sideB}$，其定義如下：

4) Set the target voltage of the EV simulator at $V_{EVSE_rated_max_sideB}$, $V_{Med}$ and $V_{EVSE_rated_min_sideB}$ of the EV supply equipment which are defined as:

$V_{EVSE_rated_max_sideB}$ = EV 供電設備 B 側之額定最高電壓

$V_{EVSE_rated_max_sideB}$ = rated maximum voltage of the EV supply equipment at side B

$V_{Med}$ = ($V_{EVSE_rated_max_sideB}$ + $V_{EVSE_rated_min_sideB}$) / 2

$V_{EVSE_rated_min_sideB}$ = EV 供電設備 B 側之額定最低電壓

$V_{EVSE_rated_min_sideB}$ = rated minimum voltage of the EV supply equipment at side B

(5) $V_T8$ 及 $A_T1$ 之趨勢圖。

5)Trend a chart of $V_T8$ and $A_T1$.

(6) 查核量測 EV 供電設備 B 側電流及電壓與 $V_T8$ 及 $A_T1$ 量側值間之差異，介於 BB.4.2 規定限制值內。

6) Check that the difference between the measured current and voltage of the EV supply equipment at side B and the values measured with VT8 and AT1 are between the limits specified in BB.4.2.

**6.3.1.103 車輛端插頭之閂鎖(Latching of the vehicle connector)**

每一系統之車輛端插頭的閂鎖要求，分別規定於附錄 AA、附錄 BB 及附錄 CC。

The requirements for latching the vehicle connector are defined in Annex AA, Annex BB and Annex CC for each system.

一旦上鎖，車輛端插頭應保持上鎖狀態，直到 B 側 DC+與 DC-間當下電壓< 60 V dc，此電壓限制值適用整個耦合期間，包括電能傳輸階段之後。若 EV 供電設備故障可提供斷連措施。若提供斷連措施，依本標準應為安全的斷連措施。

Once latched, the vehicle connector shall remain latched until the present voltage at side B between DC+ and DC– is < 60 V DC. This voltage limit applies throughout the coupling session including after the energy transfer stage. In case of an EV supply equipment malfunction, a means for disconnection may be provided, but if provided, that disconnection means shall be safe according to this document.

備考 1：閂鎖功能之致動部分，可為車輛端插頭或車輛端插座。

NOTE 1 The actuation portion of the latching function can be in either the vehicle connector or the vehicle inlet.

備考 2：上閂/解鎖功能之電壓準則可 < 60 V dc，例：系統 A 為 30 Vdc。

NOTE 2 Voltage criteria for latching/unlatching function can be < 60 V DC; for example, 30 V DC in system A.

當由 EV 供電設備作上閂時，EV 供電設備應有以下功能：

The EV supply equipment shall have the following functions when the latching is done by the EV supply equipment:

— 電氣或機械式上鎖功能，保持鎖定狀態，及

– electrical or mechanical latching function to retain the latched status;

— 針對上鎖功能，偵測電器電路斷連之功能。

– function to detect the disconnection of the electrical circuits for the latching function.

額外要求規定於 AA.3.6、BB.5.9 及 CC.4.2。系統 A 之特定電壓規定於 AA.3.3。

Additional requirements are given in AA.3.6, BB.5.9 and CC.4.2. Specific voltage for system A is specified in AA.3.3.

依以下試驗(a)及(b)查核符合性。

Compliance is checked by the following tests a) and b).

(a) 正常條件試驗

a) Normal condition test

模擬正常耦合期間。查核車輛端插頭鎖定在車輛端插座，無論何時 B 側之 DC+與 DC-間之當下電壓維持≥ 60 V dc。

Simulate a normal coupling session. Check that the vehicle connector is latched on the vehicle inlet whenever the present voltage at side B between DC+ and DC– is ≥ 60 V DC.

(b) 異常條件試驗

b) Abnormal condition test

電能傳輸階段結束後，模擬 B 側 DC+與 DC-間之當下電壓維持≥ 60 V DC，例：保持 EV 斷開裝置閉合。查核車輛端插頭上鎖於車輛端插座上， 無論何時 B 側 DC+與 DC-間之當下電壓維持≥ 60 V dc。

Simulate a condition in which the present voltage at side B between DC+ and DC– remains

≥ 60 V DC after the end of the energy transfer stage, for example, by keeping the EV disconnection device closed. Check that the vehicle connector is latched on the vehicle inlet whenever the present voltage at side B between DC+ and DC– ≥ 60 V DC.

車輛端插頭及車輛端插座應符合 CNS 15700-1 及 CNS 15700-3 之要求，亦參照 9.101。

Vehicle connectors and vehicle inlets shall comply with the requirements of IEC 62196-1 and IEC 62196-3. See also 9.101.

**6.3.1.104 相容性查核(Compatibility check)**

EV 與 EV 供電設備間之相容性，在準備階段應使用資訊交換查核。

Compatibility between the EV and the EV supply equipment shall be checked with the information exchanged at the preparation phase.

針對系統 A，若 EV 目標電壓及額定最低電壓(於 IEC 61851-24 為"目標電池組電壓〃及"最小電池電壓〃)介於 EV 供電設備 B 側額定最小與最高電壓間，應查核 EV 供電設備。

若不符合此條件，EV 供電設備應觸發錯誤停機。

For system A, the EV supply equipment shall check if target voltage and rated minimum voltage of the EV ("target battery voltage" and "minimum battery voltage" in IEC 61851-24) are between the rated maximum and rated minimum voltage of the

EV supply equipment at side B. In case this condition is not met, the EV supply equipment shall trigger an error shutdown.

針對系統 B，EV 供電設備查核之 EV 供電設備 B 側的額定最低電壓小於最高許可充電電壓。若不符合此條件，EV 供電設備應觸發錯誤停機。

For system B, the EV supply equipment checks that rated minimum voltage of the EV supply equipment at side B is less than the maximum permissible charge voltage. In case this condition is not met, the EV supply equipment shall trigger an error shutdown.

針對系統 C 參照 CC.5.6。

For system C, see CC.5.6.

系統 A 及系統 B 依以下試驗查核符合性，系統 C 依 CC.7.5.1 查核符合性。

Compliance for system A and system B is checked by the following test. Compliance for system C is checked by CC.7.5.1.

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

(2) 依 EV 供電設備製造商指定之程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 使用 EV 模擬器經由數位通訊，將表 102 之數據或訊息傳達 EV 供電設備。

3) Using the EV simulator, communicate the data or message in Table 102 to the EV supply equipment via digital communication.

表 102 符合性查核試驗之數據/訊息

Table 102 – Data/message for the compatibility check test

| **系統**<br>**System** | **數據/訊息**<br>**(參照CNS 61851-24)**<br>**Data/Message**<br>**(refer to IEC 61851-24)** | **值**<br>**Value** |
|---|---|---|
| A<br>(情形1)<br>(case 1) | 目標電池組電壓<br>Target battery voltage | 420 V |
| | 最高電池組電壓<br>Maximum battery voltage | 410 V |
| A<br>(情形2)<br>(case 2) | 目標電池組電壓<br>Target battery voltage | EV供電設備B側之額定最高電壓+ 10 V<br>Rated maximum voltage of the EV supply equipment at side B + 10 V |

| 系統<br>System | 數據/訊息<br>(參照CNS 61851-24)<br>Data/Message<br>(refer to IEC 61851-24) | 值<br>Value |
|---|---|---|
| | 最高電池組電壓<br>Maximum battery voltage | 600 V |
| A<br>(情形3)<br>(case 3) | 目標電池組電壓<br>Target battery voltage | EV供電設備B側之額定最低電壓－ 10 V<br>Rated minimum voltage of the EV supply equipment at side B-10 V |
| | 最高電池組電壓<br>Maximum battery voltage | EV供電設備B側之額定最高電壓<br>Rated maximum voltage of the EV supply equipment at side B |
| B | 電池系統最高許可充電電壓<br>Maximum permissible charge voltage of battery system | EV供電設備B側之額定最低電壓－ 10 V<br>Rated minimum voltage of the EV supply equipment at side B-10 V |

(4) 針對每一情形，查核 EV 供電設備觸發錯誤停機，若有，則顯示相關警報或錯誤資訊。對於系統 A，分別對每一情形執行試驗。

4)For each case, check that the EV supply equipment triggers an error shutdown, displaying a relevant alarm or error information, if any. For system A, perform the test separately for each case.

(5) 確認 VT6, VT7 及 VT8 < 60 V DC。

5) Confirm that VT6, VT7 and VT8 are < 60 V DC.

**6.3.1.105 電能傳輸前查核絕緣電阻 (Insulation resistance check before energy transfer)**

EV 供電設備應查核 B 側之帶電部件(DC+/DC-)與保護性導體至車輛底盤間之絕緣電阻，包括 EV 供電設備暴露之任一導電性部件。

The EV supply equipment shall check the insulation resistance between side B live parts (DC+/DC–) and protective conductor to the vehicle chassis, including any exposed conductive part of the EV supply equipment, before the EV disconnection device are allowed to close.

若絕緣電阻低於系統特定限制值，或無法在指定或更短時間內測定時，EV 供電設備應觸發錯誤停機並對 EV 表明不容許電能傳輸。

If the insulation resistance is less than the system specific limit or it cannot be determined in the specified time or less, the EV supply equipment shall trigger an error shutdown and indicate to the EV that energy transfer is not allowed.

絕緣電阻 R 不符合式(1)時，系統 A 及系統 B 之 EV 供電設備應觸發錯誤停機：

For system A and system B, when the insulation resistance R does not fulfil Formula (1), the EV supply equipment shall trigger an error shutdown:

$$R \geq 100\frac{\Omega}{V} \times U \quad (1)$$

式中，U 為 EV 供電設備 B 側之額定最高電壓，以 V 表示。細節規定於 AA.4.3.3 及 BB.8。

where

U is the rated maximum voltage of the EV supply equipment at side B, expressed in volts.

Details are specified in AA.4.3.3 and BB.8.

系統 C 參照 CC.4.1.4。

For system C, see CC.4.1.4.

依 AA.4.3.3、BB.8 及 CC.7.5.15 之試驗查核符合性。

Compliance is checked by the tests in AA.4.3.3, BB.8 and CC.7.5.15.

**6.3.1.106 B 側 DC+與 DC-間之過電壓防護(Protection against overvoltage at side B between DC+ and DC)。**

**6.3.1.106.1 一般(General)**

EV 供電設備應偵測車輛插頭 DC+與 DC-間之過電壓，且若偵測到過電壓，則依 6.3.1.106.2 及 6.3.1.106.3 執行緊急停機或錯誤停機。

The EV supply equipment shall detect an overvoltage between DC+ and DC– at the vehicle connector and perform an emergency shutdown or error shutdown if an overvoltage is detected, according to 6.3.1.106.2 and 6.3.1.106.3.

當 EV 供電設備車輛端插頭與 EV 車輛端插座嚙合時，除 6.3.1.112、附錄 AA、附錄 BB 及附錄 CC 另有規定外，EV 供電設備及 EV 應不因 B 側(正或負電壓)之 DC+與 DC-間、DC+與 PE 間或 DC-及 PE 間的當下電壓而觸發停機。

When the vehicle connector is being mated to the vehicle inlet, the EV supply equipment and the EV shall not trigger a shutdown due to a present voltage at side B (positive or negative voltage), between DC+ and DC–, between DC+ and PE or between DC– and PE, unless otherwise specified in 6.3.1.112, Annex AA, Annex BB and Annex CC.

依 ISO 17409:2020 之 6.5.2，在未嚙合時，EV 電壓> 60 V 且 DC+與 PE 間，及 DC－與 PE 間>30V ac。建議 EV 無>60V 之共模電壓，因為不平衡的絕緣故障會在 B 側產生>60V 的差分電壓。對於系統 C，EV 可嘗試使用圖 CC.3 B 側電路的 RS6 和 RS7 去能，以限制此共模電壓。

According to ISO 17409:2020, 6.5.2, when unmated, the EV can have a voltage > 60 V DC and > 30 V AC between DC+ and PE, and between DC– and PE. It is recommended that the EV does not have a common mode voltage > 60 V, as unbalanced insulation faults can generate differential voltages at side B > 60 V. For system C, the EV may try to use RS6 and RS7 in Figure CC.3 of the disabled side B circuit to limit this common mode voltage.

備考：初始化階段、電纜檢查及預充電期間之過電壓保護，仍在研議中。

Overvoltage protection during the initialization stage, cable-check phase and pre-charge phase is under consideration.

**6.3.1.106.2 B 側 DC+與 DC-間過電壓防護之緊急停機(Protection against overvoltage at side B between DC+ and DC– by emergency shutdown)**

關於系統 A，EV 供電設備應滿足 AA.3.12 過電壓保護要求。

For system A, the EV supply equipment shall fulfil the overvoltage protection requirements in AA.3.12.

對於系統 B 及系統 C，在電能傳輸期間，若 B 側 DC+與 DC-間之當下電壓大於表 103 規定電壓閾值持續 9 ms 以上時，EV 供電設備應在 1 ms 或更短時間內觸動緊急停機。

For system B and system C, the EV supply equipment shall trigger an emergency shutdown in 1 ms or less if, during the energy transfer stage, the present voltage at side B between DC+ and DC– is more than the voltage thresholds specified in Table 103 for more than 9 consecutive ms.

表 103 系統 B 及系統 C 反應緊急停機之電壓閾值

Table 103 – Voltage threshold for emergency shutdown reaction for system B and system C

| 協議最高電壓B側<br>Negotiated maximum voltage at side B (U) | 電壓閾值<br>Voltage threshold<br>V |
|---|---|
| U ≤ 500 V | 550 |
| 500 V < U ≤ 750 V | 825 |
| 750 V < U ≤ 850 V | 935 |
| 850 V < U ≤ 1 000 V | 1100 |

符合性查核，系統 B 依 BB.5.6 及系統 C 依 CC.8.3.7 (表 CC.28a)。

Compliance is checked by BB.5.6 for system B and CC.7.5.7.1 for system C.

**6.3.1.106.3 錯誤停機 B 側 DC+與 DC-間過電壓防護之錯誤停機 (Protection against overvoltage at side B between DC+ and DC– by error shutdown)**

EV 供電設備亦應依表 104 視 B 側 DC+與 DC-間當下電壓條件反應。

The EV supply equipment shall also react depending on condition of the present voltage at side B between DC+ and DC– according to Table 104.

表 104 – EV 供電設備反應視 B 側條件當下電壓而定

Table 104 – EV supply equipment reaction depending on the present voltage at side B condition

| B側當下電壓狀態<br>Present voltage at side B condition | 系統<br>System | EV供電設備 反應<br>EV supply equipment reaction |
|---|---|---|
| B側DC+與DC-間當下電壓超過協議的B側最高電壓連續400 ms<br>The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B for 400 consecutive ms | A | 於1.6 s或更短時間內<br>觸動錯誤停機<br>Trigger an error shutdown in 1,6 s or less |
| | C | 於50 ms或更短時間內<br>觸動錯誤停機<br>Trigger an error shutdown in 50 ms or less |
| B側DC+與DC-間當下電壓超過協議的B側最高電壓連續200 ms以上且少於400 ms<br>The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B for more than 200 consecutive ms and less than 400 consecutive ms | A and C | 容許電能傳輸或觸動錯誤停機<br>Allow energy transfer or trigger an error shutdown |
| B側DC+與DC-間當下電壓超過協議的B側最高電壓連續200 ms或更短時間<br>The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B for 200 or less consecutive ms | A and C | 容許電能傳輸<br>Allow energy transfer |
| B側DC+與DC-間之當下電壓超過協議的B側最高電壓<br>The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B | B | 於500 ms或更短時間內觸發錯誤停機<br>Trigger an error shutdown in 500 ms or less |

備考 1：系統 A 及 B 於通訊期間，EV 無法變更可用最高電壓。

NOTE 1 For system A and system B, the EV cannot change the applicable maximum voltage of the EV during the communication session.

系統 A 之錯誤停機計時準則的特定要求，規定於表 AA.5。

For system A, specific requirements for the error shutdown timing criteria are defined in Table AA.5.

備考 2：需要緊急及錯誤停機以防止電池系統過充，且無法假設 EV 供電設備之耐受能力。

NOTE 2 The emergency and error shutdown are necessary to prevent overcharging the battery system and cannot be assumed as a withstand capability of the EV supply equipment.

以下試驗依表 105 查核其符合性。

Compliance is checked by the following tests according to Table 105.

表 105 — 在 B 側之 DC+及 DC-間的過電壓防護的符合性試驗

Table 105 – Compliance tests for protection against overvoltage at side B between DC+ and DC–

| 故障情境<br>Fault scenario | 系統A<br>System A | 系統B<br>System B | **系統C**<br>**System C** |
|---|---|---|---|
| EV切換電壓源且B側DC+與DC-間之當下電壓變得超過EV額定最高電壓。<br>The EV switches a voltage source and the present voltage at side B between DC+<br>and DC– becomes more than the rated maximum voltage of the EV | 試驗(a) 及 試驗 (b)<br>Test a) and test b) | 試驗 (a)<br>Test a) | CC.7.5.7.2<br>CC.7.5.7.3 |
| EV修正EV可用最高電壓至低於當下B側電壓。<br>The EV modifies the applicable maximum voltage of the EV to a value less than the present voltage at side B | 不適用<br>Not applicable | 不適用<br>Not applicable | CC.7.5.7.4 |

試驗(a)

Test a)

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。圖 132 之試驗負載依表 106 設定。

1)Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. The setup of the test load in Figure 132 is in Table 106.

表 106 – 過電壓防護試驗之試驗負載設定

Table 106 – Test load setup for protection against overvoltage test

| 系統<br>**System** | 開關<br>Switches | | | | | 電路參數設定<br>Circuit parameter setup |
|---|---|---|---|---|---|---|
| | $S_T17$<br>$S_T18$ | $S_T19$ | $S_T20$ | $S_T21$ | $S_T22$ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| A | 閉合<br>closed | 閉合<br>closed | 閉合<br>closed | 斷開<br>open | 斷開<br>open | $L_T$: 0 H<br>$R_T$10: 0 Ω (bypassed) (旁通<br>bypassed)<br>$U_T$4: 未使用not used<br>$U_T$5: 電子負載操作應使用定<br>電壓模式an electronic load<br>operating under constant voltage<br>mode shall be used |
| B | 閉合<br>closed | 閉合<br>closed | 斷開<br>open | 閉合<br>closed | 斷開<br>open | $L_T$: 0 H<br>$R_T$10: 0 Ω<br>$R_T$11: variable 可變電阻<br>$U_T$4: 受控之電壓源controlled voltage source<br>$C_T$5: 5 600 μF (different case dependent)<br>$C_T$5: 5600 μF視不同的情形 |

(2) 持續量測 $V_T$8 及 $A_T$1。

2) Measure VT8 and AT1 continuously.

(3) 依 EV 供電設備製造商指定之程序開始電能傳輸。

3)Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) 使用之 EV 模擬器，藉數位通訊傳送表 107 的數據或訊息至 EV 供電設備。

4)Using the EV simulator, communicate the data or message in Table 107 to the EV supply equipment via digital communication.

表 107 – 過電壓防護試驗之數據/訊息

Table 107 – Data/messages for protection against overvoltage test

| **系統**<br>**System** | 數據/訊息名稱<br>Data/Message name | 值<br>Value |
|---|---|---|
| A | EV目標電壓<br>Target voltage of the EV | 410 V |
| | EV額定最高電壓<br>Rated maximum voltage of the EV | 420 V |
| | EV目標電流<br>Target current of the EV | $I_{EVSE_max}$ |
| B | EV適用之最高電壓<br>Applicable maximum voltage of the EV | ≤ EV 額定最高電壓<br>≤ rated maximum voltage of the EV |
| | EV 目標電壓<br>Target voltage of the EV | =協議最高電壓B側 -10V<br>= negotiated maximum voltage at side B – 10 V |

(5) 確認於 B 側 $V_T8$ 之協議最高電壓，且 EV 供電設備於指定的 OP 操作。

5) Confirm that $V_T8$ is at the negotiated maximum voltage at side B and the EV supply equipment is operating at the designated OP.

(6) 在 B 側之 DC+與 DC-間，藉表 108 的方法模擬過電壓並查核結果。

6) Simulate an overvoltage at side B between DC+ and DC– by the methods in Table 108 and check the results.

表 108 過電壓條件及查證準則

Table 108 – Overvoltage condition and verification criterion

| **系統 System** | **在B側DC+與DC-間模擬過電壓之方法Methods to simulate overvoltage at side B between DC+ and DC–** | 查證準則 Value |
|---|---|---|
| A | 於400 ms期間，調整UT5以提高VT8至430 Vdc ± 3 Vdc。 Adjust $U_T5$ to increase $V_T8$ to 430 V DC ± 3 V DC during 400 ms | 參照表AA.5。 See Table AA.5. |
| B | 調整UT4以提高VT8至15 V ± 3 V，大於協議最高電壓B側。 Adjust $U_T4$ to increase $V_T8$ to 15 V ± 3 V more than the negotiated maximum voltage at side B | 施加過電壓之後，B側當下電流(AT1) 於1 s內降至≤5 A dc。 施加過電壓之後，B側(VT8)當下電壓 於1 s內降至至≤ 60 V dc。 The present current at side B ($A_T1$) is ≤ 5 A DC in 1 s or less after the overvoltage is applied. The present voltage at side B ($V_T8$) is ≤ 60 V DC in 1 s or less after the overvoltage is applied. |

試驗(b)

Test b)

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

執行與試驗(a)相同之程序，直到步驟(5)。

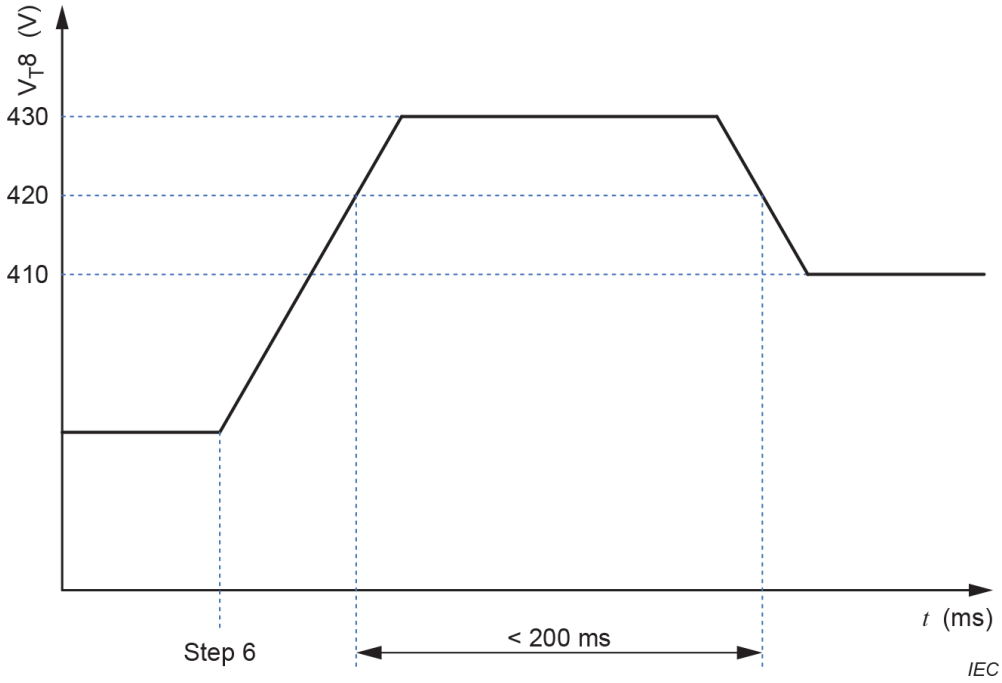
Execute the same procedure than in test a) until step 5).

(6) 藉調整系統 A 之 $U_T5$ 或系統 B 之 $U_T4$，模擬 B 側 DC+與 DC-間過電壓。提升 VT8 至 430 V ± 3 V，並接著降低 VT8 至 410 V ± 3 V ，目的為使 VT8 高於 420 V 不超過 200 ms，如圖 102 所示。

6) Simulate an overvoltage at side B between DC+ and DC– by adjusting UT5 for system A or UT4 for system B, increasing VT8 to 430 V ± 3 V, and then decreasing VT8 to 410 V ± 3 V. The purpose is to have VT8 > 420 V for less than 200 ms, as shown in Figure 102.

(7) 查核 EV 供電設備容許電能傳輸。

7) Check that the EV supply equipment allows energy transfer.



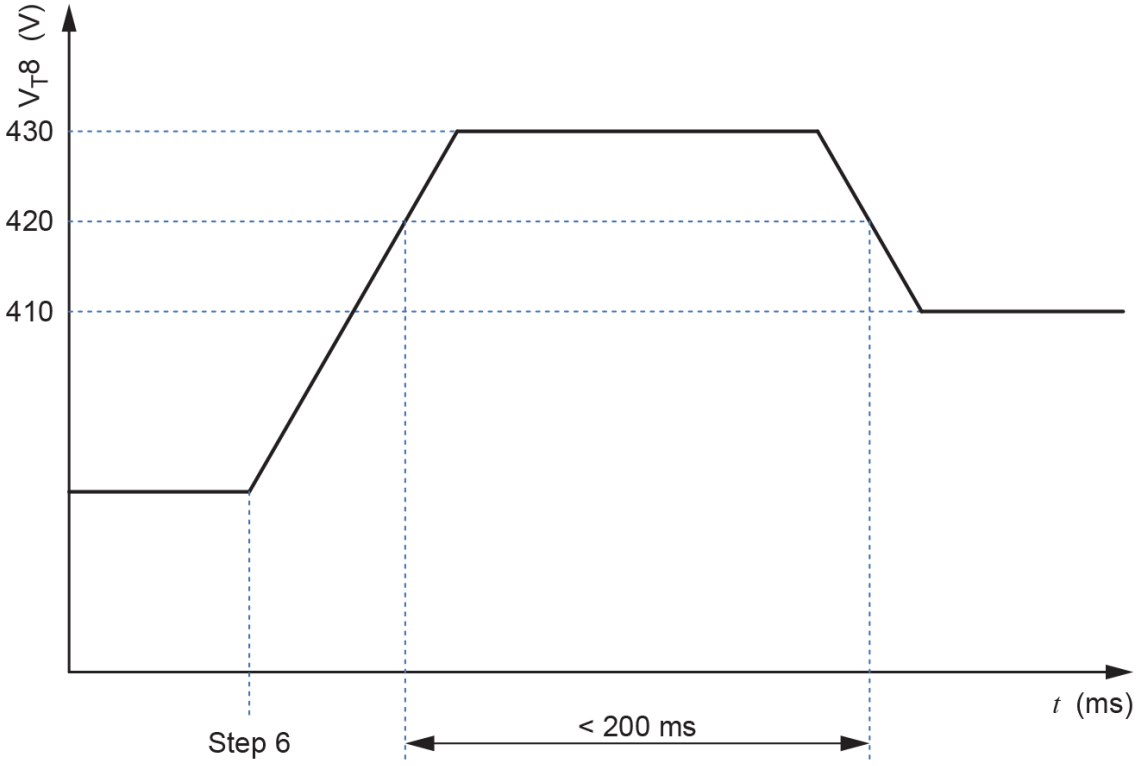



圖 102 – 施加電壓 $V_T8$，模擬 B 側 DC+及 DC–間短時間過電壓

Figure 102 – Voltage $V_T8$ to apply to simulate short period overvoltage at side B between DC+ and DC–

**6.3.1.107 車輛端插頭上閂鎖之查證(Verification of vehicle connector latching)**

本節僅適用於 EV 供電設備如系統 A 及系統 B，其負責車輛端插頭上閂鎖。

Subclause 6.3.1.107 is only applicable for EV supply equipment such as system A and system B, which are responsible for latching of vehicle connector.

當車輛端插頭未解鎖時，EV 供電設備不得通電 B 側纜線組。

The EV supply equipment shall not energize the side B cable assembly when the vehicle connector is unlatched.

藉檢驗、操作及系統 A AA.3.6、系統 B BB.5.9 查核符合性。

Compliance is checked by inspection, operation and AA.3.6 for system A, BB.5.9 for system B.

**6.3.1.108 控制電路供電之完整性(Control circuit supply integrity)**

若 B 側電路偵測到接地故障、短路或過電流，則 EV 供電設備之控制電路電源不得中斷，直到 FPT 序列完成及車輛耦合器安全解鎖。

If an earth fault, short-circuit or overcurrent is detected at side B, the power supply for the control circuit of the EV supply equipment shall not be interrupted until the FPT sequence is completed and the vehicle coupler is safely unlatched.

以下試驗依表 109 查核符合性。

Compliance is checked by the following tests according to Table 109.

表 109 控制電路供電完整性試驗

Table 109 – Control circuit supply integrity test

| 故障情境<br>Fault scenario | 系統A<br>System A | 系統A<br>System B | 系統A<br>System C |
|---|---|---|---|
| **接地故障<br>Earth fault** | AA.3.1.2 | BB.5.11 | CC.7.5.16 |
| **短路Short-circuit** | AA.3.8.3 | BB.5.8 | CC.7.5.18 |
| **過電流<br>Overcurrent** | AA.3.4 | 設計審查<br>Design review [a] | 設計審查<br>Design review |
| a系統B應依圖BB.1設計FS1及SS2<br>[a]For system B, FS1 and $S_S2$ shall be designed according to Figure BB.1. | | | |

**6.3.1.109 電能傳輸前短路查核(Short-circuit check before energy transfer)**

EV 搭接於 EV 供電設備及 EV 斷開裝置閉合前，EV 供電設備應有方法查核 B 側帶電部件(DC+/DC-)間之短路，直到 EV 斷連裝置間。

With the EV mated to the EV supply equipment and before the EV disconnection device is closed, the EV supply equipment shall have a means to check for a short-circuit between side B live parts (DC+/DC–) up to the EV disconnection device.

若偵測到短路，EV 供電設備應執行錯誤停機。

If short-circuit is detected, the EV supply equipment shall perform an error shutdown.

藉以下試驗查核系統 A 及系統 B 之符合性依。

Compliance for system A and system B is checked by the following test.

系統 C 參照 CC.7.5.22。

For system C, see CC.7.5.22.

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 針對每一系統，連接 EV 供電設備於具有專用試驗負載之 EV 模擬器。

1) Connect the EV supply equipment to a test load with dedicated EV simulator for each system.

(2) $S_T17$ 及 $S_T18$ 斷開。

2) $S_T17$ and $S_T18$ are open.

(3) 短路電阻 $R_T2$ 應為 100 Ω ±20 %。短路電感 $L_T1$ 應為 0 mH。

3) The short-circuit resistance $R_T2$ shall be 100 Ω ± 20 %. The short-circuit inductance $L_T1$ shall be 0 mH.

(4) 開關 $S_T8$ 斷開。

4) Switch ST8 is open.

(5) 藉接通開關 $S_T8$ 以模擬 B 側 DC+與 DC-間之短路。

5) Simulate the short-circuit at side B between DC+ and DC– by closing the switch ST8.

(6) 依 EV 供電設備製造商指定之程序開始電能傳輸。

6) Start energy transfer with the procedure defined by the EV supply equipment manufacturer.

(7) 於 $S_T17$ 及 $S_T18$ 容許閉合前，EV 供電設備應觸發錯誤停機。

7) The EV supply equipment shall trigger an error shutdown before ST17 and ST18 are allowed to close.

**6.3.1.110 使用者啟動關機(User initiated shutdown)**

於耦合期間，EV 供電設備應有措施，以容許使用者隨時啟動正常關機。

此措施之活化，取決於使用者之授權。

The EV supply equipment shall have a means to allow the user to initiate a normal shutdown anytime during the coupling session. The activation of this means may depend on an authorization by the user.

備考 1：EV 亦可有由使用者啟動正常關機之措施。

NOTE 1 The EV can also have a means for the user to initiate a normal shutdown.

備考 2：對於系統 A，措施亦可能觸發錯誤停機。

NOTE 2 For system A, a means to trigger an error shutdown is also possible.

依 AA.8、BB.4.5 及 CC.7.5.20 之試驗查核符合性。

Compliance is checked by the tests in AA.8, BB.4.5 or CC.7.5.20.

**6.3.1.111 並聯導體之過載保護(條件性功能) (Overload protection for parallel conductors (conditional function) )**

若一個以上導體或電線用於並聯，EV 供電設備設計應使得無任何導體或電線過載。

If more than one conductor or wire is used in parallel, the EV supply equipment shall be designed such that none of the conductors or wires will be overloaded.

查證並聯導體以查核符合性：

Compliance is checked by verifying that the parallel conductors

— 相同長度。

– are the same length,

— 包含相同導體材料。

– consist of the same conductor material,

— 相同之截面積。

– are the same cross-section,

— 相同絕緣型式。

– have the same insulation type, and

— 相同終端方式。

– are terminated in the same manner.

若一個以上車輛端插頭接腳用於並聯 DC+或 DC-，EV 供電設備設計應無任何接腳過載。

If more than one vehicle connector contact is used in parallel for DC+ or DC–, the EV supply equipment shall be designed such that none of the contacts will be overloaded.

備考：例：可監測不同路徑上之電流、接腳溫度，或可使用一個以上的電源。

NOTE For example, the currents on the different path can be monitored, the contact temperature can be monitored, or more than one power source can be used.

藉設計審查查核符合性。

Compliance is checked by design review.

**6.3.1.112 B 側帶電部件(DC+及 DC-)與保護性導體間之電壓限制值(Voltage limitation between side B live parts (DC+ and DC–) and protective conductor)**

**6.3.1.112.1 正常操作下，B 側帶電部件(DC+及 DC-)與保護性導體間之最高電壓(Maximum voltage between side B live parts (DC+ and DC–) and protective conductor under normal operation)**

B 側在正常操作情況下，DC+與 DC-加 50 Vdc 間無電壓超過當下電壓，應發生於帶電部件( DC+及 DC-)與保護性導體間。此電壓限制值不適用於暫態過電壓。參照圖 103 及圖 104。

Under normal operation, at side B, no voltage more than the present voltage between DC+ and DC– plus 50 V DC shall occur between live parts (DC+ and DC–) and protective conductor. This voltage limitation does not apply for transient overvoltages. See Figure 103 and Figure 104.

EV 供電設備之零組件可疊加共模電壓到 B 側保護性導體之當下電壓，例：IMD(絕緣監測裝置)。此可轉移 B 側帶電部件(DC+/DC-)與保護性導體間之電壓， 達到 B 側當下電壓+50 Vdc。

Components of the EV supply equipment, for example, an IMD, may superimpose a common mode voltage to protective conductor onto the present voltage at side B. This may shift the voltage between side B live parts (DC+/DC–) and the protective conductor up to present voltage at side B plus 50 V DC.

例：電阻，EV 供電設備之零組件可經由電阻轉移 B 側每一帶電部件(DC+/DC-)至保護性導體，其會導致大的 B 側共模電壓動盪。

Components of the EV supply equipment, for example, resistors, may shift each side B live part (DC+/DC–) up to protective conductor through a resistor, which results in a large common mode side B voltage swing.

若連接至中介匯流排電壓，量測電路可能引入較大的共模電壓偏差，此等電路之電壓偏移，不得造成超過 6.3.1.112.要求。

The measurement circuits might introduce a larger common mode voltage offset if connected to an intermediate bus voltage. These circuits shall not cause a voltage shift that is more than the requirements in 6.3.1.112.

EV 供電設備可以採用被動及/或主動技術，以最小化接觸脈衝電流，可能與 EV 供電設備之 IMD 或接地故障監測裝置協調。

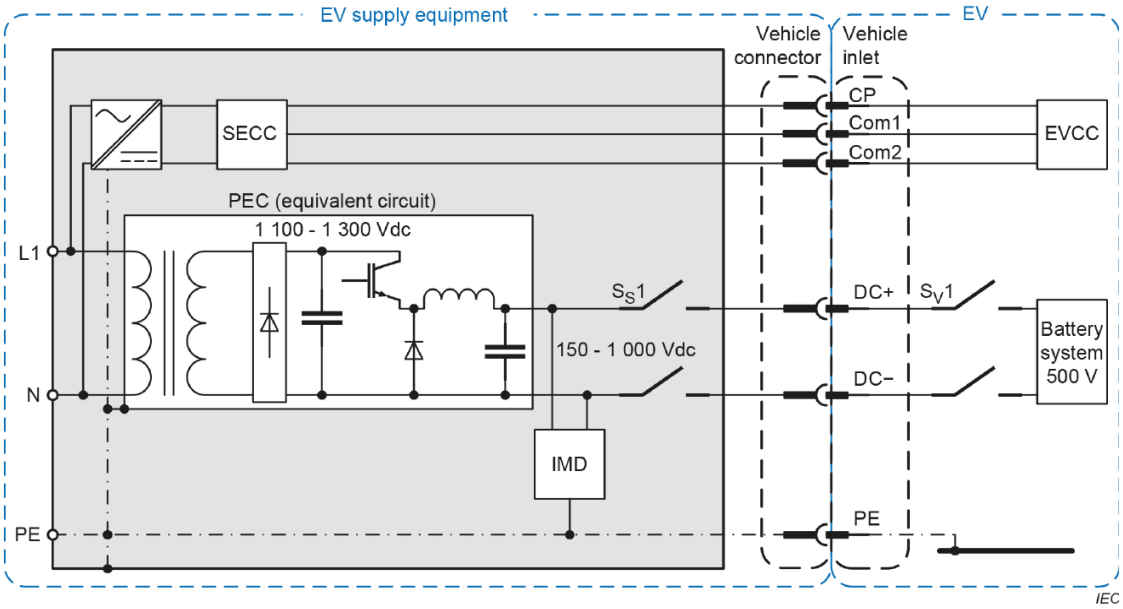
The EV supply equipment may employ passive and/or active techniques to minimize the touch impulse current, possibly in coordination with the IMD or earth fault monitor of the EV supply equipment.

備考：接近對稱，B 側帶電部件(DC+/DC－)與保護性導體間電壓，有助於最小化接觸派充電流。

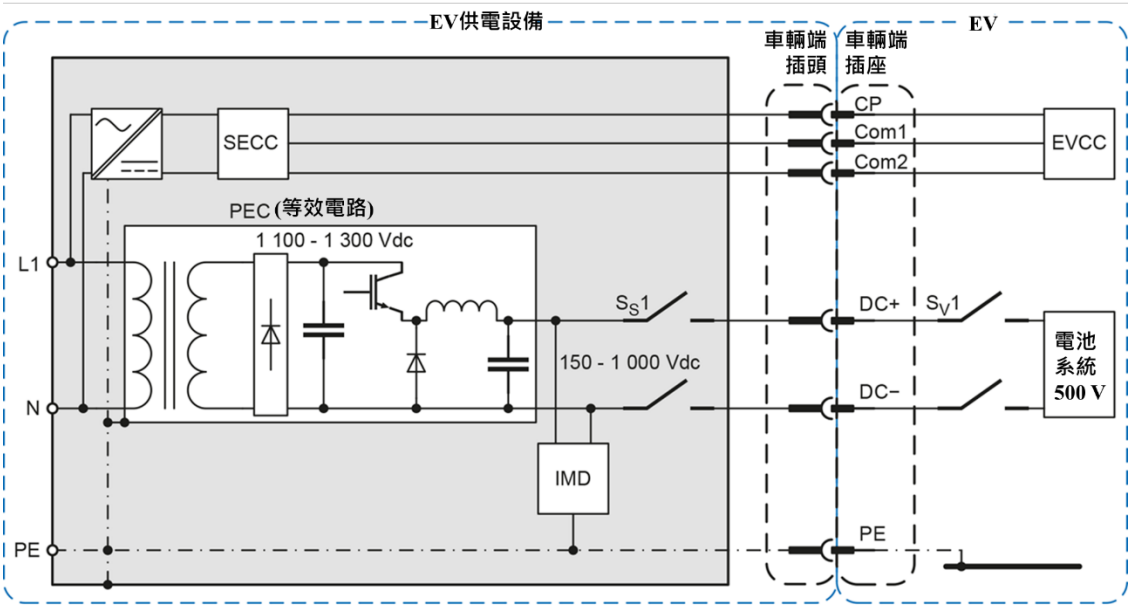
NOTE Close to symmetrical, voltages between side B live parts (DC+/DC–) and the protective conductor help to minimize the touch impulse current.

圖 103 為正確實施之範例，圖 104 為不正確實施之範例。

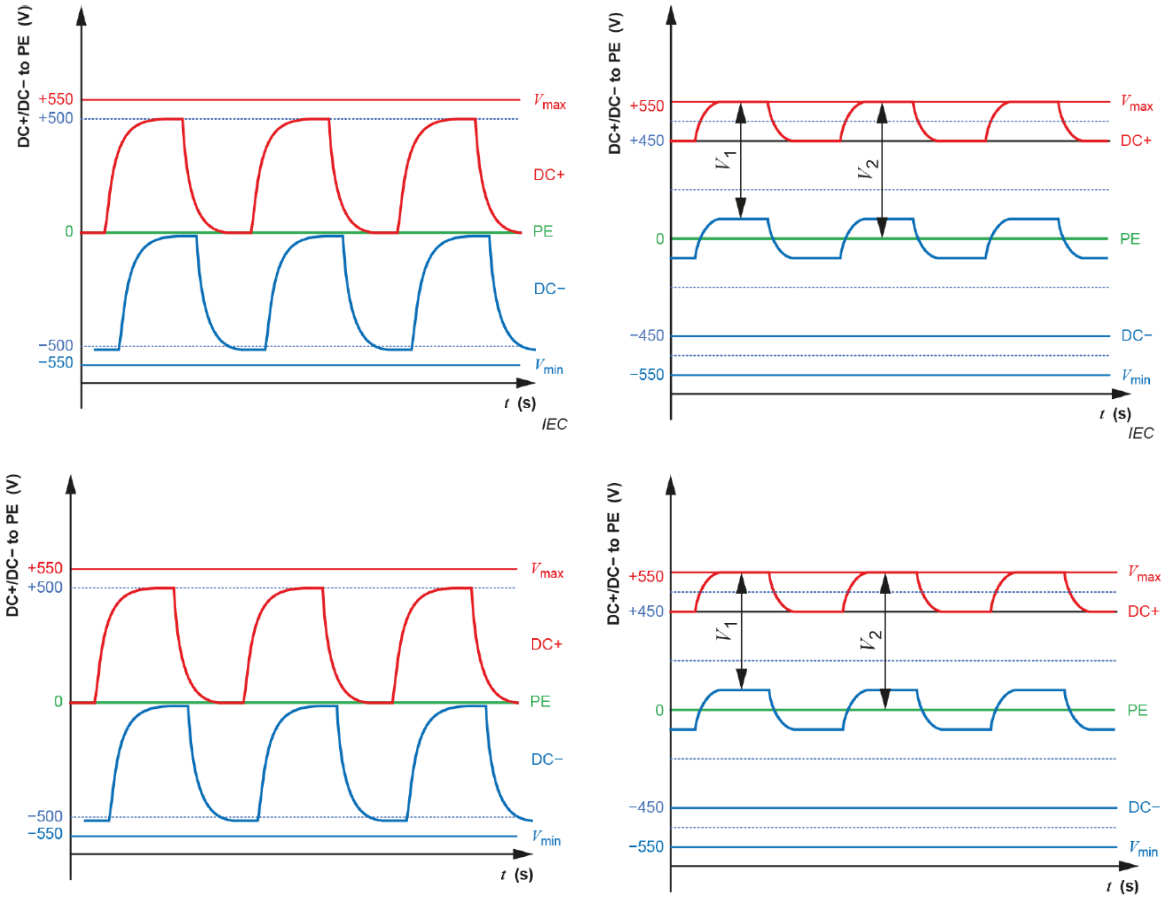
Figure 103 shows an example of a correct implementation and Figure 104 shows an example of an incorrect implementation




a) Typical IMD implementation




(a) 實施標準 IMD




(b)帶有開關電阻的 IMD 實施波形

b) Waveform of an IMD implementation with a switched resistor

(c)帶有脈衝信號的 IMD 實施波形

c) Waveform of an IMD implementation with a pulsed signal

說明

key

| | | | |
|---|---|---|---|
| V1 | B 側之 DC+及 DC-間電壓<br>voltage at side B between DC+ and DC– | Vmax | DC+及 DC-之電壓上限值<br>upper voltage limit for DC+ and DC– |
| V2 | 包括 IMD 之最大共模電壓(即參考 PE)<br>maximum common mode voltage (that is, with reference to PE) including IMD | Vmin | DC+及 DC-之電壓下限值<br>lower voltage limit for DC+ and DC– |
| PE | 保護性導體<br>protective conductor | | |

備考 1：若 DC+/DC－與保護性導體間之電壓>704 Vdc，則無法滿足依 8.105.1 特殊保護規定要求之 C1 脈衝電流限制要求。

NOTE 1 If the voltage between DC+/DC– and protective conductor is > 704 V DC,

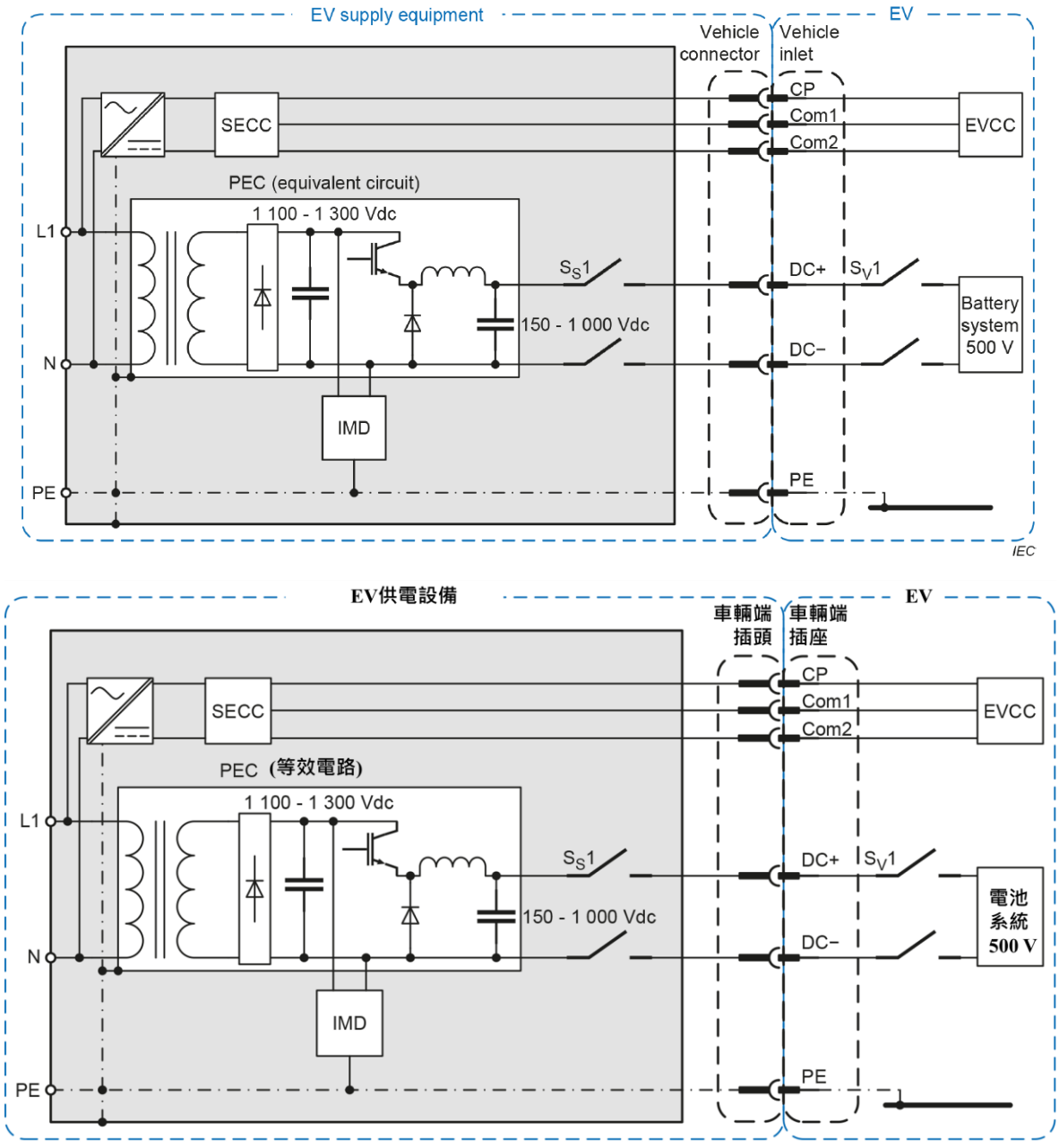
the required C1 impulse current limitation specified as special protection in 8.105.1 cannot be met.

備考：系統 A 需要相對低之接地電阻以進行接地洩漏電流監測，且在正常操作條件下，不會出現圖 103 所示的大偏差。

NOTE 2 System A requires relatively low earthing resistance for earth leakage current monitoring, and large offset shown in Figure 103 does not occur in normal operational condition.

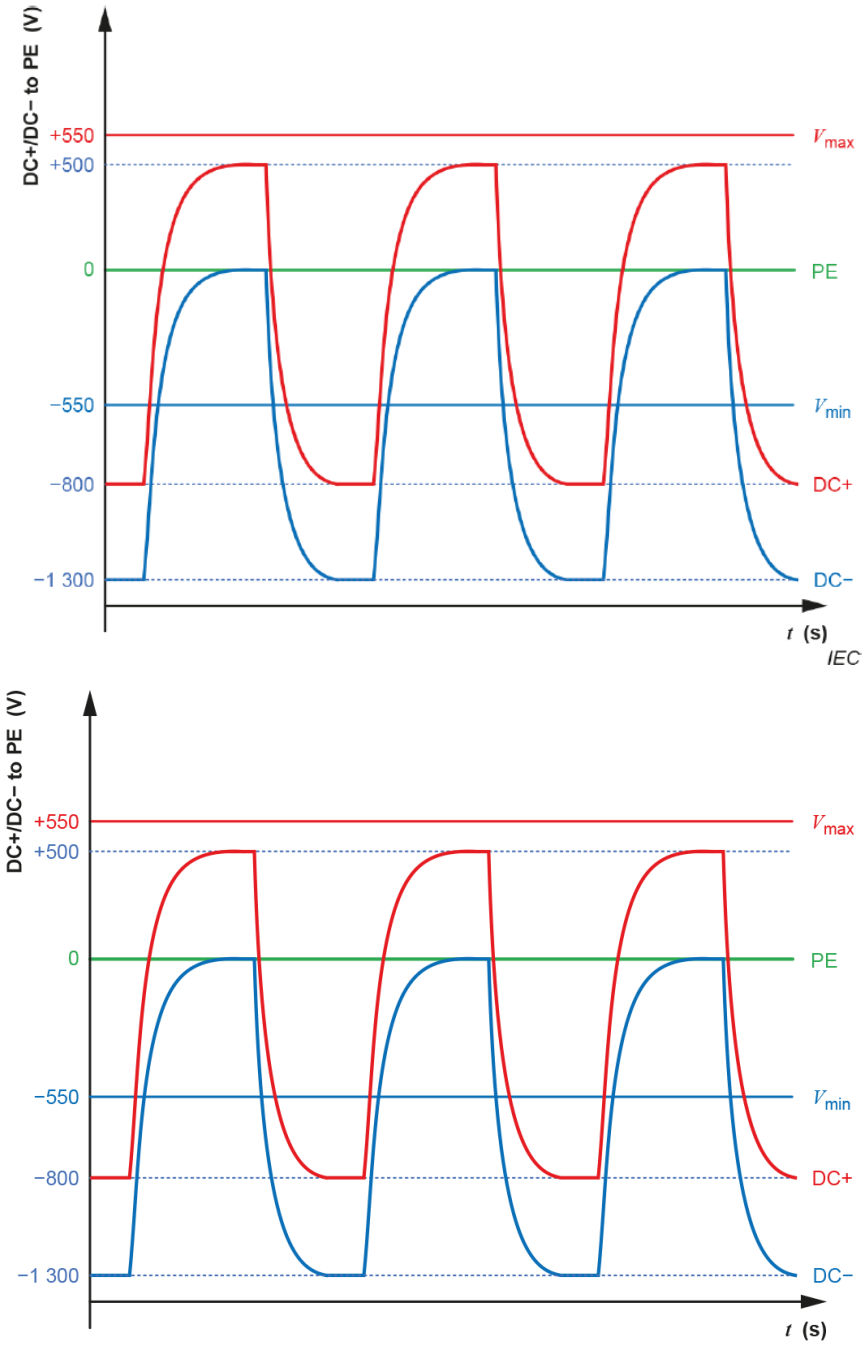
圖 103 – 正常操作下，B 側帶電部件與保護性導體間之標準的電壓

Figure 103 – Typical voltages between side B live parts (DC+/DC–) and protective conductor under normal operation




(a) 實施 IMD 不正確

a) Incorrect IMD implementation




(b) 實施 IMD 不正確波形

b) Waveform of an incorrect IMD implementation

說明 key

| | | | |
|---|---|---|---|
| Vmax | DC+及 DC-之電壓上限值<br>upper voltage limit for DC+ and DC– | PE | 保護性導體<br>protective conductor |

*V*min DC+及 DC-之電壓下限值
lower voltage limit for DC+ and DC–

圖 104 –導致電壓超過之最高電壓限制值的 IMD 連接

Figure 104 – IMD connection which results in a voltage more than the maximum voltage limits

藉以下試驗查核符合性：

Compliance is checked by the following test:

系統 A 試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system B is shown in Figure 130. The test setup for system C is shown in Figure 131.

(1) 試驗預調適

1) Preconditions for the test:

— 為了不限制操作範圍，相容性查核期間(參照 6.3.1.104)，EV 模擬器應使用以下限值：$V_{EV_rated_max} = V_{EVSE_rated_max_sideB}$ 及 $I_{EV_rated_max} = I_{EVSE_rated_boost_sideB}$

— The EV simulator shall use the following limits $V_{EV_rated_max} = V_{EVSE_rated_max_sideB}$ and $I_{EV_rated_max} = I_{EVSE_rated_boost_sideB}$ during the compatibility check (see 6.3.1.104) in order to not limit the operating range.

— 系統 A 及系統 C： 為達到並維持電力傳輸，EV 模擬器於此試驗期間應汲取電流。

– For system A and system C: The EV simulator shall draw current during this test, in order to reach and maintain power transfer.

(2) 應施加以下電壓及電流值：

2) The following voltage and current values shall be applied:

– $V_{EV\ simulator} = 0.8 \times V_{EVSE_rated_max_sideB}$

– VEV simulator = 0,8 × $V_{EVSE_rated_max_sideB}$

– $I_{EVSE\ intended} = I_{EV_trg} = I_{EVSE_rated_boost_sideB} / 2$

(3) 執行以下動作

3) Perform the following actions:

—系統 A：

– For system A:

(i) FPT 序列持續進行，直到狀態 DC-C（電能傳輸）。

i) The FPT sequence shall be successfully done until state DC-C (energy transfer).

(ii) 等候直到 AT1 ≥ IEVSE 之 80 % 持續 5 s。

ii) Wait until AT1 ≥ 80 % of IEVSE intended for 5 s.

(iii) 量測 VT6, VT7 及 VT8 持續 100 s。

iii) Measure VT6, VT7 and VT8 continuously for 10 s.

—系統 B：

– For system B:

(i)持續進行 FPT 序列直到 t6(IMD 已啟用)。

i) The FPT sequence shall be successfully done until t6 (IMD enabled).

(ii) t6(查核絕緣電阻)期間，等候直到 VT8 ≥ VEVSE max 之 80 %。

ii) During t6 (insulation resistance check), wait until VT8 ≥ 80 % of VEVSE_max.

(iii) 量測 VT6, VT7 及 VT8 持續 100 s。

iii) Measure VT6, VT7 and VT8 continuously for 100 s.

—系統 C：

– For system C:

(i) 依圖 CC.5，持續進行 FPT 序列直到 t=t8，包括訊息〝PowerDeliveryReq〞(依 DIN SPEC 70121:2014 或 ISO 15118:2014)。

i) The FPT sequence shall be successfully done until t = t8 according to Figure CC.5, including the message "PowerDeliveryReq" (according to DIN SPEC 70121:2014 or ISO 15118-2:2014).

(ii)等候直到 AT1 ≥ IEV_trg 之 80 % 持續 5 s.

ii) Wait until AT1 ≥ 80 % of IEV_trg for 5 s.

(iii) 量測 VT6, VT7 及 VT8 持續 100 s。

iii) Measure VT6, VT7 and VT8 continuously for 100 s.

為濾除暫態，應採用低通濾波器。建議擷取頻率：10~200 Hz。

Low pass filter shall be applied, in order to filter out transients. Recommended cut-off frequency: 10 Hz to 200 Hz.

4) 查核預期結果：

4) Check the expected results:

$V_T6$ 及 $V_T7$ 應不大於以下限值：

VT6 and VT7 shall be less than or equal to the following limit:

|VT6| ≤ VT8 + 50 V DC 及 |VT7| ≤ VT8 + 50 V DC

|VT6| ≤ VT8 + 50 V DC and |VT7| ≤ VT8 + 50 V DC

6.3.1.112.2 若 B 側對保護性導體絕緣故障，B 側帶電部件(DC+/DC-)與保護性導體間之最高電壓

Maximum voltage between side B live parts (DC+/DC–) and protective conductor in case of an insulation fault at side B to the protective conductor

不包括 B 側纜線總成，EV 供電設備 B 側與保護性導體間之絕緣要求視工作電壓而定，參照 8.105.5。

The insulation requirements between side B of the EV supply equipment and the protective conductor, excluding the side B cable assembly, depend on the working

voltage. See 8.105.5.

情形 1：B 側之工作電壓在≤ 550 Vdc，應提供此部件分電路與保護性導體間的基本保護。

Case 1: For a side B with a working voltage of ≤ 550 V DC, basic protection shall be provided between this part of the circuit and the protective conductor.

依檢驗查核符合性。

Compliance is checked by inspection

情形 2：B 側之工作電壓大於 550 Vdc，若保護性導體故障造成 B 側帶電部件(DC+/DC-)與保護性導體之電壓不大於 B 側當下電壓的 110 %，應提供此部件電路與保護性導體間基本保護，參照圖 109 故障 A。

Case 2: For a side B with a working voltage of > 550 V DC, if a fault to the protective conductor causes a voltage between side B live parts (DC+/DC–) and protective conductor of less than or equal to 110 % of the present voltage at side B, basic protection shall be provided between this part of the circuit and the protective conductor. See fault A in Figure 105.

依檢驗查核符合性。

Compliance is checked by inspection.

情形 3：B 側之工作電壓高於 550 V 時，若保護性導體故障導致 B 側帶電部件(DC+/DC-)與保護性導體間之電壓大於 B 側 DC+與 DC-間當下電壓 110 %，則應提供此部件電路與保護性導體間雙重或強化保護，參照圖 105 故障 B。

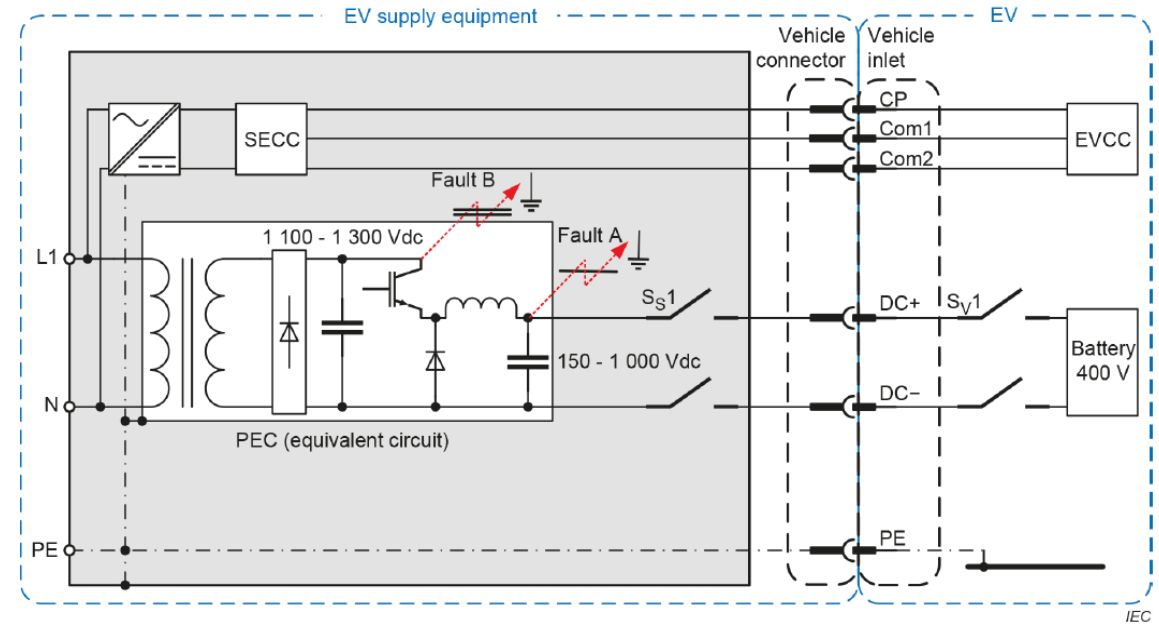
Case 3: For a side B with a working voltage of > 550 V DC, if a fault to the protective conductor causes a voltage between side B live parts (DC+/DC–) and the protective conductor of more than 110 % of the present voltage at side B between DC+ and DC–, double or reinforced protection shall be provided between this part of the circuit and the protective conductor. See fault B in Figure 105.

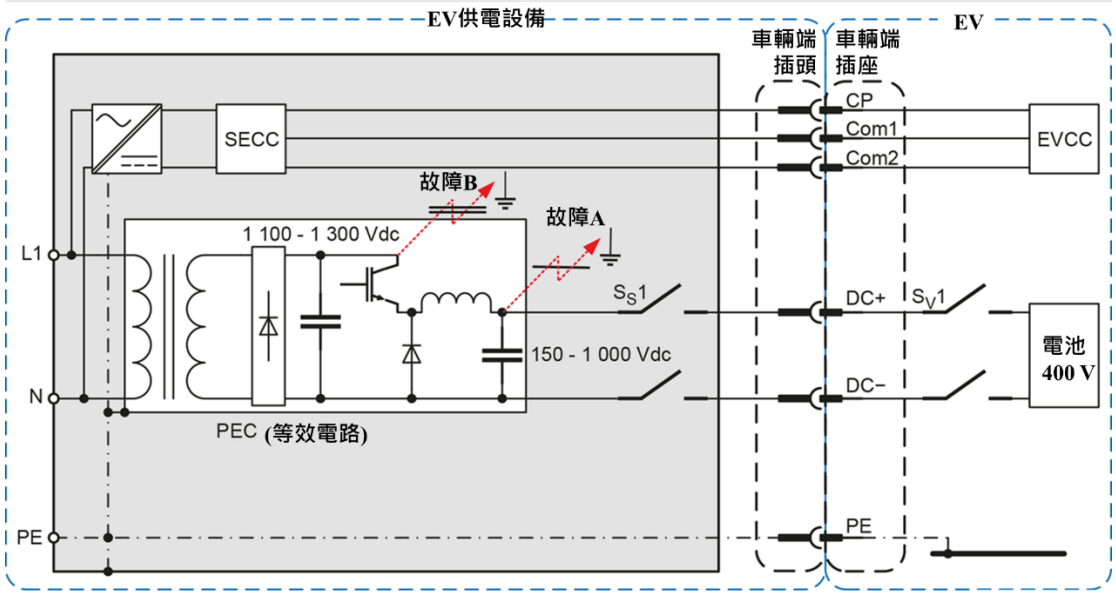
備考 1：閾值 550 Vdc 向後相容於 CNS 15511-23:2014。依檢驗查核符合性。

NOTE 1 Threshold of 550 V DC is due to backward compatibility with IEC 61851-23:2014.

依檢驗查核符合性。

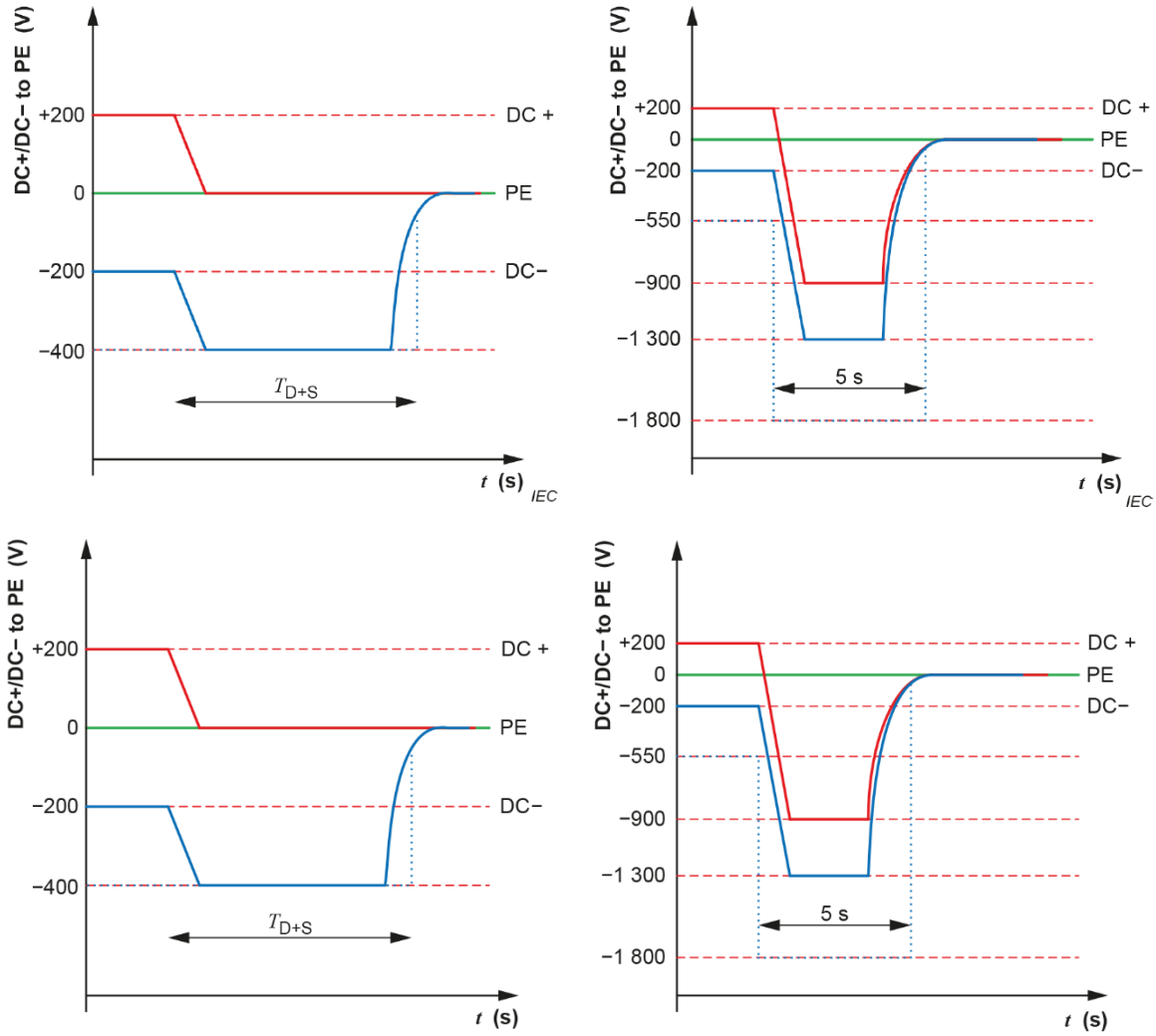
Compliance is checked by inspection.




(a) 故障位置

a) Fault locations




b) 故障 A 波形　　c) 故障 B 波形

b) Waveform of fault A　　c) Waveform of fault B

說明

key

| | |
|---|---|
| PE | 保護性導體 protective conductor |
| $T_{D+S}$ | IMD/接地洩漏電流監測裝置之偵測時間+錯誤關閉時間 detection time of the IMD/earth leakage current monitoring device plus the error shutdown time |
| 單線(single line) | 基本絕緣(參照故障 A)basic insulation (see fault A) |
| 雙線 (double lines) | 雙重絕緣或基本絕緣及電氣保護性屏蔽(遮蔽)或強化絕緣，參照故障 B。double insulation or basic insulation and electrically protective screening (shielding) or reinforced insulation (see fault B) |

圖 105 －二次側電路及保護性導體間之故障案例

Figure 105 – Examples of a fault between the secondary circuit and the protective conductor

故障條件下，以下要求適用於保護性導體。

The following requirements apply under a fault to the protective conductor.

基於情形 3 之 EV 供電設備，B 側 EVSE 具有額定最高電壓≤ 500 Vdc：

For EV supply equipment based on case 3, with a rated maximum voltage of the EV supply equipment at side B of ≤ 500 V DC:

若 B 側帶電部件(DC+/DC-)與保護性導電間當下電壓大於 550 V 超過 1 s，EV 供電設備應於 4 s 內觸發並完成錯誤停機，參照圖 105。

if a voltage > 550 V DC is present for more than 1 s between side B live parts (DC+/DC–) and the protective conductor, the EV supply equipment shall trigger and complete an error shutdown in 4 s or less. See Figure 105.

基於情形 3 之 EV 供電設備，EV 供電設備 B 側以額定最高電壓> 500 Vdc 且 ≤ 1000 Vdc：

For EV supply equipment based on case 3, with a rated maximum voltage of the EV supply equipment at side B of > 500 V DC and ≤ 1 000 V DC:

若 B 側帶電部件(DC+/DC-)與保護性導體間之電壓超過 B 側 DC+與 DC-間當下電壓 110 %超過 1 s，則 EV 供電設備應於 4 s 內觸發並完成錯誤停機，參照圖 105。

if a voltage more than 110 % of the present voltage at side B between DC+ and DC– is present for more than 1 s between side B live parts (DC+/DC–) and the protective conductor, the EV supply equipment shall trigger and complete an error shutdown in 4 s or less. See Figure 105.

保護性導體故障後 5 s 內，EV 供電設備應暫時限制 B 側帶電部件(DC+/DC-)與保護性導體間過電電壓 Vtov 為 1800 Vdc。

In 5 s or less after a fault to the protective conductor, the EV supply equipment shall limit the temporary overvoltage Vtov between side B live parts (DC+/DC–) and the protective conductor to 1 800 V DC.

備考 2：B 側電壓 DC+與 DC-間>1000Vdc 在研議中。

NOTE 2 Side B voltages between DC+ and DC– > 1 000 V DC are under consideration.

依以下試驗查核符合性。

Compliance is checked by the following tests.

系統 A 之試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

系統 C 試驗裝置如圖 131 所示。

The test setup for system C is shown in Figure 131.

DC-與保護性導體間之試驗：

Test between DC– and the protective conductor:

(1) 針對每一系統，連接 EV 供電設備於具有專用試驗負載之 EV 模擬器。

1) Connect the EV supply equipment to a test load with dedicated EV simulator for each system.

(2) 量測 VT6、VT7 之電壓及 AT1 的電流

2) Measure voltages VT6, VT7, VT8 and current AT1.

(3) 依 EV 供電設備製造商指定之程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) 確認 OP2 操作點依圖 133 規定

4) Confirm that the operating point is at OP2 as specified in Figure 133.

(5) 故障條件之先決條件：

5) Preconditions for the fault condition:

(a) $R_T4$ 應為 150 kΩ

a) $R_T4$ shall be 150 kΩ;

(b)為了設定 $U_T2$，當 ST10 閉合時，

b) $U_T2$ shall be set in order that, when $S_T10$ is closed, $V_T7$ is

(i) 若 $V_{EVSE_rated_max_sideB} > 500$ V dc，則 $V_T7$ 為 $0.1 \times V_{EVSE_rated_max_sideB}$ 或

i) (0,1 × VEVSE_rated_max_sideB) if VEVSE_rated_max_sideB is > 500 V DC, or

(ii) 若 VEVSE_rated_max_sideB ≤ 500 V dc，則 VT7 為 550 V - VEVSE_rated_max_sideB。

ii) 550 V – VEVSE_rated_max_sideB if VEVSE_rated_max_sideB is ≤ 500 V DC.

(6) 閉合 ST10

6) Close ST10.

(7) 查核 EV 供電設備執行錯誤停機

7) Check that the EV supply equipment performs an error shutdown.

(8) ST10 閉合後，查核 VT6 及 VT7 於 5 s 內< 60V dc

8) Check that VT6 and VT7 are < 60 V DC in 5 s or less after closing ST10.

DC+與保護性導體間之試驗

Test between DC+ and the protective conductor.

(1) 針對每一系統，連接 EV 供電設備於具有專用試驗負載之 EV 模擬器。

1) Connect the EV supply equipment to a test load with dedicated EV simulator for each system.

(2) 量測 VT6、VT7 之電壓及 AT1 的電流

2) Measure voltages VT6, VT7, VT8 and current AT1.

(3) 依 EV 供電設備製造商指定之程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) 確認 OP2 操作點依圖 133 規定。

4) Confirm that the operating point is at OP2 as specified in Figure 133.

(5) 故障條件的先決條件：

5) Preconditions for the fault condition:

(a) $R_T3$ 應為 150kΩ

a) $R_T3$ shall be 150 kΩ;

(b)為設定 $U_T1$，當 $S_T9$ 閉合時，

b) $U_T1$ shall be set in order that, when $S_T9$ is closed, $V_T6$ is

(i) 若 $V_{EVSE_rated_max_sideB}$ > 500 V dc，則 VT6 為-(0.1×$V_{EVSE_rated_max_sideB}$)或

i) –(0,1 × $V_{EVSE_rated_max_sideB}$) if $V_{EVSE_rated_max_sideB}$ is > 500 V DC, or

(ii) 若 $V_{EVSE_rated_max_sideB}$ ≤ 500 V dc，則 $V_T6$ 為-550 V + $V_{EVSE_rated_max_sideB}$。

ii) –550 V + $V_{EVSE_rated_max_sideB}$ if $V_{EVSE_rated_max_sideB}$ is ≤ 500 V DC.

(6) 閉合 $S_T9$。

6) Close $S_T9$.

(7) 查核 EV 供電設備執行錯誤停機。

7) Check that the EV supply equipment performs an error shutdown.

(8) 閉合 $S_T10$ 後 5s 內，查核 $V_T6$ 及 $V_T7$< 60V dc

8) Check that $V_T6$ and $V_T7$ are < 60 V DC in 5 s or less after closing $S_T9$.

備考 3：試驗可模擬 EV 供電設備或 EV 之故障。

NOTE 3 The tests simulate a fault that can either be in the EV supply equipment or EV.

**6.3.1.113 EV 供電設備之關機(Shutdown of the EV supply equipment)**

**6.3.1.113.1 一般(General)**

關機序列結束時， EV 供電設備應降低 B 側當下電流至不大於 5 Adc，且應設計使得 B 側當下電壓於 DC+與 DC-間、DC+與保護性導體間及 DC-與保護性導體間不大於 60 Vdc。

At the end of the shutdown stage, the EV supply equipment shall reduce the present current at side B to ≤ 5 A DC and shall be designed such that the present voltage at side B remains ≤ 60 V DC between DC+ and DC–, between DC+ and the protective conductor, and DC– and the protective conductor.

依 ISO 17409:2020 之 6.5.2，當未連接時，EV 於 DC+與 PE 間及 DC-與 PE 間的電壓可 > 60 Vdc 及 >30 Vac。

According to ISO 17409:2020, 6.5.2, when unmated, the EV may have a voltage > 60 V DC and > 30 V AC between DC+ and PE, and between DC– and PE.

EV 供電設備可藉 IMD 或漏電流監測裝置，以降低 B 側 DC+與保護性導體間及 DC-與保護性導體間之電壓至≤ 60 V dc。

The IMD or the earth leakage current monitoring device may be used by the EV supply equipment to reduce the voltage at side B to ≤ 60 V DC between DC+ and the

protective conductor, and DC– to the protective conductor.

**6.3.1.113.2 正常關機(Normal shutdown)**

正常關機為 EV 或 EV 供電設備本身反應，或使用者互動產生的結果，除了出現失效之外的其他原因。

Normal shutdown occurs as a result of an intrinsic reaction of the EV or the EV supply equipment or a user interaction, for other reasons than the presence of a failure.

正常關機序列結束時，EV 供電設備應調降並維持：

At the end of the normal shutdown sequence, the EV supply equipment shall reduce and maintain:

—當下 B 側電流≤ 5 Adc。

– the present current at side B ≤ 5 A DC, and

— DC+與 DC-間、DC+與保護性導體間及 DC-與保護性導體間之當下電壓 B 側維持≤ 60 Vdc。

– the present voltage at side B ≤ 60 V DC between DC+ and DC–, DC+ and the protective conductor, and DC– and the protective conductor.

更多要求規定於 AA.4.3.5.1、BB.4.5 及 CC.3.3。

Further requirements are specified in AA.4.3.5.1, BB.4.5 and CC.3.3.

**6.3.1.113.3 錯誤停機(Error shutdown)**

由 EV 供電設備觸動錯誤停機後，EV 供電設備應調降並維持：

After the error shutdown is triggered by the EV supply equipment, the EV supply equipment shall reduce and maintain:

— B 側當下電流≤ 5 A。

– the present current at side B ≤ 5 A, and

— 在 B 側 DC+與 DC-間、DC+與保護性導體間及 DC-與保護性導體間之當下電壓≤ 60 Vdc。

– the present voltage at side B ≤ 6 0 V DC between DC+ and DC–, between DC+ and the protective conductor, and DC– and the protective conductor.

計時及啟動錯誤停機之更多要求：

Timing and further requirements to initiate an error shutdown are specified

– 系統 A 規定於 AA.3.8.1 及 AA.4.3.5.2。

– for system A, in AA.3.8.1 and AA.4.3.5.2,

– 系統 B 規定於 BB.5.1。

– for system B, in BB.5.1, and

– 系統 C 規定於 CC.3.4。

– for system C, in CC.3.4.

備考：符合性試驗查證關機時間，其包含 AA.3.8.1, AA.4.3.5.2, BB.5.1 and CC.3.4 定義之執行時間加觸發時間，其中錯誤停機為結果。若關機時間符

合具體要求，則無需查證觸發時間。

NOTE The compliance test verifies the shutdown time which consists of performance time plus trigger time as
defined in AA.3.8.1, AA.4.3.5.2, BB.5.1 and CC.3.4 where error shutdown is the consequence. The trigger time does
not need to be verified provided shutdown time complies with the specific requirement.

**6.3.1.113.4 緊急停機(Emergency shutdown)**

由 EV 供電設備觸動緊急停機後，EV 供電設施應調降並維持：

After the emergency shutdown is triggered by the EV supply equipment, the EV supply equipment shall reduce and maintain:

— B 側當下電流，系統 A 及 B 於 30 ms 內≤ 5 A，系統 C 於 20 ms 內≤ 5 A

– the present current at side B ≤ 5 A in 30 ms or less for system A and system B, and in 20 ms or less for system C, and

—B 側 DC+與 DC-間、DC+與保護性導體間及 DC-與保護性導體間之當下電壓，系統 A 及 C 於 1 s 內≤ 60 V，系統 B 於 500 ms 內≤ 60 V。

– the present voltage at side B ≤ 6 0 V DC between DC+ and DC–, between DC+ and the protective conductor, and DC– and the protective conductor in 1 s or less for system A and system C, and in 500 ms or less for system B.

備考 1：查核總時間之符合性，依各別節次定義，其包含上述時間加上觸發時間，緊急停機為結果。只要關機時間符合具體要求，則無需查證觸發時間。

NOTE 1 The compliance checks the total time, which consists of the timings above plus triggering time as defined
in the respective clauses where emergency shutdown is the consequence. The trigger time does not need to be
verified provided shutdown time complies with the specific requirement.

更多要求規定於 AA.4.3.5.3、BB.5.1 及 CC.3.4。

Further requirements are specified in AA.4.3.5.3, BB.5.1 and CC.3.4.

系統 A 及 B 之符合性依以下試驗查核。

Compliance for system A and system B is checked by the following test.

系統 C 依 CC.7.5.4 及 CC.7.5.8 查核符合性。

Compliance for system C is checked by CC.7.5.4 and CC.7.5.8.

系統 A 之試驗裝置如圖 129 所示。

The test setup for system A is shown in Figure 129.

系統 B 試驗裝置如圖 130 所示。

The test setup for system B is shown in Figure 130.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。

1) Connect the EV supply equipment to a test load with dedicated EV simulator with a test load for each system.

2) 依 EV 供電設備製造商指定之程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 確認 EV 供電設備 B 側之 VT8 額定最高電壓，且 EV 供電設備於 B 側額定最大電流下操作。

3) Confirm that VT8 is at the rated maximum voltage of the EV supply equipment at side B and the EV supply equipment is operating at the rated maximum current at side B.

(4) 依以下規定斷開每一系統之繼電器。

4) Open the relay for each system as specified below:

- 系統 A：ST5
- for system A: ST5;
- 系統 B：ST4
- for system B: ST4.

(5) EV 供電設備應觸發並完成緊急停機，依以下內容顯示相關的警報或錯誤訊息（若有）：

5) The EV supply equipment shall trigger and complete an emergency shutdown, displaying a relevant alarm or error information, if any, according to the following:

- 系統 A：依 AA.3.8.2。
- for system A, according to AA.3.8.2.
- 系統 B：參照 BB.5.1 及表 BB.3。
- for system B, according to BB.5.1 and Table BB.3.

6.3.2 模式 2、3 及 4 之選項功能 Optional functions for Modes 2, 3 and 4

取代本節標題:

Replacement of the title of this subclause:

6.3.2 模式 4 之選項功能(Optional functions for Mode 4)

6.3.2.1 一般(General)

取代:

Replacement:

若由 EV 供電設備提供，以下功能，應符合如下適用節次規定：

The following functions, if provided by the EV supply equipment, shall comply with applicable clauses as given below:

- 供電期間依 6.3.2.2 通風
- ventilation during supply of energy according to 6.3.2.2;

– 使用系統 C 之模式 4 依 6.3.2.4。

– Mode 4 using system C according to 6.3.2.4;

– EV 供電設備之睡眠模式依 6.3.2.101。

– sleep mode of the EV supply equipment according to 6.3.2.101;

– 於 B 側依 6.3.2.102.偵測/調整 EV 供電設備之可用最大電流。

– detection/adjustment of the applicable maximum current of the EV supply equipment at side B according to 6.3.2.102.

可提供其他追加功能。

Other additional functions may be provided.

~~備考：以下國家/地區，需要採取積極措施防止意外斷開：美國。~~

NOTE In the following countries, a positive means to prevent unintentional disconnect is required: US.

追加子節：

Additional subclauses:

**6.3.2.101 EV 供電設備之睡眠模式(Sleep mode of the EV supply equipment)**

EV 供電設備可支援睡眠模式，以最小化電力耗用。若支援睡眠模式，EV 供電設備應由 EV 執行喚醒功能喚醒。

The EV supply equipment may support a sleep mode to minimize power consumption. If a sleep
mode is supported, the EV supply equipment shall implement a wake-up function to be woken up by the EV.

對於系統 A， EV 供電設備應自 EV 接收到特定 CAN ID 後喚醒。

For system A, the EV supply equipment shall wake up by receiving the specific CAN ID from the EV.

依以下試驗查核符合性：

Compliance is checked by the following test:

(1) 設定 EV 供電設備睡眠模式。

1) Set the EV supply equipment in sleep mode.

(2) 由 EV 模擬器送出喚醒訊號至 EV 供電設備。

2) Send a wake-up signal from EV simulator to the EV supply equipment.

(3) EV 供電設備應

3) The EV supply equipment shall

— 系統 A：依 IEC 61851-24:2023 指明，接收到來自 EV 模擬器之 H’ 700 後，表 A.2 及 A.3，傳達 CAN 訊息 ID：H’ 708。

– for system A, communicate CAN message ID: H’708 after receiving H'700 from the EV simulator as indicated in IEC 61851-24:2023, Table A.2 and Table A.3,

— 系統 B：研議中。

– for system B, under consideration, and

— 系統 C：參照 CC.5.2。

– for system C, see CC.5.2.

於耦合期間 EV 供電設備喚醒功能之可用性，可取決於 EV 供電設備製造商定義的條件

The availability of the wake-up function of the EV supply equipment during a coupling session may depend on conditions defined by the EV supply equipment manufacturer.

**6.3.2.102 EV 供電設備 B 側可用最大電流之偵測/調整(Detection/adjustment of the applicable maximum current of the EV supply equipment at side B)**

EV 供電設備可變更 EV 供電設備 B 側可用最大電流且應經由數位通訊傳送至 EV。

The EV supply equipment may change the applicable maximum current of the EV supply equipment at side B and shall communicate it to EV via digital communication.

EV 宜依 EV 供電設備 B 側之可用最大電流變動限制 EV 目標電流。

The EV should limit the target current of the EV according to the change in the applicable maximum current of the EV supply equipment at side B.

EV 目標電流應不大於 EV 供電設備 B 側可用最大電流。

The target current of the EV shall be less than or equal to the applicable maximum current of the EV supply equipment at side B.

特定要求參照 AA.7.2、BB.13 及 CC.5.5。

For specific requirements, see AA.7.2, BB.13 and CC.5.5.

**7. 通訊(Communications)**

除以下之外，CNS 15511-1:2021 第 7 節適用。

IEC 61851-1:2017, Clause 7, is applicable, except as follows.

**7.1 EV 供電設備與 EV 間之數位通訊(Digital communication between the EV supply equipment and the EV)**

*追加:*

*Addition:*

本標準定義之保護性量測，不得倚賴 EV 供電設備與 EV 間之通訊值。

Protective measures defined in this document shall not rely on communicated values between the EV supply equipment and the EV.

附錄 GG 提供 EV 供電設備 (SECC)與 EV(EVCC)間對於通訊及 FTP 序列之一般資訊。

Annex GG provides general information on the communication and FTP sequence between the EV supply equipment (SECC) and the EV (EVCC).

對於系統 A 之 BPT 控制的數位通訊要求，規定於附錄 AA。

Requirements on the digital communication for BPT control for system A are

specified in Annex AA.

追加子節：

*Additional subclause:*

**7.1.101 基本通訊介面(Basic communication interface)**

對於 EV 供電設備控制導引功能之典型介面，規定於附錄 AA、附錄 BB 及附錄 CC，每一系統透過 CNS 15700-3 規定之控制導引導體及端子進行控制導引功能。

Typical interfaces of control pilot function on EV supply equipment are specified in Annex AA,Annex BB and Annex CC. Each system carries out control pilot function through the control pilot conductors and terminals specified in IEC 62196-3.

**8. 電擊防護(Protection against electric shock)**

以下取代 CNS 15511-1 第 8 節

IEC 61851-1:2017, Clause 8, is replaced with the following:

*取代*

*Replacement:*

**8.101 一般規定(General provisions)**

**8.101.1 一般(General)**

除本標準有其他規定外，電擊防護之要求，應依以下一個或多個標準：

Requirements for protection against electric shock shall be according to one or more of the

following standards, unless otherwise specified in this document:

– IEC 62477-1:2022;

– IEC 62368-1:2023;

– IEC 61439-7:2022.

系統 C 之追加要求如 CC.4.1。

Additional requirements for system C are shown in CC.4.1.

針對本標準之目的，EV 供電設備視為 PEC 設備的一種型式。

For the purposes of this document, the EV supply equipment is considered to be a type of PEC equipment.

依 IEC 62368-1:2018，基於安全模型之危害，可用於評估電擊防護。

Hazard based safety models according to IEC 62368-1:2023 may be used to evaluate protection against electric shock.

在預期使用及合理可預見誤用之條件下，在 EV 供電設備 B 側上之電擊防護包括潛在危害，應至少提供以下措施之一：

Protection against electric shock including potential hazards on side B of the EV supply equipment under conditions of intended use and reasonably foreseeable misuse shall be provided by at least one of the following measures:

— 基本保護及故障保護，參照 8.102 及 8.103。

– basic protection and fault protection, see 8.102 and 8.103;

— 強化保護規定，參照 8.104。

– enhanced protective provision, see 8.104.

在正常操作條件下，由基本保護提供，且在單一故障條件下的保護，由故障保護提供。

Protection under normal operating conditions is provided by basic protection, and protection under single fault conditions is provided by fault protection.

B 側之特定保護措施規定於 8.105。

Specific protective measures for side B are provided in 8.105.

EV 供電設備之 A 側保護，依 8.105.9 可包括 RCD。

Protection of side A of the EV supply equipment may include an RCD according to 8.105.9.

非分離式 EV 供電設備之保護措施的特定要求，仍在研議中。

Specific requirements for protective measures for non-separated EV supply equipment are under consideration.

**8.101.2 預期使用及合理可預見之誤用(Intended use and reasonably foreseeable misuse)**

考量預期使用及合理可預見之誤用， EV 供電設備應滿足以下要求：

The EV supply equipment shall meet the following requirements, considering intended use and reasonably foreseeable misuse:

—危險性帶電部件不得可觸及，且可觸及之導電性部件不得危險帶電。

– hazardous-live-parts shall not be accessible and accessible-conductive-parts shall not be hazardous live;

— 有危險電壓時，不得斷接車輛端插頭。

– hazardous voltage shall not be disconnected with the vehicle connector.

危險帶電部件依 8.102、8.103 及 8.104 查核其符合性。

*Compliance for hazardous-live-parts is checked according to 8.102, 8.103 and 8.104.*

*危險電壓依 6.3.1.103 查核符合性。*

*Compliance for hazardous voltage is checked according to 6.3.1.103.*

**8.101.3 接觸電流或接觸電壓之限制 (Limitation of touch current or touch voltage)**

在正常操作條件及單一故障狀態下，應藉以下任一方式防護一般人員之電擊傷害：

Under normal operating conditions and single fault conditions, an ordinary person shall be protected against a harmful electric shock by either

— 限制接觸電流及接觸電能。或

– limiting the touch current and the touch energy, or

— 限制接觸電壓。

– limiting the touch voltage.

人體阻抗相當於 IEC 60479-1:2018 之 3.1.8 潮濕狀態，應視為在正常操作條件及單一故障狀態。

Body impedance corresponding to water wet conditions in IEC 60479-1:2018, 3.1.8, shall be considered under the normal operation conditions and single fault conditions.

危險帶電部件之符合性依 8.102、8.103、8.104 及 8.105 查核。

*Compliance for hazardous-live-parts is checked according to 8.102, 8.103, 8.104 and 8.105.*

備考：皮膚出汗或浸泡海水後不考量。

NOTE The skin of a sweating person or a person after immersion in sea water is not considered.

**8.101.4 感知及驚嚇反應之閾值(Threshold of perception and startle reaction)**

於正常條件及單一故障狀態下，通訊前、期間及之後的預期使用及合理可預見誤用期間，應提供防止驚嚇反應之保護措施、。在正常操作期間，有可能感知。

Protective measures shall be provided to prevent startle reactions during intended use and reasonably foreseeable misuse, before, during and after a communication session, under normal conditions and during single fault conditions. During the normal operating conditions, perception may be possible.

備考 1：本標準之驚嚇反應閾值，對應 IEC 60479-1:2018 表 11 及表 13 曲線(AC-1/AC-2 間及 DC-1/DC-2 間的邊界)。

NOTE 1 Curve a (boundary between AC-1/AC-2, DC-1/DC-2) of IEC 60479-1:2018, Table 11 and Table 13,corresponds to the threshold of startle reaction in this document.

備考 2：預期使用包括但不限於電能傳輸附錄之操作，如 B 側纜線組、車輛端插頭及車輛端插座、通訊期間初始化、通訊期間結束、一般人員或動物進出 EV、從汽車後車箱/行李箱或其他存放區域斷開及取回物品，接觸車輛底盤，接觸 EV 供電設備暴露的金屬部件。

NOTE 2 The intended use includes, but is not limited to, handling of energy transfer accessories such as side B cable assembly, vehicle connector and vehicle inlets, initiating a communication session, ending a communication session, an ordinary person or animal entering or exiting the EV, opening and retrieving an item from the EV trunk/boot or other storage areas, touching the vehicle chassis, and touching exposed metal parts of the EV supply equipment.

對於電流路徑，在正常及單一故障條下，應考慮手指在車輛端插頭至腳及手在車輛底盤至腳。針對特別保護規定，應考慮手到手之電流路徑。參照 IEC 60479 系列。

For the current path, finger at the vehicle connector to feet, and hand at the vehicle chassis to feet, shall be considered under normal and single fault conditions. The

current path from hand to hand shall be considered for special protection provisions. See the IEC 60479 series.

應提供限制接觸電流之保護措施，使得同時可接觸之導電性部件間流動的穩態接觸電流應小於

Protection by means of limitation of touch current shall be provided, such that a steady-state touch current flowing between simultaneously accessible conductive parts shall be less than

— 正常操作：0.5 mA AC/2 mA DC

– 0,5 mA AC/2 mA DC under normal operation, and

— 單一故障狀態：3.5 mA AC/10 mA DC

– 3,5 mA AC/10 mA DC under single fault condition.

符合性依 12.6 量測查核。

Compliance is checked by measurement according to 12.6.

EV 供電設備應限制放電能量，使得放電能量不得小於：

The EV supply equipment shall limit the discharge energy, such that discharge energy shall be less than

— 正常操作：5 µJ，及

– 5 µJ under normal operation, and

— 單一故障狀態：0.5 mJ

– 0,5 mJ under single fault condition.

備考 3：值係基於 IEC 61140:2016 之 5.2.7 (b)。

NOTE 3 The values are based on IEC 61140:2016, 5.2.7 b).

相關要求參照 8.105.4。

For relevant requirement, see 8.105.4.

藉設計審查查核符合性。

Compliance is checked by design review.

若基本保護防備失效且 B 側故障保護防備同時失效時，應提供特殊保護，使得穩態接觸電流不大於依 IEC 60479-2:2019 圖 23 規定曲線 b 的 DC-2 區域上邊界及表 13。

Special protection shall be provided such that, in case of a failure of the provision for basic protection and a simultaneous failure of the provision for fault protection of side B, the steadystate touch current is less than or equal to curve b, the upper boundary of the DC–2 zone, as specified in IEC 60479-1:2018, Figure 22 and Table 13.

若基本保護防備失效且 B 側故障保護防備同時失效時，應提供特殊保護，使得接觸電流分別不大於 IEC 60479-2:2019 圖 23 之 C1 曲線及 IEC 60479-1:2018 圖 22。

Special protection shall be provided such that, in case of a failure of the provision for basic

protection and a simultaneous failure of the provision for fault protection of side B, the touch
current is less than or equal to the c1 curve as specified in IEC 60479-2:2019, Figure 23, and IEC 60479-1:2018, Figure 22, respectively.
應使用以下參數：
The following parameters shall be used:
— 人體阻抗：575 Ω。
– a human body impedance of 575 Ω;
— 依 ISO 17409:2020 之 EV 最大 Y-電容。
– t— EV 最不利之非對稱洩電阻，其仍可能電能傳輸。he maximum Y-capacitances of the EV according to ISO 17409:2020;
– a worst-case asymmetric leakage resistance of the EV where energy transfer is still possible.
針對系統 B，符合性依附錄 HH 之設計審查查核。
For system B, compliance is checked by design review according to Annex HH.
針對系統 A 及系統 C，符合性依以下試驗查核。
For system A and system C, compliance is checked by the following test.
系統 A 試驗裝置如圖 129 所示。系統 C 試驗裝置如圖 131 所示。
The test setup for system A is shown in Figure 129. The test setup for system C is shown in Figure 131.
試驗預調適：
Pre-conditions for the test:
— 針對所有系統：
– For all systems:
(a) 代表人體阻抗之故障電阻為 575 Ω。
a) The fault resistance is 575 Ω, to represent the human body impedance.
(b) EV 供電設備製造商應指定 EV 供電設備之 DC+/DC-與保護性導體間具有最大儲能的 Y-電容的操作點。
b) The EV supply equipment manufacturer shall specify the operating point at which the EV supply equipment has the maximum energy stored in the Y-capacitance between DC+/DC– and the protective conductor.
(c) 依 ISO 17409 規定，步驟(b)規定之試驗裝置操作點，應有 EV 最高 Y 電容(CT7/CT8)。
c) The test setup shall have the maximum EV Y-capacitance (CT7/ CT8) for the operating point specified in step b), as specified by ISO 17409.
備考 4：EV 供電設備視電流需求，及/或因電壓需要設置串聯或並聯模組而定，可於多個 PECs 間切換，此會影響總 Y 電容及洩漏電流。
NOTE 4 The EV supply equipment can switch in more PECs depending on the

current demand, and/or put modules in series or parallel due to the voltage demand. This can influence the total Y-capacitance and leakage current.

追加，針對系統 A：

– Additionally, for system A:

(d) 設定試驗負載及 EV 模擬器之目標電流 EV IReq(參照 AA.5)，使得 EV 供電設備在預設調適(b)規定之操作點操作。

d) Set the test load and target current of the EV IReq (see Clause AA.5), of the EV simulator so that the EV supply equipment operates at the operating point specified in precondition b).

追加，針對系統 C：

– Additionally, for system C:

(e) 依 CC.7.4，在步驟(b)規定接近測試點。

e) Approach the test point as specified in step b) according to CC.7.4.

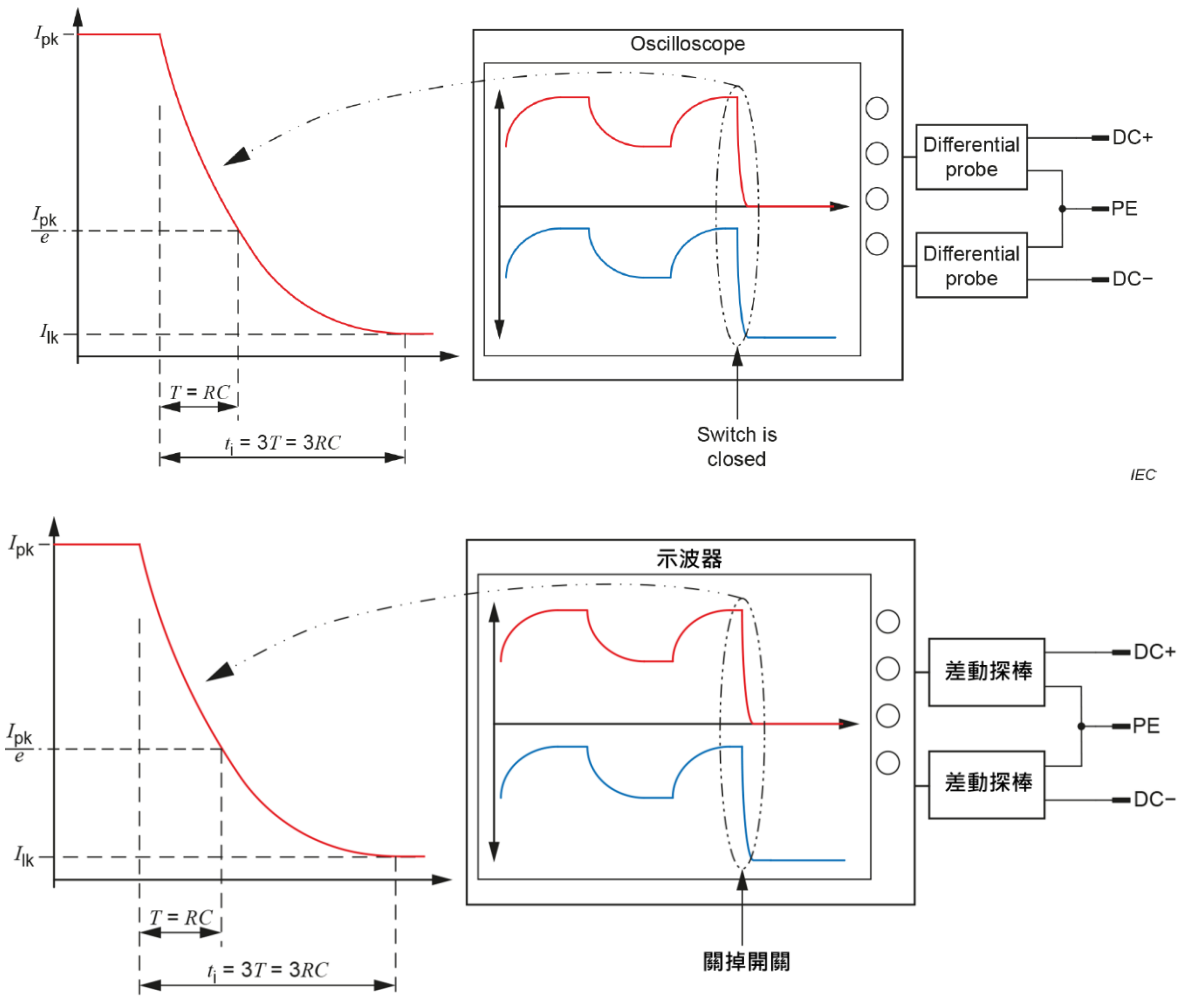



圖 106 – 接觸洩漏電流之量測

Figure 106 – Measurement of the touch leakage current

試驗應排除以下：

The test shall be executed as follows:

(1) 接通 ST13

1) Close ST13.

(2) 測定 RT6 之接地洩漏電流監測裝置(系統 A)或 IMD(系統 C)跳脫的閾值。

2) Determine the threshold of RT6 where the earth leakage current monitoring device (for system A) or IMD (for system C) trips.

(3) 為使用最大容許非對稱洩漏電阻連續充，追加 RT6 之跳脫值 10 %。

3) Add ≤ 10 % to the trip value for RT6 in order to continuously charge with the maximum allowed asymmetric leakage resistance.

(4) 等候至達到步驟(b)定義之操作點。

4) Wait until the operating point defined in step b) is reached.

(5) 藉接通 ST11，在最高電壓 施加 RT5 定義之故障電阻。

5) Apply the defined fault resistance RT5 at the maximum voltage by closing ST11.

備考 5：系統 C 之最高電壓包括因 IMD 的疊加電壓。

NOTE 5 For system C, the maximum voltage includes the voltage superimposed by the IMD.

(6) 通過 RT5 及 RT6 之電流，可藉量測已知電阻 RT5 的電壓測定。

6) The currents through RT5 and RT6 can be determined by measuring the voltage over the known resistance RT5.

(7) 使用示波器量測放電曲線，並擷取放電事件 ti = 3RC 之時間常數及決定 IRMS= (Ipeak/√6)。參照圖 106。

7) Measure the discharge curve with an oscilloscope and extract the time constant of the discharge event ti = 3RC and determine $I_{RMS} = \frac{I_{peak}}{\sqrt{6}}$ See Figure 106.

(8) 量測穩態洩漏電流 IRT5。

8) Measure the steady state leakage current IRT5.

(9) 重複試驗透過：

9) Repeat the test by:

— 在步驟 1 接通 ST11

– closing ST11 in step 1),

— 在步驟 2 測定 RT5 之閥值

– determining the threshold with RT5 in step 2),

— 透過步驟 5 接通 ST13，施加 RT6 定義之故障電阻

– applying the defined fault resistance RT6 by closing ST13 in step 5),

— 在步驟 6，量測 RT6 上之電壓，及

– measuring the voltage over RT6 in step 6), and

— 在步驟 8 量測 IRT6

– measuring IRT6 in step 8).

備考 6：IMD 之動態行為(例：切換)會影響本試驗，其需要重複試驗數次，以確保已試驗最不利之條件。

NOTE 6 The dynamic behaviour of the IMD (for example, switching) can influence this test; it can be necessary to repeat the test a few times to ensure that worst case condition is tested.

(10) 查核預期結果：

10) Check the expected results:

(a) 在步驟(8)量測之穩態洩漏電流 IRT5 及 IRT6 不大於 IEC 60479-1:2018 圖 22 之 DC-2 限制值(線條 b)及表 13。

a) The steady-state leakage current IRT5 and IRT6 measured in step 8) are less than or equal to the DC-2 limit (line b) in IEC 60479-1:2018, Figure 22 and Table 13.

備考 7：穩態 DC-2 限制值為 25 mA。

NOTE 7 In steady-state, the DC2 limit is 25 mA.

(b) 在步驟(7)量測點( IRMS, ti )不大於 IEC 60479-2:2019 圖 23 及 IEC 60479-1:2018 圖 22 之 C1 限制值。

b) The points (IRMS, ti) measured in step 7) are less than or equal to the C1 limit in IEC 60479-2:2019, Figure 23, and IEC 60479-1:2018, Figure 22.

備考 8：參照圖 HH.4。

NOTE 8 See Figure HH.4.

**8.102 基本保護(Basic protection)**

**8.102.1 一般(General)**

EV 供電設備之基本保護係用於以保護人員免於觸及危險帶電部件。基本保護應提供一種以上規定於 8.102.2、 8.102.3、8.102.4 及 8.102.5 之措施。

Basic protection in the EV supply equipment is employed to prevent persons from touching hazardous live parts. Basic protection shall be provided by one or more of the measures given in 8.102.2, 8.102.3, 8.102.4, and 8.102.5.

**8.102.2 帶電部件之基本絕緣保護措施(Protection by means of basic insulation of live parts)**

EV 供電設備之帶電部件的之基本絕緣保護措施，應依 IEC 62477-1:20222 的 4.4.3.2。

Protection by means of basic insulation of live parts in the EV supply equipment shall be according to IEC 62477-1:2022, 4.4.3.2.

基本絕緣應藉固體絕緣或空間距離及/或沿面距離提供。

Basic insulation shall be provided by solid insulation or clearance and/or creepage distance.

若帶電部件未藉絕緣要求之隔離，則所有可接近的導體性部件視為危險帶電部件。

Any accessible conductive part is considered to be a hazardous live part if not

separated from the live parts by required insulation.

基本絕緣應設計及試驗，以耐受與其連接電路之衝擊電壓及暫態過電壓。

Basic insulation shall be designed and tested to withstand the impulse voltages and temporary overvoltages for the circuits to which they are connected.

符合性依檢驗及試驗查核。

Compliance is checked by inspection and test.

試驗應依 IEC 62477-1:2022 之 5.2.3.4 表 28(僅針對直接連接主電源電路，參照 6.3.1.112)及 IEC 62477-1:2022 的 5.2.3.2 執行。

Test shall be conducted according to Table 28 of IEC 62477-1:2022, 5.2.3.4 (only for circuits connected directly to mains supply, see 6.3.1.112), and IEC 62477-1:2022, 5.2.3.2.

**8.102.3 外殼或屏障之保護措施(Protection by means of enclosures or barriers)**

EV 供電設備之外殼或屏障的保護措施應依 8.105.2 及 12.4。

Protection by means of enclosures or barriers in the EV supply equipment shall be according to 8.105.4 and 12.4.

外殼應適合其預期使用之環境。

Enclosures shall be suitable for use in their intended environments.

EV 供電設備應具有足夠之機械強度，且依 12.107 於預期使用及超過預期壽命的預期誤用時，應使得建構不會發生危害。

The EV supply equipment shall have adequate mechanical strength and shall be so constructed that no hazard occurs when subjected to intended use and expected misuse over the expected lifetime in accordance with 12.107.

外殼開啟或移除屏障應僅可能：

It shall only be possible to open enclosures or remove barriers

— 使用工具或鑰匙。

– with the use of a tool or key, or

— 危險帶電部件斷電之後

– after de-energization of hazardous live parts.

追加要求參照 12.107。

For additional requirements, see 12.107.

**8.102.4 限制電壓之保護措施(Protection by means of limitation of voltage)**

藉電壓限制防備之基本保護，應符合以下條件滿足應實現：

Basic protection by the provision of limitation of voltage shall be fulfilled where the following conditions are met:

(a) 在正常操作下，穩態接觸電壓小於表 110 之值。

a) steady-state touch voltage under normal operation is less than the values in Table 110;

(b)在單一故障狀態下，穩態接觸電壓小於表 111 之值。

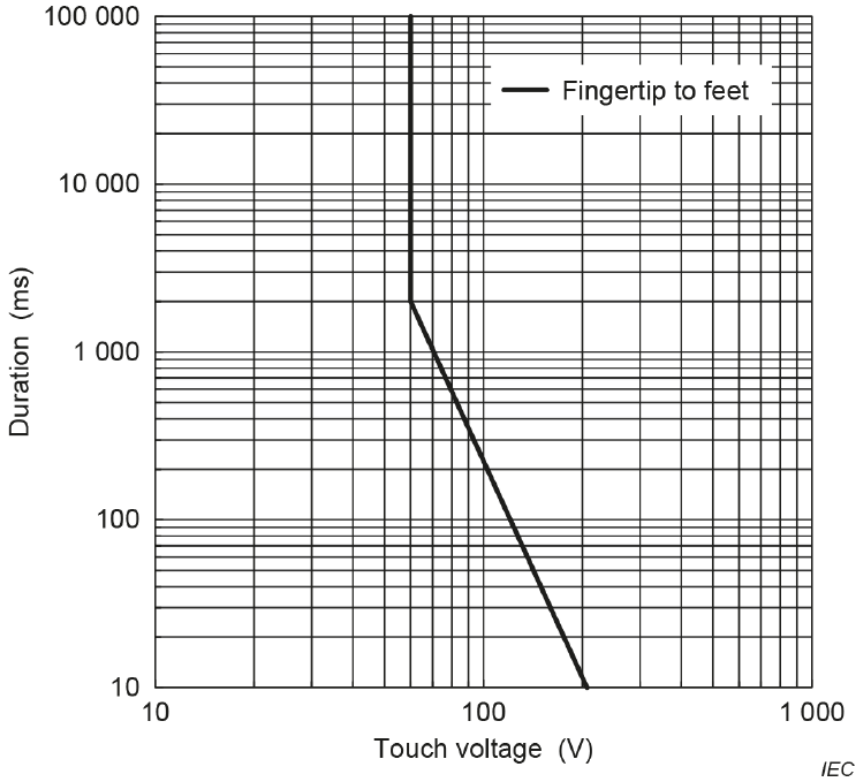
b) steady-state touch voltage under single fault condition is less than the values in Table 111;

(c) 在正常操作下，非再現 DC 接觸電壓小於表 110 之限制值。

c) a non-recurring DC touch voltage under normal operation is less than the limit in Table 110;

(d) 在單一故障狀態下，從指尖至腳之非再現 DC 接觸電壓小於圖 107 之限制值。

d) a non-recurring DC touch voltage for fingertip to feet under single fault condition is less than the limit in Figure 107;



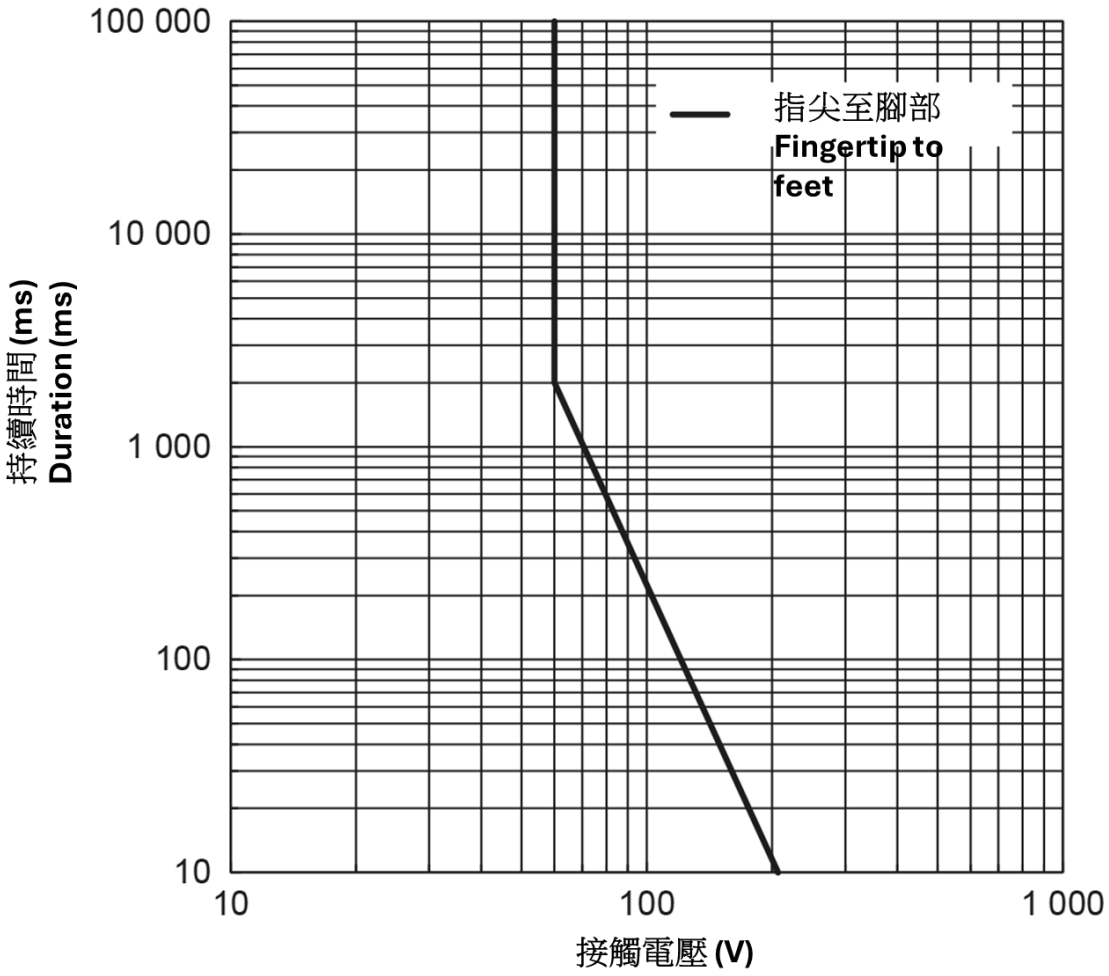



圖 107 – 在單一故障狀態下之接觸時間-DC 電壓(潮濕、指尖至腳)

Figure 107 – Touch time – DC voltage under single fault condition (water wet, fingertip to feet)

(e) 電壓由以下之一的來源供應：

e) the voltage is supplied by one of the following sources:

(1) 作為輔助電路之安全隔離變壓器，包括控制導引。

1) a safety isolating transformer for the auxiliary circuit including control pilot;

備考：該等安全隔離變壓器符合 IEC 61558-2-6。

NOTE Safety isolating transformers are those that comply with IEC 61558-2-6.

(2) 提供電壓源之安全等級等於安全隔離變壓器。

2) a source of voltage providing a degree of safety equivalent to that of a safety isolating transformer;

(3) 電化學(例：電池系統)。

3) electrochemical (for example, battery system).

表 110 – 正常操作下之接觸電壓

Table 110 – Touch voltage under normal operation

| 身體接觸範圍 Body contact area | AC (RMS) | DC |
|---|---|---|
| 身體之部位 Part of body<br>手 Hand | 基本保護<br>Basic protection | |
| 指尖 Fingertip | 12 V | 30 V |
| 備考：基於從身體接觸範圍至腳之電流路徑的值，視人站立的位置。<br>NOTE The values are based on a current path from the contact area of the body to feet, with the person in standing position. | | |

表 111 – 單一故障狀態下之接觸電壓

Table 111 – Touch voltage under single fault conditions

| 身體接觸範圍 Body contact area | AC (RMS) | DC |
|---|---|---|
| 身體之部位 Part of body<br>手 Hand | 故障保護 Fault protection | |
| 指尖 Fingertip | 30 V | 60 V |
| 備考 1：基於從身體接觸範圍至腳之電流路徑的值，視人站立的位置及潮濕狀態。<br>NOTE 1 The values are based on a current path from the contact area of the body to feet, with the person in standing position and in water wet conditions.<br>備考 2：在單一故障狀態下，若無法滿足此等值，則需要保護性隔離。<br>NOTE 2 If these values cannot be met under single fault conditions, protective separation is needed. | | |

符合性依檢驗及量測查核。

Compliance is checked by inspection and measurement.

**8.102.5 穩態接觸電流之限措施制的保護(Protection by means of limitation of steady-state touch current)**

穩態接觸電流之限制係限制接觸電流於非危險值作為防備，限制值規定在

8.101.4。

Limitation of steady-state touch current is a provision whereby touch current is limited to non-hazardous values. The limits are provided in 8.101.4.

限制接觸電流之保護性阻抗，應符合 IEC 62477-1:2022 之 4.4.5.5。

The protective impedance limiting the touch current shall comply with IEC 62477-1:2022,4.4.5.5.

符合性依 IEC 62477-1:2022 之 4.4.5.5 的試驗查核

Compliance is checked by test in IEC 62477-1:2022, 4.4.5.5.

**8.103 故障保護(Fault protection)**

**8.103.1 一般(General)**

故障保護提供基本保護失效期間及之後，因接觸危險電能而造成人身傷害的防護。

Fault protection provides protection against bodily harm due to contact with hazardous electrical energy during and after failure of the basic protection.

故障保護應提供一項以上之以下措施：

Fault protection shall be provided by one or more of the following measures:

— 8.103.2 結合保護性導體之保護性等電位搭接。

– protective equipotential bonding in 8.103.2 in combination with the protective conductor;

— 8.103.4 電源之自動斷開。

– automatic disconnection of supply in 8.103.4;

— 8.103.5 補充絕緣。

– supplementary insulation in 8.103.5;

— 8.103.6 電氣保護性遮蔽。

– electrically protective screening in 8.103.6.

故障保護應獨立並針對基本保護追加該等。

Fault protection shall be independent and additional to those for basic protection.

**8.103.2 保護性等電位搭接(Protective-equipotential-bonding)**

保護性等電位搭接為藉項目搭接一起作為防備，以避免危害接觸電壓。

Protective-equipotential-bonding is a provision whereby items are bonded together to avoid hazardous touch voltages.

EV 供電設備之保護性等電位搭接應依 IEC 62477-1:2022 之 4.4.4.2。

Protective-equipotential-bonding in the EV supply equipment shall be according to IEC 62477-1:2022, 4.4.4.2.

符合性依目視檢驗及 IEC 62477-1:2022 之 4.4.4.2 試驗查核。

Compliance is checked by visual inspection and tests in accordance with IEC 62477-1:2022,4.4.4.2.

**8.103.3 外殼與外部保護性電路間保護性導體有效的連續性(Effective protective conductor continuity between the enclosure and the external protective circuit)**

EV 供電設備暴露之導電性部件，應有效的連接至作為外部保護性導體終端，且從導體部件至外部保護性導體終端之電阻，應不大於 0.1 Ω。

Exposed conductive parts of the EV supply equipment shall be effectively connected to the terminal for the external protective conductor, and the resistance from the conductive part to the terminal of the external protective conductor shall be ≤ 0,1 Ω.

符合性依以下試驗查核：

Compliance is checked by the following test.

(1) 使用電阻量測儀器作查證，其可驅動 ≥ 10 A (AC 或 DC)電流，通過電流每一導體部件與外部保護性導體終端間。

1) Make verification using a resistance measuring instrument which can drive a current of ≥ 10 A (AC or DC). Pass the current between each exposed conductive part and the terminal for the external protective conductor.

(2) 確認電阻 ≤ 0.1 Ω。

2) Confirm that the resistance is ≤ 0,1 Ω.

備考：例行試驗可依 IEC 62477-1:2022 之 5.2.3.11.4 執行

NOTE Routine testing can be performed according to IEC 62477-1:2022, 5.2.3.11.4.

**8.103.4 電源自動斷開(Automatic disconnection of supply)**

EV 供電設備之電源自動斷開應依 IEC 62477-1:2022 的 4.4.4.4，除以下外：

Automatic disconnection of supply in the EV supply equipment shall be according to IEC 62477-1:2022, 4.4.4.4, except as follows.

— 保護性裝置可提供於設備或 EV 供電設備之任何適合的上游部件，EV 供電設備製造商應給予設備之外部保護的適當資訊，此資訊可提供於電路圖。

– The protective device may be provided in any suitable upstream part of the installation or the EV supply equipment. The EV supply equipment manufacturer shall give appropriate information for the installation of external protection. The information may be provided in a circuit diagram.

符合性依 IEC 62477-1:2022 之 4.4.4.4 檢驗及量測查核。

Compliance is checked by inspection and measurement in accordance with IEC 62477-1:2022,4.4.4.4.

**8.103.5 補充絕緣(Supplementary insulation)**

EV 供電設備之補充絕緣應依 IEC 62477-1:2022 的 4.4.4.5。

Supplementary insulation in the EV supply equipment shall be according to IEC 62477-1:2022,4.4.4.5.

符合性依檢驗查核。

Compliance is checked by inspection.

**8.103.6 電氣保護屏蔽(Electrically protective screening)**

EV 供電設備之電氣保護性屏遮蔽應依 IEC 62477-1:2022 的 4.4.4.7。電氣保護性屏蔽應包含保護性部件間插入 EV 供電設備之危險帶電部件與受保護部件間，憑藉屏蔽的帶電部件至少藉基本絕緣隔離。

Electrically protective screening in the EV supply equipment shall be according to IEC 62477-1:2022, 4.4.4.7. Electrically protective screening shall consist of a conductive screen interposed between hazardous-live-parts of the EV supply equipment and the part being protected, whereby the screen is separated from live parts by at least basic insulation.

保護性屏蔽應：

The protective screen shall

— 連接 EV 供電設備之保護性等電位搭接系統，且互聯應符合 IEC 62477-1:2012 的 4.4.4.2，及

– be connected to the protective-equipotential-bonding system of the EV supply equipment,and that interconnection shall comply with the requirements of IEC 62477-1:2022, 4.4.4.2,and

— 符合要求之保護性等電位搭接系統的元件依 IEC 61140:2016 之 5.3.3.3、5.3.3.4 及 5.3.3.5。

– comply with the requirements for elements of the protective-equipotential-bonding system according to IEC 61140:2016, 5.3.3.3, 5.3.3.4 and 5.3.3.5.

符合性依 IEC 62477-1:2022 之 4.4.4.3 檢驗及試驗查核。

Compliance is checked by inspection and tests in accordance with IEC 62477-1:2022, 4.4.4.3.

**8.104 加強保護性防備(Enhanced protective provision)**

**8.104.1 一般(General)**

加強保護性防備依 8.104.2 及 8.104.3 提供基本保護及故障保護兩者規定之一或多項防備。

An enhanced protective provision provides both basic protection and fault protection according to one or more of the provisions specified in 8.104.2 and 8.104.3.

**8.104.2 雙重絕緣或強化絕緣(Double or reinforced insulation)**

EV 供電設備之雙重絕緣應依 IEC 62477-1:2022 之 4.4.5.2。

Double insulation in the EV supply equipment shall be according to IEC 62477-1:2022, 4.4.5.2.

EV 供電設備之強化絕緣應依 IEC 62477-1:2022 之 4.4.5.3。

Reinforced insulation in the EV supply equipment shall be according to IEC 62477-1:2022,4.4.5.3.

備考：下列國家，對採用雙重及/或加強絕緣系統之設備有附加要求：美國。

NOTE In the following country, additional requirements for equipment employing a system of double and or reinforced insulation are required: US.

符合性依 IEC 62477-1:2022 4.4.5.2 及 4.4.5.3 之檢驗及試驗查核。

Compliance is checked by inspection and tests in accordance with of IEC 62477-1:2022, 4.4.5.2 and 4.4.5.3.

**8.104.3 電路間之保護性隔離(Protective separation between circuits)**

EV 供電設備之電路間的保護性隔離，應依 IEC 62477-1:2022 之 4.4.5.4。

Protective separation between circuits in the EV supply equipment shall be according to IEC 62477-1:2022, 4.4.5.4.

針對 B 側，穩態接觸電流應不大於 IEC 60479-1:2018 圖 22 及表 13 規定之 DC-2 區域之邊界上限的曲線 b。

For side B, the steady-state touch current shall be less than or equal to curve b, the upper boundary of the DC-2 zone, as specified in IEC 60479-1:2018, Figure 22 and Table 13.

另外，接觸電流應分別不大於 IEC 60479-2:2019 圖 23 及 IEC 60479-1:2018 圖 22 規定之曲線 C1。參照 8.101.4。

Additionally, the touch current shall be less than or equal to the c1 curve as specified in IEC 60479-2:2019, Figure 23, and IEC 60479-1:2018, Figure 22, respectively. See 8.101.4.

符合性依 IEC 62477-1:2022 之 4.4.5.4 檢驗及試驗查核。

Compliance is checked by inspection and tests in accordance with IEC 62477-1:2022, 4.4.5.4.

**8.105 EV 供電設備隔離要求(Requirements for separated EV supply equipment)**

**8.105.1 一般(General)**

EV 供電設備 B 側應依電擊防護、，基本保護、故障保護及依表 112 規定之特殊保護設計。

The side B of the EV supply equipment shall be designed according to the provisions against electric shock, for basic protection, fault protection and special protection as specified in Table 112.

表 112 EV 供電設備 B 側之電擊防護的安全規定

Table 112 – Safety provisions for protection against electric shock for EV supply equipment at side B

| **基本保護規定**<br>**Provisions for basic Protection**<br>故障無保護<br>Protection in absence of a fault | **故障保護規定 Provisions for fault protection**<br>故障保護<br>Protection in case of a fault | **特殊保護規定**<br>**Provisions for special protection** |
|---|---|---|
| 基本絕緣[g]：<br>Basic insulation[g]:<br>－基本絕緣(固體)<br>－ (solid) basic insulation<br>－ 空氣基本絕緣<br>－ basic insulation by air<br>－ 屏蔽或外殼內<br>－ inside barriers or enclosures | 針對 I[j] 類部分：<br>For class I[j] portions:<br>－A 側與 B 側間之保護隔離 [a,c] (8.105.5)<br>－ Protective separation between side A and side B [a, c] (8.105.5)<br>－保護性等電位搭接於可接觸導電性部件(IEC 61140:2016 之 5.3.3.2)，例：對金屬外罩[a](8.105.1)，與<br>－ Protective equipotential bonding to accessible conductive parts (IEC 61140:2016, 5.3.3.2), for example, for metal housing[a] (8.105.1), in combination with:<br>・系統 A (AA.3.8.2)：保護性等電位搭接失效時，藉觸發緊急停機斷開 EV[h]。<br>・ for system A (AA.3.8.2): disconnection of the EV by triggering an emergency shutdown upon loss of protective equipotential bonding[h]; | －A 側與 B 側間之保護隔離 [a,c] (8.105.5)。<br>－ Protective separation between side A and side B a, c (8.105.5)<br>－保護性導體之電氣連續性的持續查核，並於連續性失去時斷電 [a,d] (6.3.1.2)<br>－ Continuous continuity checking of the protective conductor and de-energization upon loss of continuity a, d (6.3.1.2)<br>－對系統 B，保護性等電位搭接耐受短路能量 [i] (8.105.11, BB.14)<br>－ For system B, the protective equipotential bonding withstands the short-circuit energy [i] (8.105.11, Clause BB.14)<br>－藉 (IMD 或接地洩漏電流監測裝置偵測，保護性導體發生非對稱或對稱絕緣故障時，執行錯誤停機 [a, e] (8.105.1)<br>－Perform an error shutdown when an asymmetric or symmetric insulation fault to |

| 基本保護規定<br>**Provisions for basic Protection**<br>故障無保護<br>Protection in absence of a fault | **故障保護規定 Provisions for fault protection**<br>故障保護<br>Protection in case of a fault | **特殊保護規定**<br>**Provisions for special protection** |
|---|---|---|
| | ・系統 B (BB.14)及系統 C (CC.4.6)：等電位搭接之機械強度藉兩者<br>・ for system B (BB.14) and system C (CC.4.6): mechanical robustness of theequipotential bonding by both<br>i)保護性導體之最小截面，及<br>i) minimum cross section of the protective conductor, and<br>ii)使用依 IEC 62196-1、IEC 62196-3 及 IEC 62196-3-1 之車輛耦合器。<br>ii) using a vehicle coupler according to IEC 62196-1, IEC 62196-3 and IEC 62196-3-1.<br>－帶電危險部件與部件之絕緣材料可接觸表面間之電氣保護性屏障(遮蔽)(8.105.5)<br>－Electrically protective screening (shielding) Between hazardous-live-parts and accessible surfaces of parts of insulating material (8.105.5).<br>II [j] 類設備部分 | protective conductor occurs,detected by the IMD or earth leakage current monitoring device [a, e] (8.105.1)<br>－多個 B 側應藉基本絕緣隔離彼此 [a,f] (8.105.1)。<br>Multiple side Bs shall be separated from each other by basic insulation [a, f] (8.105.1)<br>－穩態接觸電流(B)及脈衝電流(C1)之限制 [a](8.101.4)。<br>－ Limitation of steady-state touch current (B) and impulse current (C1) a (8.101.4)<br>－每軌之 Y 電容限制值 < 500 nF [a, b]（8.105.3）<br>－ Limitation of Y-capacitance to < 500 nF per rail [a, b] (8.105.3) |

| **基本保護規定**<br>**Provisions for basic Protection**<br>故障無保護<br>Protection in absence of a fault | **故障保護規定 Provisions for fault protection**<br>故障保護<br>Protection in case of a fault | **特殊保護規定**<br>**Provisions for special protection** |
|---|---|---|
| | 雙重或強化絕緣(8.105.5).<br>For class II [j] portions: Double or reinforced insulation (8.105.5).<br>可接觸 SELV/PELV 電路：<br>Accessible SELV/PELV circuits:<br>B 側與 SELV/PELV 電路間，或基本絕緣與腳註給出之所有條件的保護性隔離 [e] (8.105.5)。<br>Protective separation between side B and the SELV/PELV circuit, or basic insulation and all of the conditions given in footnote [e] (8.105.5). | |

a 為支援整體 I 類設備或包含部分設計為 I 類設備設計之 EV 的保護性規定，EV 供電設備應提供此規定。此規定甚至適用本身整體為 II 類設備設計之 EV 供電設備。

a The EV supply equipment shall provide this provision in order to support the protective provisions of an EV that is designed entirely as class I equipment or that contains portions that are designed as class I equipment.
This applies even if the EV supply equipment itself is designed entirely as class II equipment.

b 依 ISO 6469-3:2018 及 ISO 17409:2015，為支援使用接觸能量限制值作為故障保護之 EV 的保護性規定，EV 供電設備應提供此規定。

b The EV supply equipment shall provide this provision in order to support the protective provisions of an EV that uses limitation of touch energy as provision for fault protection in accordance with ISO 6469-3:2018 and ISO 17409:2015.

| 基本保護規定<br>**Provisions for basic Protection**<br>故障無保護<br>Protection in absence of a fault | 故障保護規定 **Provisions for fault protection**<br>故障保護<br>Protection in case of a fault | 特殊保護規定<br>**Provisions for special protection** |
|---|---|---|

c 此單一規定同時服務：

c This single provision serves simultaneously as:

–若帶電部件與可接觸導體部件間之基本保護失效時， 針對 I 類設備或系統部分 I 類的故障保護，及

– fault protection for class I equipment, or class I portions of the system, in case of a failure of the basicprotection between live parts and accessible conductive parts, and

–若基本保護之防備失效且故障保護的防備同時失效時，針對 II 類設備或系統部分 II 類的特殊保護。

– special protection for class II equipment, or class II portions of the system, in case of a failure of the provision for basic protection and a simultaneous failure of the provision for fault protection.

d 此規定同時服務

d This provision serves simultaneously

–針對 PE 斷開"之後〃發生故障時，防止因 IMD/漏電流監測裝置"盲點〃引起的危害，及

– to prevent hazards caused by "blinding" of the IMD/earth leakage current monitoring device for faults occurring "behind" a broken PE, and

–防止因系統中第 I 類設備部分的等電位接地失效所造成的危險。

– to prevent hazards caused by a loss of equipotential bonding for class I portions of the system.

e 條件：

e Conditions:

– PELV 電路連接到保護性導體。

– the PELV circuit is connected to the protective conductor;

–因 PELV 電路與 DC 電路間之絕緣故障，PELV 電路無危險電壓或接觸電流發生（參照 8.101.3）。

– no hazardous voltage or touch current occurs (see 8.101.3) in the PELV circuit due to an insulation fault between the PELV circuit and the DC circuit;

–IMD 或洩漏電流監測裝置偵測 PELV 電路與 DC 電路間之絕緣故障，並觸發錯誤或緊急停機。

– the IMD or earth leakage current monitoring device detects this insulation fault between the PELV circuit and the DC circuit, and triggers an error or emergency shutdown.

| 基本保護規定<br>**Provisions for basic Protection**<br>故障無保護<br>Protection in absence of a fault | 故障保護規定 **Provisions for fault protection**<br>故障保護<br>Protection in case of a fault | 特殊保護規定<br>**Provisions for special protection** |
|---|---|---|

f 為考量僅一 EV 作 Y 電容(Cy)計算，及為了防止因多個 IMD 造成干擾。

f In order to consider only one EV for calculation of the Y-capacitance (Cy) and in order to prevent interference caused by multiple IMDs.

g EV 供電設備之每一部分，應實施針對基本保護之此等防備之一。亦參照 IEC 61140:2016 之 5.2。

g For each portion of the EV supply equipment, one of these provisions for basic protection shall be implemented. See also IEC 61140:2016, 5.2.

h 藉經由 CP 斷開 EV 斷開裝置，達成 EV 斷開。

h The disconnection of the EV is achieved by opening the EV disconnection device via CP, see Figure AA.1.

i 此短路能量係兩個獨立故障之結果，其一來自 DC+對保護性導體的故障，另一來自 DC-對保護性導體之故障，其一發生在 EV，另一發生在 EV 供電設備。

i This short-circuit energy is a consequence of two independent faults, one from DC+ to the protective conductor and one from DC– to the protective conductor, of which one occurs in the EV and the other one occurs in the EV supply equipment.

j 考量 IEC 61140:2016 之 7.3 及 7.4。

j Considering IEC 61140:2016, 7.3 and 7.4.

每一系統之 EV 供電設備防護電擊危害的要求，分別規定於 AA.3.1、BB.2 及 CC.4.1 為。

Requirements for protection against electric shock hazard for separated EV supply equipment are defined for each system in AA.3.1, Clause BB.2, and CC.4.1.

若 EV 供電設備可同時為輛以上 EV 供電，針對每一車輛端插頭應實施獨立的保護措施(電擊防護、過載及短路保護)。

In case the EV supply equipment can supply more than one EV simultaneously, independent protection means (protection against electrical shock, overload and short-circuit protection) for each vehicle connector shall be implemented.

若 EV 供電設備具有多個 B 側電路，本標準對 B 側之所有要求應個別施加於每一 B 側電路。

If the EV supply equipment has multiple side B circuits, all the requirements in this document on side B shall apply at each side B circuit individually.

若 EV 供電設備具有多個 B 側電路，每一 B 側間應至少藉基本絕緣隔離。

If the EV supply equipment has multiple side B circuits, each side B circuit shall be separated from each other by at least basic insulation.

備考 1：此意為不容許每一 B 側與其他任何 B 側共用 DC+及/或 DC-。

NOTE 1 This means each side B is not allowed to share a DC+ and/or DC–, with any other side B.

備考 2：每一車輛端插頭之保護性導體藉搭接 A 側保護性導體共用，參照 8.105.2。

NOTE 2 The protective conductor of each vehicle connector is shared by bonding to the protective conductor of side A, see 8.105.2.

多個 B 側之 EV 供電設備的追加要求規定於附錄 FF。

Additional requirements for multi-side B EV supply equipment are specified in Annex FF.

~~備考 3：以下國家，無論是非隔開式電動車供電設備還是非分離型電動車供電設備，都必須符合國家標準的要求：美國 (US)、加拿大 (CA)。~~

NOTE 3 In the following countries, both separated EV supply equipment and non-separated EV supply equipment must comply with the requirements in national standards: US, CA.

藉設計審查查核符合性。

Compliance is checked by design review.

**8.105.2 B 側等電位搭接(Equipotential bonding on side B)**

EV 供電設備應針對 B 側提供保護性導體。

此保護性導體應提供 EV 及 EV 供電設備外露導電性部件之保護性等電位搭接。

此保護性導體亦應分別用於接地洩漏電流監測（參照 AA.3.1.2）、絕緣電阻查核（參照 BB.2.2 和 BB.8 規定）或絕緣監測（參照 CC.4.1.3）。

The EV supply equipment shall provide a protective conductor for side B.

This protective conductor shall provide protective equipotential bonding of exposed conductive parts of the EV supply equipment and the EV. This protective conductor shall also be used for earth leakage current monitoring (see AA.3.1.2), insulation resistance check (see BB.2.2 and Clause BB.8), or insulation monitoring (CC.4.1.3), respectively.

EV 供電設備應依 IEC 62196-1、IEC 62196-3 及 IEC 62196-3-1 經由車輛端插頭之適當觸腳，提供此保護性導體予 EV。

The EV supply equipment shall provide this protective conductor to the EV through the appropriate contact of the vehicle connector according to IEC 62196-1, IEC 62196-3 and IEC 62196-3-1.

針對系統 A，RPT EV 供電設備之要求規定於 AA.6.1。

For system A, the requirement for RPT EV supply equipment is specified in AA.6.1.

若有 A 側保護性導體終端，應搭接於 B 側保護性導體。

若電網提供保護性導體予 EV 供電設備，此保護性導體應搭接 B 側保護性導體。

The side A protective conductor terminal, if any, shall be bonded to the side B protective conductor. If the supply network provides a protective conductor to the EV supply equipment, this protective conductor shall be bonded to the protective conductor of the side B.

若電網提供保護性導體予 EV 供電設備，或由未接地電源電路提供保護性導體，則使用手冊應註明 EV 供電設備僅允許由專業人員或經指導人員操作。

If the supply network does not provide a protective conductor to the EV supply equipment or the protective conductor provided by the supply circuit is not earthed, the user manual shall state that the EV supply equipment is only allowed to be operated by skilled personnel or instructed personnel.

~~備考：以下國家，即使供電電路（在此情況下為 EV）及/或負載未提供接地保護導體，或無法在附近提供接地（RPT EV 供電設備的接地棒可插入的地面），普通人仍可操作 RPT EV 供電設備：日本 (JP)。~~

NOTE In the following countries, an ordinary person can operate the RPT EV supply equipment even if the supply circuit (in this case, an EV) and/or the load does not provide an earthed protective conductor, or the earth (ground where the earthing rod of the RPT EV supply equipment can be inserted) is not available nearby: JP.

符合性依檢驗查核。

Compliance is checked by inspection.

**8.105.3 B 側保護性電路阻抗(Impedance to protective conductor on side B)**

當 B 側帶電時，B 側帶電部件(DC+/DC-)至保護性導體間不會導致停機之 EV 供電設備 與的實際總實體絕緣電阻，應限制接觸電流於 IEC 60479-1:2018 圖 22 之 DC-2 範圍內。

When side B is live, the actual total physical insulation resistance of the EV supply equipment between side B live parts (DC+/DC–) to the protective conductor, which will not result in a shutdown, shall limit the touch current within the DC-2 area of IEC 60479-1:2018, Figure 22.

備考 1：實際總實體絕緣電阻為 EV 供電設備內所有組件與 EV 併聯之阻抗的組合。

NOTE 1 The actual total physical insulation resistance is a combination of the impedance of all the components within the EV supply equipment and the EV in parallel.

備考 2：絕緣電阻量測不包括絕緣量測裝置或漏電流監測裝置之內部電阻。

NOTE 2 The measured insulation resistance does not include the internal resistance of the insulation measurement device or earth leakage current monitoring device.

符合性依 8.101.4 核。

Compliance is checked according to 8.101.4.

對系統 A，EV 供電設備之漏電流監測裝置應偵檢測到第一次故障，及對於系統

C，IMD 應偵測到第一次故障並斷開電源或執行錯誤停機。

接地洩漏電流監測裝置及 IMD 不提供故障保護，但可作為特殊保護防止危害的電擊。

For system A, an earth leakage current monitor in the EV supply equipment shall detect the first fault, and for system C, an IMD shall detect the first fault and disconnect the supply or perform an error shutdown. The earth leakage current monitoring device and the IMD do not provide fault protection but can prevent a hazardous electric shock as special protection.

備考 3：對於系統 B，於電能傳輸期間，EV 將執行絕緣監測。

NOTE 3 For system B, the EV will perform the insulation monitoring during energy transfer.

IMD 或接地洩漏電流監測裝置之反應時間應依 AA.3.1.2、BB2.2.2、BB.8 及 CC.4.1.6 的要求。

Y 電容之值應確保 IMD 或接地洩漏電流監測裝置的反應時間小於限制值。

於 B 側電路，DC+與保護性導體間之 Y 電容 應< 500 nF。

於 B 側電路，DC-與保護性導體間之 Y 電容應< 500 nF。

The reaction time of IMD or earth leakage current monitoring device shall be according to AA.3.1.2, BB.2.2, BB.8 and CC.4.1.6. The value of the Y-capacitances shall ensure that the reaction time of IMD or earth leakage current monitoring device is less than the limit. In the side B circuit, the Y-capacitance between DC+ and the protective conductor shall be < 500 nF. In the side B circuit, the Y-capacitance between DC– and the protective conductor shall be < 500 nF.

備考：EV 供電設備之 B 側電路的 Y 電容要求導致總電容為 1uF。

NOTE 4 The side B circuit Y-capacitance requirements for the EV supply equipment result in a total capacitance of 1 μF.

針對 EV 供電設備之單一故障狀態，Y-電容之能量儲存限制值，不得作為故障保護使用。

The limitation of stored energy in the Y-capacitors shall not be used as fault protection under single fault condition for the EV supply equipment.

**8.101.4 要求之特殊保護，可藉 B 側帶電部件（DC+/DC-）及保護性導體（包括所連接 EV）間提供受限阻抗**

The special protection required in 8.101.4 may be provided by limited impedance between side B live parts (DC+/DC–) and the protective conductor, including the connected EV.

備考 1：系統 A 要求具有電池系統電壓≤ 500 Vdc 之 EV 的 Y 電容限制值，在最不利情況下，使得 B 側帶電部件(DC+/DC-)總儲存能量對 EV 供電設備匹配的 EV≤ 0.2J

NOTE 5 System A requires the limitation of the Y-capacitance of EVs with battery system voltages to ≤ 500 V DC,such that the total stored energy per side B live part

(DC+/DC–) to protective conductor of the EV supply equipment mated to the EV is ≤ 0,2 J under the worst-case scenario.

Y 電容限制值之符合性依下列試驗查核。

Compliance to the Y-capacitance limit is checked by the following test.

系統 A 試驗裝置如圖 129 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system A is shown in Figure 129. The test setup for system C is shown in Figure 131.

試驗預調適：

Pre-conditions for the test:

所有系統：

– For all systems:

(a) 故障電阻為 1 kΩ，電阻低至足以消除其他電路電阻之影響。設定 RT5 或 RT6 為故障電阻值。

a) The fault resistance is 1 kΩ, a low enough resistance to cancel out the influence of other circuit resistances. Set RT5 or RT6 to the fault resistance value.

(b) EV 供電設備製造商應指定 DC+/DC-與保護性導體間之 Y 電容儲存最大能量時，EV 供電設備的操作點。

b) The EV supply equipment manufacturer shall specify the operating point at which the EV supply equipment has the maximum energy stored in the Y-capacitance between DC+/DC– and the protective conductor.

(c) EV 模擬器之 Y-電容(CT7/CT8)應已知。

c) The Y-capacitances (CT7/CT8) of the EV simulator shall be known.

備考 2：視電流需求，及/或因電壓需求投入串聯或並聯模組，EV 供電設備可於多個 PEC 間切換，此會影響總 Y 電容及洩漏電流。

NOTE 6 The EV supply equipment can switch in more PECs depending on the current demand, and/or put modules in series or parallel due to the voltage demand. This can influence the total Y-capacitance and leakage current.

— 追加，針對系統 A：

– Additionally, for system A:

(d) 設定 EV 模擬器之 EV IReq 的試驗負載及目標電流 (參照 AA.5)，使得 EV 供電設備在步驟(b)規定之操作點操作。

d) Set the test load and target current of the EV IReq (see Clause AA.5) of the EV simulator o that the EV supply equipment operates at the operating point specified in step b).

— 追加，針對系統 C：

– Additionally, for system C:

(e) 依 CC.7.4，視步驟(b)規定接近試驗點。

e) Approach the test point as specified in step b) according to CC.7.4.

試驗應依下列步驟執行

The test shall be executed as follows.

(1) 等待直到 EV 供電設備達到預調適(b)規定之操作點。

1) Wait until the EV supply equipment reaches the operating point specified at precondition b).

(2) 閉合 ST11 或 ST13 以施加故障電阻(RT5 或 RT6)

2) Close ST11 or ST13 to apply the fault resistance (RT5 or RT6).

(3) 量測電容之放電曲線。藉擷取放電事件的時間常數，可測定總電容(式(2))。參照圖 106。

3) Measure the discharge curve of the capacitance. By extracting the time constant of the ischarge event, the total capacitance can be determined (Formula (2)). See Figure 106.

$$C = \frac{t}{R_{T_Fault}} \quad (2)$$

式中，

Where

| | |
|---|---|
| C | Y 電容，單位：法拉第(F)<br>is the Y-capacitance, expressed in Farad; |
| $R$T_Fault | 故障電阻，單位：Ω<br>is the fault resistance, expressed in Ohms; |
| $t$ | 放電時間，單位：s<br>is the discharge time, expressed in seconds; |

(4) 減去 EV 模擬器之 Y 電容(預調適(c))後，查核最大總並聯 Y 電容小於 1 $\mu$F。

4) Check that, after subtracting the Y-capacitance of the EV simulator (precondition c)), the maximum total parallel Y-capacitance is < 1 uF.

**8.105.4 接近危險帶電部件之防護等級(Degrees of protection against access to hazardous-live-parts)**

EV 供電設備外殼防護等級應至少符合 IPXXC。

Degrees of protection for enclosures of EV supply equipment shall fulfil at least IPXXC.

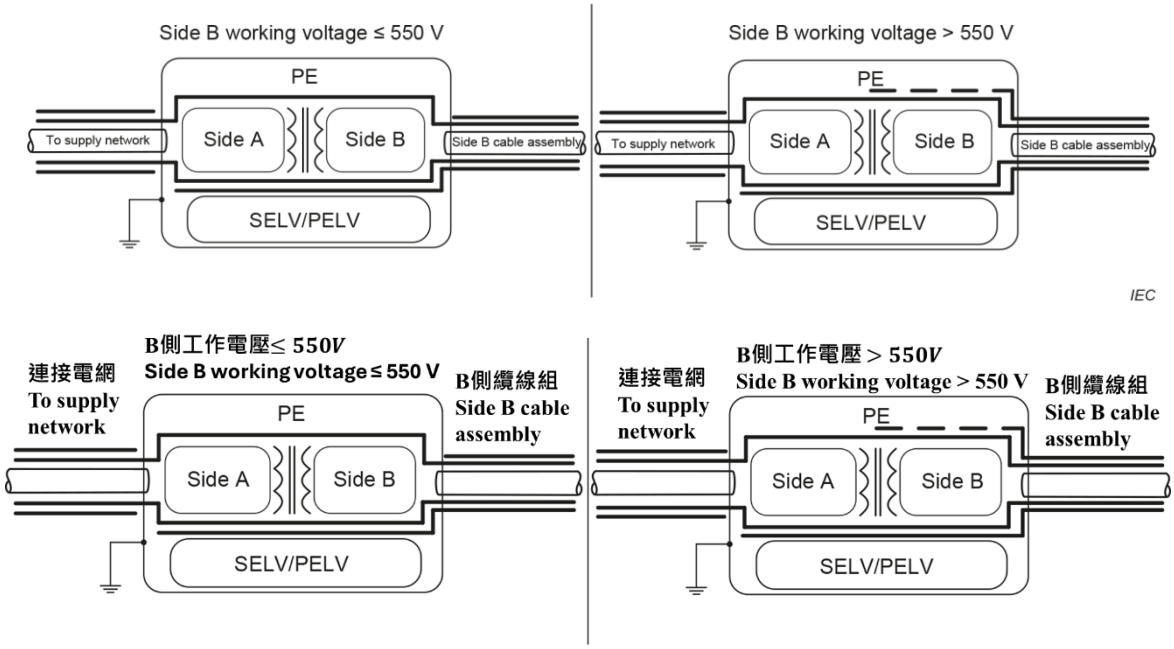
符合性依檢驗及量測查核。

Compliance is checked by inspection and measurement.

**8.105.5 絕緣屏障(Insulation barriers)**

EV 供電設備應有圖 108 所示之絕緣屏障。EV 供電設備應依表 113 規定提供最低的保護措施。

The EV supply equipment shall have insulation barriers as shown in Figure 108. The EV supply quipment shall provide the minimum protective measures as defined in Table 113.




說明 Key

| | |
|---|---|
| PE | 保護性導體<br>protective conductor |
| 單線(single line) | 基本絕緣<br>basic insulation |
| 雙線(double lines) | 雙重絕緣或基本絕緣及電氣保護性屏蔽(遮蔽)或強化絕緣。<br>double insulation or basic insulation and electrically protective screening (shielding) or reinforced insulation |
| 虛線(dashed line) | (虛線 double lines) 基本絕緣或雙重/強化絕緣參照表 113。<br>basic insulation or double/reinforced insulation. See Table 113. |

備考：閾值 550 V dc 相容於 CNS 15511-23。

NOTE Threshold of 550 V DC is due to backward compatibility with IEC 61851-23:2014.

圖 108 – 絕緣屏障

Figure 108 – Insulation barriers

表 113 第一欄規定電路類型與第一列規定電路類型或人員間之屏障要求的性質（關於保護）。

Table 113 gives the required property (with respect to protection) of barriers between the type f circuits given in the first column of Table 113 and the type of

circuits, or persons, given in the first row of Table 113.

Table 113 – Minimum protective measures

| | B 側<br>Side B | SELV/PELV | 保護性導體<br>Protective conductor | 普通人 Ordinary person |
|---|---|---|---|---|
| A 側<br>Side A | 保護性隔離<br>Protective separation | 保護性隔離<br>Protective separation | 基本絕緣<br>Basic insulation | – 雙重/強化絕緣或<br>–<br>Double/reinforced insulation, or<br>– 基本絕緣及電氣保護性屏蔽(遮蔽)或<br>– Basic insulation and electrically protective screening (shielding),or<br>– 兩者之組合<br>– A combination of both |
| B 側<br>Side B | 不適用 n.a | 保護性隔離<br>Protective separation | 工作電壓 ≤ 550 Vdc：基本絕緣<br>For a working voltage ≤ 550 V DC:<br>Basic insulation<br>工作電壓>550 Vdc：基本絕緣或雙重/強化絕緣<br>For a working voltage > 550 V DC:<br>– Basic insulation, or<br>–<br>Double/reinforced insulationc | 雙重絕緣/強化絕緣或<br>– Double/reinforced insulation, or<br>基本絕緣及電氣保護屏蔽(遮蔽)或<br>– Basic insulation and electrically protective screening (shielding), or<br>兩者之組合<br>– A combination of both |
| SELV | 不適用 n.a | 不適用 n.a | 功能性絕緣 | 無 None |

| | | | | |
|---|---|---|---|---|
| | | | Functional insulation d | |
| 保護性導體 Protective conductor | 不適用 n.a | 不適用 n.a | 不適用 n.a | 無 None |

a 法規可要求雙重絕緣。使用基本絕緣時，可能需要額外監測保護性導體。對於某些系統，若某一個設置於 EV 供電設備時，要求對保護性導體之雙重絕緣直到 RCD，例：TT 系統。

a Local regulations may require double insulation. In some countries, extra monitoring of protective conductor
is required when using basic insulation. For some systems, for example, TT systems, double insulation to
protective conductor is required up to the RCD, if one is installed in the EV supply equipment.

b 若能滿足所有以下條件，依 IEC 62477-1:2022 表 2 及 4.4.5.5，則容許 B 側與 PELV 間為基本絕緣。

b In accordance with IEC 62477-1:2022, Table 2 and 4.4.5.5, basic insulation between side B and PELV is allowed if all of the following conditions are met:

– PELV 電路連接到保護性導體。

– the PELV circuit is connected to the protective conductor;

–因 PELV 電路與 DC 電路間絕緣故障，PELV 電路無危險電壓或接觸電流產生(參照 8.101.3)。

– no hazardous voltage or touch current occurs (see 8.101.3) in the PELV circuit due to an insulation fault between the PELV circuit and the DC circuit;

– IMD 或接地洩漏電流監測裝置偵測 PELV 電路與 B 側間之絕緣故障，並觸發錯誤或緊急停機。

– the IMD or earth leakage current monitoring device detects this insulation fault between the PELV circuit and side B, and triggers an error or emergency shutdown.

c 若在 B 側電路之某部件工作電壓大於 550 V dc 且對保護性導體故障，將造成 B 側帶電部件(DC+/-) 間對 B 側保護性導體之當下電壓大於 110 %時，此部件與保護性導體間需要雙重/強化絕緣，參照 6.3.1.112.2。

c If there is a part of the side B circuit with a working voltage > 550 V DC and a fault to the protective conductor will cause an offset between side B live parts (DC+/DC–) to protective conductor > 110 % of the present voltage at side B,

double/reinforced insulation is required between this part and the protective conductor. See 6.3.1.112.2.

備考：550 V dc 之閾值向後相容於 IEC 61851-23:2014。

NOTE Threshold of 550 V DC is due to backward compatibility with IEC 61851-23:2014.

d 若 SELV 未連結至保護性導體，則可施加 500 V ac RMS 試驗電壓以試驗絕緣。

d If SELV is not connected to the protective conductor, a 500 V AC RMS test voltage may be applied to test the insulation.

防火外殼外部，B 側帶電部件(DC+/-)電路應藉雙重或強化絕緣隔離彼此及其他電路。

Outside of a fire enclosure, the live parts (DC+/DC–) of the side B circuit shall be separated by ouble or reinforced insulation from each other and other circuits.

符合性依檢驗查核。

Compliance is checked by inspection.

**8.105.6 能量儲存(Stored energy)**

**8.105.6.1 接於 EV 供電設備之插頭及纜線的斷開(Disconnection of plug-and-cable-connected EV supply equipment)**

在 A 側接於 EV 供電設備之插頭及纜線，其中接腳為可觸及，依 IEC 60309-1 敘述，標準插頭自標準插座拔出斷開後 1 s，標準插頭之可觸及接腳任一組合間的電壓應不大於於 60 Vdc 及 12 Vac (RMS)，或儲存之可用能量應小於 0.5 mJ。

For EV supply equipment that is plug-and-cable-connected at side A, where the connection pins re accessible after unplugging, 1 s after disconnecting the standard plug from the standard ocket-outlet, for example, as described in IEC 60309-1, the voltage between any combination f accessible contacts of the standard plug shall be ≤ 60 V DC and ≤ 12 V AC (RMS) or the tored energy available shall be < 0,5 mJ.

符合性依檢驗並依 IEC 62368-1:2023 之 5.5.2.2 試驗方法，插頭拔掉後 1 s 量測。

Compliance is checked by inspection and by the test method in IEC 62368-1:2023, 5.5.2.2,measured 1 s after the disconnection of the plug.

備考：EV 之要求規定在 ISO 17409:2020。

NOTE Requirements for the EV are specified in ISO 17409:2020.

**8.105.6.2 EV 供電設備失去永久連接之電源電壓(Loss of supply voltage to permanently-connected EV supply equipment)**

量測 EV 供電設備之 A 側終端時，A 側任何帶電部件間或 A 側任一帶電部件與保護性導體間之電壓，應於 EV 供電設備斷開電網後 5 s 內。不大於 60 V dc 及 12 V ac RMS，或儲存能量不大於 0.5 mJ。

The voltage between any side A live parts or between any side A live part and the protective onductor, when measured at the side A terminals of the EV supply

equipment, shall be ≤ 60 V C and ≤ 12 V AC (RMS) or the stored energy shall ≤ 0,5 mJ in 5 s or less after disconnecting he EV supply equipment from the live supply network.

符合性依檢驗及依 IEC 62368-1:2023 之 5.5.2.2 試驗法，於供電電壓 EV 供電設備斷開電網後 5 s 內量測。

Compliance is checked by inspection and by the test method in IEC 62368-1:2023, 5.5.2.2,measured 5 s after disconnecting the EV supply equipment from the live supply network.

**8.105.7 自車輛斷開(Disconnection from vehicle)**

於電能傳輸期間，若車輛端插頭之任何接腳間當下電壓 > 60V dc 或 > 12V ac (RMS)，則 EV 供電設備應在車輛端插頭自車輛端插座拔除後 1 s 內，應降低任一接腳間電壓至≤ 60 V dc 及 ≤ 12 V ac (RMS)。

If the present voltage between any contacts at the vehicle connector is > 60 V DC or > 12 V AC(RMS) during energy transfer, the EV supply equipment shall reduce the voltage between any contacts to ≤ 60 V DC and ≤ 12 V AC (RMS) in 1 s or less after un-mating the vehicle connector from the vehicle inlet.

電壓應在未嚙合之車輛端插頭處量測

The voltage shall be measured at the unmated vehicle connector.

應依以下程序查核符合性：

Compliance shall be checked according to the following procedure.

系統 A 試驗裝置如圖 129 所示。系統 B 試驗裝置如圖 130 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system A is shown in Figure 129. The test setup for system B is shown in Figure 130. The test setup for system C is shown in Figure 131.

(1) 針對待測系統，連接 EV 供電設備於具有專用試驗負載之 EV 模擬器。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

(2) 依 EV 供電設備製造商指定程序開始通訊期間。

2) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(3) 在額定最高電壓下查核 EV 供電設備 B 側 VT8。

3) Check that VT8 at the rated maximum voltage of the EV supply equipment at side B.

(4) 持續量測 VT6、VT7 及 VT8。

4) Measure VT6, VT7 and VT8 continuously.

(5) 基於每一系統定義之停止順序停止通訊期間。

5) Stop the communication session based on the stop sequence defined by each system.

(6) 若斷開所有訊號線或連接器閂鎖電路(若有)後，VT6、VT7 及 VT8 之電壓值於 1s 內 ≤ 60 Vdc ，則試驗通過。

6) The test is passed if the voltage values VT6, VT7 and VT8 are ≤ 60 V DC in 1 s or less after disconnecting all the signal lines or the connector-latch circuit, if any.

**8.105.8 來自電網之保護性(接地)導體 Protective (earthing) conductor from the supply network**

來自電網之保護性(接地)導體及保護性導體依 IEC 60364-5-54:2011 的 543.1.2 要求，應具足夠之定額。

The protective (earthing) conductor and the protective conductor from the supply network shall be of sufficient rating according to the requirements of IEC 60364-5-54:2011, 543.1.2.

~~備考：以下國家，保護接地導體的尺寸及額定值由國家法規及規範決定：加拿大(CA)、美國 (US)、日本 (JP)。~~

NOTE In the following countries, the size and rating of the protective earthing conductor are determined by national codes and regulations: CA, US, JP.

EV 供電設備應提供以下任一：

The EV supply equipment shall provide either

— 來自電網 A 側接地終端對 EV 的保護性(接地)導體；或

– a protective (earthing) conductor from the side A earthing terminal of the supply network to the EV, or

— 來自 EV 供電設備對 EV 之保護性導體，若故障保護係基於保護性隔離。參照 8.105.11 之要求。

– a protective conductor from the EV supply equipment to the EV, if fault protection is based on protective separation. See requirements in 8.105.11.

永久連接 EV 供電設備之保護性(接地)導體不得切換。

For permanently connected EV supply equipment, protective (earthing) conductors shall not be switched.

II 類保護之 EV 供電設備應有具雙重絕緣或強化絕緣的導線穿過保護性導體，作為搭接車輛底盤的保護性導體。

Protection class II EV supply equipment shall have a lead-through protective conductor with double insulation or reinforced insulation for the protective conductor bonded to the vehicle chassis.

符合性依檢驗查核。

Compliance is checked by inspection.

**8.105.9 殘餘電流保護裝置(Residual current protective devices)**

預期作為固定式安裝之 EV 供電設備，可依靠結合內建於 EV 供電設備，及/或依 EV 供電設備安裝手冊及相關電路圖規定安裝於設備上游的 RCD。

The EV supply equipment intended for fixed installation may rely on RCD(s) incorporated in the EV supply equipment and/or provided upstream by the

installation as defined in the installation manual of the EV supply equipment and relevant circuit diagrams.

EV 供電設備之插頭及電纜，應於 EV 供電設備外殼內或插頭或電纜上提供 RCD，且插頭與其他任何無 RCD 保護之部件間，對保護性導體要求為雙重絕緣。

Plug and cable EV supply equipment shall be provided with RCD(s) within the EV supply equipment enclosure or on the cable or the plug, and double insulation to the protective conductor is required between the plug and any parts not protected by RCD(s).

若 RCD 結合內建於 EV 供電設備 外殼內，應至少為 A 型並符合以下準之 一：IEC 61008-1(CNS)、 IEC 61009-1(CNS)、IEC 60947-2(CNS14816-2)或 IEC 62423。

RCDs incorporated in EV supply equipment enclosure, if any, shall be at least of type A and comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 or IEC 62423.

若 RCD 結合內建於纜線上，應至少為 A 型並符合 IEC 61540。

RCDs incorporated on the cable, if any, shall be at least of type A and comply with IEC 61540.

RCD 應斷開全部帶電導體。

RCDs shall disconnect all live conductors.

~~備考 1：以下國家，RCD 應安裝在 EV 供電設備插頭 0.3m 或更短的距離內，或直接安裝於插頭中：美國 (US)、加拿大 (CA)。~~

NOTE 1 In the following countries, the RCD shall be located in 0,3 m or less of the plug of the EV supply equipment or in the plug: US, CA.

EV 供電設備製造商應依 IEC 612477-1:2022 附錄 H 提供之指引，在正常及單一故障狀態下藉模擬或計算保護性導體之電流，查核結合內建於 EV 供電設備或由設備提供 RCD 的相容性。

The EV supply equipment manufacturer shall check compatibility with RCDs incorporated in the EV supply equipment, or to be provided by the installation, by simulation or calculation of current in the protective conductor under normal and single fault conditions according to the guideline provided in IEC 62477-1:2022, Annex H.

若有一個以上電網連接 EV 供電設備之 A 側，則每一連接的電網應符合 8.105.9 要求。

In case more than one supply networks are connected to the side A of the EV supply equipment, each connection to a supply network shall comply to the requirements in 8.105.9.

EV 供電設備之插頭及纜線，在正常及故障狀態下，通常設計應使得保護性導體

產生的任何 DC 分量電流≤ 6 mA。

Plug and cable EV supply equipment shall always be designed such that under normal and fault conditions any resulting DC component of the current in the protective conductor is ≤ 6 mA DC.

備考 2. 保護性導體之 DC 分量電流限制值，可藉以下達到：

NOTE 2 Limitation of DC component of the current in the protective conductor can be achieved by

—可導致 DC 洩漏電流至任何其他電路及保護性導體之電路的雙重或強化絕緣，或；

– double or reinforced insulation of the circuit that can cause a DC leakage current to any other circuit and protective conductor, or

—斷開導致 超過 DC 洩漏電流之電路的 DC 漏電偵測。

例：於 EV 供電設備內部依符合 IEC 62955 添加 RDC-DD

– DC leakage detection that disconnects the circuit that causes excessive DC leakage current. For example,adding an RDC-DD according to IEC 62955 inside the EV supply equipment.

符合性依建構檢驗及 EV 供電設備製造商提供之文件查核。

Compliance is checked by inspecting the construction and documents provided by the EV supply equipment manufacturer.

**8.105.10 EV 供電設備與 EV 間之輔助電路的安全要求 Safety requirements for auxiliary circuits between the EV supply equipment and the EV**

依 IEC 62477-1，延伸超出 EV 供電設備外殼作為連接 EV 之任何輔助電路，應為超低電壓（SELV 或 PELV），例：控制導引電路。

Any auxiliary circuit, which extends beyond the EV supply equipment enclosure for connection with the EV, for example, control pilot circuit, shall be extra low voltage (SELV or PELV) according to IEC 62477-1.

符合性依檢驗及試驗查核。

Compliance is checked by inspection.

**8.105.11 保護性導體之截面積尺度(Protective conductor dimension cross-sectional area)**

EV 供電設備之 B 側的保護性接地導體或保護性導體應：

The protective earthing conductor or protective conductor of side B of the EV supply equipment shall

符合 IEC 60364-5-54:2011 之 543.1.2 要求，及

– comply with the requirements of IEC 60364-5-54:2011, 543.1.2, and

— 依 AA.3.1.1、BB.14 或 CC.4.6 設計。

– be designed according to AA.3.1.1, BB.14 or CC.4.6.

~~備考：以下國家，保護接地導線的尺寸及額定值於國家法規有明確規定：美國 (US)、加拿大 (CA)。~~

NOTE In the following countries, the size and rating of a protective earthing conductor is specified in national code and regulation: US, CA.

關於系統 A 及系統 C，B 側帶電部件(DC+/DC-)與保護性導體間之故障可忽略阻抗，預期故障電流等於第一個故障電流。

For system A and system C, the prospective fault current is equivalent to the first fault current for a fault of negligible impedance between the side B live parts (DC+/DC–) and the protective conductor.

關於系統 B，預期故障電流等於保護性裝置之定額，參照 13.101。

For system B, the prospective fault current is equivalent to the rating of the protective devices.See 13.101.

符合性依檢驗及量測查核。

Compliance is checked by inspection and measurement.

**9. 傳導性電氣介面要求(Conductive electrical interface requirements)**

除以下之外，CNS 15511-1 第 9 節適用。

IEC 61851-1:2017, Clause 9, is applicable, except as follows.

**9.1 一般(General )**

取代：

Replacement:

EV 與 EV 供電設備間之實體導電性電氣介面要求，規定於 CNS 15700-3 或 IEC TS 62196-3-1。

The physical conductive electrical interface requirements between the EV and the EV supply equipment are defined in IEC 62196-3 or IEC TS 62196-3-1.

**9.5 DC 介面之功能性敘述 (Functional description of the DC interface)**

取代：

Replacement:

一般要求及定額應符合 IEC 62196-3 或 IEC TS 62196-3-1 規定。

General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-3 or IEC TS 62196-3-1.

**9.7 中性導體之接線(Wiring of the neutral conductor)**

取代：

Replacement:

設置手冊應提供接線說明書 (參照 16.1)。

Wiring instructions shall be provided in the installation manual (see 16.1).

追加子節：

Additional subclause:

**9.101 在負載下避免斷開(Avoidance of breaking under load)**

在負載下，不預期斷路斷開車輛耦合器。在正常操作狀態下，負載下不得發生未嚙合，藉車輛端插頭上鎖於車輛端插座。

The vehicle couplers are not intended for breaking under load. Un-mating shall not take place under load under normal operation condition, by latching the vehicle connector to the vehicle inlet.

除 6.3.1.103 規定之閂鎖機構外，若車輛耦合器意外未嚙合時，B 側當下電流應在規定時間內降低，以容納可能的電弧於車輛耦合器外罩內。

在 B 側降低當下電流之時間，應符合 AA.3.8.2、BB.5、CC.4.3 及 CC.4.4 規定值，依 IEC 62196-1 用於分離車輛端插頭之速度為 0.8 m/s ± 0.1 m/s。

In addition to the latching mechanism defined in 6.3.1.103, in case of an unintended un-mating of the vehicle coupler, the present current at side B shall be reduced in a defined time or less to contain a possible electric arc within the vehicle coupler housing. The time to reduce the present current at side B shall comply with the values specified in AA.3.8.2, BB.5, CC.4.3 and CC.4.4, using a speed of separation of the vehicle connector of 0,8 m/s ± 0,1 m/s according to IEC 62196-1.

若閂鎖功能故障，未嚙合之車輛耦合器應藉失去導引電路（例：控制導引、近接電路）的電氣連續性偵測，藉執行緊急停機以減輕電弧及電擊危害。

Un-mating the vehicle coupler in case of a fault of the latching function shall be detected by the loss of electrical continuity of pilot circuit(s), for example, control pilot, proximity circuit, to mitigate electrical arcing and shock hazards by performing an emergency shutdown.

符合性依 6.3.1.113.4 試驗查核。

Compliance is checked by the test in 6.3.1.113.4.

斷開容量及系統餘裕(redundancy)之具體要求，系統 A 規定於 AA3.6 及 AA3.8.2，系統 B 規定於 BB.5，系統 C 規定於 CC4.3 及 CC4.4。

The system specific requirements for breaking capacity and system redundancy are defined in AA.3.6 and AA.3.8.2 for system A, BB.5 for system B, and CC.4.3 and CC.4.4 for system C.

**10. 轉接器要求(Requirements for adaptors)**

取代：

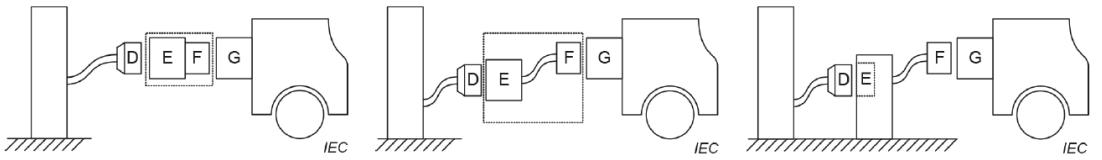
Replacement:

車輛端插頭與車輛端插座間，應使用由 EV 製造商或 EV 供電設備製造商指定且認可之車輛轉接器。

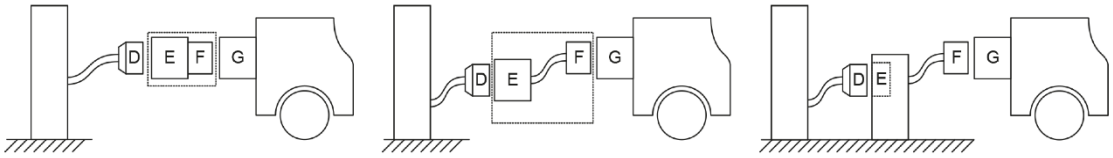
車輛轉接器可依 IEC TS 62196-7 及 CHAdeMO 協議會發行之〝CHAdeMO 3.0 車輛端插座轉接器性能確認圖表〞設計。

Vehicle adapters between the vehicle connector and the vehicle inlet shall be used if specifically designated and approved by the vehicle manufacturer or by the EV supply equipment manufacturer. The vehicle adapters can be designed in accordance

with IEC TS 62196-74 and
“CHAdeMO 3.0 inlet adapter performance confirmation sheet” published by CHAdeMO Association5; other national requirements can apply.
此車輛轉接器應符合本標準及 IEC 62196-3 要求。
車輛轉接器應標示以指明車輛端轉接器製造商容許使用的特定條件，例：IEC 62196-1、IEC 62196-3 及 IEC 62196-3-1、IEC TS 62196-7
Such vehicle adapters shall comply with the requirements of this document and IEC 62196-3.
The vehicle adapters shall be marked to indicate the specific conditions of use allowed by the vehicle adapter manufacturer, for example, IEC 62196-1, IEC 62196-3 and IEC 62196-3-1, IEC TS 62196-7.
備考 1. 修正 IEC 61851-1:2017 研議"
車輛轉接器不得用於連接車輛端插頭於車輛端插座〞。
NOTE 1 Revision of the requirement "Vehicle adapters shall not be used to connect a vehicle connector to a vehicle inlet" in IEC 61851-1:2017 is under consideration.
備考 2.IEC 62196-7 容許車輛轉接器對 AA 或 BB 配置之車輛端插頭連接，如同 IEC 62196-3 規定依 IEC PAS 63454 及 GG 架構(將 IEC 62196-3 規定)對車輛端插座。
NOTE 2 IEC TS 62196-7 allows vehicle adapters to connect a vehicle connector of configuration AA or configuration BB as specified in IEC 62196-3 to a vehicle inlet according to IEC PAS 63454 and of configuration GG (to be specified in IEC 62196-3).
車輛轉接器應為下列任一結構型式(參照圖 109)：
The vehicle adapters shall be of any of the following construction types (see Figure 109):
A 型：，同一外罩內包含轉接插座及轉接器插頭之可攜式車輛轉接器。
– Type A: A portable vehicle adapter containing an adapter inlet and an adapter connector in the same housing.
B 型：，轉接器插頭及轉接器插座容納於不同外罩，藉電纜/有線連接一起之可攜式車輛轉接器。
– Type B: A portable vehicle adapter containing an adapter inlet and an adapter connector in different housings, wired/connected together by a cable.
C 型：轉接器插座及轉接器插頭容納於不同外罩，藉電纜有線連接，使用之轉接器插頭外罩固定在 EV 供電設備。
– Type C: A vehicle adapter containing an adapter inlet and an adapter connector in the different housings wired by a cable, with the housing of the adapter inlet fixed to the EV supply equipment.




a) Type A　　b) Type B　　c) Type C




a) A 型　　b) B 型　　c) C 型

說明 key

| | | | |
|---|---|---|---|
| D | 車輛端插頭<br>vehicle connector | F | 轉接器插頭<br>adapter connector |
| E | 轉接器插座<br>adapter inlet | G | 車輛端插座<br>vehicle inlet |

備考：結構型式基於 IEC TS 62196-7。

NOTE Construction types are based on IEC TS 62196-7.

圖 109 – 車輛轉接器之結構型式

Figure 109 – Construction types of vehicle adapters

**11. 纜線組要求 (Cable assembly requirements)**

除以下之外，CNS 15511-1 第 11 節適用。

IEC 61851-1:2017, Clause 11, is applicable, except as follows.

**11.1 一般(General)**

取代：

Replacement:

EV 供電設備之 B 側應配備非分離式纜線組。

The EV supply equipment shall be equipped with a non-detachable side B cable assembly.

B 側纜線組應依 IEC 62893-4-1:2020 提供適合之電纜，且纜線組依 IEC 62893-4-1:2020 配備熱傳裝置。

The side B cable assembly shall be provided with a cable that is suitable for the application according to IEC 62893-4-1:2020 and for cable assemblies with thermal transport device according to IEC 62893-4-1:2020.

**11.6 應變消除(Strain relief)**

取代第 2 段。

Replacement of the 2nd paragraph:

針對情況 C，EV 供電設備之應變消除應依 11.6.101。

For case C, the strain relief at the EV supply equipment shall be in accordance with 11.6.101.

追加子節：

Additional subclauses:

**11.6.101 B 側纜線組之應變消除(Strain relief of the EV supply equipment's side B cable assembly)**

B 側纜線組應連接 EV 供電設備外殼，使得導體替換免於應變，包括其連接端子或終端之扭曲，且其受覆蓋保護免於磨損。

Side B cable assemblies shall be connected to the enclosure of the EV supply equipment so that the conductors are relieved from strain, including twisting, where they are connected to the terminals or terminations, and that their covering is protected from abrasion.

結構應確保 B 側纜線組不會接觸到可觸及金屬部件或內部金屬部件，例：電纜固定螺絲。若此等電氣連接可觸及金屬部件，除非可觸及之金屬部件連接內部的保護性接地終端。

The construction shall ensure that the side B cable assembly cannot touch accessible metal parts or internal metal parts, for example, cable anchorage screws, if these are electrically connected to accessible metal parts, unless the accessible metal parts are connected to the internal protective earth terminal.

電纜錨定設計應於組裝時，使得錨定裝置或其組件對 B 側纜線組於相對正確位置。

電纜錨定對 B 側纜線組不得出現銳邊，且應以 EV 供電設備外殼開啟時，其組件不得遺失之方式設計。

The design of the cable anchorage shall be such that the anchorage or its components are properly positioned relative to the side B cable assembly when assembled. Cable anchorages shall present no sharp edges to the side B cable assembly and shall be designed in a way that their components shall not be lost when the enclosure of the EV supply equipment is being opened.

不得使用暫代方法，如 B 側纜線組打結或用繩子捆綁端部。電纜錨定及電纜插座應適合於可能連接之不同型式可撓性 B 側纜線組。

Makeshift methods, such as tying the side B cable assembly into a knot or tying the ends with string, shall not be used. Cable anchorages and cable inlets shall be suitable for the different types of flexible side B cable assemblies that may be connected.

若纜線入口提供套管以防止損壞 B 側纜線組，此套管應為絕緣材料，及應平整且

無毛邊。若提供漏斗狀開口，其端部直徑應至少為連接纜線最大截面積之直徑的1.5 倍。

If a cable entrance is provided with a sleeve to prevent damage to the side B cable assembly, this sleeve shall be of insulating material and shall be smooth and free from burrs. If a bellmouthed opening is provided, the diameter at the end shall be at least 1,5 times the diameter of the cable with the largest cross-sectional area to be connected.

螺旋形金屬彈簧無論裸露或披覆絕緣材料，不容許如同 B 側纜線組之套管。

Helical metal springs, whether bare or covered with insulating material, are not allowed as side B cable assembly sleeves.

符合性依檢驗及 11.6.102 試驗查核。

Compliance is checked by inspection and by the tests in 11.6.102.

**11.6.102 B 側纜線組錨定試驗(Test of the anchorage of the side B cable assembly)**

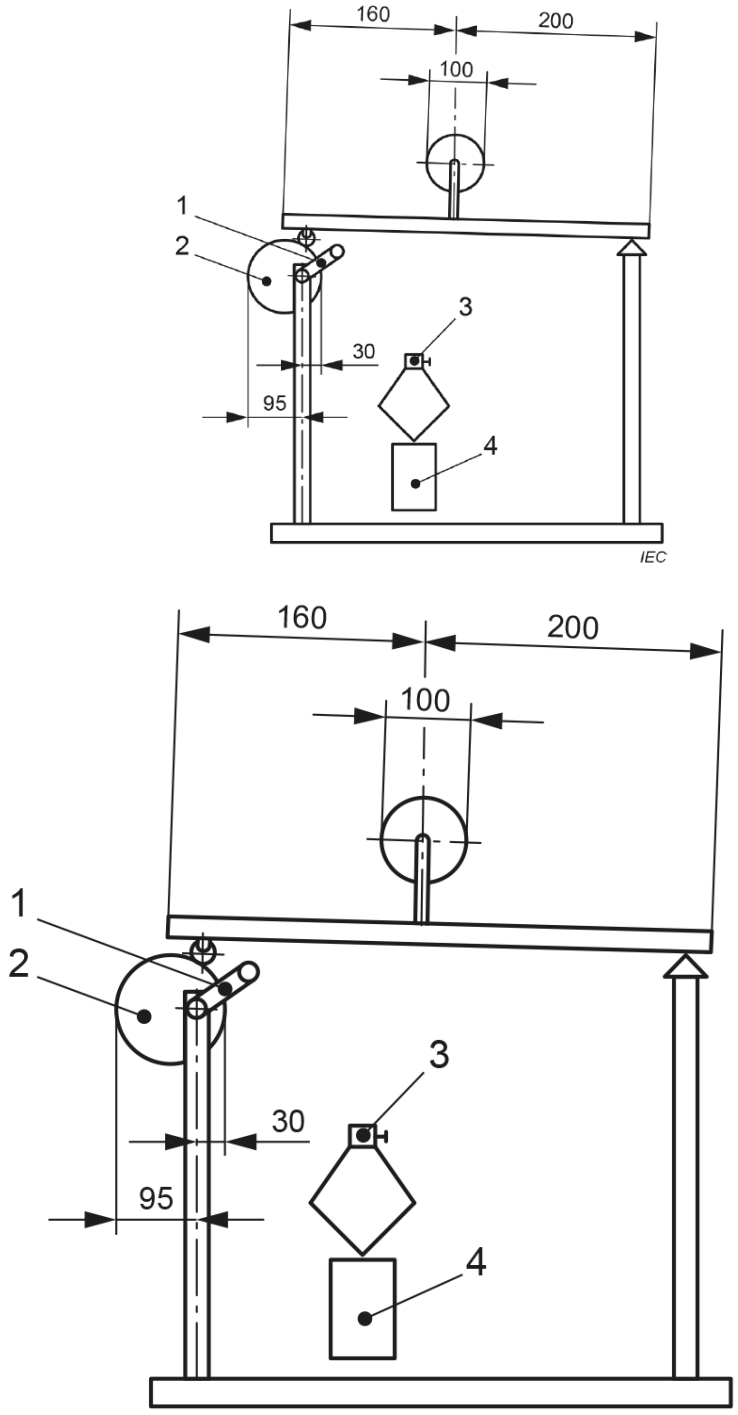
待測裝置（DUT）為 EV 供電設備。試驗應依圖 110 及圖 111 試驗設置，針對附接至 DUT 之每一 B 側纜線組執行。

B 側纜線組之任何纜線管理系統，應於試驗前移除。

The device under test (DUT) is the EV supply equipment. The test shall be performed for each side B cable assembly attached to the DUT according to the test setups in Figure 110 and Figure 111. Any cable management systems for the side B cable assembly shall be removed before the test.

B 側纜線組錨定裝置之測試裝置如圖 110，應緊鄰 DTU，以使 B 側纜線組水平對準 DUT 外殼的方法設置，參照圖 111。

The apparatus for testing the side B cable assembly anchorage shown in Figure 110 shall be set up next to the DUT in such a way that the side B cable assembly points horizontal from the enclosure of the DUT, see Figure 111.

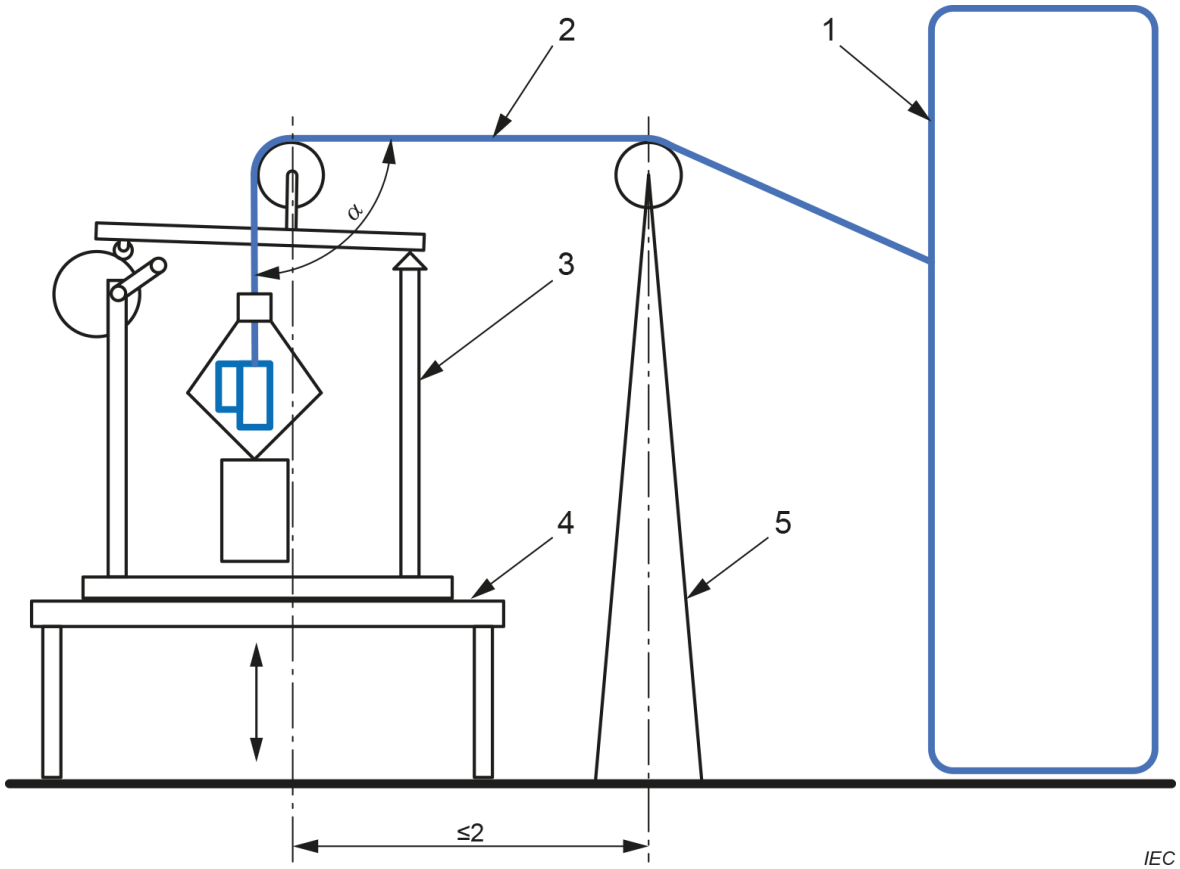


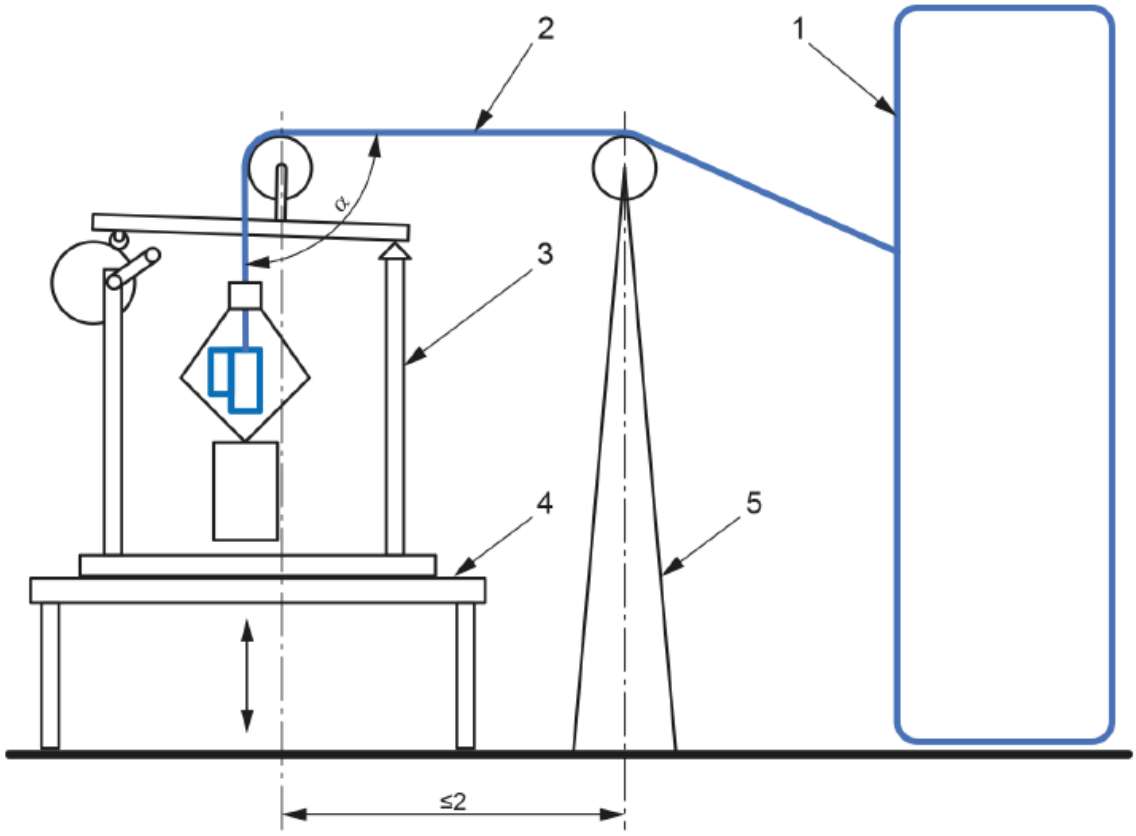

說明 key

| | | | |
|---|---|---|---|
| 1 | 曲柄 Crank | 3 | 電纜固定<br>Cable fixation |
| 2 | 偏心輪<br>eccentric | 4 | 重量<br>weight |

圖 110 – B 側纜線組錨定試驗之裝置

Figure 110 – Apparatus to test the side B cable assembly anchorage




說明 key

| | |
|---|---|
| 1 | DUT |
| 2 | B 側纜線組 side B cable assembly |
| 3 | 試驗裝置 test apparatus |
| 4 | 可調式桌子 |
| 5 | 纜線支架 cable support |
| α | 90° ± 10° |

圖 111 – B 側纜線組錨定試驗裝置

Figure 111 – Test setup the side B cable assembly anchorage

B 側纜線組之車輛端插頭若固定於試驗裝置(參照圖 110)，使纜線之軸向垂直進入的車輛端插頭。

The vehicle connector, if any, of the side B cable assembly is fixed in the test apparatus (see Figure 110) so that the axis of the cable is vertical where it enters the vehicle connector.

若 B 側纜線組之試驗設備與 EV 供電設備外殼間的自由長度超過 2 m，則 B 側纜線組應使用適當的方式支撐（參照圖 111）。黏貼帶應位在 B 側纜線組之 DTU 外殼出口或 DTU 應變消除措施位置。此黏貼帶將基於黏貼帶之位移，藉以容許用於量測施力後纜線移動的縱向位移，。此外，應在黏貼帶及外殼或應變消除裝置作標記，且兩個標記要對齊，以指明施加扭矩後纜線之任何扭轉或旋轉移動。

If the free length of the side B cable assembly between the apparatus and the enclosure of the EV supply equipment is more than two meters, then the side B cable assembly shall be supported by appropriate means, see Figure 111. An adhesive strip shall be placed on the cable at the point where the side B cable assembly exits the DUT’s enclosure or the strain relief means provided in the DUT. This adhesive strip will be used for the measurement of the longitudinal displacement after the force is applied by allowing for measurement of any displacement based on movement of the adhesive strip. Additionally, a mark is to be made on the adhesive strip and the enclosure or strain relief means, and the two marks are to be aligned in order to indicate any twisting or rotary movement of the cable after the torque is applied.

B 側纜線組應進行表 114 規定拉力值 100 次，每次施加拉力應不突然動作並持續 1 s。

The side B cable assembly shall be subjected 100 times to a pull of the value specified in Table 114. Each pull shall be applied without jerks and with a duration of 1 s.

接著，B 側纜線組應進行施加表 114 規定扭矩值 1 min

Immediately afterwards, the side B cable assembly shall be subjected to a torque of the value specified in Table 114 for 1 min.

試驗後，量測黏貼帶從進入外殼或應變消除位置之任何位移。此外，量測黏貼帶上標記與外殼或應變消除裝置上標記間之任何位移。比較此等量測值與表 114 之最大位移值。

After the tests, any displacement of the adhesive strip from the point where it enters the enclosure or strain relief means is to be measured. Additionally, any displacement between the mark made on the adhesive strip and the mark made on the enclosure or strain relief means is to be measured. These measured values are then compared to the maximum displacement values in Table 114.

表 114 B 側纜線組錨定之拉力及扭矩試驗值

Table 114 – Pull force and torque test values for side B cable assembly anchorage

| EV 供電設備 B 側之額定連續電流<br>Rated continuous current of the EV supply equipment at side B<br>A | 拉力 Pulling force<br>N | 扭矩 Torque<br>Nm | 最大位移<br>Maximum Displacement<br>mm |
|---|---|---|---|
| 13 to 20 | 160 | 0.6 | 2.4 |
| 30 to 32 | 200 | 0.7 | 2.4 |
| 60 to 70 | 240 | 1.4 | 2.4 |
| 125 | 240 | 2.7 | 2.4 |
| 200 | 250 | 5.4 | 2.4 |
| 250 | 500 | 11.0 | 4.8 |
| > 400 | 500 | 16.3 | 4.8 |

若滿足下列所有條件，則試驗合格：

The test is passed if all the following conditions are met:

- 以正常或矯正視力目視檢驗時，B 側纜線組不呈現損壞。
- the side B cable assembly shall not indicate damage when inspected by normal or corrected vision;
- B 側纜線組之位移不得超過表 114 指明的值
- the side B cable assembly shall not be displaced by more than the values indicated in Table 114.

**11.101 纜線脫離(Cable breakaway)**

電纜應於外殼內建構或連接端子之方式，使若電纜錨定失效，當施加應變時，導體可能後續順序中斷裂：

The cable shall be constructed or connected to terminals within the enclosure in such a way that, if the cable anchorage fails, the conductors would break in the following sequence when strain is applied:

— 控制導引導體

– the control pilot conductor/conductors;

— 電流載流導體

– the current carrying conductors;

— 保護性導體

– the protective conductor.

符合性依檢驗查核。

Compliance is checked by inspection.

**11.102 B 側纜線組之表面溫度(Surface temperature of the side B cable assembly)**

B 側纜線組(包括纜線、車輛端插頭及所有其他握柄或把手)應視可握持部件處理。

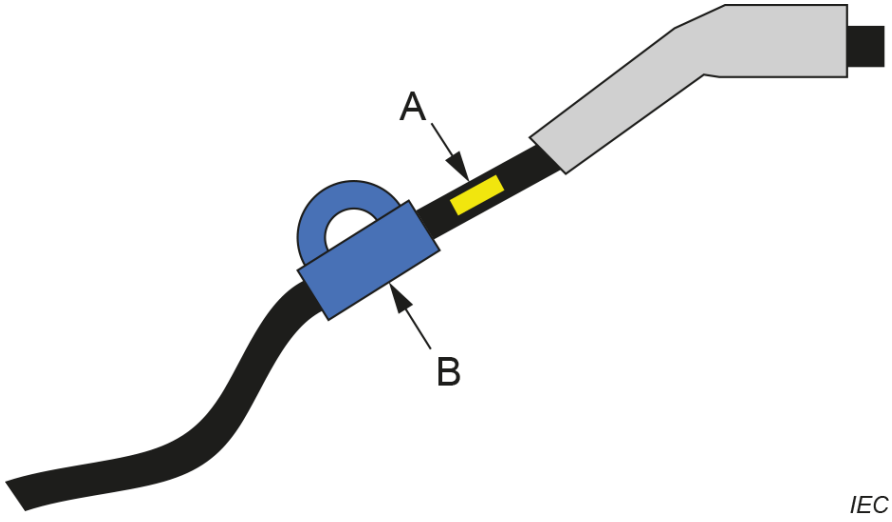
The side B cable assembly (including cable, vehicle connector and any additional handle or grip) shall be treated as a graspable part.

B 側纜線組之表面溫度(包括車輛端插頭)應不大於使用絕緣的溫度定額，且於 40 ℃周圍溫度下，EV 供電設備正常操作期間可握持部件之金屬件應不大於 50 ℃且非金屬件不大於 60 ℃。

The surface temperature of the side B cable assembly (including the vehicle connector) shall be less than or equal to the temperature rating of the insulation used and, during normal operation of the EV supply equipment under the ambient temperature of 40 °C, the graspable part shall be ≤ 50 °C for metal parts and ≤ 60 °C for non-metal parts.

若纜線表面欲視為可接觸部位，纜線應依 ISO 7010-W017:2011-05 [熱表面]或 ISO 7010-W001:2011-05 [一般警示] 提供附貼之警告標籤或標示，並配備握柄或把手(參照圖 116)。在此情形下，可觸及部位之金屬部件應不大於 60 ℃及非金屬部分為不大於 85 ℃。

If the cable surface is intended to be considered as a touchable part, the cable shall be provided with a warning label or marking according to ISO 7010-W017:2011-05 (hot surface) or ISO 7010-W001:2011-05 (general warning) attached and be equipped with a handle or a grip (see Figure 112). In such case, the touchable part shall be ≤ 60 °C for metal parts and ≤ 85 °C for non-metal parts.




說明 key

| | |
|---|---|
| A | 警告標籤<br>warning label |
| B | 握柄或把手<br>handle or grip |

圖 112 – B 側纜線組配備握把且警告標籤附貼於纜線之範例

Figure 112 – Example of a side B cable assembly equipped with handle and a warning label attached to the cable

~~備考：以下國家，警告標籤為強制性要求：日本 (JP)、加拿大 (CA)。~~

NOTE In the following countries, the warning label is mandatory: JP, CA.

符合性依以下試驗查核。

Compliance is checked by the following test.

僅配備熱感測之 B 側纜線組，試驗應在 20 ℃與 40 ℃間之周圍溫度執行，且獲得的結果應修正為 40 ℃的周圍溫度(若適用)。

For a side B cable assembly equipped only with thermal sensing, the test shall be performed at an ambient temperature between 20 °C and 40 °C and the obtained results shall be corrected to an ambient temperature of 40 °C (if applicable).

配備熱傳輸裝置之 B 側纜線組，試驗應於(40 ± 5) ℃周圍溫度執行，修正結果為 40 ℃周圍溫度。

For a side B cable assembly equipped with thermal transport device, the test shall be performed at an ambient temperature of (40 ± 5) °C. The results are corrected to an ambient temperature of 40 °C.

不支援增壓電流之 EV 供電設備適用以下

For an EV supply equipment that does not support the boost current, the following applies.

— 間隔 10 min 或更長時間取連續 3 個讀值，視已發生之熱穩定性而定，指明增加 ≤ 2 K。

– Thermal stabilisation is considered to have occurred when three successive readings, taken at intervals of 10 min or more, indicate an increase of ≤ 2 K.

– 依 EV 供電設備製造商之數據圖表，若無其他規定，試驗電流為 EV 供電設備 B 側之額定連續電流，且試驗期間應保持恆定。

– The test current is the rated continuous current of the EV supply equipment at side B, according to EV supply equipment manufacturer's data sheet, if not stated otherwise, and shall remain constant during the test.

支援增壓電流之 EV 供電設備適用以下：

For an EV supply equipment that supports the boost current, the following applies.

– 當溫度讀值達到 EV 供電設備製造商指定之最大值時，視為已發生熱穩定。

– Thermal stabilisation is considered to have occurred when the temperature reading reached the maximum value specified by the EV supply equipment manufacturer.

— 初始試驗電流為 EV 供電設備 B 側額定提高電流，試驗期間於電能傳輸一段時間後，其將降低至 EV 供電設備 B 側額定連續電流，若無其他規定，所有可依 EV 供電設備製造商之數據圖表指定。

– The test current is initially the rated boost current of the EV supply equipment at side B, which will be reduced to the rated continuous current of the EV supply equipment at side B after transferring energy for a certain period of time during the test, all of which may be specified in the EV supply equipment manufacturer's data sheet, if not stated otherwise.

試驗程序如下

The test procedure is as follows.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。

各系統之試驗負載設置如表 AA.10、BB.2 及圖 132 所示。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. The setup of the test load for each system is shown in Table AA.10, Table BB.2, and Figure 132.

(2)開始量測 B 側纜線組之表面溫度。量測點應包括 B 側纜線組每一可觸及且可握持部位至少兩個以上位置，即總共四個以上位置。

2) Start the measurement of the surface temperature of the side B cable assembly. The measurement points shall include two or more locations from each of the touchable and graspable part of the side B cable assembly, that is, four points or more in total.

(3) 依 EV 供電設備製造商指定之程序以試驗電流開始電能傳輸。針對支援增壓電流之 EV 供電設備，重複指定的通訊期間，直到確認 B 側纜線組之表面溫度已達熱穩定。

3) Start energy transfer at the test current with the procedure specified by the EV supply equipment manufacturer. For an EV supply equipment supporting boost current, repeat the designated communication session cyclically until the thermal stabilization

of the surface temperature of the side B cable assembly has been confirmed.

(4) 確認所有量測點已達熱穩定。

4) Confirm that the thermal stabilization has been reached for all the measurement points.

通過本試驗，若：

This test is passed if

— 非金屬部件：試驗期間，可握持部位及可觸及部位之所有量測溫度分別為≤60 ℃及≤85 ℃。

– for non-metal parts: all the temperature measurements are ≤ 60 °C for the graspable part and ≤ 85 °C for the touchable part during the test, and

— 金屬部件：試驗期間，可握持部位及可觸及部位之所有量測溫度分別為≤50 ℃ ≤60 ℃。

– for metal parts: all the temperature measurements are ≤ 50 °C for the graspable part and ≤ 60 °C for the touchable part during the test.

**12. EV 供電設備構造要求及試驗(EV supply equipment constructional requirements and tests)**

除以下之外，CNS 15511-1 第 12 節適用。

IEC 61851-1:2017, Clause 12, is applicable, except as follows.

**12.1 一般(General)**

追加：

Addition:

依 B 側纜線組製造商指定之數據圖表，EV 供電設備應符合限制/限制值。

The EV supply equipment shall comply with the restrictions/limitations as specified in the data sheet of the side B cable assembly manufacturer.

符合性依檢驗查核。

Compliance is checked by inspection.

**12.2 機械開關裝置之特性(Characteristics of mechanical switching devices)**

**12.2.5 繼電器(Relays)**

CNS 15511-1 之 12.2.5 不適用

IEC 61851-1:2017, 12.2.5, is not applicable.

**12.3 空間距離與沿面距離(Clearances and creepage distances)**

取代第 1 段：

Replacement of the 1st paragraph:

依 EV 供電設備製造商預期設置之 DC EV 供電設備的空間距離與沿面距離，應依 IEC 62477-1 規定之要求。

The clearance and creepage distances in the DC EV supply equipment, installed as intended by the EV supply equipment manufacturer, shall be according to the requirements specified in IEC 62477-1.

追加：

Addition:

EV 供電設備之 B 側應依額定脈衝電壓≥2500 Vdc 設計。

The side B of an EV supply equipment shall be designed according to a rated impulse voltage of ≥ 2 500 V DC.

符合性依 CNS 15511-1 之 12.7 查核。

Compliance is checked according to IEC 61851-1:2017, 12.7.

**12.4 IP 等級(IP degrees**

**12.4.1 外殼對固體異物及水之防護等級(Degrees of protection against solid foreign objects and water for the Enclosures)**

追加：

Addition:

定置型 EV 供電設備應依 EV 供電設備製造商指定設置條件試驗，此等條件應於設置手冊中載明。

For an EV supply equipment of stationary type, the test conditions shall be according to the installation conditions specified by the EV supply equipment manufacturer. These conditions shall be as indicated in the installation manual.

**12.5 絕緣電阻 (Insulation resistance)**

除以下之外，CNS 15511-1 之 12.5 適用。

IEC 61851-1:2017, 12.5, is applicable, except as follows.

替代最後一段

Replacement of the last paragraph:

若試驗針對 IEC 61851-23:2023 之 12.9，接續為 IEC 61851-23:2023 之 12.5、IEC 61851-23:2023 之 12.6 及最終 IEC 61851-23:2023 之 12.9 調適，則針對絕緣試驗及接觸電流可避免連續進行調適試驗。

The conditioning test for the insulation test and the touch current can be avoided if the conditioning for the test of IEC 61851-23:2023, 12.9, followed by test of IEC 61851-23:2023,12.5, IEC 61851-23:2023, 12.6, and final test of IEC 61851-23:2023, 12.9, are conducted sequentially in that order.

追加：

Addition:

絕緣電阻不包括依 12.108 組件橋接之絕緣及 IMD 或接地洩漏電流監測裝置，此等電路於試驗期間應斷開。

Insulation resistance does not include components bridging insulation according to 12.108 and IMD or earth leakage current monitoring device. These circuits shall be disconnected during the test.

**12.6 接觸電流(Touch current)**

以下內容取代 CNS 15511-1 之 12.6。

IEC 61851-1:2017, 12.6, is replaced with the following.

取代：

Replacement:

**12.6.101 接觸電流限制值(Touch current limit)**

AC (RMS) 及 DC 接觸電流應不大於表 115 規定值。

The AC (RMS) and DC touch current shall be less than or equal to the values indicated in Table 115.

表 115 接觸電流限制值

Table 115 – Touch current limits

| 條件 Condition | AC (RMS) | DC |
|---|---|---|
| 正常操作 Normal operation | 0.5 mA | 2 mA |
| 依 IEC 60990:2016 6.2.2 之故障條件<br>Fault condition according to IEC 60990:2016, 6.2.2 | 3.5 mA | 10 mA |

若試驗接觸電流大於表 115 限制值，I 類 EV 供電設備適用 12.6.103。

For class I EV supply equipment, if the test touch current is more than the limits of Table 115,12.6.103 is applicable.

符合性依 12.6.102.試驗查核。

Compliance is checked by the test in 12.6.102.

**12.6.102 試驗(Test)**

**12.6.102.1 試驗配置(Test configuration)**

洩漏電流量測之試驗配置應依 IEC 60990:2016 的 5.4.1。若 EV 供電設備依 EV 供電設備製造商分類僅用於某些電網，則 EV 供電設備應依每一該等系統進行試驗。

Test configurations for measurement of leakage current shall be according to IEC 60990:2016,5.4.1. If the EV supply equipment is classified by the EV supply equipment manufacturer for use only on certain supply networks, the EV supply equipment shall be tested with each of those systems.

**12.6.102.2 量測電網之應用(Application of measuring network)**

量測電網規定於 IEC 60990:2016 之圖 3、4 及 5。

The measuring network is defined in IEC 60990:2016, Figure 3, Figure 4 and Figure 5.

AC 接觸電流量測 ≤ 2 mA RMS 應適用 IEC 60990 圖 4，及 AC 接觸電流量測 > 2 mA RMS 應適用 IEC 60990 圖 5。

IEC 60990:2016, Figure 4, shall be applied for AC touch current measurement ≤ 2 mA

RMS,and IEC 60990:2016, Figure 5, shall be applied for AC touch current measurement > 2 mA RMS.

DC 接觸電流量測應使用 IEC 60990:2016 之圖 3、4 或 5。

Any of IEC 60990:2016, Figure 3, Figure 4 or Figure 5, shall be used for DC touch current measurement.

量測電網之終端 A 輪流連接每一導電性或未接地的可觸及表面。針對終端 A 電極之每一應用，終端 B 電極應用於接地，另，輪流應用於每一其他可觸及部件。所有可觸及之導電性或未接地表面針對接觸電流試驗。

Terminal A of the measuring network is connected to each conductive or unearthed accessible surface in turn. For each application of the terminal A electrode, the terminal B electrode is applied to earth, then to each of the other accessible parts in turn. All accessible conductive or unearthed surfaces are to be tested for touch currents.

對於可觸及之非導電性部件，以尺度為 100 mm × 200 mm 的金屬箔片接觸此部件進行試驗。

For an accessible non-conductive part, the test is made to metal foil having dimensions of 100 mm by 200 mm in contact with the part.

**12.6.102.3 試驗條件(Test condition)**

此試驗前，針對監測為目的而不連續操作，且 EV 供電設備 B 側於正常操作期間不提供保護性導體電流之電路，可透過固定電阻或參考電阻接地斷開。

Circuitry which is connected through a fixed resistance or referenced to earth for monitoring purpose which is not continuously operated, and which does not contribute to a protective conductor current during normal operation of the side B circuit of EV supply equipment may be disconnected before this test.

EV 供電設備試驗應使用具有專用 EV 模擬器之試驗負載進行，待測系統依圖 132 於 EV 供電設備 B 側額定加壓功率。

The test shall be made with the EV supply equipment to a test load with a dedicated EV simulator for the system under test according to Figure 132 at rated boost power of the EV supply equipment at side B.

於 IEC 60068-2-78 試驗 Cab 在 40 ℃ ± 2 ℃且相對濕度 93 %下之濕熱連續試驗 96 h 後， EV 供電設備依 IEC 60990:2016 第 6 節連接電網，應於 1 h 內量測接觸電流。A 側當下電壓應為電網之額定最高電壓。

The touch current shall be measured in 1 h or less after the damp heat continuous test of IEC 60068-2-78, test Cab, at 40 °C ± 2 °C and 93 % relative humidity for 4 d, with the EV supply equipment connected to a supply network according to IEC 60990:2016, Clause 6. The present voltage at side A shall be the rated maximum voltage of the supply network.

量測應依 IEC 60990:2016 6.2.2 進行每一可適用之故障條件。

Measurements shall be made with each of the applicable fault conditions according to IEC 60990:2016, 6.2.2.

**12.6.102.4 試驗量測 (Test measurements)**

接觸電流之 AC (RMS)值或 DC 值，應依 IEC 60990:2016 之圖 3、圖 4 或圖 5 規定測定。

The AC (RMS) value and the DC value of touch current shall be determined as indicated in IEC 60990:2016, Figure 3, Figure 4 or Figure 5.

若量測值不大於表 112 規定之對應的接觸電流限制值，則試驗合格。

The test is passed if the measured values are less than or equal to the corresponding touchcurrent limits specified in Table 115.

**12.6.103 試驗接觸電流大於 3.5 mA 之保護措施(Protection measures for the test touch current more than 3,5 mA)**

在故障狀態下斷開接地導體之 I 類 EV 供電設備 A 側，若故障狀態下斷開接地導體的試驗接觸電流 > 3.5 mA RMS，應滿足以下要求之一：

For the side A of a class I EV supply equipment under the fault condition of opened earthing conductor, if the test touch current under the fault condition of opened earthing conductor is > 3,5 mA RMS, one of the following requirements shall be met.

(a)保護性接地導體整個長度之截面積，銅應 10 mm2 以上或鋁應 16 mm2 以上。

a) The protective earthing conductor shall have a cross-sectional area of ≥ 10 mm2 Cu or ≥ 16 mm2 Al, through its total length.

(b)保護性接地導體截面積，銅 < 10 mm2 或鋁 < 16 mm2 時，則應提供不小於相同截面積之第二個保護性接地導體，保護性接地導體截面積達到銅 ≥10 mm2 或鋁 ≥16 mm2。

b) Where the protective earthing conductor has a cross-sectional area of < 10 mm2 Cu or < 16 mm2 Al, a second protective earthing conductor of more than or equal to the same cross-sectional area shall be provided up to a point where the protective earthing conductor has a cross-sectional area of ≥ 10 mm2 Cu or ≥ 16 mm2 Al.

備考：此可要求 EV 供電設備針對第二個保護性接地導體有各別終端。

NOTE This can require that the EV supply equipment has a separate terminal for a second protective earthing
conductor.

(c)若保護性接地導體自電網失去連續性，自動斷開電源。

c) Automatic disconnection of the supply in case of loss of continuity of the protective earthing conductor from supply network.

EV 供電設備之外部應設置使用者可目視之警告標誌，參照 16.1(e)

A caution symbol shall be placed on the outside of the EV supply equipment, visible to the user.See 16.1 e).

保護性接地導體之最小尺寸，應在安裝手冊中指明。

可適用安全法規。

The minimum size of the protective earthing conductor shall be indicated in the installation manual. Local safety regulations can apply.

符合性依檢驗查核。

Compliance is checked by inspection.

**12.7 介電耐受電壓(Dielectric withstand voltage)**

**12.7.2 脈衝耐受電壓(1.2/50 μs) (Impulse dielectric withstand (1,2 µs/50 µs) )**

替代第二段：

Replacement of the 2nd paragraph:

衝擊電壓應施加於 A 側帶電部件及暴露的導電性部件

The impulse voltage shall be applied to side A live parts and exposed conductive parts.

追加子節：

Additional subclauses:

**12.7.101 抑制 A 側之暫態過電壓(絕緣協調) (Suppression of transient overvoltage at side A (insulation coordination) )**

依 IEC 60664-1:2020 表 F.1 使用脈衝電壓施加於 IEC 61851-21-2:2018 附錄 E 之試驗裝置 A 側時，EV 供電設備 B 側當下電壓應限制為：

When applying the test setup of IEC 61851-21-2:2018, Annex E, with an impulse voltage according to IEC 60664-1:2020, Table F.1, at side A, the EV supply equipment shall limit the present voltage at side B to:

— DC+與保護性導體間為 2500 Vdc。

– 2 500 V DC between DC+ and the protective conductor,

— DC-與保護性導體間為 2500 Vdc。

– 2 500 V DC between DC– and the protective conductor, and

-DC+與 DC-間(為脈衝前之 B 側當下電壓加 500 Vdc)

– (present voltage at side B (before the impulse) plus 500 V DC) between DC+ and DC– .

符合性依 IEC 60664-1:2020 表 F.1 使用 A 側當下電壓施加於 IEC 61851-21-2:2018 附錄 E 試驗裝置的查核。

Compliance is checked by applying the test setup of IEC 61851-21-2:2018, Annex E, with a present voltage at side A according to IEC 60664-1:2020, Table F.1.

試驗應依 IEC 61851-21-2:2018 圖 E.1 描述使用試驗裝置依以下修正執行：

The test shall be performed with the test setup as described in IEC 61851-21-2:2018, Figure E.1,with the following modifications:

– 無 DC 功率經由濾波器饋入(編號 15)

- without a DC power feed through filter (no.15);
- 沒有功率負載（編號 16）
- without a power load (no.16);
- 在電源/負載埠終端斷開線路（編號 10）
- with open lines at the supply/load port of termination (no.10).

針對連接 AC 電網設計之 EV 供電設備，試驗應依序於 L1/L2/L3/N 與 PE 間以正弦波最高波峰使用單獨正脈衝，及 L1/L2/L3/N 與 PE 間以正弦波最低波谷使用單獨負脈衝執行。

For EV supply equipment designed to be connected to an AC supply network, the test shall be performed sequentially between L1/L2/L3/N and PE with a single positive pulse at the highest peak of the sine wave, and between L1/L2/L3/N and PE with a single negative pulse at the lowest peak of the sine wave.

針對連接 DC 電網設計 EV 供電設備，應於 L+/L- 與 PE 間依序使用單獨正脈衝及單獨負脈衝執行試驗。

For EV supply equipment designed to be connected to a DC supply network, the test shall be performed sequentially between L+/L- and PE with a single positive pulse and a single negative pulse.

試驗執行應於

The test shall be performed at

- EV 供電設備 B 側之額定最高電壓，且
- rated maximum voltage of the EV supply equipment at side B, and
- EV 供電設備 B 側之額定最低電壓
- rated minimum voltage of the EV supply equipment at side B.

針對系統 A，試驗應於電能傳輸前之絕緣電阻查核期間執行，若可行，可使用具有 CVM 之特殊試驗模式。

For system A, this test shall be performed during insulation resistance check before energy transfer. A special test-mode with CVM can be used, if available.

針對系統 B 及系統 C，此試驗應以 CVM 執行。

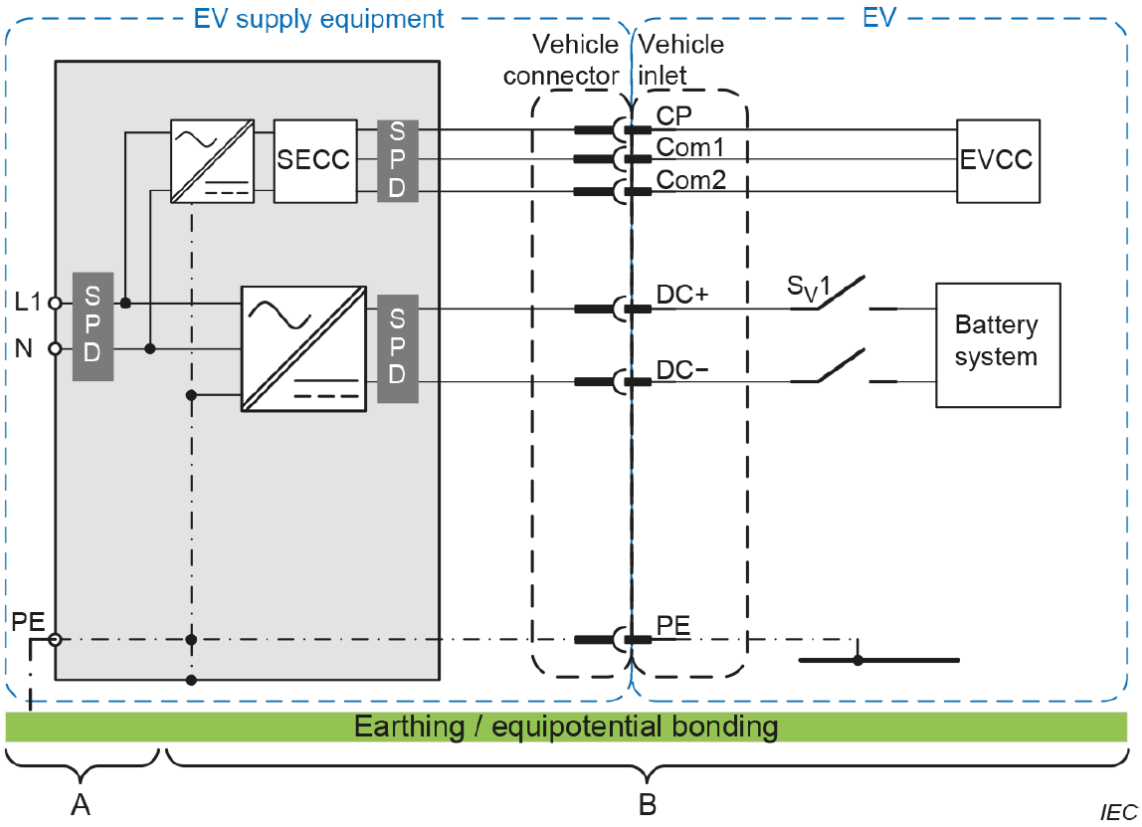
For system B and system C, this test shall be performed in CVM.

備考 1. 依 IEC 60664-1:2020 之 4.2.2.5，過電壓降低可藉一種以上衰減措施之組合達成。

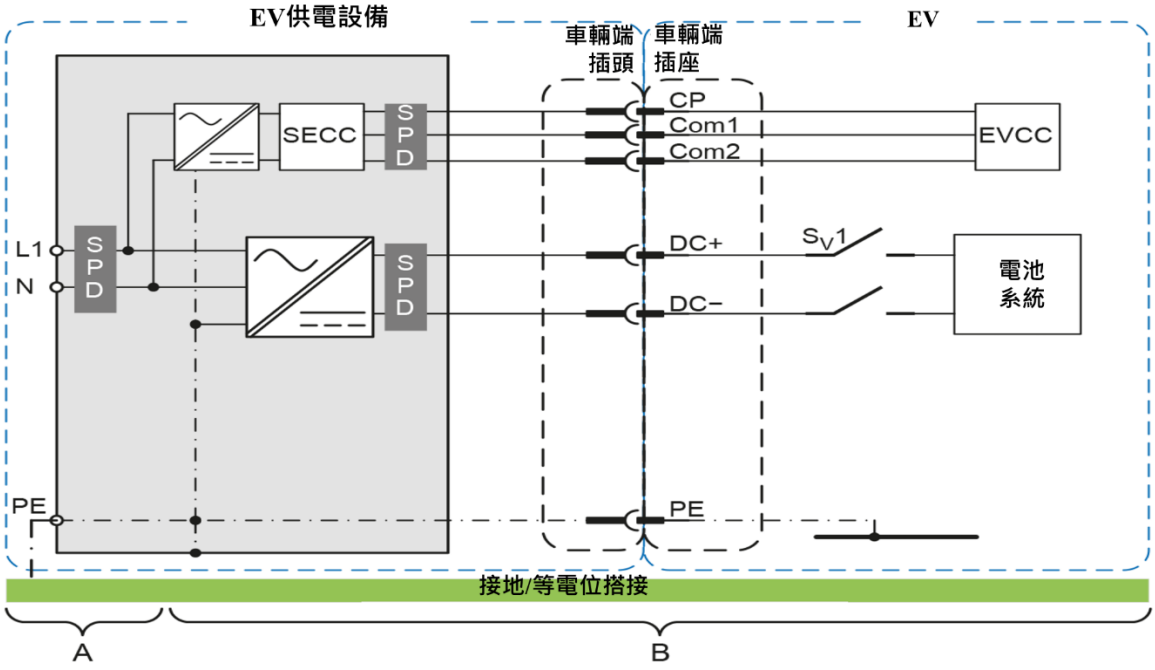
NOTE 1 The overvoltage reduction can be achieved by combination of one or more attenuation means according to IEC 60664-1:2020, 4.2.2.5.

備考 2. EV 供電設備 A 側過電壓類別(overvoltage category, OVC) 之規格，參照 IEC 61851-1:2017 的 12.3。

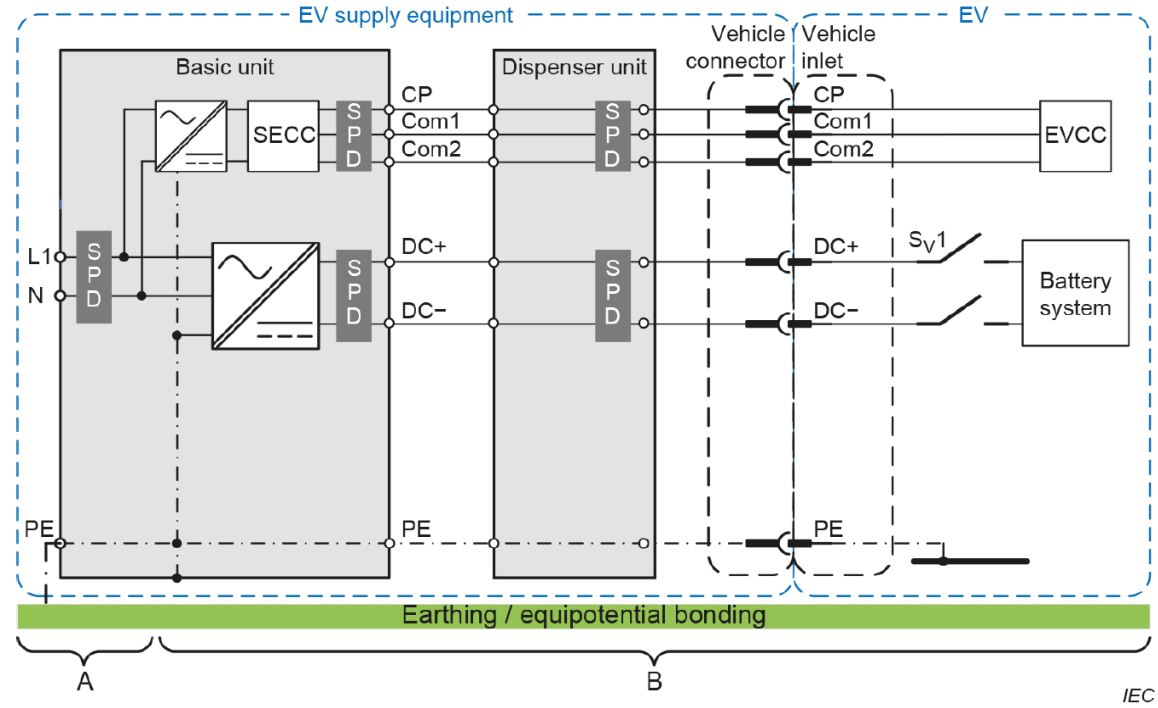
NOTE 2 For specification of the overvoltage category (OVC) of side A of the EV supply equipment, see IEC 61851-1:2017, 12.3.

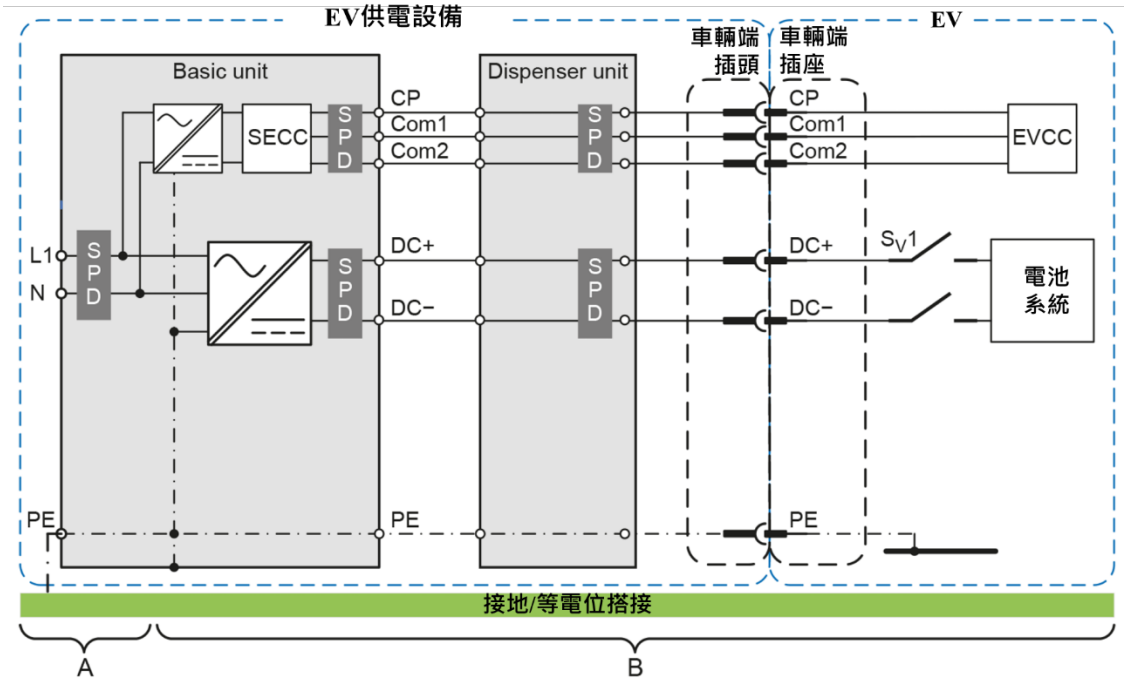



a) EV supply equipment




(a) EV 供電設備




(b) 包含基本單元及分配單元之 EV 供電設備

b) EV supply equipment with a basic unit and a dispenser unit

說明 key

| | | | |
|---|---|---|---|
| L1, N | AC 或 DC 電網<br>AC or DC supply network | CP | 控制導引及/或數位通訊導體<br>control pilot(s) and/or digital communication conductors |
| PE | 保護性導體<br>protective conductor | SPD | 突波保護裝置<br>surge protection device |

| | | | |
|---|---|---|---|
| DC+ | B 側之正極端子<br>positive terminal of side B | A | 參照 12.7.101<br>see 12.7.101 |
| DC- | B 側之負極端子<br>negative terminal of side B | B | 參照 12.7.102<br>see 12.7.102 |
| Com1,<br>Com2 | 數位通訊導體(若適用)<br>digitalcommunication conductors(if applicable) | | |

備考：EV 供電設備有較長 DC 纜線或 DC 纜線靠近雷擊保護系統之情況。

NOTE Examples: In case the EV supply equipment has long DC cables, or DC cables close to a lightning protection system.

圖 113 －保護 EV 供電設備防止暫態 SPD 之設置範例

Figure 113 – Example setup of SPD for the protection of the EV supply equipment against transients

**12.7.102 因大氣或切換之暫態過電壓防護(Protection against transient overvoltages of atmospheric origin or due to switching)**

連接 EV 供電設備之任何電力或數位通訊導體，應藉使用適當措施以防止雷擊或切換事件，例：

Any power or digital communication conductors connected to the EV supply equipment shall be

protected against lightning or switching events by the use of appropriate means, such as:

— EV 供電設備內之 SPD (surge protective devices, SPDs)。

– surge protective devices (SPDs) within the EV supply equipment;

— EV 供電設備 A 側內之 SPD。

– SPDs within side A of the EV supply equipment;

— EV 供電設備之環境保護設備。

– environmentally protected installations of the EV supply equipment.

EV 供電設備依 IEC 60364-5-53:2019 第 534 節，應依設置之 SPD 功能分類，此資訊應提供於安裝手冊。

The EV supply equipment shall be classified with respect to the SPD function installed according to IEC 60364-5-53:2019, Clause 534. This information shall be provided in the installation manual.

SPD 之選擇及建造，應依 IEC 60364-5-53:2019 第 534 節進行。

The selection and erection of SPDs shall be done according to IEC 60364-5-53:2019,

Clause 534.

SPD 應依：

SPDs shall be according to:

— AC：IEC 61643-11，若有。

– IEC 61643-11 for AC, if any,

—數位通訊導體：IEC 61643-21，若有

– IEC 61643-21 for digital communication conductors, if any, and

— DC：SPD 宜依 IEC 61643-416，若有

SPDs should be according to IEC 61643-416, for DC, if any.

突波保護性組件(例：MOV(金屬氧化鋅變阻器)、GDT(接地變壓器)、TVS(暫態電壓抑制器))可因其他原因併入 EV 供電設備。若此等組件作為 SPD 之一部分使用，SPD 應依 IEC 61643 系列標準試驗。

Surge protective components (for example, MOV, GDT, TVS) can be incorporated in the EV supply equipment for other reasons. If these components are used as part of an SPD, the SPD shall be tested according to the IEC 61643 series.

EV 供電設備 B 側使用額定最高電壓 ≤1000 Vdc 之系統 A、系統 B 或系統 C，EV 供電設備應在車輛端插頭提供保護等級，例：使用具保護等級之 SPD：

The EV supply equipment shall provide a protection level at the vehicle connector for system A, system B or system C with a rated maximum voltage of the EV supply equipment at side B ≤ 1 000 V DC, for example, by using SPDs with a protection level of:

— DC+與保護性導體間 2500 Vdc，及

– 2 500 V DC between DC+ and protective conductor, and

— DC-與保護性導體間 2500 Vdc。

– 2 500 V DC between DC– and protective conductor.

針對車輛端插頭防護暫態過電壓護之 SPD 的安裝及能量協調，EV 供電設備設置手冊應包括以下資訊：

The installation manual of the EV supply equipment shall include the following information for the erection and energy coordination of the SPDs for protection against transient overvoltages at the vehicle connector:

— 包括 EV 供電設備之設置,應提供 DC+/DC-與保護性導體間的車輛端插頭 2500 V 保護等級，例：使用 SPD。

– The installation including the EV supply equipment shall provide a protection level at the vehicle connector of 2 500 V between DC+/DC– and protective conductor, for example, by using SPDs.

– 無論:

– Either:

• EV 供電設備安裝之 SPD 型式\，包括可滿足 DC+/DC- 與保護性接地導體間

2500 Vdc 放電電流之保護等級，或

• what types of SPDs are installed in the EV supply equipment, including the discharge current at which the protection level of 2 500 V DC between DC+/DC– and protective earthing conductor can be met, or

• 無安裝 SPD

• that no SPD is installed.

— IEC 60364-5-53 提供包括於 EV 供電設備之 SPD 與已安裝在上游電網 SPD 的能量協調資訊。

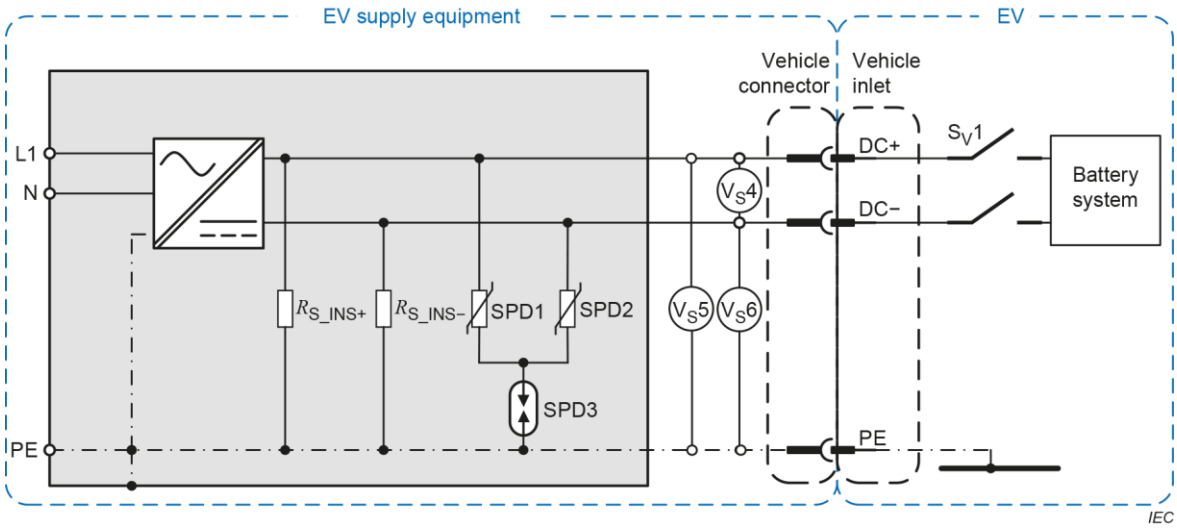
– IEC 60364-5-53 provides information for the energy coordination of the SPDs included in EV supply equipment with upstream SPDs already erected in the supply network.

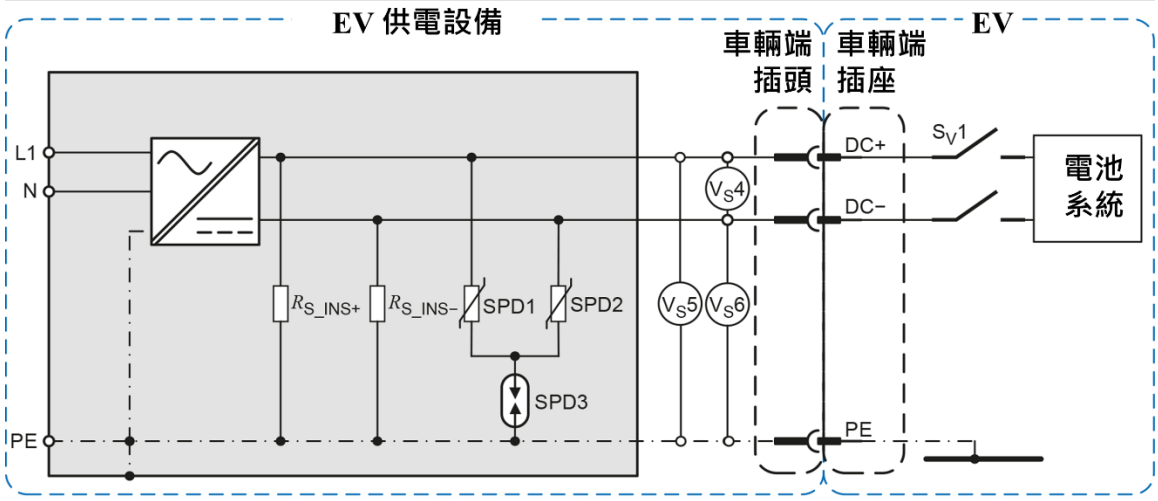
— IEC 62305 系列標準提供雷擊防護資訊，此等裝置之試驗類別及突波/脈衝電流要求(In 及/或 Iimp)可依 IEC 60364-5-53 測定。

– The IEC 62305 series provides information for protection against lightning. The test class and the surge/impulse current requirement (In and/or Iimp) for these devices may be determined according to the IEC 60364-5-53.

— 限制 B 側電路帶電部件(DC+/DC-)與保護性導體間之 SPD 及其他夾緊裝置電壓，應具有額定 DC 耐電壓 ≥ 1200 Vdc 之高阻抗；例：B 側帶電部件（DC+及 DC-）與保護性導體間包含一個以上可滿足此要求之電壓開關型 SPD 的 SPD 組合件。不需考慮臨時過電壓期間之同時暫態過電壓，此臨時過電壓僅在短期間發生，參照圖 114。

– SPDs and other clamping devices limiting the voltage at the side B circuit, between live parts (DC+/DC–) and the protective conductor, shall have high impedance with a rated DC withstand voltage of ≥ 1 200 V DC; for example, SPD-assemblies which include one or more "voltage switching type" SPD between side B live parts (DC+ and DC–) and the protective conductor can meet this requirement. A simultaneous transient overvoltage during a temporary overvoltage needs not to be considered, because this temporary overvoltage only occurs for a short period of time. See Figure 114.




說明 Key

| | | | |
|---|---|---|---|
| L,N | AC 或 DC 電網<br>AC or DC supply network | VS4 | B 側 DC+與 DC- 間最高電壓 1000 Vdc<br>maximum side B voltage between DC+ and DC– of 1 000 V DC |
| PE | 保護性導體<br>protective conductor | VS5 | 不利情況：永久不平衡電壓間 DC+至 PE ≤ 1000 Vdc<br>worst case: permanent unbalanced voltage between DC+ and PE ≤ 1 000 VDC |
| DC+ | B 側之正極端子<br>positive terminal of side B | VS6 | 不利情況：DC-與 PE 間之永久不平衡電壓 ≤ 1000 Vdc<br>worst case: permanent unbalanced voltage between DC– and PE ≤ 1 000 VDC |

| | | | |
|---|---|---|---|
| DC- | B 側之負極端子<br>negative terminal of side B | SDP1, SDP2 | 突波保護裝置，例：變阻器<br>surge protection devices, for example,varistors |
| RS_INS+, RS_INS | 不利情形：內部絕緣電阻 ≥ 100 kΩ<br>worst case: internal insulation resistance ≥ 100 kΩ | SDP3 | 保護性間隙<br>protective gap |

圖 114 – 在 B 側帶電導體(DC+及 DC-)與 PE 間有一個電壓開關型 SPD 之 SPD 總成的範例

Figure 114 – Example of an SPD-assembly having one voltage switching type SPD between side B live conductors (DC+/DC–) and protective conductor

— B 側電路之適合的路由(routing)最小化感應迴路並在 B 側減少內部產生突波電壓。迴路範圍可藉 B 側電路之路由帶電部件(DC+/DC-)彼此靠近並靠近保護性導體，且路由電氣及訊號線一起最小化，參照 IEC 62305-4。

– Suitable routing of the side B circuit minimizes induction loops and reduces the creation of surge voltages internally in side B. The loop area can be minimized by routing the live parts (DC+/DC–) of the side B circuit close to each other and close to the protective conductor, and by routing electrical and signal lines together. See IEC 62305-4.

—屏蔽內部線路最小化內部感應突波，若長 DC 電纜 (> 10 m) 或 DC 電纜靠近雷擊保護系統 (lightning-protection-system , LPS)，屏蔽在每一末端須搭接。例：使用屏蔽電纜或電纜槽。

– Shielding of internal lines, for example, using shielded cables or cable ducts, minimizes internally induced surges in case of long DC cables (> 10 m) or in case DC cables running close to a lightning-protection-system (LPS) – shields need to be bonded at either end.

— 共模接地及/或搭接網路，最小化潛在的差別並可降低磁場，參照 IEC 62305-4。

– A common earthing and/or bonding network minimize potential differences and may reduce the magnetic field, see IEC 62305-4.

**12.8 溫升(Temperature rise)**

取代：

Replacement:

低電壓開關設備及控制設備之總成，應符合 IEC 61439-7:2022 之溫升要求。

Low-voltage switchgear and controlgear assemblies shall comply with the temperature rise requirements in IEC 61439-7:2022.

組件應符合其適用標準之溫升要求。

Components shall comply with the temperature rise requirements of their appropriate standards.

**12.9 濕熱功能測試(Damp heat functional test)**

取代：

Replacement:

於下述規定之調適期間，EV 供電設備應處於斷電。在調適後 1 h 內，EV 供電設備應通過 6.3.1.105 符合性試驗。

During the conditioning defined below, the EV supply equipment shall be de-energized.

Following the conditioning and within 1 h, the EV supply equipment shall pass the compliance test in 6.3.1.105.

調適：

Conditioning:

室內單元：依 IEC 60068-2-30（試驗 Db）進行 6 個週期，每一週期濕熱循環試驗為 24 h，溫度為（40 ± 3）°C，相對濕度為 95%。

– for indoor units, 6 cycles of 24 h each to a damp heat cycling test according to IEC 60068-2-30 (test Db) at (40 ± 3) °C and relative humidity of 95 %;

室外單元：依 IEC 60068-2-30（試驗 Db）進行 10 個週期，每一個週期濕熱循環測試 24 h，溫度為（40 ± 3）°C，相對濕度為 95%。

– for outdoor units, 10 cycles of 24 h each to a damp heat cycling test according to IEC 60068-2-30 (test Db) at (40 ± 3) °C and relative humidity of 95 %.

IEC 60068-2-11 鹽霧試驗之應用研議中。

The application of the salt mist test of IEC 60068-2-11 is under consideration.

**12.10 最低溫度功能性試驗(Minimum temperature functional test)**

替代第二段

Replacement of the 2nd paragraph:

預調適後， EV 供電設備立即依 6.3.1.105 於最低操作溫度下通過試驗，則視為通過試驗，不需查證計時的精密度。

The EV supply equipment is deemed to pass the test if, immediately after the preconditioning,it passes the test according to 6.3.1.105 while at the minimum operating temperature. Theprecision of the timing does not need to be verified.

**12.11 機械強度(Mechanical strength)**

取代：

Replacement:

模式 4 EV 供電設備外殼之機械衝擊防護的最低等級，依 IEC 62262 應為 IK08。

For mode 4 EV supply equipment, the minimum degree of protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262.

EV 供電設備之外殼遭受衝擊力時，不得有裂紋或斷裂擴展致發生以下任一：

The enclosure of EV supply equipment, when subjected to impact forces, shall not crack or break to the extent that any of the following occurs:

—依 CNS 14165，關節試驗指可觸及未絕緣之帶電部件。

– uninsulated live parts are made accessible to the jointed test finger according to IEC 60529;

— 危及外殼依 12.4 之 IP 等級。

– the IP rating of the enclosure according to 12.4 is compromised;

—空間及沿面距離減少至小於 12.3 要求之最小值。

– clearances and creepage distances are reduced to a value less than the minimum values according to 12.3;

–任何方式損壞之設備，會妨礙符合本標準之要求。

– the equipment is damaged in any way that would prevent compliance with the requirements in this document.

材料及部件之強度的其他要求，參照 12.107.2

Other requirements for strength of materials and parts are described in 12.107.2.

符合性依以下試驗查核。

Compliance is checked by the following test.

取一個 EV 供電設備樣品進行本試驗。固定壁掛式或地面式設備，當 EV 供電設備依預期固定定位後，對所有暴露之外殼表面執行試驗。除非 EV 供電設備設計針對正確操作要求具體定位之 EV 供電設備，可攜及移動式 EV 供電設備應對外殼的所有表面執行試驗。

One sample of the EV supply equipment is subjected to this test. For wall or ground mounted equipment, the test is performed on all exposed enclosure faces when the equipment is positioned as intended after mounting. For portable and mobile EV supply equipment, the test shall be performed on all enclosure surfaces unless the EV supply equipment is designed such that specific orientations of the EV supply equipment are required for proper operation.

EV 供電設備放置在混凝土面上，待試驗之外殼表面水平朝上。由立式錘垂直落下給予外殼表面衝擊，重新定位 EV 供電設備之所有試驗的外殼面。試驗應對收到狀態及不需預調適之 EV 供電設備執行試驗，試驗期間 EV 供電設備不通電。

The EV supply equipment is placed on a concrete surface with the enclosure face under test in a horizontal position facing upwards. The impact is delivered by vertical

hammer that is dropped and allowed to impact the enclosure surface. The EV supply equipment is repositioned for all enclosure faces to be tested. The test shall be performed on the EV supply equipment in the as-received condition and no pre-conditioning of the equipment is required. The EV supply equipment is not energized during this test.

衝擊力依 IEC 60068-2-75:2014 圖 A.3 透過立式錘施加。立式錘為總質量 1.7 ± 0.2 kg 之鋼製作，尺度如 IEC 60068-2-75:2014 圖 A.3 所示，係為如何完成正確試驗標物件的範例，但總長度可為了獲得總質量改變。但可改變總長度以獲得正確的總質量。

The impact force is imparted through a vertical hammer in according to IEC 60068-2-75:2014,Figure A.3. The vertical hammer is constructed of steel with an overall mass of 1,7 kg ± 0,2 kg.

The dimensions shown in IEC 60068-2-75:2014, Figure A.3, are an example of how to achieve the correct test object, but the overall length can be varied in order to achieve the correct overall mass.

立式錘容許自高度 300 mm 自由落下並衝擊待測外殼表面，要避免二次撞擊或彈跳。每一外殼待測表面應衝擊 3 次，包括隨每次衝擊在不同位置的可移動部件。不得對安裝在外殼表面上或內之組件吹風，例：依 IEC 62196-1、IEC 62196-3 及 IEC 62196-3-1 之插座、纜線組、按鈕及顯示器。

The vertical hammer is allowed to fall freely from a height of 300 mm and impact the enclosure face under test. Secondary strikes, or rebounds, are to be avoided. Each enclosure face under test, including movable parts, shall be impacted three times, with each impact in a different location. Blows shall not be applied on components mounted on or in the surface of the enclosure, for example, socket outlets, cable assemblies according to IEC 62196-1, IEC 62196-3 and IEC 62196-3-1, push-buttons, and displays.

每一次衝擊後，目視觀察外殼以判定是否產生任何裂痕或破裂，瑕疵、刮痕、磨損等及類似，不視為裂痕或破裂。

若懷疑外殼裂縫或破裂不符合要求，則應重複適用的試驗或評估，以查證符合性。

After each impact, the enclosure is observed to determine if any cracking or breaking occurred.

Blemishes, scratches, scuffing, and the like are not considered. If there are any doubts that a crack or break in the enclosure is noncompliant, the applicable tests or evaluations shall be repeated to verify compliance.

小於 18 kg 之可攜式及移動式 EV 供電設備，應符合 IEC 62368-1:2018 的 4.4.3.3。

Portable and mobile EV supply equipment less than 18 kg shall comply with IEC 62368-1:2023,4.4.3.3.

追加子節：

Additional subclauses:

**12.101 A 側電流 (Side A current)**

在最繁重之電能傳輸狀態下， EV 供電設備 A 側的當下電流，不得大於 EV 供電設備 A 側於 FPT 之額定最大電流 10%。

The present current at side A of the EV supply equipment shall not be more than the rated maximum current of the EV supply equipment at side A in FPT by more than 10 % under the most onerous energy transfer conditions.

於 A 側產生最高值當下電流操作點(102.2.5)之下， 在 EV SEA 側量測當下電流查核符合性。

Compliance is checked by measuring the present current at side A of the EV supply equipment under the operating point (102.2.5) which produces the highest value of present current at side A:

— 當 EV 供電設備在 A 側具有多個 EV 供電設備額定最高電壓時，應於 FPT 中每個額定電壓值量測 A 側的當下電流。

– when the EV supply equipment has more than one rated maximum voltage of the EV supply equipment at side A, the present current at side A in FPT is measured at each voltage rating;

–當 EV 供電設備在 A 側具有一個或多個 EV 供電設備額定最高電壓範圍時，在每個額定電壓範圍極限制值量測 FPT 之 A 側的當下電流。

– when the EV supply equipment has one or more ranges of rated maximum voltage of the EV supply equipment at side A, the present current at side A in FPT is measured at the extremes of each rated voltage range.

A 側當下電流之每一量測值，應於 A 側當下電流穩定時取。

Each measurement of the present current at side A shall be taken when the present current at side A has stabilized.

**12.102 電源線(Power supply cords)**

**12.102.1 一般(General)**

若提供之電源線為 EV 供電設備整體的一部分，電源線應為護套型並符合以下：

If a power supply cord is provided as an integral part of the EV supply equipment, the power supply cord shall be of the sheathed type and comply with the following:

— 若為橡膠護套，依 IEC 60245-1:2003 為合成橡膠護套可撓性電線，指定 60245 IEC 53、 IEC 57 或 IEC 66，

– if rubber sheathed, be of synthetic rubber sheathed flexible cord according to IEC 60245-1:2003, designated 60245 IEC 53, IEC 57 or IEC 66;

— 若為 PVC 護套：

– if PVC sheathed:

(a) 配備不可拆卸式電源線且質量 ≤ 3 kg 之設備，依 IEC 60227-1:2007 為輕型

PVC 護套可撓性纜線，指定 60227 IEC 52 或 IEC 53。

a) for equipment provided with a non-detachable power supply cord and having a mass ≤ 3 kg, be light PVC sheathed flexible cord according to IEC 60227-1:2007, designated 60227 IEC 52 or IEC 53;

(b) 配備不可拆卸式電源線且質量 > 3 kg 之設備，依 IEC 60227-1:2007 為普通的 PVC 護套軟電源線，指定 60227 IEC 53。

b) for equipment provided with a non-detachable power supply cord and having a mass > 3 kg, be ordinary PVC sheathed flexible power supply cord according to IEC 60227-1:2007, designated 60227 IEC 53;

(c) 配備可拆卸式電源線之設備，依 IEC 60227-1:2007 為輕型 PVC 護套可撓性纜線，指定 60227 IEC 52 或 IEC 53。

c) for equipment provided with a detachable power supply cord, be light PVC sheathed flexible cord according to IEC 60227-1:2007, designated 60227 IEC 52 or IEC 53.

備考：若設備欲使用可拆卸式電源線，對於設備之質量無限制。

NOTE There is no limit on the mass of the equipment if the equipment is intended for use with a detachable power supply cord.

針對 EV 供電設備之插頭及纜線，電源線應包括保護性導體。

For plug and cable EV supply equipment, a protective conductor shall be included in the power supply cord.

符合性依檢驗查核。

Compliance is checked by inspection.

**12.102.2 截面積(Cross-sectional area)**

電源線導體之截面積應不小於該等表 116 規定。

The power supply cords shall have conductors with cross-sectional areas more than or equal to those specified in Table 116.

表 116 電源線之導體尺寸

Table 116 – Sizes of conductors of power supply cord

| EV 供電設備 A 側之額定最大電流 Rated maximum current of the EV supply equipment at side A [a] A ≤ | 導體最小尺寸 Minimum conductor sizes | |
|---|---|---|
| | 截面積 Cross-sectional area mm² | AWG or kcmil [cross-sectional area in mm²] [e] |
| 3 | 0.5[b] | 20[0.5] |
| 6 | 0.75 | 18[0.8] |
| 10 | 1.00(0.75)[c] | 16[1.3] |

| EV 供電設備 A 側之額定最大電流<br>Rated maximum current of the EV supply equipment at side A [a]<br>A<br>≤ | 導體最小尺寸 Minimum conductor sizes | |
|---|---|---|
| | 截面積<br>Cross-sectional area<br>$mm^2$ | AWG or kcmil<br>[cross-sectional area in $mm^2$] [e] |
| 16 | 1.50(1.0)[d] | 14[2] |
| 25 | 2.5 | 12[3] |
| 32 | 4 | 10[5] |
| 40 | 6 | 8[8] |
| 63 | 10 | 6[13] |
| 80 | 16 | 4[21] |
| 100 | 25 | 2[33] |
| 125 | 35 | 1[42] |
| 160 | 50 | 0[53] |
| 190 | 70 | 000[85] |
| 230 | 95 | 0000[107] |
| 260 | 120 | 250[126] |
| 300 | 150 | 300[152] |
| 340 | 185 | 400[202] |
| 400 | 240 | 500[253] |
| 460 | 300 | 600[304] |

備考 1. IEC 60320-1 規定器具耦合器及可撓性纜線可接受的組合，該等涵蓋於註腳 b、c 及 d。然而，多個國家表示他們不接受本表列出的所有數值，特別是註腳 b、c 及 d 所涵蓋的部分。

NOTE 1 IEC 60320-1 specifies acceptable combinations of household appliance couplers and flexible cords, including those covered by footnotes b, c and d. However, several countries have indicated that they do not accept all the values listed in this table, particularly those covered by footnotes b, c and d.

備考 2. 對於較高電流參照 IEC 60364 系列標準。

NOTE 2 For higher currents, see the IEC 60364 series.

a EV 供電設備 A 側額定最大電流包括可自插座汲取，提供其他設備主要電力之電流。

a The rated maximum current of the EV supply equipment at side A includes currents that can be drawn
from a socket outlet providing mains power for other equipment.

| EV 供電設備 A 側之額定最大電流<br>Rated maximum current of the EV supply equipment at side A [a]<br>A<br>≤ | 導體最小尺寸 Minimum conductor sizes | |
|---|---|---|
| | 截面積<br>Cross-sectional area<br>$mm^2$ | AWG or kcmil<br>[cross-sectional area in $mm^2$] [e] |
| b EV 供電設備 A 側之額定最大電流 ≤ 3 A，若電線長度 ≤ 2 m，可使用標稱截面積 0.5 mm2 之電線。<br>b For a rated maximum current of the EV supply equipment at side A ≤ 3 A, a nominal cross-sectional area of 0,5 mm2 may be used in some countries, provided that the length of the cord is ≤ 2 m.<br>c 括號內之值適用於可拆卸式電源線，若電線長度 ≤ 2 m，依 IEC 60320-1 (型式 C13、C15、C15A 及 C17)配置額定 10 A 插頭。<br>c The value in parentheses applies to detachable power supply cords fitted with the connectors rated 10 A according to IEC 60320-1 (types C13, C15, C15A and C17) provided that the length of the cord is ≤ 2 m.<br>d 括號內之值適用於可拆卸式電源線，若電線長度小於 2 m，依 IEC 60320-1 (型式 C19、C21 及 C23)配置額定 16 A 插頭。<br>d The value in parentheses applies to detachable power supply cords fitted with the connectors rated 16 A in accordance with IEC 60320-1 (types C19, C21 and C23) provided that the length of the cord is< 2 m.<br><br>e AWG 及 kcmil 尺寸僅提供參考，中括號內有關之截面積已四捨五入，僅顯示有效數字。AWG 引用美國線規(American Wire Gage)且〝cmil〞引用圓密耳(circular mil)，其中 1 圓密耳等於直徑 1 密耳(千分之一英吋或 0.0254 mm)的圓面積。<br>e AWG and kcmil sizes are provided for information only. The associated cross-sectional areas, in square brackets, have been rounded to show significant figures only. AWG refers to the American Wire Gage and the term "cmil" refers to circular mils where one circular mil is equal to the area of a circle having a diameter of one mil (one thousandth of an inch or 0,025 4 mm). These terms are commonly used to designate wire sizes in North America. | | |

符合性依檢驗查核。

Compliance is checked by inspection.

**12.102.3 不可拆卸式電源線之電線固定及應變消除(Cord anchorages and strain**

**relief for non-detachable power supply cords)**

**12.102.3.1 電線應變消除(Cord strain relief)**

**12.102.3.1.1 一般(General)**

防止應變傳送至 EV 供電設備終端之電源線導體的保護措施規定如下。

Protective measures against strain being transmitted to the EV supply equipment terminations of the conductors of the power supply cord are specified below.

電源線或纜線打結，不得作為應變消除機構。

A knot in the power supply cord or cable shall not be used as a strain relief mechanism.

包括螺釘，直接承受電線或電纜之螺釘，不得作為應變消除機構，除非電線錨定由絕緣材料製作且螺釘尺寸相當於夾住的電線直徑。

A screw that bears directly on the cord or cable shall not be used as a strain relief mechanism unless the cord anchorage, including the screw, is made of insulating material and the screw is of comparable size to the diameter of the cord being clamped.

拉力或扭矩施加於不可拆卸之電源線或電纜時，施加拉力及扭矩時，基本安全防護應最小化傳送至電線或電纜終端的應變。

When a pull force and a torque are applied to a non-detachable power supply cord or cable, a basic safeguard shall minimize strain from being transmitted to the cord or cable terminations.

符合性依以下試驗查核。

Compliance is checked by the following test.

施加在電線或電纜之拉力規定於表 117，在最不利的方向施力 1 s 並重複 25 次。

The pull force applied to the cord or cable is specified in Table 117. The force is applied in the most unfavourable direction for 1 s and repeated 25 times.

表 117 – 消除電線拉力之應變

Table 117 – Cord strain relief pull force

| 設備質量 Mass of the equipment<br>kg | 力 Force<br>N |
|---|---|
| ≤ 1 | 30 |
| > 1 且 ≤ 4<br>> 1 and ≤ 4 | 60 |
| > 4 | 100 |

施加第 25 次拉力後，立即以 0.25 Nm 扭矩施加 1 min 於電線或電纜。扭矩施加實務上儘可能靠近應變消除機構並在反方向重複。

Immediately after the 25$^{th}$ pull force application, a torque of 0,25 Nm is applied for 1 min to the cord or cable. The torque is applied as close as practicable to the strain relief mechanism and is repeated in the opposite direction.

電線或導體不得損壞且導體位移應 ≤2 mm。電線外部護套伸展而導體不位移，不視為位移。

There shall be no damage to the cord or conductors and the displacement of the conductors shall be ≤ 2 mm. Stretching of the cord outer jacket without displacement of the conductors is not considered displacement.

**12.102.3.1.2 應變消除機構失效(Strain relief mechanism failure)**

除了提供不可拆卸式電源線應變消除措施外，應提供補充保護措施，以確保 EV 供電設備導體內終端之電源線導體應變，使得保護性導體終端持續承擔應變。

In addition to the cord strain relief means provided for the non-detachable power supply cord, a supplementary protective measure shall be provided to ensure that strain on the power supply cord conductors at the terminations within the EV supply equipment conductors will be such that the protective conductor termination is the last to take the strain.

符合性依檢驗查核，且施加表 117 之力時，視需要使基本保護措施失效並檢驗導體鬆弛度。

Compliance is checked by inspection and, if necessary, by defeating the basic protective measure and inspecting the conductor slack while applying the force in Table 117.

**12.102.3.1.3 電線護套或護套位置(Cord sheath or jacket position)**

電線或纜線護套或護套應自基本安全防護裝置(應變消除機構)延伸至設備不小於電線或纜線直徑的一半。

The cord or cable sheath or jacket shall extend from the basic safeguard (strain relief mechanism) into the equipment more than or equal to one-half the diameter of the cord or cable.

符合性依檢驗查核。

Compliance is checked by inspection.

**12.102.3.1.4 應變消除及電線固定材料(Strain relief and cord anchorage material)**

電線固定應針對基本絕緣要求，由絕緣材料或具有符合要求之絕緣材料內襯製作。電線固定包括連接屏蔽之屏蔽電源線的電氣連接襯套管的情況下，則此要求應不適用。

The cord anchorage shall either be made of insulating material or have a lining of insulating material complying with the requirements for basic insulation. Where the cord anchorage is a bushing that includes the electrical connection to the screen of a screened power cord, this requirement shall not apply.

若基本保護措施(應變消除機構)為聚合物材料製作，或若基本保護措施固定在包含聚合物材料之外殼，基本保護措施應保持其結構性質，接下來依 12.103 模應力消除。

If the basic protective means (strain relief mechanism) is made of polymeric material

or if the basic protective means is mounted in an enclosure consisting of polymeric material, the basic protective means shall retain its structural properties following the mould stress relief according to 12.103.

接著 12.103 應力消除試驗，基本保護措施回復至室溫後，符合性依依檢驗及施加 12.102.3.1 之力及扭矩試驗查核。

Compliance is checked by inspection and by applying the force and torque tests of 12.102.3.1 after the basic protective means has returned to room temperature following the stress relief test of 12.103.

**12.103 應力消除試驗(Stress relief test)**

使用非金屬材料之外殼或其他安全關鍵部件，不得劣化、收縮、翹曲、融化或變形，使得帶電部件變得可觸及、危及 IP 等級，或功能性部件不再滿足預期之安全關鍵功能。

Non-metallic materials that are used for enclosures, or other safety critical parts, shall not deteriorate, shrink, warp, melt, or deform such that the live parts become accessible, the IP rating is compromised, or the functionality of the part no longer meets the safety critical function for which it was intended.

符合性依以下試驗查核。

Compliance is checked by the following test.

包含完整設備或與完整外殼一起之任何支撐框架樣品，樣品放置在高於 12.107.2.2.1 加熱試驗期間最高溫度 10 K 之循環空氣烘箱中觀察，但 ≥ 70 ℃，期間為 7 h，然後冷卻至室溫。一旦材料已回復至室溫，觀察樣品所有劣化、變形、收縮、翹曲或融化的指標。依個別試驗法呈現，經此調適後，可能需要重複其他試驗。

One sample consisting of the complete equipment, or of the complete enclosure together with any supporting framework, is placed in a circulating air oven at a temperature 10 K more than the maximum temperature observed on the sample during the heating test of 12.107.2.2.1, but ≥ 70 °C, for a period of 7 h, then cooled to room temperature. Once the material has returned to room temperature, it is observed for any indication of deterioration, deformation, shrinkage, warping, or melting. Other tests may need to be repeated after this conditioning as indicated in individual test methods.

備考 1.

對於大型 EV 供電設備，調適完整外殼為不切實際，可使用包括所有機械性支撐件，具有相關厚度及外型之完整總成代表性的部分外殼。

For large EV supply equipment where it is impractical to condition a complete

enclosure, a portion of the enclosure representative of the complete assembly with regard to thickness and shape, including any mechanical support members, may be used.

備考: 在此試驗期間，空氣相對濕度不須維持在特定值。

NOTE Relative air humidity need not be maintained at a specific value during this test.

**12.104 異常操作及模擬故障狀態試驗(Abnormal operation and simulated fault condition tests)**

**12.104.1 一般(General)**

若 EV 供電設備異常操作或模擬故障條件，防護熱、電擊及能量危害之風險，應依 12.104 規定的試驗評估。在最終使用條件下，測試可對定位及操作之次總成執行。

Protection against the risk of thermal, electric shock and energy hazards in the case of an abnormal operating or simulated fault condition of the EV supply equipment shall be evaluated by tests defined in 12.104. Testing may be performed on sub-assemblies while positioned and operated under end use conditions.

模擬異常操作及故障狀態，應一次施加一種。模擬故障或異常操作狀態之直接結果的故障，視為模擬故障或異常操作狀態的一部分。

Simulated abnormal operating and fault conditions shall be applied one at a time. Faults that are a direct consequence of a simulated fault or abnormal operating condition are considered to be a part of that simulated fault or abnormal operating condition.

應使用粗棉布及/或外科手術用棉布作為著火風險的指示器。此等指示器應以不會顯著影響冷卻方式放置在外殼外部之所有開口處。

Cheesecloth and/or surgical cotton shall be used as indicators for risk of fire. These indicators shall be placed at all openings on the outside of the enclosure in a manner which will not significantly affect cooling.

若設置手冊要求防護故障之外部措施，此等特定措施應針對試驗提供。

Where the installation manual requires external means of protection against faults, these specific means shall be provided for the test.

應監測可觸及 SELV 電路，及接地與未接地導電性部件之電壓。

The voltages of accessible SELV circuits as well as accessible earthed and unearthed conductive parts shall be monitored.

試驗應執行至保護裝置或機構 (內部或外部) 啟動，中斷組件發生失效的故障條件、穩定溫度、或著火風險及/或電擊危害發生終止。

The test shall be performed until terminated by activation of a protective device or mechanism (internal or external), a component failure occurs that interrupts the fault condition, temperatures stabilize, or a risk of fire and/or electric shock hazard occurs.

**12.104.2 合格準則(Pass criteria)**

依 12.104.3 至 12.104.6 之測試結果，EV 供電設備應符合以下：

As a result of testing from 12.104.3 to 12.104.6, the EV supply equipment shall comply with the following:

— 應無火焰散發、粒狀燃燒物或金屬熔融。

– there shall be no emission of flame, burning particles or molten metal;

— 不得點燃粗棉布或外科手術用棉布。

– the cheesecloth or surgical cotton indicator shall not have ignited;

— 不得斷開接地連接(若有)及保護性等電位搭接。

– the earth connection, if any, and protective equipotential bonding shall not have opened;

— 門或蓋應保留在原位。

– doors and covers shall remain in place;

— 試驗期間及之後，應無可觸及 SELV 電路及導電性部件：

– during and after the test, accessible SELV circuits and accessible conductive parts shall not

— 顯示電壓大於 8.102.4 規定之接觸電壓。

exhibit voltages more than the touch voltages specified in 8.102.4;

— CNS 15511-1:2021 之 12.7 規定的介電耐受電壓。

– dielectric withstand voltage test specified in IEC 61851-1:2017, 12.7;

— 用於監測帶電部件之裝置/組件不得脫離其初始位置。

– devices/components used for the mounting of live parts shall not break away from their initial position;

—導體不得拉出其導體終端。

– no conductor shall be pulled out of its terminal conductor.

測試後，EV 供電設備不需要操作，且外殼可能變形。容許斷開構成 EV 供電設備所必須之過電流保護，或依設置手冊指定設備。

The EV supply equipment is not required to be operational after testing and it is possible that the enclosure can become deformed. Overcurrent protection integral to the EV supply equipment, or specified by the installation manual to be used with the equipment, is allowed to open.

**12.104.3 組件故障試驗(Breakdown of components test)**

**12.104.3.1 負載條件(Load conditions)**

待測系統於產生最嚴苛條件之操作點，藉電路分析鑑別組件故障，受試之 EV 供電設備應連接至針對每一系統專用試驗負載的 EV 模擬器。

The breakdown of a component, identified by circuit analysis, shall be tested with the EV supply equipment connected to a test load with a dedicated EV simulator for the system under test at the operating point that creates the most severe condition.

測試可使用當地已鑑別組件配置之次粽成執行。在此情形下，次總成應加載以模擬正常操作條件。

Testing may be conducted using the sub-assembly in which the identified component is located.

In this case, the sub-assembly shall be loaded to simulate normal operating conditions.

**12.104.3.2 短路或斷路之應用(Application of short-circuit or open circuit)**

短路應採用正常流經組件電流之適當截面積試驗電線，而截面積≥2.5 $mm^2$。執行試驗之迴路長度，實務上迴路長度應儘可能短，以執行試驗。使用適當的開關操裝置施加短路及斷路。

The short-circuit shall be applied with test leads of a cross section appropriate for the current that normally flows through the component, but ≥ 2,5 mm2. The length of the loop shall be as short as practical to perform the test. Short-circuits and open circuits are applied using an appropriate switching device.

每一組件鑑別應僅進行一次故障模擬，除非具斷路及短路在同一組件兩者的失效模式可能類似。

Each identified component shall be subjected to only one simulation of breakdown unless both open circuit and short-circuit failure modes are likely in that component.

**12.104.3.3 試驗序列(Test sequence)**

針對組件故障試驗，取其產生最嚴重危害者，組件鑑別之短路或斷路應一次一個。

For the breakdown of components test, identified components shall be short-circuited or open circuited, whichever creates the worst hazard, one at a time.

符合性依 12.104.2 適用之合格準則查核。另外，短路或斷路施加期間及之後，設備內部之任何火焰應在 10 s 內熄滅，且應不點燃周遭部件。

Compliance is checked by the application of the pass criteria in 12.104.2. In addition, during and after the application of the short-circuit or open circuit, any flame inside the equipment shall extinguish in 10 s or less and no surrounding parts shall have ignited.

**12.104.4 電源欠相試驗(Loss of AC supply phase test)**

多相位之 EV 供電設備 A 側，應使用每一相位(包括中性，若使用)輪流操作 EV 供電設備 A 側斷開。

針對於 EV 供電設備 B 側額定最大功率操作之待測系統，試驗應連接設備於使用專用 EV 模擬器的試驗負載，藉斷開設備某一相位連接執行。

重複試驗藉初始通電 EV 供電設備使用的某一電線斷開。

A multi-phase side A EV supply equipment shall be operated with each phase (including neutral,

if used) disconnected in turn at side A of the EV supply equipment. The test shall be performed by disconnecting one phase with the equipment connected to a test load with a dedicated EV simulator for the system under test operating at rated maximum power of the EV supply equipment at side B. The test is repeated by initially

energizing the EV supply equipment with one lead disconnected.

試驗應持續至保護機制終止、組件發生失效或溫度穩定。

The test shall continue until terminated by a protective mechanism, a component failure occurs, or the temperature stabilizes.

符合性依 12.104.2 適用之合格準則查核。

Compliance is checked by the application of the pass criteria in 12.104.2.

**12.104.5 鼓風機/風扇電動機不運作試驗(Inoperative blower/fan motor test)**

使用強制通風之 EV 供電設備應連接至使用專用 EV 模擬器的試驗負載。針對在 EV 供電設備額定提高電流下操作的待測系統，B 側風扇或鼓風電動機或電動機因單一故障作個別或組合的無效。風扇或鼓風電動機應藉實體防止旋轉或斷供電源作失效。

EV supply equipment with forced ventilation shall be connected to a test load with a dedicated EV simulator for the system under test while operating at rated boost current of the EV supply equipment at side B with the fan or blower motor or motors made inoperative either individually or in combination from a single fault. The fan or blower motor shall be made inoperative by either physically preventing rotation or by disconnecting its power source.

符合性依 12.104.2 適用之合格準則查核。

Compliance is checked by the application of the pass criteria in 12.104.2.

**12.104.6 過濾器堵塞試驗(Clogged filter test)**

使用排風過濾開口之 EV 供電設備，應連接使用專用 EV 模擬器的試驗負載。針對在額定提高電流操作之待測系統，堵塞 EV 供電設備 B 側開口以代表過濾器堵塞。試驗應於通風口面積堵塞 50 %開始執行，在完全堵塞狀態下應重複試驗。

EV supply equipment with filtered ventilation openings shall be connected to a test load with a dedicated EV simulator for the system under test while operating at rated boost current of the EV supply equipment at side B with the openings blocked to represent clogged filters. The test shall be performed initially with 50 % of the ventilation openings surface blocked. The test shall be repeated under a full blocked condition.

符合性依 12.104.2 適用之合格準則查核。

Compliance is checked by the application of the pass criteria in 12.104.2.

**12.105 電氣火災防護(Protection against electrically caused fire)**

**12.105.1 一般(General)**

在正常操作條件及單一故障狀態下，降低火勢蔓延至環境之風險的保護措施有兩個層次：

The protective measure to reduce the risk of the spread of fire under normal operating conditions and single fault conditions to the environment from within is two-fold:

— 採用防火外殼

- implementation of a fire enclosure;
— 內部可燃部件選擇低可燃性等級。
- selection of internal combustible parts with a low flammability classification.

備考：通常，異常操作及故障狀態測試(例：電子組件之斷路及短路)會要求著火覆蓋範圍之潛在風險的證明。然而，設計此保護措施促進使用低可燃性等級的內部材料及防火外殼(外部或內部或兩者組合)，以提供源自內部著火的阻遏。

NOTE Normally, abnormal operating and fault condition testing (for example, open circuit and short-circuit of electronic components) would be required to demonstrate the potential risk of fire coverage. However, this protective measure is designed to facilitate the use of low flammability classification internal materials and a fire enclosure (external or internal or a combination of both) to provide containment of fire originating from within.

**12.105.2 防火外殼(Fire enclosure)**

防火外殼用於降低著火自內部蔓延至環境的風險，獨立於其設置的場所。應提供 EV 供電設備一個完全的防火外殼，除非內部有提供防火外殼。

Fire enclosures are used to reduce the risk of the spread of fire to the environment from within, independent of the location where they are installed. An overall fire enclosure shall be provided for the EV supply equipment unless internal fire enclosure(s) are provided.

防火外殼應依 IEC 62477-1: 2022 之 4.6.3 設計。

The fire enclosure shall be designed according to IEC 62477-1:2022, 4.6.3.

準備內部防火外殼作為防止電氣火災蔓延，導致位在內部防火外殼之任何外部重要部件燃燃的保護措施，例：裝飾功能、且不要求保護措施如同部件。此等外部部件不要求滿足 5 VB 可燃性等級且最低等級僅須 HB。

Provision of internal fire enclosure(s) as the protective measure against the spread of electrically-caused fire leads to consideration of any external combustible parts, for example, decorative in function, located outside of the internal fire enclosure and not required as part of the protective measure. These external parts are not required to meet the 5 VB flammability class requirement and need only have a HB minimum classification.

內部防火外殼結構及內部可燃材料之重要性敘述相同。

Internal fire enclosure construction and internal combustible material considerations are the same as described.

位於防火外殼內之可燃材料應符合 IEC 62477-1:2022 之 4.6.2.2。

Combustible materials located within the fire enclosure shall comply with IEC 62477-1:2022,4.6.2.2.

符合性依 IEC 62477-1:2022 4.6.2.2 之檢驗及試驗查核。

Compliance is checked by inspection and tests according to IEC 62477-1:2022, 4.6.2.2.

**12.106 化學品危害防護(Protection against chemical hazards)**

**12.106.1 冷媒型式(Type of coolant)**

使用液態冷媒依全球化學品統一分類及標籤制度應不危害環境。液態冷媒之生物可分解性依 OECD 301 B 試驗應≥ 60%並說明於資料圖表。

The liquid coolant utilized shall be non-hazardous to the environment according to the Globally harmonized system for the classification and labelling of chemicals. The biodegradability of the liquid coolant shall be ≥ 60 % tested according to OECD 301 B and stated into the data sheet.

備考：法規可要求其他符合性。

NOTE Local regulations can require other compliances.

設置手冊或資料圖表應提供警示，指明若使用非 EV 供電設備製造商指定之其他冷媒，可能發生洩漏或材料退化。

Warnings shall be provided in the installation manual or data sheet indicating that leaking or material degradation might occur if a coolant other than that specified by the EV supply equipment manufacturer is used.

符合性依檢驗查核。

Compliance is checked by inspection.

**12.106.2 可燃性(Flammability**

液態冷媒若洩漏於暴露之電氣部件時，不得導致著火危害。液態冷媒之最低閃火點應為 135 ° C.。

The liquid coolant shall not lead to a fire hazard if leaked onto exposed electrical parts. The minimum flashpoint of the liquid coolant shall be 135 °C.

符合性依物質安全資料表檢驗或依 ISO 2719 試驗查核。

Compliance is checked by inspection of the material safety data sheets or by the test according to ISO 2719.

**12.106.3 材料相容性(Material compatibility)**

液體處理系統之全部液態冷媒限制部件，應抗液態冷媒作用且暴露於熱不得隨時間退化。非金屬部件暴露於如下液態冷媒與空氣後，隨時間老化應能維持其物理特性：

All liquid coolant confining parts of the liquid handling system shall be resistant to the action of the liquid coolant and shall not degrade over time due to the exposure to heat. Non-metallic parts shall be able to maintain their physical properties after being exposed to the liquid coolant and air over aging as follows.

符合性依以下試驗查核。

Compliance is checked by the following tests.

(a) 塑膠部件及墊片在空氣烘箱老化

a) Air oven aging plastic parts and gaskets

6 個試樣在 121 ℃之空氣循環烘箱中老化 7 天，且應維持其抗張強度及伸長率之物理特性。抗張強度及最終伸長率應≥ 60 %接收樣品之抗張強度及最終伸長率。應依 IEC 60811-501 之試驗法。

Six specimens are aged in an air circulating oven at 121 °C for 7 days and shall maintain the physical properties of tensile strength and elongation. The tensile strength and ultimate elongation shall be ≥ 60 % of the tensile strength and ultimate elongation of the as-received sample. The test method of IEC 60811-501 shall be followed.

(b) 暴露於液體冷媒

b) Liquid coolant exposure

其他試樣浸漬於 80 ° C ± 2.0 ° C 液體冷媒 70 h ± 30 min。

Other specimens are to be immersed in the liquid coolant at 80 °C ± 2,0 °C for 70 h ± 30 min.

本試驗要求每一材料取寬 25.4 mm 及長 203 mm，且厚度不大於應用之最薄部件共 6 個樣品。試驗 3 個接收樣品及 3 個樣品依下浸漬。抗張強度及最終伸長率應≥ 60 %接收樣品之抗張強度及最終伸長率。

Six samples of each material, 25,4 mm wide and 203 mm long and not thicker than the thinnest part in the application, are required for this test. Three are tested as-received and three are tested following immersion.

The tensile strength and ultimate elongation shall be ≥ 60 % of the tensile strength and ultimate elongation of the as-received samples.

(c)沿面電阻試驗

c) Creep resistance test

每種液態冷媒限制系統之每一非金屬部件取兩個樣品，應置於完全乾燥的空氣循環烘箱並於 87 ℃溫度調適 14 天。調適後，部件不得呈現有裂紋及脆化等劣化跡象。

Two samples of each non-metallic part of the liquid coolant confining system shall be conditioned for 14 days at a temperature of 87 °C and placed in a full draft air-circulating oven. Following the conditioning, the parts shall show no sign of deterioration such as cracking and embrittlement.

**12.107 外殼(Enclosures)**

**12.107.1 一般(General)**

外殼應依 IEC 62477-1:2012 之 4.12 設計，除防護等級及衝擊試驗要求外，本標準 12.4 及 12.11 適用。

Enclosures shall be designed according to IEC 62477-1:2022, 4.12, with the exception of the requirements for degrees of protection and the impact test, for which 12.4 and 12.11 in this document apply.

符合性依 12.4、12.11 及 IEC 62477-1:2022 之 4.4.4.3 檢驗及試驗查核，若適用。

Compliance is checked by inspection and tests according to 12.4, 12.11 and IEC 62477

1:2022,4.12, where applicable.

~~備考：以下國家，國家法規針對 EV 供電設備之外殼提出要求：美國 (US)、日本 (JP)。~~

NOTE In the following countries, national regulations provide requirements on the enclosure of EV supply equipment: US, JP.

**12.107.2 材料及部件之強度(Strength of materials and parts)**

**12.107.2.1 一般(General)**

EV 供電設備之材料及部件的強度，應依 IEC 61439-7:2018 之 10.2，除了本標準 12.11 衝擊試驗。

Strength of materials and parts of EV supply equipment shall be according to IEC 61439-1:2020,10.2, except for the impact test in 12.11 of this document.

建構 EV 供電設備之材料應能耐受預期使用條件可能遭遇的機械、電氣、熱及環境應力。

The EV supply equipment shall be constructed of materials capable of withstanding the mechanical, electrical, thermal and environmental stresses that are likely to be encountered in anticipated service conditions.

**12.107.2.2 絕緣材料性質(Properties of insulating materials)**

**12.107.2.2.1 熱穩定性(Thermal stability)**

以絕緣材料製作之外殼或外殼部件的熱穩定性，應藉乾熱試驗查證。

For enclosures or parts of enclosures made of insulating materials, thermal stability shall be verified by the dry heat test.

符合性依檢驗及 IEC 61439-1 之 10.2.3.1 試驗查核。

Compliance is checked by inspection and test in accordance with IEC 61439-1:2020, 10.2.3.1.

**12.107.2.2.2 絕緣材料對熱及著火之抵抗力(Resistance of insulating materials to heat and fire)**

絕緣材料對熱及著火之抵抗力應依 IEC 61439-1:2011 之 8.1.3.2 試驗。

Resistance of insulating materials to heat and fire shall be according to IEC 61439-1:2020,8.1.3.2.

符合性依 EV 供電設備製造商之試驗數據檢驗或試驗查核。

Compliance is checked by inspection of EV supply equipment manufacturer’s test data or test.

**12.107.3 外殼完整性試驗(Enclosure integrity tests)**

外殼完整性應依 IEC 62477-1:2012 之 5.2.2.4 試驗。

The enclosure integrity tests shall be according to IEC 62477-1:2022, 5.2.2.4.

備考：外殼完整性試驗規定於 IEC 62477-1:2012，包括以下試驗：撓(deflection)、穩定力、衝擊、落下、應力消除、穩定性、壁掛或天花板固定設備、把手及手動控

制器安全緊固試驗。

NOTE The enclosure integrity tests specified in IEC 62477-1:2022 include the following tests: deflection, steady force, impact, drop, stress relief, stability, wall or ceiling mounted equipment, handles and manual controls securement test.

**12.108 組件橋接絕緣(Components bridging insulation)**

**12.108.1 一般(General)**

組件橋接絕緣應符合其橋接之絕緣位準的要求，例：基本、強化或雙重絕緣。

Components bridging insulation shall comply with the requirements of the level of insulation,for example, basic, reinforced or double, they are bridging.

組件橋接絕緣應滿足 IEC 62368-1:2018 之 5.5 要求，並依該節規定進行符合性測試。

Components bridging insulation shall meet the requirements of IEC 62368-1:2023, 5.5, and be subjected to compliance testing as specified in that clause.

限制 B 側電路之帶電部件(DC+/DC-)與保護性導體間電壓的 SPD 及其他夾緊裝置，於，應耐受額定≥ 1200 Vdc。

SPDs and other clamping devices limiting the voltage at the side B circuit, between live parts (DC+/DC–) and the protective conductor, shall have a rated DC withstand voltage of ≥ 1 200 V DC.

EV 製造商宜考量依 IEC 61851- 23:2014 設計 EV 供電設備，配備可耐受較低 DC 電壓之 SPD。

EV manufacturers should consider that EV supply equipment designed according to IEC 61851-23:2014 can be equipped with SPDs with a lower DC withstand voltage.

備考 1. 若 EV 使用夾緊裝置，建議 EV 製造商考量 6.3.1.112.2 之要求。

NOTE 1 If clamping devices are used in EV, the EV manufacturer is advised to consider the requirement in 6.3.1.112.2.

備考 2. 針對工作電壓> 550 V 因要求雙重或強化絕緣 (參照 8.105.5)，若單一接地故障，B 側帶電部件(DC+/DC-) 與保護性導體間不會出現> 1 200 Vdc 的短暫過電壓。

NOTE 2 Due to the requirements for a double or reinforced insulation for working voltages > 550 V DC (see 8.105.5) in case of a single earth fault, temporary overvoltages > 1 200 V DC between side B live parts (DC+/DC–) and the protective conductor do not occur.

藉設計審查查核符合性。

Compliance is checked by design review.

**12.108.2 電容器(Capacitors)**

電容器橋接絕緣應符合 IEC 60384-14。

Capacitors bridging insulation shall comply with IEC 60384-14.

符合性依檢驗查核。

Compliance is checked by inspection.

**12.109 隔離變壓器 Isolating transformers**

不包括用於輔助電路之安全隔離變壓器，隔離變壓器應符合 IEC 62368-1:2023 之 G.5.3 或 IEC 61558-1 及 IEC 61558-2-4 要求。

Isolating transformers, excluding safety isolating transformers used for auxiliary circuits, shall comply with the requirements of IEC 62368-1:2023, G.5.3, or both IEC 61558-1 and IEC 61558-2-4.

符合性依檢驗查核。

Compliance is checked by inspection.

## 13. 過載及短路保護(Overload and short-circuit protection)

除以下之外，CNS 15511-1 第 13 節適用。

IEC 61851-1:2017, Clause 13, is applicable, except as follows.

### 13.1 一般(General)

取代：

Replacement:

B 側電路可同時使用且預期由同一 A 側供電的情況下，個別保護應併入於 EV 供電設備。

Where side B circuits can be used simultaneously and are intended to be supplied from the same side A, they shall have individual protection incorporated in the EV supply equipment.

若 EV 供電設備有一個以上 B 側電路，則此 B 側電路可共同的過載保護方式且可有共同的短路保護方式，該等保護方式提供 B 側每一電路所需的保護(例：共用保護裝置額定不得高於 B 側電路最低額定)

If the EV supply equipment presents more than one side B circuits, then such side B circuits may have common overload protection means and may have common short-circuit protection means, if those protection means provide the required protection for each of the side B circuits (for example, the common protection device shall have a rating no higher than the lowest rating of the side B circuits).

備考 1. 此配置可能衝擊 EV 供電設備之可用性，其可藉適當的負載管理(例：負載分配)解決。

NOTE 1 Such a configuration might have an impact on the availability of the EV supply equipment, which could be resolved by adequate load management (for example, load sharing).

若 EV 供電設備有多個不能同時使用之 B 側電路，則此 B 側電路可共用保護方式。

If the EV supply equipment presents more than one side B circuit that cannot be used simultaneously, then such side B circuits can have common protection means.

~~備考 2.以下國家，防止過電流及過電壓的方法符合當地國家規範：美國 (US)、日本 (JP)、加拿大 (CA)。~~

NOTE 2 In the following countries, the methods of protection against overcurrent and overvoltage are in accordance with national codes: US, JP, CA.

備考 3.分路過電流保護基於 EV 供電設備 A 側為額定最大電流之 125%。

NOTE 3 In the following countries, the branch circuit overcurrent protection is based upon 125 % of the rated maximum current of the EV supply equipment at side A: US, CA.

備考 4. FPT 視為連續負載，依相關法規限制為分路保險絲或斷路器定額之 80%。

NOTE 4 In the following countries, FPT is considered a continuous load and is limited to 80 % of the branch circuit fuse or circuit breaker rating by national rules: US, CA.

備考 5.保護裝置可裝備 EV 供電設備內部、固定設置或兩者皆有。

NOTE 5 Protection devices can be provided inside the EV supply equipment, in the fixed installation or in both places.

備考 6. A 側保護性導體須符合相關標準要求。

NOTE 6 In the following countries, the protective conductor at side A complies with the test requirement in national standard: JP.

**13.2 纜線組之過載保護(Overload protection of the cable assembly)**

IEC 61851-1:2017 之 13.2 不適用

IEC 61851-1:2017, 13.2, is not applicable.

**13.3 充電纜線之短路保護(Short-circuit protection of the charging cable)**

IEC 61851-1:2017 之 13.3 不適用

IEC 61851-1:2017, 13.3, is not applicable.

追加子節：

Additional subclause:

**13.101 電能傳輸期間 DC 連接之短路保護(Short-circuit protection of the DC connection during energy transfer)**

EV 供電設備應滿足以下(a)至(c) 之所有要求，因以下任一故障條件而 EV 供電設備供給短路電流：

The EV supply equipment shall fulfil all the requirements a) to c) below, for a short-circuit current supplied by the EV supply equipment due to any of the following fault conditions:

— 故障條件 1：B 側帶電部件(DC+及 DC-)間之短路。

– fault condition 1: a short-circuit between side B live parts (DC+ and DC–);

— 故障條件 2：PEC 失效，例：降壓轉換器之永久全導通開關元件。

– fault condition 2: a failure in the PEC, for example, a permanently fully conductive switching element in a buck converter.

(a) 限制峰值電流，包括暫態效應，以：

a) Limit the peak current, including transient effects, to:

針對系統 A

– for system A:

— B 側當下電壓 ≤500 Vdc，車輛端插頭之 B 側帶電部件(DC+及 DC-)≤10 kA。

• ≤ 10 kA at side B live parts (DC+ and DC–) of the vehicle connector for a present voltage at side B ≤ 500 V DC;

— B 側 DC+與 DC-間當下電壓 > 500 Vdc，在車輛端插頭之 B 側帶電部件(DC+及 DC-)電壓為[10 kA × (DC+與 DC-間 B 側當下電壓 / 500 V)] (或小於)。

• [10 kA × (present voltage at side B between DC+ and DC– / 500 V DC)] (or less) at side B live parts (DC+ and DC–) of the vehicle connector for a present voltage at side B between DC+ and DC– > 500 V DC;

—系統 B 及 C：

– for system B and system C:

車輛端插頭之 B 側帶電部件(DC+及 DC-)≤10 kA。

• ≤ 10 kA at side B live parts (DC+ and DC–) of the vehicle connector.

備考 1. CNS 15700-3 規定車輛端插頭及車輛端插座之短路峰值電流仍在研議中。

NOTE 1 The short-circuit peak current value for the vehicle connector and vehicle inlet specified in IEC 62196- 3 is under consideration.

(b) 限制 I2t 值至：

b) Limit the I2t value to:

— 系統 A，車輛端插頭之 B 側帶電部件(DC+及 DC-) ≤ 400,000 A2s。

– ≤ 400 000 A2s at side B live parts (DC+ and DC–) of the vehicle connector for system A;

— 系統 B，車輛端插頭之 B 側帶電部件(DC+及 DC-) ≤ 500,000 A2s。

– ≤ 500 000 A2s at side B live parts (DC+ and DC–) of the vehicle connector for system B;

— 系統 C，車輛端插頭之 B 側帶電部件(DC+及 DC-) ≤ 1,000,000 A2s。

– ≤ 1 000 000 A2s at side B live parts (DC+ and DC–) of the vehicle connector for system C.

(c) 依各別試驗規定，短路條件開始後，1 s 內觸發緊急停機。

c) Trigger an emergency shutdown in 1 s or less after the start of the short-circuit condition as specified in the respective test.

在要求時間內限制 I2t 值，若短路電流因 EV 供電設備未完全使跳脫熔絲(若有)，則 EV 供電設備應提供替代方式以中斷短路電流。

If the short-circuit current supplied by the EV supply equipment is not sufficient to trip a fuse, if any, in the required time or less to limit the I2t value, the EV supply equipment shall provide an alternative means to interrupt the short-circuit current.

備考 2. 電流峰值為 EV 供電設備之電容放電的結果。電容性放電為 ms 範圍之暫態現象。

NOTE 2 The current peak is a result of the discharge of the capacitance of the EV supply equipment. The capacitive discharge is a transient phenomenon in the range of milliseconds.

備考 3. 進行 6.3.1.109 電能傳輸前，查核短路要求。

NOTE 3 Requirements for short-circuit check before energy transfer are given in 6.3.1.109.

針對系統 A，藉設計審查與檢驗及電路分析證明 (a)至(b)之符合性，(c)符合性依 AA.3.8.3 查核。

For system A, the compliance for a) to b) is demonstrated by design review with inspection and circuit analysis. Compliance for c) is checked by AA.3.8.3.

針對系統 B ，藉設計審查與檢驗及電路分析證明(a)至(b)之符合性，(c)符合性依 BB.5.8 查核。

For system B, the compliance for a) to b) is demonstrated by design review with inspection and circuit analysis. Compliance for c) is checked by BB.5.8.

針對系統 C 之故障狀態 1，依 CC.7.5.18 試驗 (a)至(c) 之符合性要求。針對系統 C 之故障狀態 2，透過設計審查證明(a)至(c)要求的符合性。

For system C, for fault condition 1, the compliance with requirements a) to c) is tested according to CC.7.5.18. For system C for fault condition 2, the compliance with requirements a) to c) is demonstrated through design review.

由 EV 供應之短路電流，應符合(d)或(e)要求。

For a short-circuit current supplied by the EV, the requirements in d) or e) shall be fulfilled.

(d) EV 供電設備之車輛端插頭，應有短路電流耐受定額(I2t)，且針對不同系統，依 ISO 17409:2020 規定應耐受峰值電流。電線導體最小截面積，應依 IEC 60364-4-43:2008 公式(3)計算。

d) At the vehicle connector, the EV supply equipment shall have a short-circuit current withstand rating (I2t) and shall withstand a peak current according to the values as specified in ISO 17409:2020 for the different systems. The minimum cross-sectional area of the line conductors shall be calculated according to IEC 60364-4-43:2008, Formula (3).

備考 4. 系統 B 之短路電流耐受定額(I2t)未規定於 ISO 17409:2015 未規定，但 CN 標準規定為 5, 000,000 A2s。

NOTE 4 Short-circuit current withstand rating (I2t) for system B is not specified in ISO 17409:20157, but it is specified as 5 000 000 A2s in CN standards.

備考 5.依 ISO 17409:2015 之 I2t 限制值，參照 ISO 17409:2020 的 7.2.4.2 警告。系統 C 之 I2t 要求在 ISO 17409:2015 為 12,000,000 A2s。

NOTE 5 For the limits of I2t according to ISO 17409:2015, see the warning in ISO

17409:2020, 7.2.4.2. The I2t requirement for system C was 12 000 000 A2s in ISO 17409:2015.

(e) EV 供電設備 B 側應提供過電流保護裝置。針對不同系統，過電流保護裝置應耐受依 ISO 17409:2020 規定值之峰值電流。藉此保護裝置保護之 B 側區塊，應依此過電流保護裝置之特性設計。不藉此保護裝置保護之 B 側區塊，應符合(d)的要求。

e) An overcurrent protection device shall be provided in side B of the EV supply equipment.The overcurrent protection device shall withstand a peak current according to the values as specified in ISO 17409:2020 for the different systems. The section of side B which is protected by this protection device shall be designed according to the characteristics of this overcurrent protection device. The section of side B which is not protected by this overcurrent protection device shall comply with requirement d).

符合性依(d)及(e)之要求檢驗查核。

Compliance for requirements d) and e) is checked by inspection.

**14. 保護裝置之自動復閉(Automatic reclosing of protective devices)**

IEC 61851-1:2017 第 14 節不適用。

IEC 61851-1:2017, Clause 14, is not applicable.

**15. 緊急開關或斷接(選項)(Emergency switching or disconnect (optional))**

IEC 61851-1:2017 第 15 節適用

IEC 61851-1:2017, Clause 15, is applicable.

**16. 標識及說明書(Marking and instructions)**

除以下之外，CNS 15511-1 第 16 節適用。

IEC 61851-1:2017, Clause 16, is applicable, except as follows.

**16.1 EV 充電站之設置手冊(Installation manual of EV charging stations)**

追加：

Addition:

針對系統 B，16.1 仍在研議中。

For system B, 16.1 is under consideration.

(a) 冷媒

a) Coolant

系統 A 及系統 C：

For system A and system C:

—若使用冷媒， EV 供電設備設置手冊依 12.106 應包括關於冷媒特性之資訊，例：熱管理系統。

– if coolant is used, for example, for thermal management system, the installation

manual of the EV supply equipment shall include information about the coolant properties according to 12.106;

— 依 ISO 7010-M002:2011-05 之標準標誌〝參照說明書手冊〞，應清晰可視附貼在熱交換器上。

– a standard sign "Refer to instruction manual" according to ISO 7010-M002:2011-05 shall

be visibly attached to the thermal exchange;

—冷媒名稱應清晰可視 附貼於冷卻單元外殼。

– the name of the coolant shall be visible attached at the enclosure of the cooling unit.

b) RCD

預期固定設置之 EV 供電設備，設置手冊應包括由設備提供保護措施之資訊。在正常及故障狀態下，若任何導致保護性導體之電流的 DC 分量 > 6 mA，則應在設置手冊中提供注意事項及 ISO 7000-0434B:2004-01 之標誌（參照圖 115），且該標誌應置於產品上。警告通知應如下或相當（亦參照 IEC 62477-1:2022 之 6.3.7.5 及 4.4.8）：

For EV supply equipment intended for fixed installation, the installation manual shall include information about the protective measure to be provided by the installation. If, under normal and fault conditions, any resulting DC component of the current in the protective conductor may be > 6 mA DC, a caution notice and the symbol ISO 7000-0434B:2004-01 (see Figure 115) shall be provided in the installation manual, and the symbol shall be placed on the product. The caution notice shall be the following or equivalent (see also IEC 62477- 1:2022, 6.3.9.5 and 4.4.8):

〝注意：本產品之保護性導體產生 DC 電流。使用殘餘電流動作保護裝置 (RCD) 防護電擊之情況下，則本產品的電源側僅容許使用 B 型 RCD。〞

"CAUTION: This product can cause a DC current in the protective conductor. Where a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of type B is allowed on the supply side of this product."



備考：代表：注意，依照文件。

NOTE Denotes: Caution, refer to documentation.

Figure 115 – Symbol ISO 7000-0434B:2004-01

(c) 維護計畫

c) Maintenance program

EV 供電設備製造商應指定預防性維護計畫，例：更換 B 側纜線組依使用一段預定時間及/或耦合期間的次數。

The EV supply equipment manufacturer shall prescribe a preventative maintenance program, for example, for the replacement of the side B cable assembly following a predetermined period of time in service and/or number of coupling sessions.

(d) 配電系統

d) Power distribution system

設置手冊應包括 5.101.5 敘述關於分類的資訊。

The installation manual shall include information about the classification described in 5.101.5.

(e) 接觸電流

e) Touch current

在接地導體失去電氣連續性之故障情況下，EV 供電設備試驗的接觸電流超過 3.5 mA ac RMS，其設置手冊應包含以下資訊。

For an EV supply equipment that, under a fault condition of loss of electrical continuity of the earthing conductor, has a test touch current of > 3,5 mA AC RMS, the installation manual shall include the following information.

- 注意通知及標誌參照 ISO 7000-0434B:2004-01、ISO 7010-W012:2011-05 或 IEC 60417-6042:2010-11（參照圖 115）。注意通知應依以下或相當：

– A caution notice and the symbol ISO 7000-0434B:2004-01, ISO 7010-W012:2011-05, or IEC 60417-6042:2010-11 (see Figure 115). The caution notice shall be the following or equivalent:

"注意：接地導體失去電氣連續性之故障情況下，接觸電流可能會大於 3.5mA ac RMS"

"CAUTION: A touch current > 3,5 mA AC RMS is possible in case of a fault condition of loss of electrical continuity of the earthing conductor."

保護性接地導體之最小尺，應符合相關安全法規。

– The minimum size of the protective earthing conductor shall comply with the local safety regulations.

(f)保護性導體連接至保護性接地導體或接地。

f) Connection of the protective conductor to a protective earthing conductor or earth

EV 供電設備設置後，若 EV 供電設備容許連接至未提供保護性導體或保護性導體未接地的電網，注意通知應提供於設置手冊。在此情況下，EV 供電設備製造商應依 16.3 項目(k)提供標誌，於設置期間標示於 EV 供電設備 。

A caution notice shall be provided in the installation manual if the EV supply equipment, when installed, is allowed to be connected to a supply network that does not provide a protective conductor or a protective conductor that is not earthed. In this case, the EV supply equipment manufacturer shall provide a label according to item k) in 16.3, to mark the EV supply equipment during the installation.

設置手冊之 9.7、12.4.1、12.7.102、 12.104.2、12.106.1 及 101.1.1 內容應包括追加要求。

Additional requirements for the contents of the installation manual in 9.7, 12.4.1, 12.7.102, 12.104.2, 12.106.1 and 101.1.1 shall be included.

符合性依檢驗查核。

Compliance is checked by inspection.

**16.2 EV 供電設備使用者手冊(User manual for EV supply equipment)**

追加：

Addition:

設置時，使用者手冊應依連接電網，以資訊型式提供容許個人操作 EV 供電設備。資訊應如下或同等：

The user manual shall provide information on which type of personnel is allowed to operate the EV supply equipment according to the supply network it is connected to when installed. The information shall be the following or equivalent:

〝設置時，若 EV 供電設備連接至提供保護性接地導體之電網，容許普通人操作 EV 供電設備〞

– "The EV supply equipment is allowed to be operated by an ordinary person if the EV supply equipment, when installed, is connected to a supply network that provides a protective earthing conductor."

〝若設置之 EV 供電設備連接至未提供保護性導體或未接地保護性導體的電網，則僅容許專業人員或經指導人員操作〞

– "The EV supply equipment is only allowed to be operated by skilled personnel or instructed personnel if the EV supply equipment, when installed, is connected to a supply network that does not provide a protective conductor or a protective conductor that is not earthed."

使用者手冊內容應包括 101.1.1 及 FF.4.2 追加要求。

Additional requirements for the contents of the user manual in 101.1.1 and FF.4.2 shall be included.

符合性依檢驗查核。

Compliance is checked by inspection.

**16.3 EV 供電設備之標識(Marking of EV supply equipment)**

追加：

Addition:

k) "EV 供電設備設置時，若 EV 供電設備設置於未提供保護性導體或未接地導體

之電網，應提供以下訊息於 EV 供電設備：〝限專技人員或經指導人員使用。"

k) "Only to be used by skilled or instructed personnel", or equivalent, if the EV supply equipment was installed to a supply network that does not provide a protective conductor or a protective conductor that is not earthed.

備考 1.EN 17186 規定標示要求，視操作範圍及系統而定。

NOTE 2 EN 17186 provides labelling requirements depending on operating ranges and systems.

符合性依檢驗查核。

Compliance is checked by inspection.

**16.4 情形 B 之充電纜線組標誌(Marking of charging cable assemblies case B)**

IEC 61851-1:2017 之 16.4 不適用。

IEC 61851-1:2017, 16.4, is not applicable.

追加子節：

Additional clauses:

101 EV 供電設備之特定要求(Specific requirements for EV supply equipment)

101.1 分離式 EV 供電設備之特定要求(Specific requirements for separated EV supply equipment)

101.1.1 B 側電壓、電流及功率操作範圍(Operating ranges for voltage, current, and power at side B)

EV 供電設備製造商應使用以下參數指定操作範圍，並表明於使用者手冊及設置手冊：

The EV supply equipment manufacturer shall specify the operating range using the following parameters, and indicate them in the user manual and the installation manual:

— B 側額定電壓操作範圍(Vmin, Vmax)

– rated voltage operating range at side B (Vmin, Vmax);

—B 側額定連續電流操作範圍(Imin, Icont)

– rated continuous current operating range at side B (Imin, Icont);

—B 側額定提高電流操作範圍(Imin, Iboost)

– rated boost current operating range at side B (Imin, Iboost);

—B 側額定連續功率操作範圍(Pmin, Pcont)

– rated continuous power operating range at side B (Pmin, Pcont);

—B 側額定升壓功率操作範圍(Pmin, Pboost)

– rated boost power operating range at side B (Pmin, Pboost);

—周圍溫度操作範圍。

– ambient operating temperature range;

—最高操作之海拔高度。

– maximum operating altitude above sea level.

備考：CNS 15511-24 規定該等參數須使用數位通訊通知 EV 及如何完成。

NOTE 1 IEC 61851-24 specifies which of these parameters need to be communicated to the EV using digital communication, and how this is accomplished.

周圍操作溫度範圍應至少涵蓋-5 ℃至+40 ℃的範圍。

The ambient operating temperature range shall at least cover the range from –5 °C to +40 °C.

備考 2. 戶外使用依 12.10 規定，最低操作溫度為-25 ℃ ± 3 K。

NOTE 2 Subclause 12.10 specifies a minimum operating temperature of -25 °C ± 3 K for outdoor use.

最高操作海拔高度應 ≥ 2000 m。

The maximum operating altitude shall be ≥ 2 000 m above sea level.

~~備考 3：以下國家，系統 A EV 供電設備之最高運作海拔高度可≥ 1,000mm：日本(JP)。~~

NOTE 3 In the following countries, the maximum operating altitude can be ≥ 1 000 m above sea level for system A EV supply equipment: JP.

EV 供電設備製造商可指定以下一個以上追加之操作範圍：

The EV supply equipment manufacturer may specify one or more of the following additional operating ranges:

— 周圍操作溫度範圍較上述寬。

– ambient operating temperature range wider than the one referred to above;

— 最高操作海拔較上述高。

– maximum operating altitude above sea level more than the one referred to above.

在此情形下，針對該等/此額外操作範圍之其他參數，可偏離上述的參數範圍，例：

In such a case, the other parameter ranges applicable for those/this additional operating range(s) may deviate from the ones referred to above, for example:

— B 側額定電壓操作範圍小於依上述，及/或

– a rated voltage operating range at side B smaller than the one referred to above, and/or

— B 側額定連續電流操作範圍小於上述提，及/或

– a rated continuous current operating range at side B smaller than the one referred to above, and/or

— B 側額定連續功率操作範圍小於依上述。

– a rated continuous power operating range at side B less than the one referred to above.

EV 供電設備應能夠於 101.1.2 規定之每一操作範圍間提供電能傳輸。

The EV supply equipment shall be able to provide energy transfer as specified in

101.1.2 between each operating range.

B 側當下功率應不大於 EV 供電設備 B 側額定升壓功率，即使 EV 目標功率高於 EV 供電設備 B 側額定升壓功率。

The present power at side B shall be less than or equal to the rated boost power of the EV supply equipment at side B, even if the target power of the EV is more than the rated boost power of the EV supply equipment at side B.

EV 供電設備亦可在低於指定操作範圍下限值之下操作，即若 B 側當下電流 < Imin 或當下電壓電壓<Vmin，不須滿足 101.1.2 規定的要求。

The EV supply equipment may also be able to operate at a value less than the lower limit of a specified operating range, that is, provide a present current at side B < Imin or a present voltage at side B < Vmin, without the need to fulfil all the requirements given in 101.1.2.

101.1.2 B 側電壓及電流之許可差(Voltage and current tolerance at side B)

101.1.2.1 B 側 CCM 之電流調節(Side B current regulation in CCM)

B 側 CCM 之電流調節要求規定於 AA.3.10、BB4.1 及 CC.6.2。

Requirements for side B current regulation in CCM are specified in AA.3.10, BB.4.1 and CC.6.2.

EV 供電設備應限制 B 側當下電壓於 101.1.2.2 規定之 EV 當下電壓的最大容許偏差內。

The EV supply equipment shall limit the present voltage at side B to the target voltage of the EV with a maximum allowable deviation defined in 101.1.2.2.

系統 A 及系統 B 之符合性依以下試驗查核，系統 C 之符合性依 CC.7.5.11 查核。

Compliance for system A and system B is checked by the following test. Compliance for system C is checked by CC.7.5.11.

系統 A 試驗裝置如圖 129 所示。系統 B 試驗裝置如圖 130 所示。

The test setup for system A is shown in Figure 129. The test setup for system B is shown in Figure 130.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1)連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. The setup of the test load for each system is shown in Table AA.10 and BB.7.

(2)持續量測 $V_T8$ 及 $A_T1$。

2) Measure VT8 and AT1 continuously.

(3) 依 EV 供電設備製造商指定程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) 依附錄 AA 及 BB 規定，記錄 EV 模擬器及 AT1 於操作點之目標電流，操作點參照 102.2.5。EV 模擬器之目標電流藉數位通訊發送至 EV 供電設備。

4) Record the target current of the EV simulator and AT1 at the operating points as specified in Annex AA and Annex BB. For operating point, see 102.2.5. The target current of the EV simulator is sent to the EV supply equipment via digital communication.

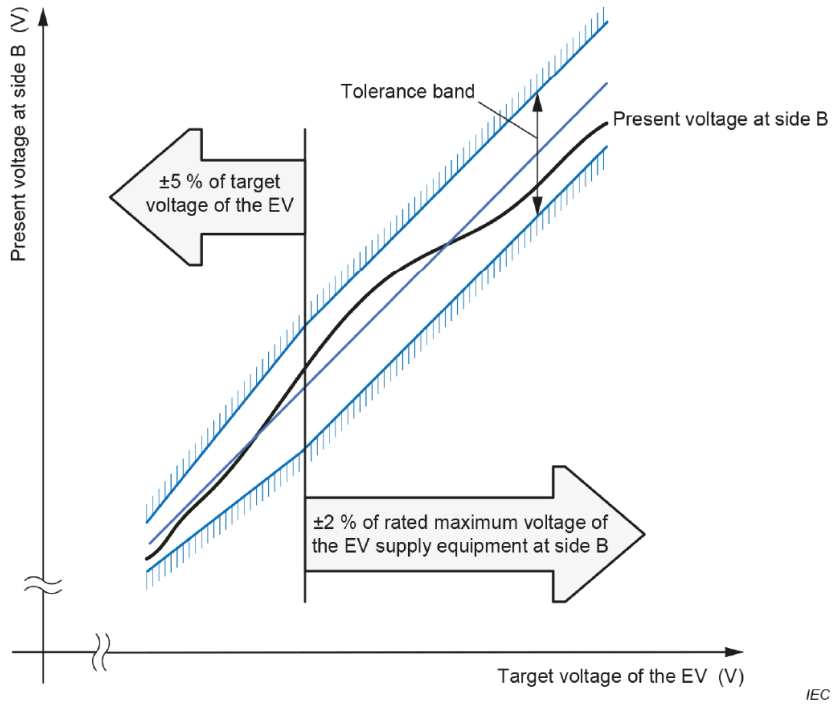
(5)於電壓/電流掃描（從一 OP 轉換到另一）及每一操作點期間，查核 AT1 與 EV 模擬器目標電流之差異於 101.1.2.1 規定的限制值內。

5) During the voltage/current sweep (transition from one OP to another) and for each operating point, check that the difference between AT1 and the target current of the EV simulator is between the limits specified in 101.1.2.1.

101.1.2.2 B 側 CVM 之電壓調節(Side B voltage regulation in CVM)

針對 CVM，於電池系統預充電階段及電能傳輸階段之期間，最高電壓偏差應在 EV 要求目標電壓的±5 %內，或 EV 供電設備 B 側額定最高電壓±2 %內，取其偏差較小者（參照圖 116）。

For CVM, the maximum voltage deviation, during the pre-charge phase and during the energy transfer stage of the battery system shall be between ±5 % of the target voltage requested by the EV, or ±2 % of the rated maximum voltage of the EV supply equipment at side B, whichever deviation is smaller (see Figure 116).



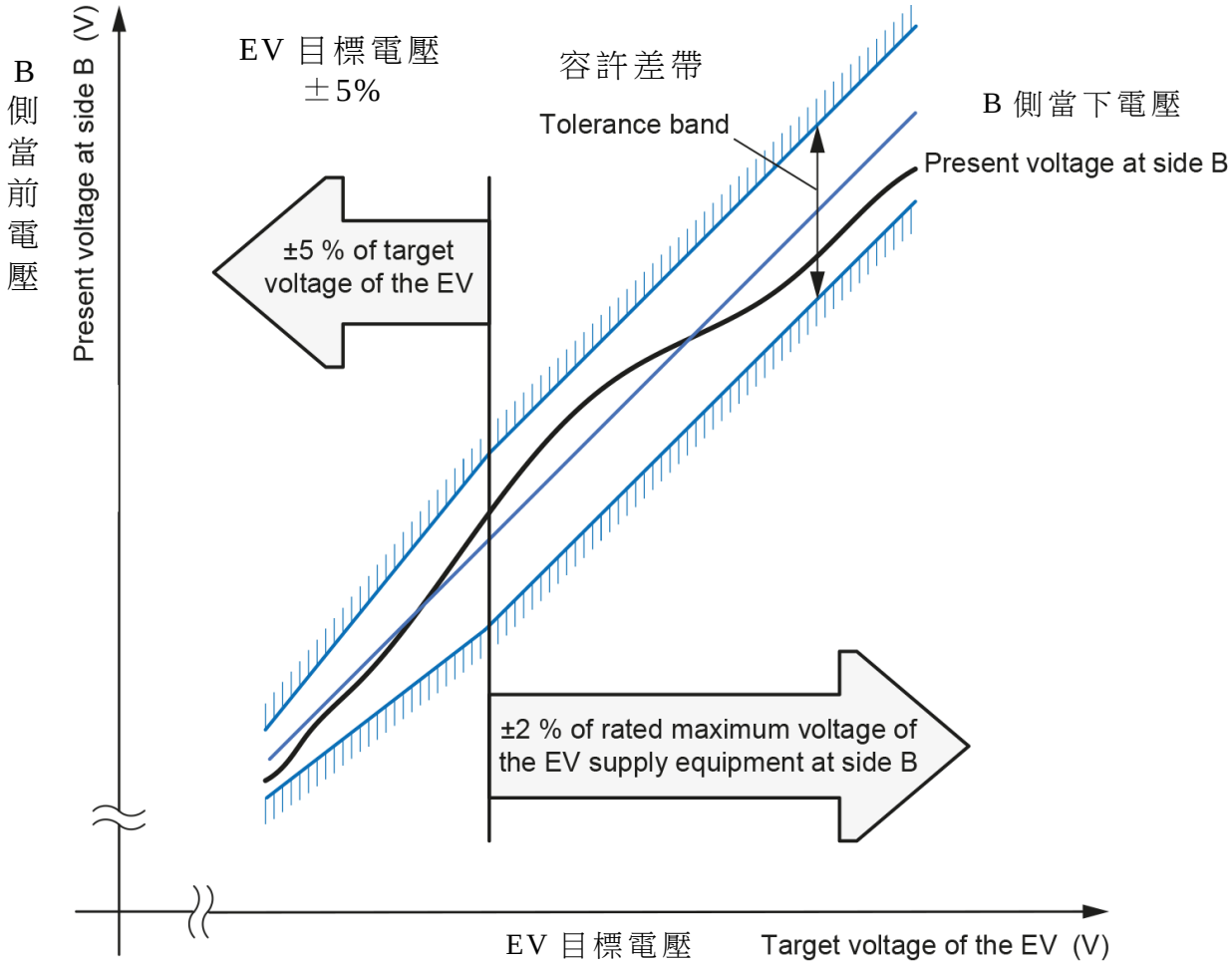



圖 116 – B 側 CVN 之電壓許可差

Figure 116 – Side B voltage tolerances in CVM

此等要求應符合系統 B 及系統 C。

These requirements shall be fulfilled for system B and system C.

EV 供電設備應限制 B 側當下電流於 101.1.2.1 規定之 EV 當下電流的最大容許偏差內。

The EV supply equipment shall limit the present current at side B to the target current of the EV with a maximum allowable deviation defined in 101.1.2.1.

符合性依 BB.9 及 CC. 7.5.12 之試驗查核。

Compliance is checked by the tests in BB.9 and CC.7.5.12.

備考 1. CVM 模式內未規定電流漣波，視 B 側與電池組間之阻抗而定，ISO 17409 未規定此。

NOTE 1 The current ripple is not specified within the CVM as it depends on the impedance between side B and the batter EV 供電設備 B 側額電最大電壓±2% n ISO 17409.

CCM 之電流要求類似調節(參照 101.1.2.1)及控制之延(參照 101.1.3)，適用 CVM，其導致 CVM 內未定義之電流行為。

The current requirements of CCM like regulation (see 101.1.2.1) and control delay (see 101.1.3) are not applicable in CVM, which leads to undefined current behaviour

within the CVM.

EV 可以以防止 EV 供電設備在電能傳輸期間中免於意外進入 CVM，如同此於附接電池系統時，會導致大的電流漣波，或 EV 目標電壓減電壓偏差小於電池系統電壓時，則會導致無電流。當電池系統附接到 B 側時，CVM 可藉通訊至少 VCompensation 大於電池系統電壓之 EV 目標電壓避免。參照公式(3)

The EV can prevent the EV supply equipment from unintentionally entering the CVM during energy transfer as this can lead to large current ripples when the battery system is attached, or it can lead to no current if the target voltage of the EV minus the voltage deviation is less than the battery system voltage. When the battery system is attached to side B, the CVM can be avoided by communicating a target voltage of the EV of at least VCompensation more than the battery system voltage. See Formula (3).

$$
\begin{aligned}
&VEV_Target = Vcompensation + VBattery \\
&Vcompensation = VDeviation + VRipple + VEV_Drop + VMargin \\
&VDeviation = \min(2\% \times VRated, 5\ \% \times VEV_Target) \\
&VRipple = \max(5\ V\ DC, 1\% \times VEV_Target) \\
&VEV_Drop = I_{SideB} \times ZEV\ I_{SideB}
\end{aligned}
\qquad (3)
$$

式中：

Where

| | |
|---|---|
| VEV_Target | EV 目標電壓，單位：伏特(V)<br>is the target voltage of the EV, expressed in volts; |
| VCompensation | EV 防止 CVM 宜增加之電壓，單位：伏特(V)<br>is the voltage the EV should add to prevent CVM, expressed in volts; |
| VBattery | 電池系統電壓，單位：伏特(V)<br>is the voltage of the battery system, expressed in volts; |
| VDeviation | B 側電壓偏差，單位：伏特(V)<br>is the voltage deviation at side B, expressed in volts; |
| VRipple | B 側電壓漣波，單位：伏特(V)<br>is the voltage ripple at side B, expressed in volts; |
| VEV_Drop | 車輛端插頭與電池系統間之電壓降，單位：伏特(V)<br>is the voltage drop between the vehicle connector and the battery system, expressed in volts; |
| VMargin | EV 製造商選擇之電壓邊界，單位：伏特(V)<br>is the voltage margin chosen by the EV manufacturer, expressed in volts; |
| VRated | EV 供電設備 B 側額定最高電壓，單位：伏特(V)<br>is the rated maximum voltage of the EV supply equipment at side B,expressed in volts; |

| | |
|---|---|
| $I_{SideB}$ | B 側當下電流，單位：安培(A)。<br>is the present current at side B, expressed in ampere; |
| $ZEV(I_{SideB})$ | EV 於 B 側當下電流之阻抗，單位：歐姆(Ω)<br>is the impedance of the EV at the present current at side B, expressed in ohms; |
| $V_{Deviation} + V_{Ripple}$ | VRated = VEV_Target = 1 000V dc 時為 30Vdc。<br>is 30 V DC at VRated = VEV_Target = 1 000 V DC. |

**101.1.3 B 側 CCM 當下電流之控制延遲 Control delay of present current at side B in CCM**

若 EV 通訊之 EV IReq_n 目標電流 異於先前 EV IReq_n－1 目標電流，依 IEC 61851-24 接收到目標電流後，如同公式(4)規定，B 側當下電流應不大於 101.1.2.1 規定 TTransition MAX 延遲時間之許可差限制值間。

If the EV communicated a target current of the EV IReq_n different to the previous target current of the EV IReq_n–1, the present current at side B shall be between the tolerance limits given in 101.1.2.1 in a delay time TTransition Max or less, as defined in Formula (4), after acknowledging the reception of the target current of the EV according to IEC 61851-24.

$$T_{\text{TransitionMax}} = \max\left(1\ s, \frac{\left|I_{\text{Req_n}} - I_{\text{SideB}}(t_0)\right|}{20\frac{A}{s}}\right) \quad (4)$$

式中，

where

| | |
|---|---|
| $T_{TransitionMax}$ | 新目標電流帶之最長轉變時間，單位：秒(s)<br>is the maximum transition time to the tolerance band of the new target current,expressed in seconds; |
| $I_{Req_n}$ | EV 接收之目標電流值，單位：安培(A)<br>is the value for the acknowledged target current of the EV, expressed in ampere; |

| | |
|---|---|
| $I_{SideB(t0)}$ | 接收 IReq_n 瞬間之 B 側當下電流值，單位：安培(A)<br>is the value for the present current at side B at the moment IReq_n is acknowledged, expressed in ampere. |

備考. 針對系統 A 及系統 B，CAN 資訊框(frame)參考 ACK 欄位確認。針對系統 C，確認係 TCP 參考 ACK 確認。

NOTE For system A and system B, the acknowledgement refers to the ACK field in the CAN frames. For system C, the acknowledge refers to the ACK in TCP.

若 EV 供電設備無法許可較快之負載變化，公式(4) 選擇 20 A/s 值以容許 EV 供電設備限制於施加電網的動態負載變化。然而，若 EV 供電設備設置在電網可許可此較快速負載變化之場域的情況，建議 EV 供電設備支援電流變化速率 > 20 A/s，即為了縮短對使用者互動之響應時間如啟動並停止通訊期間，由公式(4)計算較短的轉變時間。

The value of 20 A/s in Formula (4) is chosen to allow the EV supply equipment to limit the dynamics of the load change imposed on the supply network if the supply network cannot tolerate faster load changes. However, it is recommended that the EV supply equipment support a current change rate > 20 A/s, that is, much shorter transition times than calculated by Formula (4), in order to shorten the response time to user interactions like starting and stopping the communication session, if the EV supply equipment is installed at a site where the supply network can tolerate such faster load changes.

於增加電流轉變期間，B 側當下電流應：

During an increasing current transition, the present current at side B shall be

– 依 101.1.2.1 及 101.1.5，低於 EV 目標電流 ($I_{Req_n}$) 之許可差上限及漣波限制值

– less than the upper tolerance and ripple limits of the target current of the EV (IReq_n),according to 101.1.2.1 and 101.1.5, and

– 依 101.1.2.1 和 101.1.5，通知 EV 新目標電流（$I_{SideB}(t_0)$）之時間，高於許可差下限及 B 側當下電流漣波限制值

– more than the lower tolerance and ripple limits of the present current at side B at the time the new target current of the EV was communicated ($I_{SideB}(t_0)$), according to 101.1.2.1 and 101.1.5.

圖 117 所示為增加電流轉變之最不利情況範例， B 側當下電流達上限且低於許可差及漣波限制值。

Figure 117 shows an example of a worst-case scenario for an increasing current transition, where the present current at side B reaches the upper and lower tolerance and ripple limits.

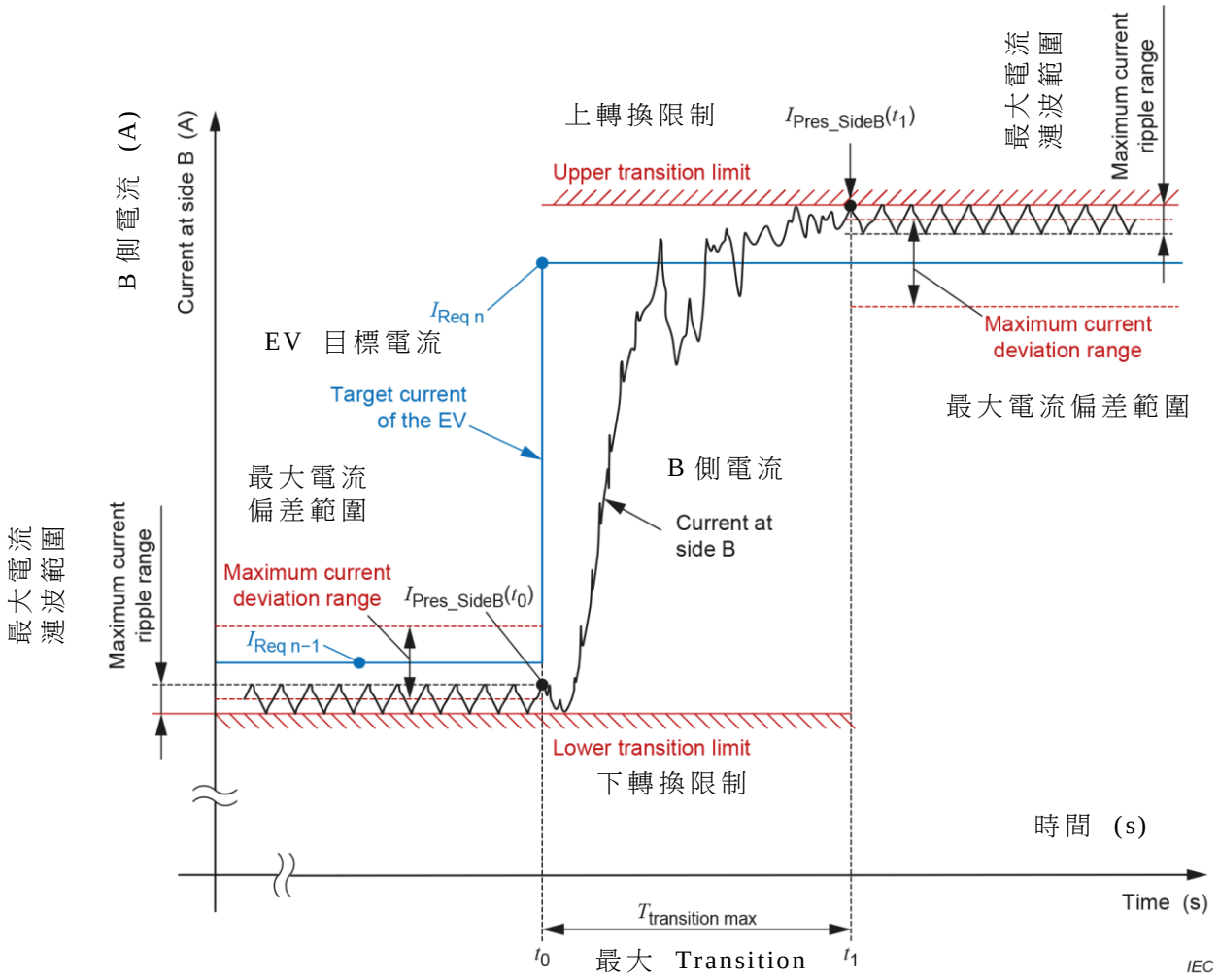



圖 117 – 針對電流增加請求下之電流控制延遲時間

Figure 117 – Current control delay for an increasing current request

於電流減少轉變期間，B 側當下電流應：

During a decreasing current transition, the present current at side B shall be

依 101.1.2.1 及 101.1.5，通知 EV 新目標電流（$I_{SideB}(t_0)$）時，B 側當下電流低於其許可差上限及漣波限制值

– less than the upper tolerance and ripple limits of the present current at side B at

the time the new target current of the EV was communicated (ISideB(t0)), according to 101.1.2.1 and 101.1.5, and

依 101.1.2.1 及 101.1.5，EV 目標電流（IReq_n）大於許可差下限及漣波限制值。

– more than the lower tolerance and ripple limits of the target current of the EV (IReq_n), according to 101.1.2.1 and 101.1.5.

圖 118 所示為減少電流轉變之最不利情況範例，B 側當下電流達到上限且低於許可差下限及漣波限制值

Figure 118 shows an example of a worst-case scenario for a decreasing current transition, where the present current at side B reaches the upper and lower tolerance and ripple limits.

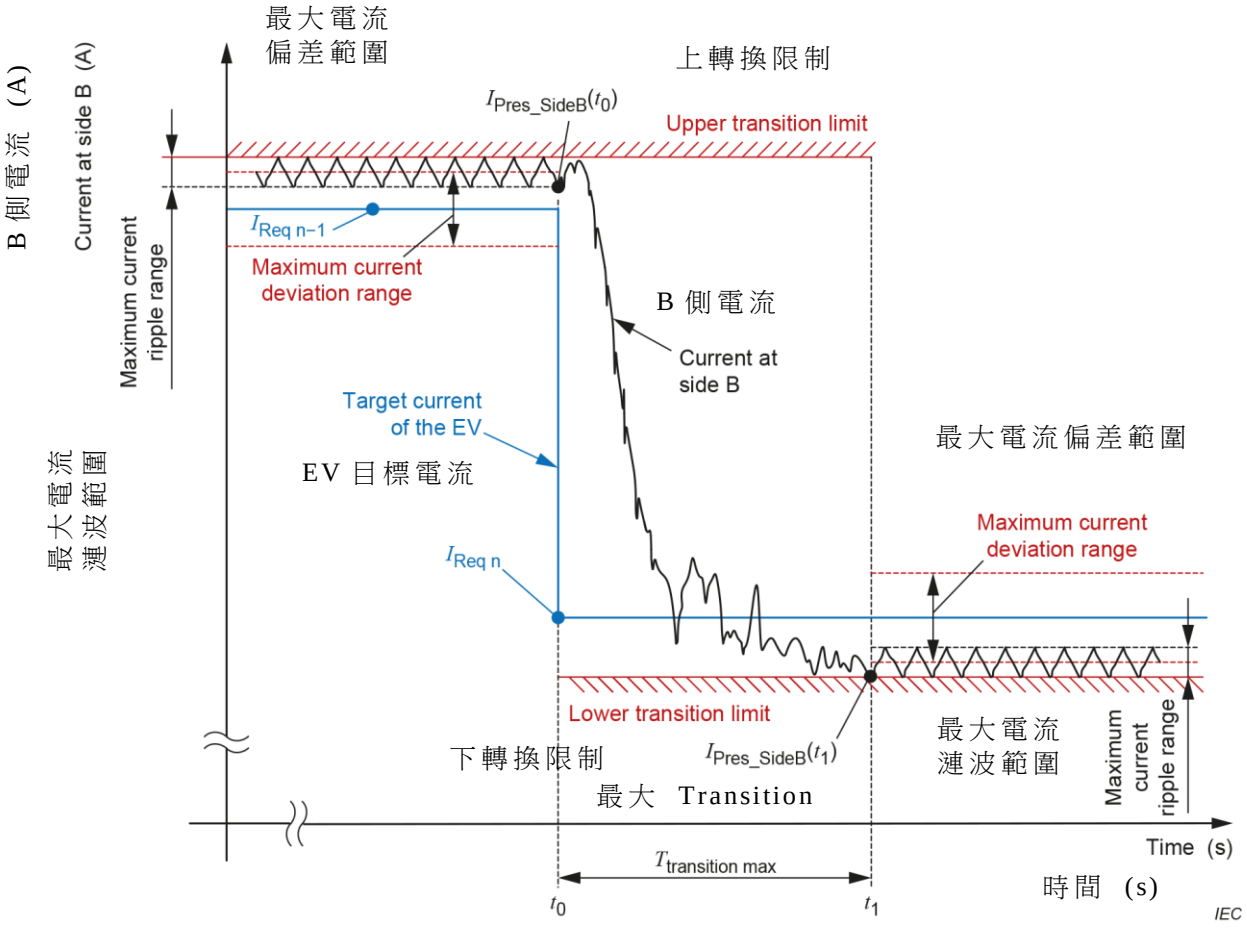



圖 118 – 針對當下電流減少請求下之電流控制延遲時間

Figure 118 – Current control delay for a decreasing current control request

系統 A 及系統 B 之符合性依以下試驗查核，系統 C 之符合性依 CC.7.5.14 查核。

Compliance for system A and system B is checked by the following test. For system C, see CC.7.5.14.

系統 A 試驗裝置如圖 129 所示。系統 B 試驗裝置如圖 130 所示。

The test setup for system A is shown in Figure 129. The test setup for system B is shown in Figure 130.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載並在

CCM 模式下操作。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, operating in CCM.

(2) 應記錄 EV 模擬器送出 EV 模擬器目標電流之時間，且亦應記錄某時段的 AT1。

2) The time of the EV simulator sending the target current of the EV simulator shall be recorded, and AT1 in a certain period of time shall be also recorded.

3)通知 EV 目標電流

3) The EV communicated a target current.

– 偏差 ≤ 20 A dc

– Deviation is ≤ 20 A DC.

– 偏差 > 20 A dc

– Deviation is > 20 A DC.

(4)變更系統 A 操作點 (參照圖 113) 從

4) For system A, change the operating point (see Figure 133) from

– OP1 至 OP3, OP4, OP5, OP6, OP7,

– OP1 to OP3, OP4, OP5, OP6, OP7,

– OP2 至 OP3, OP4, OP5, OP6, OP7,

– OP2 to OP3, OP4, OP5, OP6, OP7,

– OP3, OP4, OP5, OP6, OP7 至 OP1, 及

– OP3, OP4, OP5, OP6, OP7 to OP1, and

– OP3, OP4, OP5, OP6, OP7 至 OP2.

– OP3, OP4, OP5, OP6, OP7 to OP2.

變更系統 B 操作點 (參照圖 BB.5) 從

For system B, change the operating point (see Figure BB.5) from

– OP1 至 OP5,

– OP1 to OP5,

– OP2 至 OP3, OP4 (限 II 型 EV 供電設備),

– OP2 to OP3, OP4 (only for type II EV supply equipment),

– OP5 至 OP1, 及

– OP5 to OP1, and

– OP4 (限 II 型 EV 供電設備), OP3 至 OP2.

– OP4 (only for type II EV supply equipment), OP3 to OP2.

(5) EV 供電設備應控制 B 側當下電流

5) The EV supply equipment shall control the present current at side B

已通知 EV 模擬器目標電流後 1 s 內，及

– in 1 s or less after the target current of the EV simulator has been communicated, and

– 不大於公式（4）規定最大轉換延遲時間 TTransition_Max 內，如圖 117 及圖 118 所示。

– in a delay time TTransition_Max or less as defined in Formula (4), and as shown in Figure 117 and Figure 118.

101.1.4 B 側當下電流下降率 Descending rate of present current at side B

B 側當下電流因錯誤停機及緊急停機之下降率，應依計時及 B 側當下電流限制，系統 A 參照 AA.4.3.5 及 AA.5、系統 B 參照 BB.5.1()及系統 C 參照 CC.3.4。

The descending rates of the present current at side B for error shutdown and emergency shutdown shall be according to the timing and present current at side B restrictions specified in AA.4.3.5 and AA.5 for system A, BB.5.1 for system B and CC.3.4 for system C.

系統 C符合性依附錄 CC 之各別錯誤或緊急停機試驗情形查核。參照表 CC.10。

For system C, compliance is checked by the respective error or emergency shutdown test case in Annex CC. See Table CC.10.

系統 A 及系統 B 之符合性依以下試驗查核。

Compliance for system A and system B is checked by the following test.

系統 A 試驗裝置如圖 129 所示。系統 B 試驗裝置如圖 130 所示。

The test setup for system A is shown in Figure 129. The test setup for system B is shown in Figure 130.

本試驗應模擬電能傳輸階段之期間，由 EV 停止充電命令，以偵測 B 側當下電流。

This test shall simulate the stop charge command from EV, to detect the changes of the present current at side B during the energy transfer stage.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載並在 CCM 模式操作。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, operating in CCM.

(2)應記錄 EV 模擬器送出目標電流命令之 EV 控制模擬器時間，且亦應記錄 AT1 於某時段的時間。

2) The time of the EV control simulator sending the target current of the EV simulator shall be recorded, and AT1 in a certain period of time shall be also recorded.

(3) 正常操作

3) For normal operation:

—系統 A：自 OP1、OP2、OP3、OP4、OP5、OP6 及 OP7 變更操作點至 B 側當下電流 < 5 A dc

– for system A: change the operating point from OP1, OP2, OP3, OP4, OP5, OP6 and OP7 to a present current at side B < 5 A DC;

— 無 CPM 功能之系統 B：自 OP1、OP2、OP3 及 OP5 變更操作點至 B 側當下電

流 < 5 Adc (I 型 EV 供電設備)。

– for system B without the function of CPM: change the operating point from OP1, OP2, OP3 and OP5 to a present current at side B < 5 A DC (for type I EV supply equipment);

— 具 CPM 功能之系統 B ：自 OP1、OP2、OP3、OP4 及 OP5 變更操作點至 B 側當下電流 < 5 Adc (II 型 EV 供電設備)。

– for system B with the function of CPM: change the operating point from OP1, OP2, OP3,OP4 and OP5 to a present current at side B < 5 A DC (for type II EV supply equipment).

(4)緊急停機

4) For emergency shutdown:

— 系統 A：自 OP1、OP2、OP3、OP4、OP5、OP6 及 OP7 執行緊急停機。

– for system A: perform the emergency shutdown from OP1, OP2, OP3, OP4, OP5, OP6 and OP7;

— 無定功率共享功能之系統 B：自 OP3 執行緊急停機(I 型 EV 供電設備)。

– for system B without the function of constant power sharing: perform the emergency shutdown from OP3 (for a type I EV supply equipment);

—具定功率共享功能之系統 B：自 OP4 執行緊急停機(II 型 EV 供電設備)。

– for system B with the functions of constant power sharing: perform the emergency shutdown from OP4 (for a type II EV supply equipment).

(5)滿足錯誤或緊急停機系統特性要求試驗之查核。

5) Check that the system specific requirements for error or emergency shutdown test are met.

101.1.5 週期性及隨機偏差(CCM 期間之 B 側電流漣波)Periodic and random deviation (current ripple at side B during CCM)

CCM 期間之 B 側電流漣波，應不大於表 118 規定的限制值。於 EV 供電設備 B 側額定最大功率及 EV 供電設備 B 側額定提高電流，或 B 側當下電壓及 B 側當下電流對應 B 側理論最高電流漣波之最不利情形下，應作量測。

B 側電流漣波不包括 101.1.2.1 規定義之當下電流許可差。

The present current ripple at side B during CCM shall be less than or equal to the limit as defined in Table 118. The measurement shall be made at the rated maximum power of the EV supply equipment at side B and the rated boost current of the EV supply equipment at side B, or in the worst case where the present voltage at side B and present current at side B correspond theoretically to the maximum current ripple at side B. The current ripple at side B is not included in the present current tolerance defined in 101.1.2.1.

表 118 – EV 供電設備之電流漣波限制值

Table 118 – Current ripple limit of the EV supply equipment

| 頻率 Frequency [a] | B 側當下電流(I) Present current at side B (I) | | |
|---|---|---|---|
| | I ≤ 200 A dc [d] | 200 A dc < I ≤ 400 A dc | I > 400 A dc |
| 10 Hz | 1,5 [c] | I × 0.75 % [c] | 3,0 [b] |
| | | | I × 0.75 % [c] |
| 5 kHz | (I × 1.5 % + 3) [b] | 6.0 [c] | I × 1.5 % [c] |
| 150 kHz | 6.0 [c] | | 18.0 b |
| | 9.0 [c] | I × 4.5 % [c] | I × 4.5 % [c] |

註

[a]一階低通濾波器之截止頻率。[a] Cut-off frequency of the first order low pass filter.

[b]在 Apeak-to-peak 建議限制值。[b] Recommended limit in Apeak-to-peak.

[c]在 Apeak-to-peak 絕對最大限制值。[c] Absolute maximum limit in Apeak-to-peak.

[d]對於系統 B，≤ 250 Adc。[d] For system B, ≤ 250 A DC.

備考 1. 系統 A 支援 B 側當下電流 ≤ 400 Adc。

NOTE 1 System A supports a present current at side B ≤ 400 A DC.

備考 2. 系統 B 支援 B 側當下電流 ≤ 250 Adc。

NOTE 2 System B supports a present current at side B ≤ 250 A DC.

未連接電池系統之 CCM 仍在研議中。

For CCM, when the battery system is not connected: under consideration.

系統 A 及系統 B 之符合性依以下試驗查核，系統 C 之符合性依 CC.7.5.11 查核。

Compliance for system A and system B is checked by the following test. Compliance for system C is checked by CC.7.5.11.

系統 A 試驗裝置如圖 129 所示。系統 B 試驗裝置如圖 130 所示。

The test setup for system A is shown in Figure 129. The test setup for system B is shown in Figure 130.

試驗負載應依圖 132 使用。

The test load according to Figure 132 shall be used.

(1)連接 EV 供電設備於針對待測系統使用之專用 EV 模擬器的試驗負載，具有指定的平滑電容器。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, with a designated smoothing capacitor.

(2) EV 供電設備應針對在適合之操作點試驗(參照圖 133)。

2) The EV supply equipment shall operate at proper operating points for the test (see Figure 133).

(3)量測 AT1 以定義表 118 規定之每一頻帶的 B 側電流漣波。

3) Measure AT1 to define the current ripple at side B of each frequency bands specified in Table 118.

系統特定試驗條件規定如下：

System specific test condition are given below.

系統 A，參照 AA.3.11。

– For system A, see AA.3.11.

— 系統 B 之 I 型 EV 供電設備，應僅查核 OP3。系統 B 之 II 型 EV 供電設備，應查核 OP3 及 OP4。

– For a system B type I EV supply equipment, only OP3 shall be checked. For a system B type II EV supply equipment, OP3 and OP4 shall be checked.

101.1.6 週期性及隨機偏差(CVM 期間之 B 側電壓漣波)Periodic and random deviation (voltage ripple at side B during CVM)

EV 目標電壓 ≤ 500 V d c 之 EV，若適用，於正常操作及預充電階段的 B 側最高電壓漣波應 介於±5 V 間。

For a target voltage of the EV ≤ 500 V DC, the maximum voltage ripple at side B in normal operation and pre-charge phase, if applicable, shall be between ±5 V.

EV 目標電壓 > 500 V dc 之 EV，若適用，於正常操作及預充電階段的 B 側最高電壓漣波應介於 EV 目標電壓 ±1 % 間。

For a target voltage of the EV > 500 V DC, the maximum voltage ripple at side B in normal operation and pre-charge phase, if applicable, shall be between ±1 % of the target voltage of the EV.

B 側電壓漣波不包括 101.1.2.2 規定之許可差。

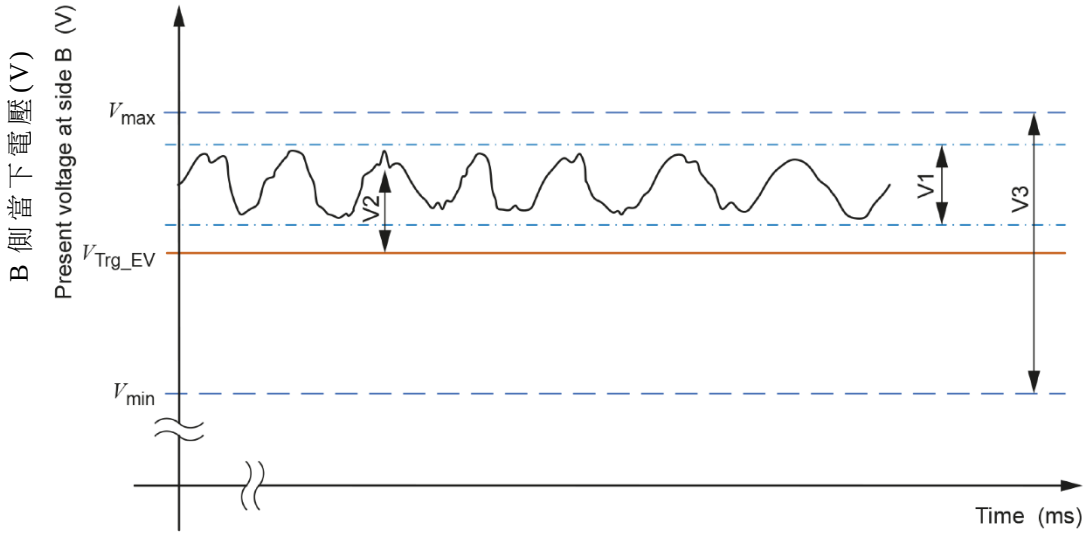
The voltage ripple at side B is not included in the tolerance defined in 101.1.2.2.

正常操作下之最高電壓迴轉率應介於±20 V/ms 間。

The maximum voltage slew rate in normal operation shall be between ±20 V/ms.

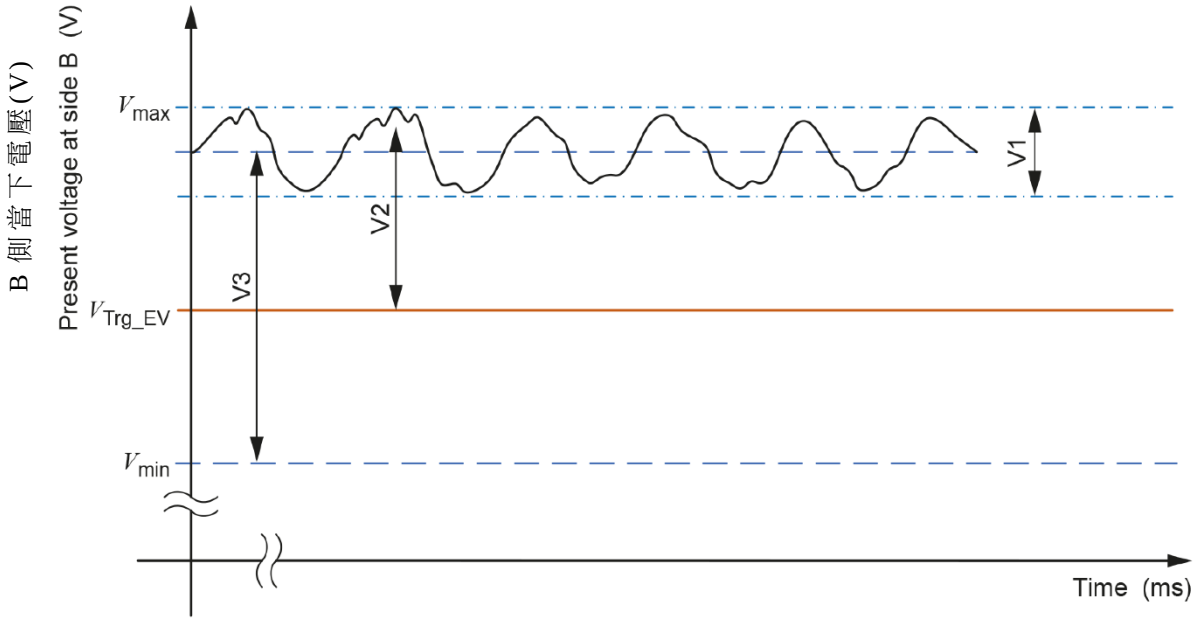
用語解釋參照圖 119。

For explanation of terms, see Figure 119.




(a) 正常操作期間 B 側 DC+與 DC-間之電壓 (於限制值間)

a) Voltage at side B between DC+ and DC– during normal operation (between limits)




(b)正常操作期間 B 側 DC+與 DC-間之電壓 (最不利情境)

b) Voltage at side B between DC+ and DC– during normal operation (worst case scenario)

說明 key

| | | | |
|---|---|---|---|
| $V_{Max}$ | $V_{EV\ Request} + V_{Deviation}$ | V1 | 電壓漣波範圍<br>voltage ripple range |
| $V_{EV\ Request}$ | EV 之目標電壓<br>target voltage of the EV | V2 | 電壓偏差<br>voltage deviation |
| $V_{Min}$ | $V_{EV\ Request} - V_{Deviation}$ | V3 | 最高容許電壓偏差 |

| | | | |
|---|---|---|---|
| | | | maximum allowed voltage deviation |

圖 119 – CVM 於穩態操作之 B 側電壓漣波

Figure 119 – Voltage at side B in CVM operation in steady state with ripple

符合性查核，系統 B 依第 BB.10 節及系統 C 依 CC.7.5.12。

Compliance is checked by BB.10 for system B and CC.7.5.12 for system C.

未連接電池系統之 CVM 仍在研議中。

For CVM, when the battery system is not connected: under consideration.

**101.1.7 負載突降(Load dump)**

電能傳輸期間，若 EV 斷接裝置於 EV 供電設備 B 側額定提高電流斷開 ， B 側當下電壓應不大於每一系統在 AA.3.12、BB.5.7 或 CC.6.1 規定之限制值。

If the EV disconnection devices open during energy transfer at the rated boost current of the EV supply equipment at side B, the present voltage at side B shall be less than or equal to the limit specified for each system in AA.3.12, BB.5.7 or CC.6.1.

符合性查核，系統 A 依 AA.3.12、系統 B 依 BB.5.7 及系統 C 依 CC.7.5.9。

Compliance is checked by AA.3.12 for system A, BB.5.7 for system B and CC.7.5.9 for system C.

**101.1.8 B 側電感(Side B inductance)**

於負載突降情境及短路情境期間，為限制施加於 EV 及 EV 供電設備之效應，建議限制 EV 供電設備 B 側電感。

It is recommended to limit the side B inductance of the EV supply equipment in order to limit the effects imposed on the EV and the EV supply equipment during a load dump scenario, as well as during a short-circuit scenario.

B 側電感限制值仍在研議中。

The value for the side B inductance limit is under consideration.

B 側電感可藉以下方法量測。

The side B inductance can be measured by the following method.

EV 供電設備宜提供導致 B 側最高電感之配置，例： B 側纜線組最大長度、車輛端插頭與 PEC 間最大距離，及其他因子。B 側最高電感配置宜僅包括依設置手冊之容許配置，此配置宜用於此量測法。

The EV supply equipment should be provided in the configuration that results in the highest side B inductance, for example, maximum side B cable assembly length, maximum distance between the PEC and the vehicle connector, and other factors. The highest side B inductance configuration should only include configurations allowed by the installation manual. This configuration should then be used for this measurement method.

EV 供電設備宜連接至圖 120 所示試驗負載，及針對每一系統之專用 EV 模擬器。

The EV supply equipment should be connected to a test load as shown in Figure 120

and a dedicated EV simulator for each system.

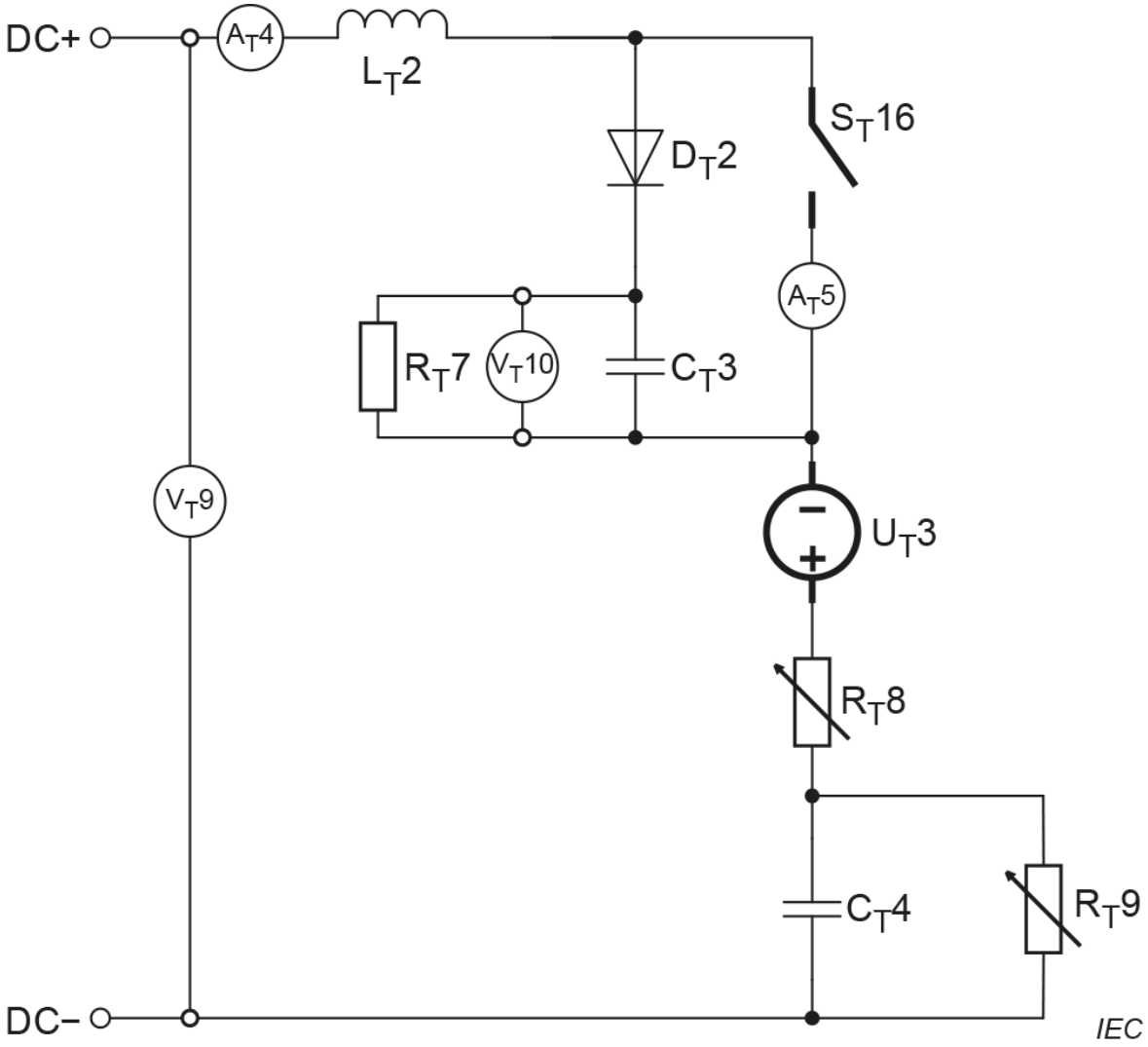



圖 120 – B 側最高電感之量測裝置

Figure 120 – Setup to measure the maximum side B inductance

ST16 開關宜為一或多個並聯之半導體，使得開關斷開小於 1 µs。基於試驗電流及半導體並聯使用，CT3 值宜介於 1 µs 及 100 µs 間。

RT7 值宜 > 100 kΩ。

UT3、RT8、RT9 及 CT4 值宜依表 120 所示。

The switch ST16 should be a semiconductor or several semiconductors in parallel such that the switch will open in less than 1 µs. The value for CT3 should be between 1 µF and 100 µF, based on the test current and the semiconductors used in parallel. The value for RT7 should be > 100 kΩ. The values for UT3, RT8, RT9, and CT4 should be as shown in Table 120.

LT2 代表負載電感且宜於完成試驗量測法前測量。

LT2, represents the load inductance and should be measured before completing the measurement method.

(1)EV 供電設備宜於試驗點等於 CCM 之 OP7 操作。

1) The EV supply equipment should operate at a test point equal to OP7 in CCM.

(2) 一旦已達到試驗點，斷開 ST16 開關前，立即量測 B 側當下電流 AT4。

2) Once the test point has been reached, measure the present current at side B, AT4, immediately before opening switch ST16.

(3) 接著斷開半導體開關 ST16。

3) The semiconductor, switch ST16, is then opened.

(4)於斷開開關 ST16 後，使用截止頻率 ≥ 2 MHz 及每秒最小採樣 10 Mega 樣本量測穿過電容器 CT3 最高電壓 VT10 持續 tMeasure。

使用最高電壓量測。

tMeasure 值宜依公式（5）決定。

4) After opening switch ST16, the maximum voltage across the capacitor CT3, VT10, is

measured for a duration of tMeasure with a cut-off frequency of ≥ 2 MHz, and a minimum

sampling of 10 Mega samples per second. The maximum voltage measured is to be used.

The value of tMeasure should be determined by Formula (5):

$$t_{Measure} = 6 \times \sqrt{L_{exp} \times C_T 3} \qquad (5)$$

式中，

where

| | |
|---|---|
| tMeasure | 係量測持續時間，單位：s。<br>is the measurement duration, expressed in seconds; |
| Lexp | 係預期最高電感值，單位：亨利(H)。<br>is the maximum expected value of inductance, expressed in henry; |
| CT3 | 係電容器 CT3 值，單位：法拉(F)。<br>is the value of the CT3 capacitor, expressed in farad. |

5) 一旦完成此等量測，LCalculated 宜依公式(6)決定。

5) Once these measurements are complete, LCalculated should be determined by Formula (6).

$$L_{Calculated} = \left(V_T 10^2 / A_T 4^2 \times C_T 3\right) - L_T 2 \qquad (6)$$

式中，

where

| | |
|---|---|
| LCalculated | 係計算之 B 側電感值，單位：亨利(H)。 |

| | |
|---|---|
| | is the calculated side B inductance, expressed in henry; |
| VT10 | 係 CT3 量測之最高電壓，單位：伏特(V)。<br>is the maximum voltage measured on CT3, expressed in volts; |
| AT4 | 係 B 側當下電流，單位：安培(A)。<br>is the present current at side B, expressed in ampere; |
| CT3 | 係 CT3 之電容值，單位：法拉(F)。<br>is the CT3 capacitance, expressed in farad; |
| LT2 | 係 LT2 之 電感值，單位：亨利(H)。<br>is the LT2 inductance, expressed in henry. |

**101.2 僅具有熱管理系統或熱感側之電能傳輸的特定要求(Specific requirement for energy transfer with a thermal management system or thermal sensing only)**

**101.2.1 一般(General)**

101.2.1 本節適用於系統 A 及系統 C。系統 B 仍在研議中。

Subclause 101.2 is applicable for system A and system C. For system B: under consideration.

具有熱管理系統之電能傳輸，EV 供電設備應依 IEC TS 62196-3-1 配備 B 側纜線組。

For energy transfer with a thermal management system, the EV supply equipment shall be equipped with a side B cable assembly according to IEC TS 62196-3-1.

**101.2.2 溫度限制值及自我診斷(Temperature limits and self-diagnostics)**

**101.2.2.1 車輛端插頭之 DC 接腳總成的溫度(Temperature of the DC contact assembly of the vehicle connector)**

於周圍溫度 ≤ 40℃下操作，EV 供電設備應確保車輛端插頭之 DC 接腳總成的溫度符合以下要求：

The EV supply equipment shall ensure that the temperature of the DC contact assembly of the vehicle connector complies with the following requirements under the operating ambient temperature ≤ 40 °C.

— DC 接腳總成之絕對溫度 ≤ 90 ℃。

– The absolute temperature of the DC contact assembly shall be ≤ 90 °C.

—依 CNS 15700-1 之 16.5，B 側纜線組之表面溫度不大於溫度限制值。

– The surface temperature of the side B cable assembly shall be less than or equal to the temperature limits according to IEC 62196-1:2022, 16.5.

— EV 供電設備應對 DC 接腳總成之熱感測裝置(溫度感測器或熱保護熔線)的行為反應。

– The EV supply equipment shall react on the behaviour of the thermal sensing device(temperature sensor or thermal protective fuse) at the DC contact assembly.

**101.2.2.2 熱管理系統之自我診斷功能的要求(Requirements for self-diagnostics**

**function for thermal management system)**

EV 供電設備製造商應依 IEC 60812 執行失效模式及效益分析(FMEA)，以展現符合 101.2.2.2。

The EV supply equipment manufacturer shall perform a failure modes and effects analysis (FMEA) according to IEC 60812 to show conformity with 101.2.2.2.

若熱管理系統首先發生故障，EV 供電設備應提供適當的措施以降低危害之可能性。

The EV supply equipment shall provide appropriate means to reduce the likelihood of a hazard occurring in case of a first fault in the thermal management system.

例：雙重或強化絕緣、流率、壓力、溫度、冷媒等級等。

EXAMPLE By double or reinforced insulation, flow rate, pressure, temperature, level of coolant, etc.

若熱交換裝置或熱傳裝置失效(例：冷卻泵失效、冷卻軟管堵塞)，EV 供電設備應觸發停機或降低 EV 供電設備 B 側可用最大電流至無熱交換及/或熱傳的操作值，若 B 側纜線組製造商有指定此值。EV 供電設備應經由數位通訊通知 EV。

In case of a thermal exchange device or thermal transport device failure (for example, failure of cooling pump, jammed cooling hose), the EV supply equipment shall either trigger a shutdown or reduce the applicable maximum current of the EV supply equipment at side B to a value for operation without thermal exchange and/or thermal transport, if such a value is specified by the side B cable assembly manufacturer. The EV supply equipment shall communicate it to EV via digital communication.

若熱感測故障，參照 101.2.3.3。

In case of a thermal sensing fault, see 101.2.3.3.

符合性依 101.2.4.4 檢驗及試驗查核。

Compliance is checked by inspection and test in 101.2.4.4.

**101.2.3 溫度監測(Temperature monitoring)**

**101.2.3.1 一般(General)**

使用 B 側纜線組提供溫度感測數據之 EV 供電設備，應有持續監測溫度數據提供的措施。

The EV supply equipment using a side B cable assembly providing thermal sensing data shall have measures to continually monitor the provided temperature data.

在整個通訊期間，EV 供電設備應連續監測 DC 接腳總成之溫度數據。

The EV supply equipment shall continuously monitor the temperature data of the DC contact assemblies during the complete communication session.

**101.2.3.2 過溫處理(Overtemperature handling)**

若 DC 接腳配件之接腳溫度 s > 90 ℃連續 8，EV 供電設備應於 1 s 內觸發錯誤停機，系統 A 依 AA.4.3.5 及系統 C 依 CC.3.4。

If the contact temperature of the DC contact accessory is > 90 °C for 8 consecutive seconds, the EV supply equipment shall trigger an error shutdown in 1 s or less according to AA.4.3.5 for system A and CC.3.4 for system C.

若 DC 接腳配件之接腳溫度> 95 ℃達 1 s ，EV 供電設備應於 1 s 內觸發錯誤停機。

If the contact temperature of the DC contact accessory is > 95 °C for 1 s, the EV supply equipment shall trigger an error shutdown in 1 s or less.

符合性依 101.2.4.3 試驗查核。

Compliance is checked by test in 101.2.4.3.

因一或二個 DC 接腳溫度大於製造商指定值而發生連續 3 次錯誤停機，系統 A 之 EV 供電設備由專業技術人員維修前，不得開始新的通訊期間。

For system A, if three consecutive error shutdowns occur due to temperature more than the manufacturer's specified limit at one or both DC contacts, the EV supply equipment shall not start a new communication session until serviced by a skilled person.

符合性依檢驗及量測查核。

Compliance is checked by inspection and measurement.

**101.2.3.3 熱感測提供值之合理性查核(Check of the plausibility of the values provided by the thermal sensing devices)**

每一通訊期間前，應進行車輛端插頭之熱感測裝置的合理性查核。

若合理性查核失效，EV 供電設備僅能在 B 側纜線組製造商指定之不產生熱交換及/或熱輸情況的電流下操作。

A plausibility check of the thermal sensing devices of the vehicle connector shall be done prior to each communication session. If the plausibility check fails, the EV supply equipment shall only operate under the current assigned by the side B cable assembly manufacturer for operation without thermal exchange and/or thermal transport.

符合性依 101.2.4.5.2 檢驗及試驗查核。

Compliance is checked by inspection and test in 101.2.4.5.2.

電能傳輸期間，若 DC 接腳總成之熱感測未送出或送出不合理之訊號，則 EV 供電設備應降低 EV 供電設備 B 側可用最大電流至 B 側纜線組製造商指定無熱交換及/或熱輸的電流下操作，或依 AA.3.8.1 及 CC.3.4 於 9 s 內觸發錯誤停機。

If the thermal sensing of a DC contact assembly sends no or an implausible signal during energy transfer, the EV supply equipment shall reduce the applicable maximum current of the EV supply equipment at side B to the current assigned by the side B cable assembly manufacturer for operation without thermal exchange and/or thermal transport or trigger an error shutdown according to AA.3.8.1 and CC.3.4 in 9 s or less.

符合性依 101.2.4.5.3 檢驗及試驗查核。

Compliance is checked by inspection and test in 101.2.4.5.3.

**101.2.4 EV 供電設備之熱管理系統性能試驗(Tests for thermal management system performance of the EV supply equipment)**

**101.2.4.1 一般(General)**

所有試驗每間隔 10 min 或以上取一讀值，連續 3 個讀值顯示增加 ≤ 2 K 時，視為已達熱穩定。

For all tests, thermal stabilisation is considered to have occurred when three successive readings, taken at intervals of 10 min or more, indicate an increase of ≤ 2 K.

若無其他規定，依待測裝置(DUT)製造商之資料圖表，試驗電流為 EV 供電設備 B 側額定提高電流。

The test current is the rated boost current of the EV supply equipment at side B according to the device under test (DUT) manufacturer’s data sheet, if not stated otherwise.

此等試驗之 DUT 為 EV 供電設備。

The DUT for these tests is the EV supply equipment.

針對 101.2.4 之所有試驗，應使用配備電流匯(sink)之特定 EV 模擬器的系統。

A system specific EV simulator equipped with a current sink shall be used for all tests in 101.2.4.

每一試驗應使用稱為參考裝置(reference device, RD)之對應試驗配件執行，其匹配車輛端插頭。

Each test shall be performed with a corresponding test accessory, called reference device (RD), which mates with the vehicle connector.

所有參考裝置之材料應為 Cu-ETP。

The material for all reference devices shall be Cu-ETP.

系統 A 除過溫處理依 101.2.4.3 外，所有試驗應依圖 121 使用 RD 並依圖 122 的試驗裝置執行。依 101.2.4.3 之過溫處理試驗，應依圖 123 使用 RD 並依圖 124 的試驗裝置執行。

For system A, all tests, except the test of overtemperature handling according to 101.2.4.3, shall be performed with an RD according to Figure 121 and a test arrangement according to Figure 122. The test for overtemperature handling according to 101.2.4.3 shall be performed with an RD according to Figure 123 and a test arrangement according to Figure 124.

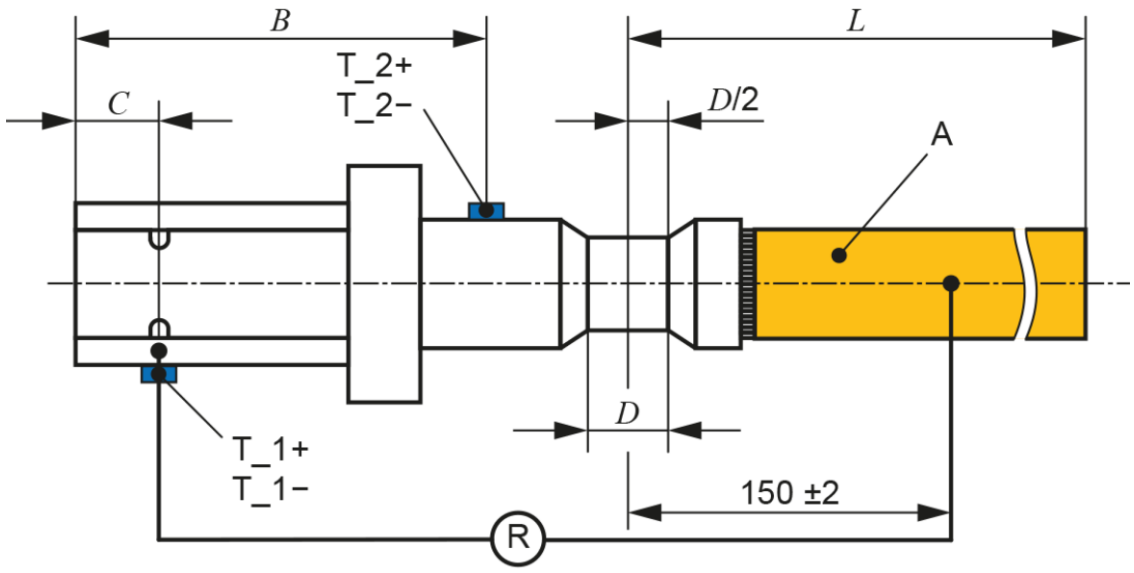
系統 C 除過溫處理依 101.2.4.3 外，所有試驗應依圖 125 使用 RD 並依圖 126 試驗裝置執行。依 101.2.4.3 之過溫處理試驗，應依圖 127 使用 RD 及圖 128 試驗裝置執行。

For system C, all tests, except the test of overtemperature handling according to 101.2.4.3, shall be performed with an RD according to Figure 125 and a test

arrangement according to Figure 126. The test for overtemperature handling according to 101.2.4.3 shall be performed with an RD according to Figure 127 and a test arrangement according to Figure 128.

依圖 121 及圖 125 藉四端子感測(four-terminal sensing)量測，包括 DC 接腳、接腳體、機械連性接點及 150 mm 之連接導體的參考裝置接觸電阻，應符合表 119 指示值。

The contact resistances of the reference devices, including DC contact, contact body, mechanical joining and 150 mm of the attached conductor, measured by four-terminal sensing according to Figure 121 and Figure 125, shall comply with the values indicated in Table 119.




說明 Key

| | |
|---|---|
| T_1, T_2 | 參考裝置(RD)之溫度感測器<br>temperature sensors on the reference device (RD) |
| A | A 導體截面(視試驗電流而定，參照表 119)<br>conductor cross-section (depending on the test current, see Table 119) |
| B | 長度依 B 側纜線組製造商指定<br>length to be specified by the side B cable assembly manufacturer |
| C | 長度依 B 側纜線組製造商指定<br>length to be specified by the side B cable assembly manufacturer |
| D | 長度依 B 側纜線組製造商指定<br>length to be specified by the side B cable assembly manufacturer |
| L | 附接導體長度(參照表 119)<br>length of attached conductor (see Table 119) |
| R | 電阻量測(參照表 119) |

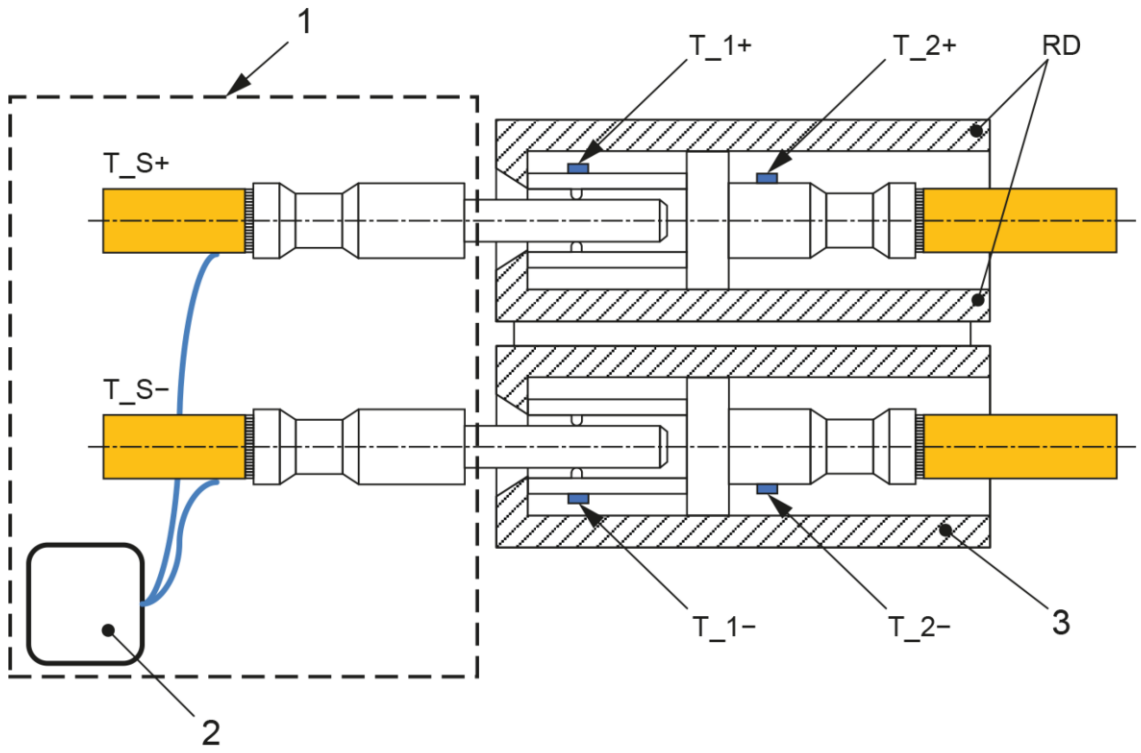
| | |
|---|---|
| | resistance measurement (see Table 119 for values) |

備考：所有數值均為毫米單位。關於缺少尺寸，請參照 IEC 62196-3:2022 標準之表 3-Ia。

NOTE All values are in mm. For missing dimensions, see IEC 62196-3:2022, standard sheet 3-Ia.

圖 121 參考裝置(RD) A_0

Figure 121 – Reference device (RD) A_0




說明 Key

| | |
|---|---|
| 1 | DUT(車輛端插頭)<br>device under test (vehicle connector) |
| 2 | 熱交換裝置(若有)<br>thermal exchange device, if any |
| 3 | RD 總成之外罩及支撐<br>housing and support for RD assembly |
| RD | 參考裝置 AA_0<br>reference device AA_0 |
| T_S+,<br>T_S− | 車輛端插頭於 DC+及 DC-之熱感測裝置<br>thermal sensing device of the vehicle connector at DC+ and DC− |
| T_1+, | 參考裝置之熱感測器 |

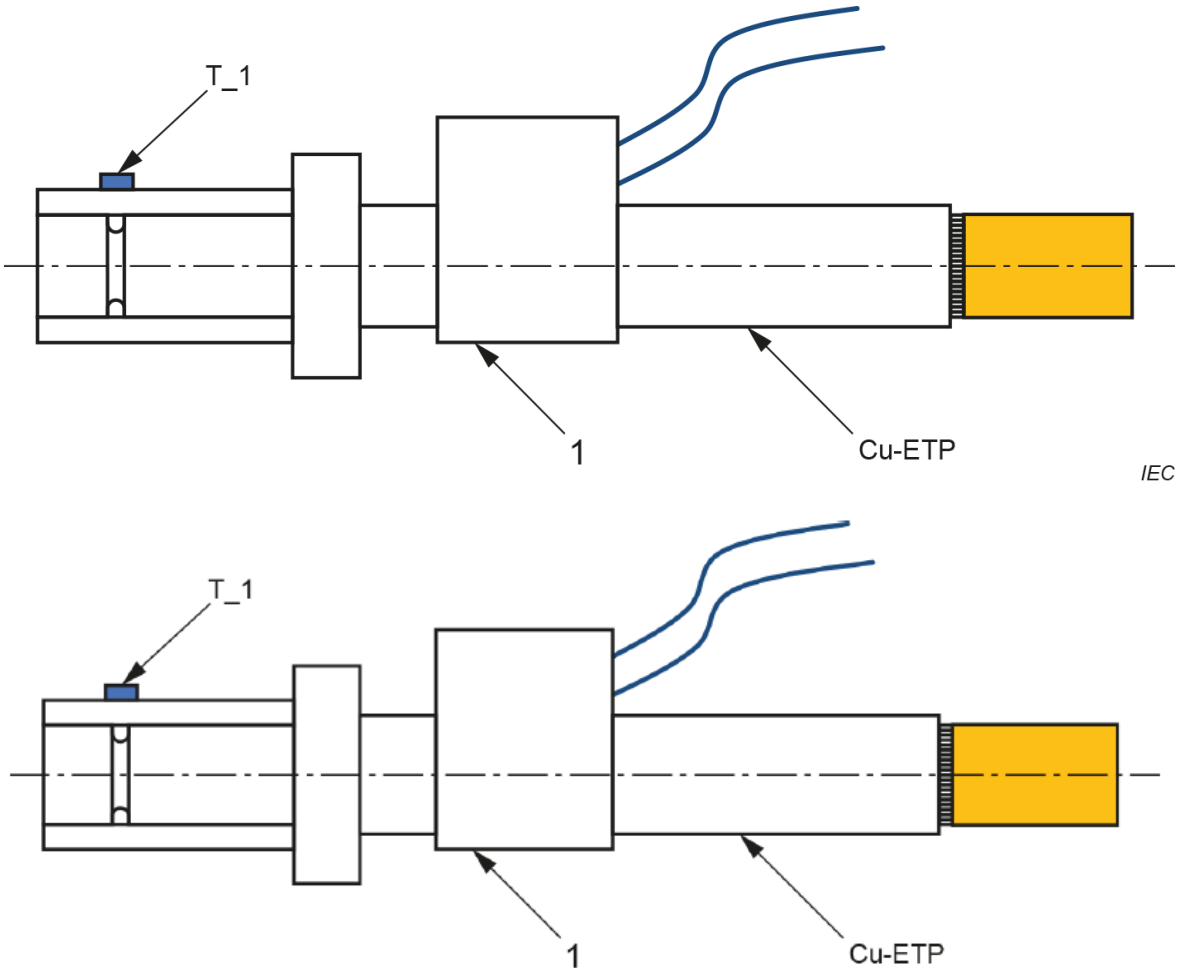
| | |
|---|---|
| T_2+,<br>T_1–,<br>T_2– | thermal sensors of the reference device |

備考：關於欠缺尺度，參照 IEC 62196-3:2022 之標準圖表 3-Ia。

NOTE For missing dimensions, see IEC 62196-3:2022, standard sheet 3-Ia.

圖 112 – 試驗裝置 A_0

Figure 122 – Test arrangement A_0




說明 Key

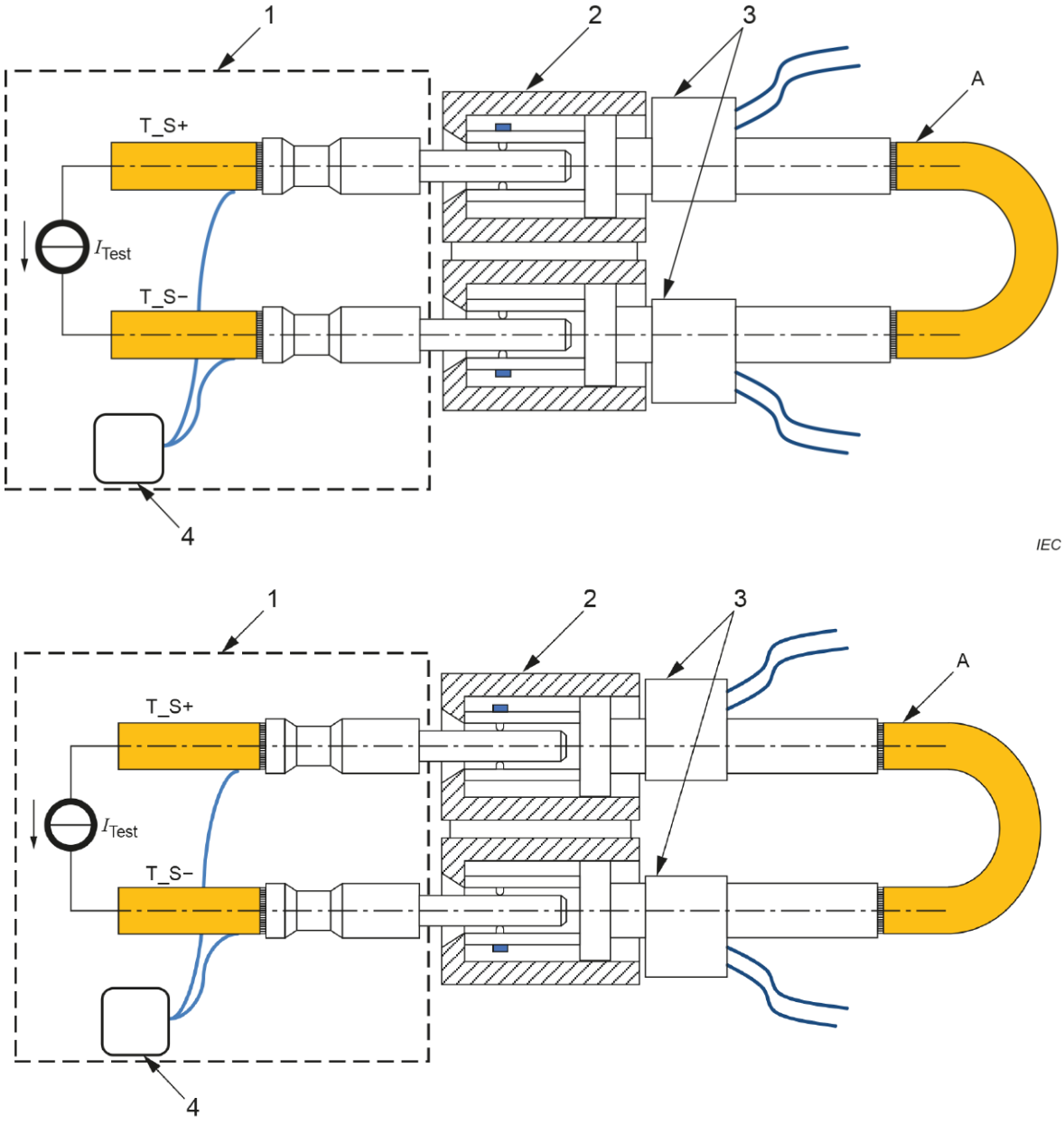
| | |
|---|---|
| 1 | 加熱單元(建議最小 50 W)<br>heating unit (minimum of 50 W is recommended) |
| T_1 | 附接 DC+/DC-之溫度感測器<br>temperature sensor attached to DC+/ DC– |
| Cu-ETP | 電解精銅(純度 99.9%)<br>electrolytic though-pitch copper (99,9 % purity) |

備考：關於欠缺尺寸，參照 IEC TS 62196-3-1:2020 的標準圖表 3-Ia。

NOTE For missing dimensions, see IEC TS 62196-3-1:2020, standard sheet 3-Ia.

圖 123 參考裝置(RD) A_1

Figure 123 – Reference device RD A_1




說明 Key

| | |
|---|---|
| 1 | DUT(車輛端插頭)<br>device under test (vehicle connector) |
| 2 | 依 IEC 62196-3:2022 標準圖表 3-la 之嚙合面<br>mating face according to IEC 62196-3:2022, standard sheet 3-la |
| 3 | RD AA_1<br>reference device AA_1 |
| 4 | 熱交換裝置(若有) |

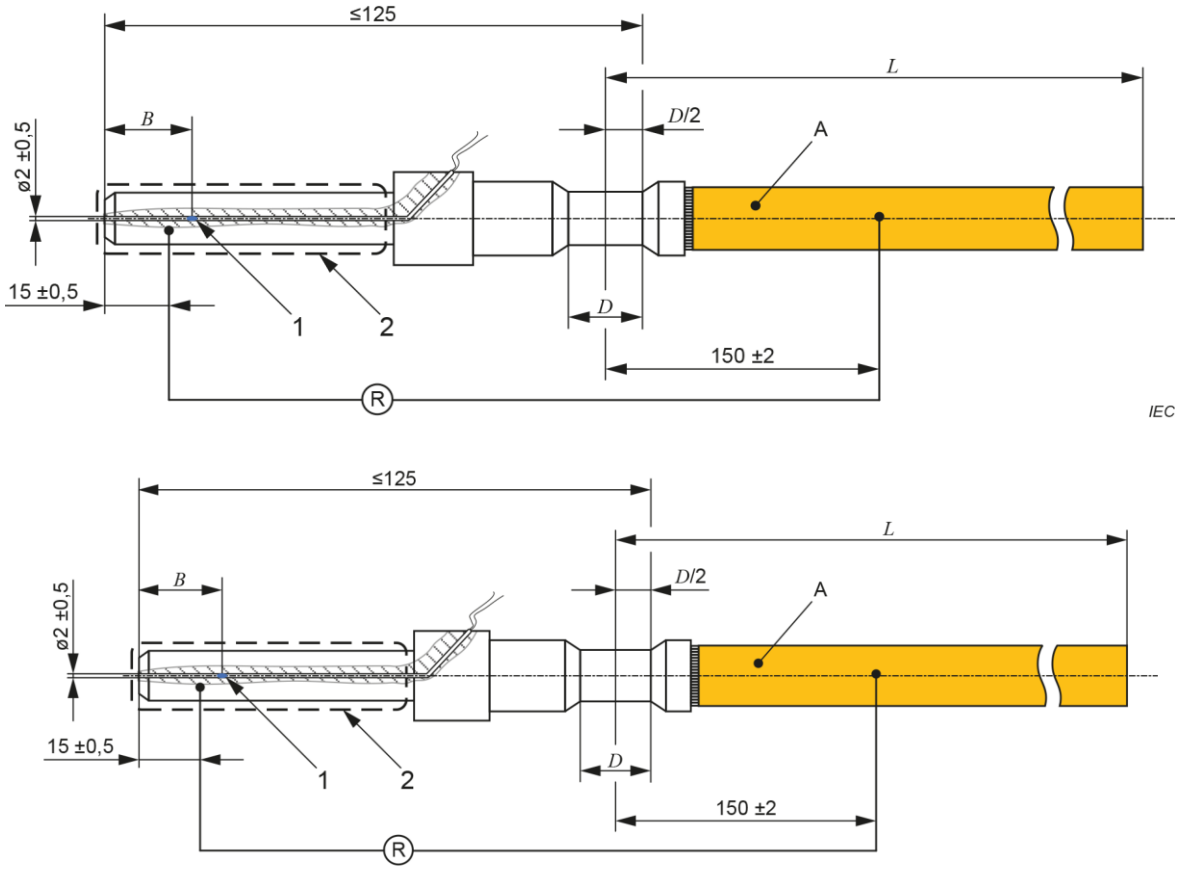
| | |
|---|---|
| | thermal exchange device, if any |
| T_S+, T_S– | 車輛端插頭內部之 DC+及 DC-熱感測裝置<br>thermal sensing device inside the vehicle connector at DC+ and DC– |
| T_1+, T_2– | RD 之熱感測器<br>thermal sensors of the reference device |
| A | 導體截面<br>conductor cross section |
| $I_{Test}$ | 試驗電流源<br>source for test current |

備考：關於欠缺尺度，參照 IEC 62196-3:2022 之標準圖表 3-Ia。

NOTE For missing dimensions, see IEC 62196-3:2022, standard sheet 3-Ia.

圖 124　試驗裝置 A_1

Figure 124 – Test arrangement A_1



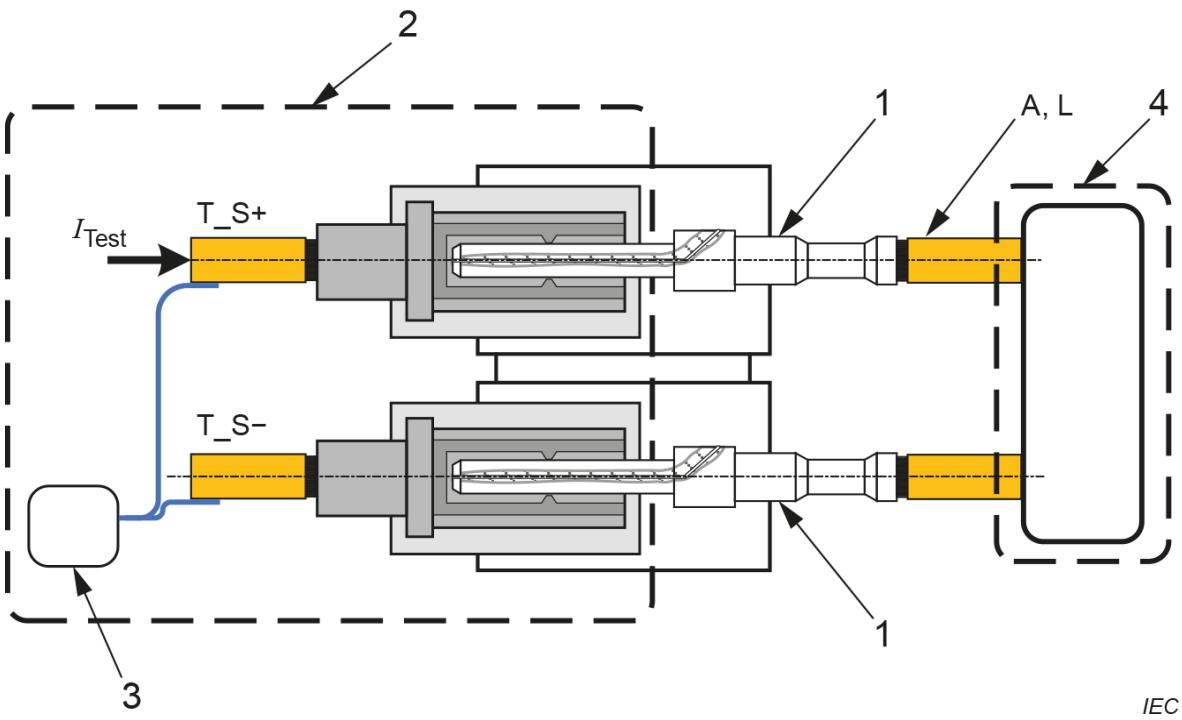

說明 Key

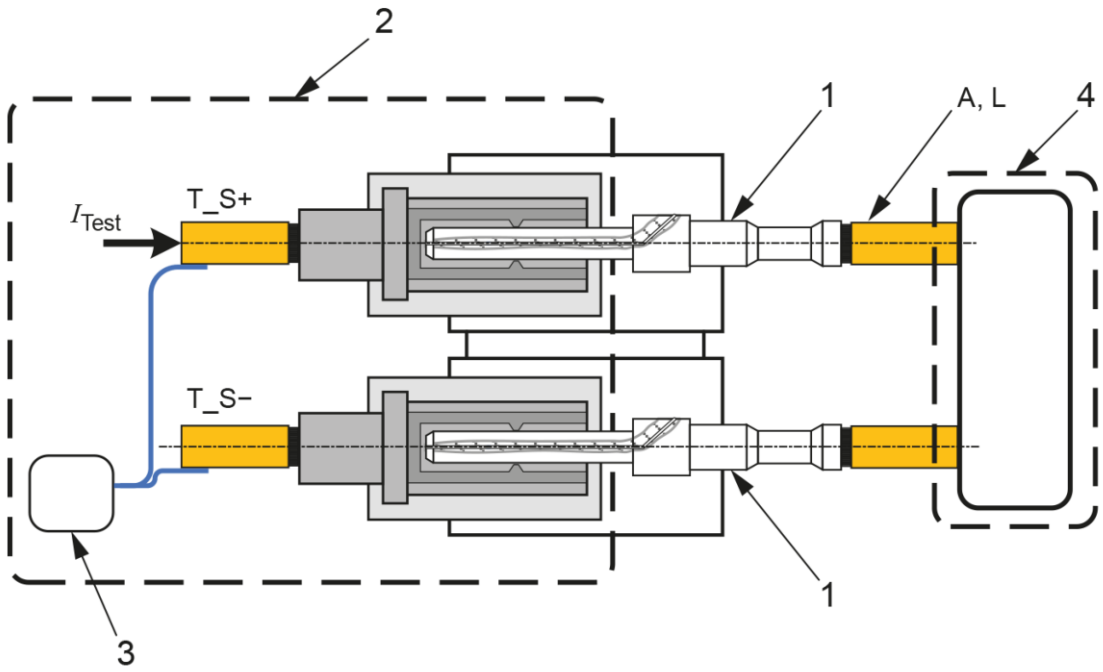
| | |
|---|---|
| 1 | 參考溫度感測器<br>reference temperature sensor |
| 2 | 依 IEC 62196-3:2022 之標準圖表 3-IIIa (EE 架構)或 3-Iva(FF 架 |

| | |
|---|---|
| | 構)的 DC+/DC-接腳<br>DC+/DC– contacts according to IEC 62196-3:2022, standard sheet 3-IIIa (configuration EE) or standard sheet 3-IVa (configuration FF) |
| A | 導體截面(視試驗電流而定，參照表 119)<br>conductor cross-section (depending on the test current, see Table 119) |
| B | EE 架構為 12 mm ± 1 mm，FF 架構為 18 mm ± 1 mm<br>12 mm ± 1 mm for configuration EE, 18 mm ± 1 mm for configuration FF |
| D | 依 B 側纜線組製造商指定<br>to be specified by the side B cable assembly manufacturer |
| L | 附接導體長度(參照表 119)<br>length of attached conductor (see Table 119) |
| R | 電阻量測(值參照表 119)<br>resistance measurement (see Table 119 for values) |

圖 125 – 參考裝置 RD C_0

Figure 125 – Reference device RD C_0



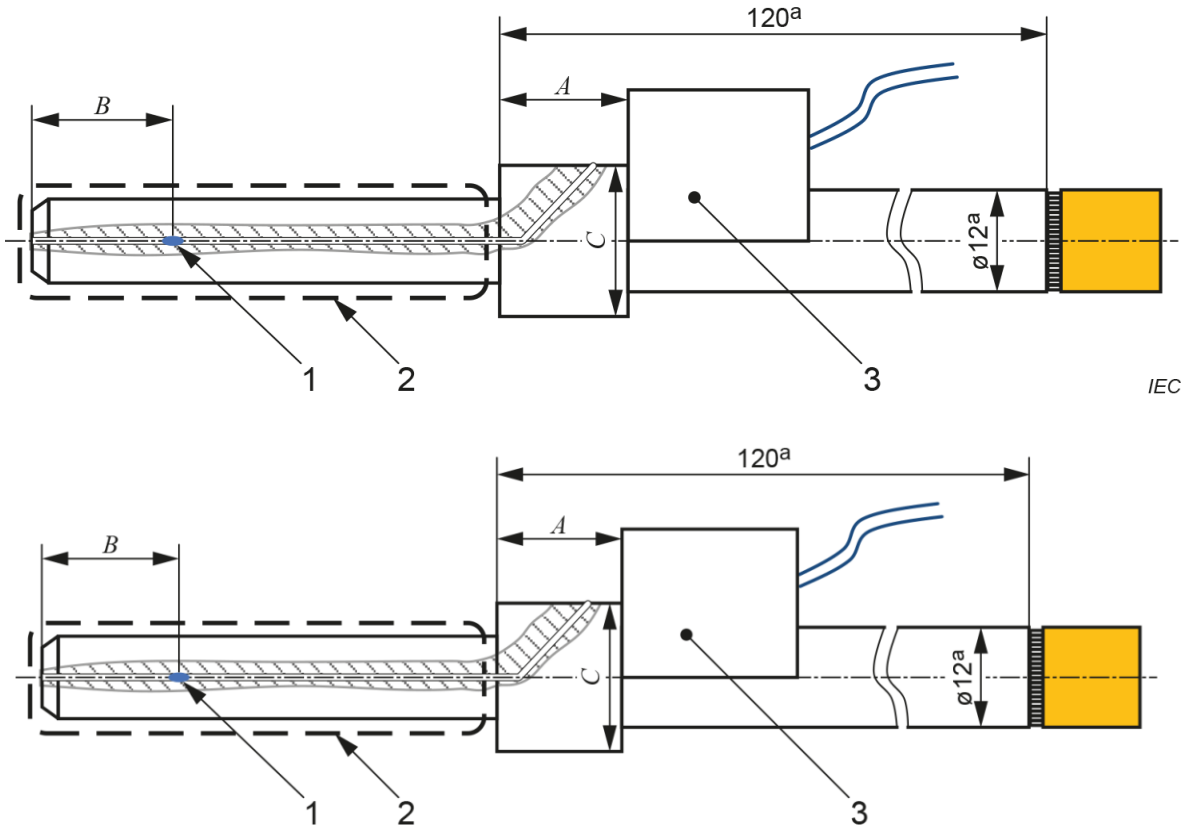



說明 Key

| | |
|---|---|
| 1 | RD C_0<br>reference device C_0 |
| 2 | DUT(車輛端插頭)<br>device under test (vehicle connector) |
| 3 | 熱交換及熱傳(若有)<br>thermal exchange and thermal transfer, if any |
| 4 | 具電流匯之 EV 模擬器<br>EV simulator with current sink |
| A | 導體截面(視試驗電流而定，參照表 119)<br>conductor cross-section (depending on the test current, see Table 119) |
| L | 附接導體長度(參照表 119)<br>length of attached conductor (see Table 119) |
| $I_{Test}$ | 試驗電流<br>test current |
| T_S+, T_S– | 車輛端插頭內部之 DC+及 DC-熱感測裝置<br>thermal sensing device inside vehicle connector at DC+ and DC– |

圖 126 – 試驗裝置 C_0

Figure 126 – Test arrangement C_0

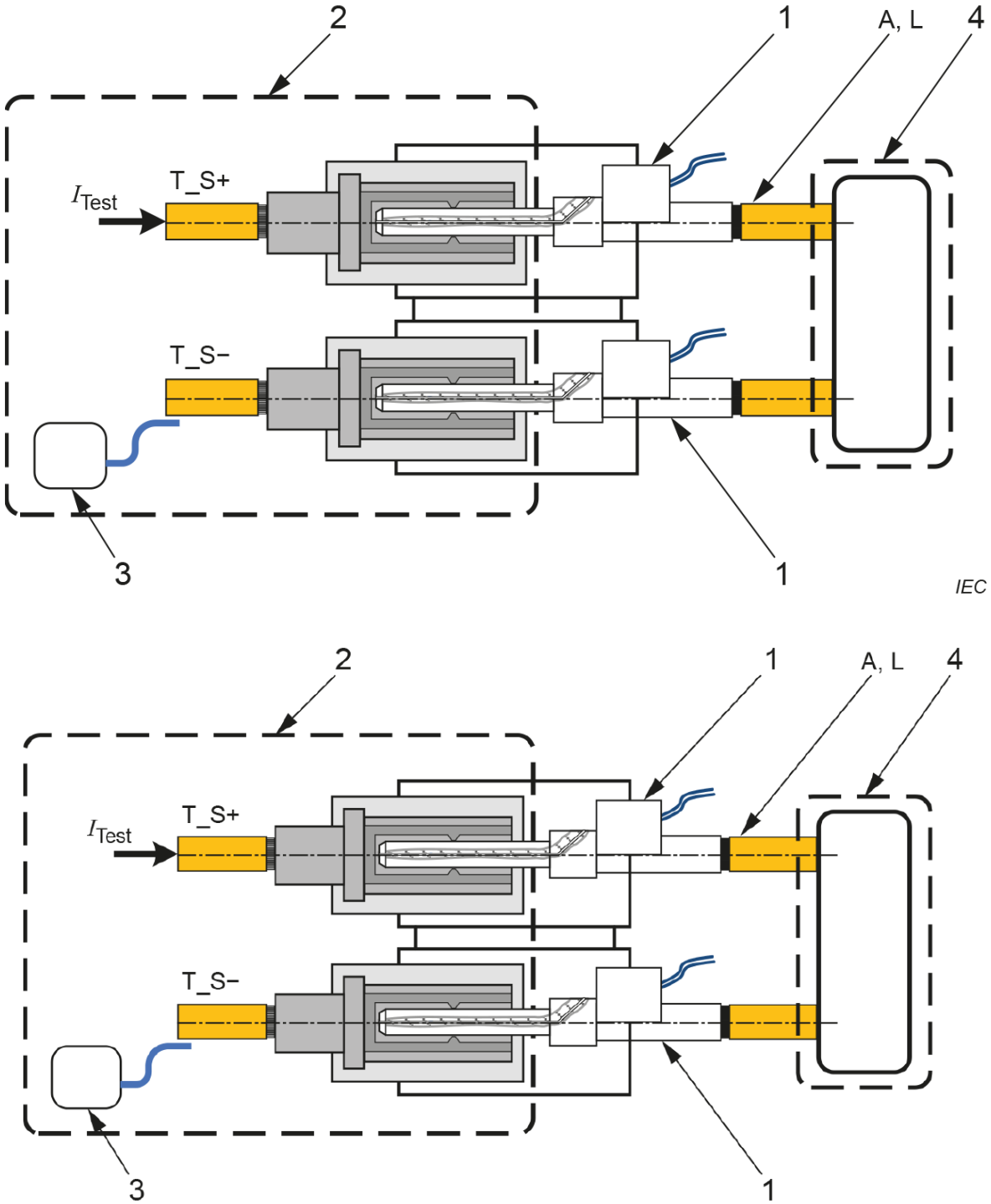



說明 Key

| | |
|---|---|
| 1 | 參考溫度感測器<br>reference temperature sensor |
| 2 | 依 IEC 62196-3:2020 之標準圖表 3-IIIa (EE 架構)或 3-Iva(FF 架構)的 DC+/DC-接腳<br>DC+/DC– contacts according to IEC 62196-3:2022, standard sheet 3-IIIa (configuration EE) or standard sheet 3-IVa (configuration FF) |
| 3 | 加熱單元<br>heating unit |
| A | 依 B 側纜線組製造商指定<br>to be specified by the side B cable assembly manufacturer |
| B | EE 架構為 12 mm ± 1 mm，FF 架構為 18 mm ± 1 mm<br>12 mm ± 1 mm for configuration EE, 18 mm ± 1 mm for configuration FF |
| C | 依 B 側纜線組製造商指定<br>to be specified by the side B cable assembly manufacturer |
| a | 端接之直徑及長度(Ø12 and 120)為建議值。<br>The diameter and length of termination (Ø12 and 120) are recommended values. |

圖 127 – RD C_1

Figure 127 – Reference device RD C_1




說明 Key

| | |
|---|---|
| 1 | RD C_0<br>reference device C_0 |
| 2 | DUT |
| 3 | 具有熱交換及熱傳遞之 EV 供電設備(若有)<br>EV supply equipment with thermal exchange and thermal transfer, |

| | |
|---|---|
| | if any |
| 4 | 使用電流匯之 EV 模擬器<br>EV simulator with current sink |
| A | 導體截面(視試驗電流而定，參照表 119)<br>conductor cross-section (depending on the test current, see Table 119) |
| L | 附接導體長度(參照表 119)<br>length of attached conductor (see Table 119) |
| $I_{Test}$ | 試驗電流<br>test current |
| T_S+, T_S– | 車輛端插頭內部之 DC+及 DC-熱感測裝置<br>thermal sensing device inside vehicle connector at DC+ and DC– |

圖 128 – 試驗裝置 C_1

Figure 128 – Test arrangement C_1

電線截面及纜線長度之值規定於表 119。

Values for wiring cross section and cable length are specified in Table 119.

表 119 試驗參數值

Table 119 – Test parameter values

| 導體截面 Conductor cross section A | EV 供電設備 B 側額定提高電流 Rated boost current of the EV supply equipment at side B | | | 電阻 Resistance | |
|---|---|---|---|---|---|
| | **系統 A System A** | | **系統 C System C** | **系統 A System A** | **系統 C [a, b] SystemC [a, b]** |
| | **無冷卻 Non-cooled** | **冷卻 Cooled** | | | |
| $mm^2$ | A | A | A | μΩ | μΩ |
| 35 | 125 | 150 | 100 | 依 B 側纜線組製造商指定 As specified by the side B cable assembly manufacturer | n.a. |
| 50 | 150 | 200 | 200 | | ≥ 123 |
| 70 | 200 | 300 | 300 | | ≥ 91 |
| 95 | 300 | 400 | 400 | | ≥ 65 |
| 120 | 350 | n.a. | 500 | | ≥ 57 |
| 150 | 400 | n.a. | n.a. | | n.a. |
| L 纜線長度 Cable length ≥ 2 m. | | | | | |

| |
|---|
| L Cable length ≥ 2 m. |
| a 電阻量測期間所有線需連接一起。 |
| a All strands to be connected during resistance measurement. |
| b 在 25 ℃之參考值 Resistance values at 25 ° C. |
| b Resistance values at 25 °C. |

**101.2.4.2 熱管理系統性能試驗(Thermal management system performance test)**

依系統 A 及系統 C，本試驗適用於使用一個熱管理系統之 EV 供電設備。

This test is applicable for EV supply equipment according to system A and system C using a thermal management system.

系統 A 之試驗依圖 121 使用 RD 及圖 122 的裝置執行。

For system A, the test is performed with an RD according to Figure 121 and a test arrangement according to Figure 122.

系統 C 之試驗依圖 125 使用 RD 及圖 126 裝置執行。

For system C, the test is performed with an RD according to Figure 125 and a test arrangement according to Figure 126.

系統 A 試驗裝置如圖 129 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system A is shown in Figure 129. The test setup for system C is shown in Figure 131.

試驗應依以下執行：

The test shall be executed as follows.

(1) DUT 應置於 40 ℃ ± 4 ℃至少 2 h。

1) The DUT shall be stored for 2 h or more at 40 °C ± 4 °C.

(2) 試驗應於周圍溫度 40 ℃ ± 4 ℃及 EV 供電設備 B 側額定連續電流執行。若 DUT 提供控制溫度之電能傳輸（參照 101.3），依 DUT 資料表，則試驗應進行包括 EV 供電設備 B 側的額定提高電流。

此藉執行 EV 供電設備 B 側額定提高電流，並接著降低 EV 供電設備 B 側至額定連續電流，直至熱穩定完成試驗。

2) The test shall be executed at 40 °C ± 4 °C ambient temperature and at rated continuous current of the EV supply equipment at side B. If the DUT provides temperature-controlled energy transfer (see 101.3), the test shall be performed including the rated boost current of the EV supply equipment at side B according to the data sheet of the DUT. This is accomplished by performing the test at rated boost current of the EV supply equipment at side B and then decreasing to the rated continuous current of the EV supply equipment at side B until thermal stabilization.

(3) 一旦已達到熱穩定，DUT 應在 EV 供電設備 B 側追加 60 min 額定連續電流操作。

3) Once thermal stabilisation has been reached, the DUT shall be operated at the rated continuous current of the EV supply equipment at side B for an additional 60 min.

(4) AT1 電流應 < 2 A d.c.。

4) The current AT1 shall be < 2 A DC.

(5) RD 之參考溫度感測器的溫度量測，整個試驗應使用每秒一個以上樣本監測。

5) The temperatures measured by the reference temperature sensors of the RD shall be monitored with one or more samples per second throughout the test.

(6) 此試驗合格，若：

6) This test is passed, if

— EV 供電設備系統執行電能傳輸階段無任何錯誤，及

– the EV supply equipment performs the energy transfer stage without any errors,

— 參考溫度感測器量測之溫度 ≤ 90 ℃，及

– the measured temperatures by the reference temperature sensors are ≤ 90 °C, and

— DUT 之任一可接觸及可握持表面溫度，系統 C 不大於 IEC 62196-1:2022 之 16.5 溫度限制值，或系統 A 不大於 AA.9 溫度限制值。

– the temperature at any touchable and graspable surface of the DUT (for system C only) or the temperature limits according to Clause AA.9 (for system A only) is less than or equal to the temperature limits according to IEC 62196-1:2022, 16.5.

**101.2.4.3 過溫處理試驗(Tests of overtemperature handling)**

本試驗適用於依系統 A 及系統 C 使用一個熱管理系統的 EV 供電設備。

This test is applicable for EV supply equipment according to system A and system C using thermal management system.

對系統 A 之試驗依圖 123 使用 RD 及圖 124 裝置執行。

For system A, the test is performed with an RD according to Figure 123 and a test arrangement according to Figure 124.

對系統 C 之試驗依圖 127 使用 RD 及圖 128 裝置執行。

For system C, the test is performed with an RD according to Figure 127 and a test arrangement according to Figure 128.

系統 A 試驗裝置如圖 129 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system A is shown in Figure 129. The test setup for system C is shown in Figure 131.

試驗應依以下執行

The test shall be executed as follows.

(1) DUT 應置於 40 ℃ ± 4 ℃至少 2 h。

1) The DUT shall be stored for 2 h or more at 40 °C ± 4 °C.

(2) 然後，DUT 通電。AT1 電流應為 EV 供電設備 B 側之額定連續電流。

本試驗之 VT8 電壓值可為 EV 供電設備容許之任一電壓。

2) The DUT is then energized. The current AT1 shall be the rated continuous current of the EV supply equipment at side B. The voltage VT8 for this test can be any voltage allowed by the EV supply equipment.

(3) 監測車輛端插頭之 DC+及 DC-的接腳溫度，且一旦已達到熱穩定，施加熱功率模擬車輛端插頭的過溫，確保車輛端插頭 DC+接腳固定溫度上升 2.5 ± 0.5 K/min(由參考溫度感測器量測)。

3) Temperatures are monitored on the DC+ and DC– contacts of the vehicle connector, and once thermal stabilization has been reached, the over-temperature of the vehicle connector is simulated by applying heat power ensuring a constant temperature rise of 2,5 ± 0,5 K/min (measured by the reference temperature sensor) on the DC+ contact of the vehicle
connector.

(4) DUT 應

4) The DUT shall

—參考溫度感測器之溫度 > 90 ℃後，系統 A 及系統 C 分別依 AA.4.3.5 及 CC.3.4 於 9 s 內執行錯誤停機程序，且

– perform an error shutdown sequence according to AA.4.3.5 for system A and CC.3.4 for system C in 9 s or less after the reference temperature sensor signals a temperature of > 90 °C, and

—參考溫度感測器量測之溫度達到 90 ℃前，降低 B 側當下電流至 2 A d.c.。

– reduce the present current at side B to 2 A DC before the temperature measured by the reference temperature sensor reaches 90 °C.

(5) 容許 DUT 車輛端插頭 DC+及 DC-接腳冷卻，直到溫度達到 40 ℃ ± 4 ℃。

5) The DC+ and DC– contacts of the vehicle connector of the DUT are allowed to cool until a temperature of 40 °C ± 4 °C is reached.

(6) 重複步驟(2)及步驟(3)，使用熱功率施加於車輛端插頭 DC-接腳，DUT 應依步驟(4)反應。

6) Step 2) and step 3) shall be repeated with heat power applied on the DC– contact of the vehicle connector. The DUT shall react in accordance with step 4).

(7) 容許 DUT 車輛端插頭之 DC+及 DC-接腳冷卻至溫度達到 40 ℃ ± 4 ℃。

7) The DC+ and DC– contacts of the vehicle connector of the DUT are allowed to cool until a temperature of 40 °C ± 4 °C is reached.

(8)重複步驟(2)至(6)。

8) Step 2) through step 6) are repeated.

**101.2.4.4 熱管理系統之自行診斷功能試驗(Test for self-diagnostics function for thermal management system)**

本試驗適用於依系統 A 及系統 C 使用一個熱管理系統的 EV 供電設備。系統 A 之試驗依圖 121 使用 RD 及圖 122 裝置執行。系統 C 之試驗依圖 125 使用 RD 及圖 126 裝置執行。

This test is applicable for EV supply equipment according to system A and system C using thermal management system. For system A, the test is performed with an RD according to Figure 121 and a test arrangement according to Figure 122. For system

C, the test is performed with an RD according to Figure 125 and a test arrangement according to Figure 126.

系統 A 試驗裝置如圖 129 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system A is shown in Figure 129. The test setup for system C is shown in Figure 131.

試驗應依以下執行

The test shall be executed as follows.

(1) DUT 應置於 40 ℃ ± 4 ℃至少 2 h。

1) The DUT shall be stored for 2 h or more at 40 °C ± 4 °C.

(2)然後，DUT 通電。AT1 電流應為 EV 供電設備 B 側之額定連續電流。

本試驗之 VT8 電壓值可為 EV 供電設備容許之任一電壓。

2) The DUT is then energized. The current AT1 shall be rated continuous current of the EV supply equipment at side B. The voltage VT8 for this test can be any voltage allowed by the EV supply equipment.

(3) 試驗應依以下試驗程序執行

3) The test shall be executed for the following test sequences.

- 程序(a)
- Sequence a) :

— 一旦已達到熱穩定，應關閉熱傳裝置，例：冷卻泵。

Once thermal stabilization has been reached, the thermal transport device, for example, cooling pump, shall be switched off.

- 程序(b)
- Sequence b):

— 一旦已達到熱穩定，應關閉熱交換傳輸裝置，例：冷卻單元。

Once thermal stabilization has been reached, the thermal exchange device, for example, cooling unit, shall be switched off.

(4) 關閉相應裝置後，DUT 應追加操作 60 min。

4) After switching off the corresponding device, the DUT shall be operated for an additional 60 min.

(5)通過本試驗，若：

5) This test is passed if

—參考溫度感測器之量測溫度 ≤ 90 ℃，且

- the measured temperatures by the reference temperature sensors are ≤ 90 °C, and

— DUT 之任一可接觸及可握持表面，系統 C 不大於 IEC 62196-1:2022 之 16.5 溫度限制值，或系統 A 不大於 AA.9 溫度限制值。

- the temperature at any touchable and graspable surface of the DUT (for system C only) or the temperature limits according to Clause AA.9 (for system A only) are less than or equal to the temperature limits according to IEC 62196-1:2022, 16.5.

備考：合格準則可藉降低 EV 供電設備 B 側可用之最大電流達成。

NOTE Pass criteria can be achieved by reducing the available maximum current of the EV supply equipment at side B.

**101.2.4.5 熱感測裝置之可用性試驗(Test for availability of thermal sensing devices)**

**101.2.4.5.1 一般(General)**

系統 A 之試驗依圖 121 使用 RD 及圖 122 裝置執行。

For system A, the test is performed with an RD according to Figure 121 and a test arrangement according to Figure 122.

系統 C 之試驗依圖 125 使用 RD 及圖 126 裝置執行。

For system C, the test is performed with an RD according to Figure 125 and a test arrangement according to Figure 126.

DUT 應在每一熱感測之訊號路徑配備一個斷接裝置。

The DUT shall be equipped with a disconnection device in each signalling path of thermal sensing.

以下每一試驗應使用試驗裝置進行：

Tests shall be conducted for each of the following test setups:

斷開車輛端插頭 DC+ 接腳之熱感測信號路徑並閉合車輛端插頭 DC- 接腳的熱感測信號路徑。

– signalling path of thermal sensing on DC+ contact of the vehicle connector open and signalling path of thermal sensing on DC– contact of the vehicle connector closed;

閉合車輛端插頭 DC+ 接腳之熱感測信號路徑及斷開車輛端插頭 DC- 接腳的熱感測信號路徑。

– signalling path of thermal sensing on DC+ contact of the vehicle connector closed and signalling path of thermal sensing on DC– contact of the vehicle connector open.

**101.2.4.5.2 電能傳輸前熱感測裝置之可用性試驗(2025-00583Test for availability of thermal sensing devices before energy transfer)**

試驗應依以下執行

The test shall be executed as follows.

(1) 每一通訊期間前，應查核每一熱感測裝置之可用性。

1) The availability of each thermal sensing device shall be checked before each communication session.

(2) 依 101.2.4.5.1 斷接裝置設定狀態後，應開始一個通訊期間。

2) After setting the disconnection devices in the positions according to 101.2.4.5.1, a communication session shall be initiated.

(3) 若 DUT 通過此試驗

3) This test is passed if the DUT

–針對無熱交換及/或熱傳操作，依 B 側纜線組製造商指定電流執行通訊期間，或

– performs a communication session with the current specified by the side B cable

assembly manufacturer for operation without thermal exchange and/or thermal transport, or

– 不執行通訊期間，直到由專業人員維修。

– does not perform a communication session until serviced by a skilled person.

**101.2.4.5.3 電能傳輸期間熱感測裝置之可用性試驗(Test for availability of thermal sensing devices during energy transfer)**

系統 A 試驗裝置如圖 129 所示。系統 C 試驗裝置如圖 131 所示。

The test setup for system A is shown in Figure 129. The test setup for system C is shown inFigure 131.

試驗應依以下執行

The test shall be executed as follows.

(1) DUT 通電。AT1 電流應為 EV 供電設備 B 側之額定連續電流。

本試驗之 VT8 電壓值可為 EV 供電設備容許之任一電壓。

1) The DUT is energized. The current AT1 shall be the rated continuous current of the EV supply equipment at side B. The voltage VT8 for this test can be any voltage allowed by the EV supply equipment.

(2) 然後，EV 斷接裝置應依 101.2.4.5.1 設定狀態。

2) Then, the EV disconnection devices shall be set in the positions according to 101.2.4.5.1.

(3) 針對無熱交換及/或熱傳之操作，發生故障後，DUT 依 AA.4.3.5 或 CC.3.4 於 9 s 內減少 B 側當下電流至 B 側纜線組製造商指定電流，或觸發錯誤停機，，則通過此試驗。

3) This test is passed if the DUT reduces the present current at side B to the current assigned by the side B cable assembly manufacturer for operation without thermal exchange and/or thermal transport or triggers an error shutdown according to AA.4.3.5 or CC.3.4 in 9 s or less after the occurrence of the fault.

**101.3 對於溫控電能傳輸之特定要求(Specific requirements for temperature-controlled energy transfer)**

本節適用於系統 A 及系統 C，系統 B 於研議中

Subclause 101.3 is applicable for system A and system C. For system B: under consideration.

系統 A 之追加要求規定於 AA.3.16。

Additional requirements for system A are specified in AA.3.16.

基於 B 側纜線組製造商與 EV 供電設備製造商間之協議，EV 供電設備可容許 B 側額定提高電流(參照 3.7.129)大於 EV 供電設備 B 側纜線組額定連續電流，依 101.2.2.1 只要 B 側纜線組之溫度要求符合 EV 供電設備製造商的條件。EV 供電設備 B 側之額定提高電流依 IEC TS 62196-3-1 應僅適用於 B 側纜線組。

The EV supply equipment may allow a rated boost current of the EV supply equipment

at side B (see 3.7.129) more than the rated continuous current of the EV supply equipment at side B of the side B cable assembly based on agreement between side B cable assembly manufacturer and the EV supply equipment manufacturer, as long as the temperature requirement of the side B cable assembly according to 101.2.2.1 is fulfilled for the condition required by the EV supply
equipment manufacturer. The rated boost current of the EV supply equipment at side B shall only be applied to side B cable assemblies according to IEC TS 62196-3-1.

EV 供電設備 B 側之溫控電能傳輸及額定連續電流，應完全由 EV 供電設備製造商與 B 側纜線組製造商間協議。

The temperature controlled energy transfer and the rated continuous current of the EV supply equipment at side B shall be mutually agreed between the EV supply equipment manufacturer and the side B cable assembly manufacturer.

依 IEC TS 62196-3-1 之 EV 供電設備 B 側支援額定提高電流的 B 側纜線組要求，仍於研議中

Requirements for side B cable assembly supporting a rated boost current of the EV supply equipment at side B according to IEC TS 62196-3-1 are under consideration.

符合性依 101.2.4.2 檢驗及試驗查核。

Compliance is checked by inspection and test in 101.2.4.2.

**102 試驗法(Test methods)**

**102.1 技術資料(Technical data)**

來自 EV 供電設備製造商之以下資訊，應規定符合性試驗：

The following information from the EV supply equipment manufacturer shall be provided for compliance test:

- 操作點(102.2.5)。
- operating points (102.2.5);
- 操作溫度範圍。
- operating temperature range;
- 操作濕度範圍。
- operating humidity range;
- 電網電壓(電網 A 側之額定最低電壓，電網 A 側之額定最高電壓)
- supply network voltages (rated minimum voltage of the supply network at side A, rated maximum voltage of the supply network at side A).

除了上述，系統 C 應規定以下資訊：

— 追加 B 側使用最大漣波之操作點 ，若有。

- In addition to the above, the following information shall be provided for system C: additional operating points with a maximum ripple at side B, if any.

**102.2 一般試驗條件 (General test conditions)**

**102.2.1 周圍試驗條件(Ambient test conditions)**

**102.2.1.1 環境條件 ( Environmental conditions)**

除有其他規定，所有試驗應於以下試驗條件進行：

Unless otherwise specified, all tests shall be carried out under the following test conditions:

— 溫度：(25 ± 10) ℃。

– temperature: (25 ± 10) °C;

— 大氣壓力：86 kPa 至 106 kPa 。

– atmospheric pressure: 86 kPa to 106 kPa;

— 相對濕度：10 %至 90 %(無凝露)。

– relative humidity: 10 % to 90 % (without condensation).

**102.2.1.2 試驗功率要求(Test power requirements)**

若設計由電網供電，則 DUT 應依 IEC 60038 供電。

Power to the DUT shall be according to IEC 60038, if designed to be supplied by the supply network.

— AC 頻率：50 Hz ± 0.5 Hz、60 Hz ± 0.5 Hz。

– AC power frequency: 50 Hz ± 0,5 Hz; 60 Hz ± 0,5 Hz.

— AC 電壓，例：110/220 V、120/240 V、240/415 V 240/400 V ± 10 %、220 V/380 V ± 10 %。

– AC power voltage, for example: 100/200 V; 120/240 V; 240/415 V, 230/400 V ± 10 %; 220/380 V ± 10 %.

— AC 電壓不平衡程度：< 5 %。

– degree of voltage unbalance on AC power: < 5 %.

— AC 功率波形：正弦波，偏差因數小於。

– AC power waveform: sinusoidal, with a distortion factor less than

— 系統 A 及系統 C：8 %。

• for system A and system C: 8 %, and

— 系統 B：5 %。

• for system B: 5 %.

**102.2.2 量測儀表(Measuring instruments)**

量測儀表之特性，應適合於對應試驗項目規定值的查證。

The characteristics of the measuring equipment shall be suitable to verify the specified values in the corresponding test items.

電壓、電流、溫度及時間之量測設備，校正應依適當的要求及 IEC Guide 115。

The equipment for measurement of voltage, current, temperature and time shall be according to suitable requirements for calibration and to IEC Guide 115.

備考：校正之良好實務相關指引參照 CNS 17025。

NOTE Guidance about good practices for calibration can be found in ISO/IEC 17025.

系統 B 亦適用以下要求：使用之儀表應能夠量測電壓及電流值，應選擇此等儀表

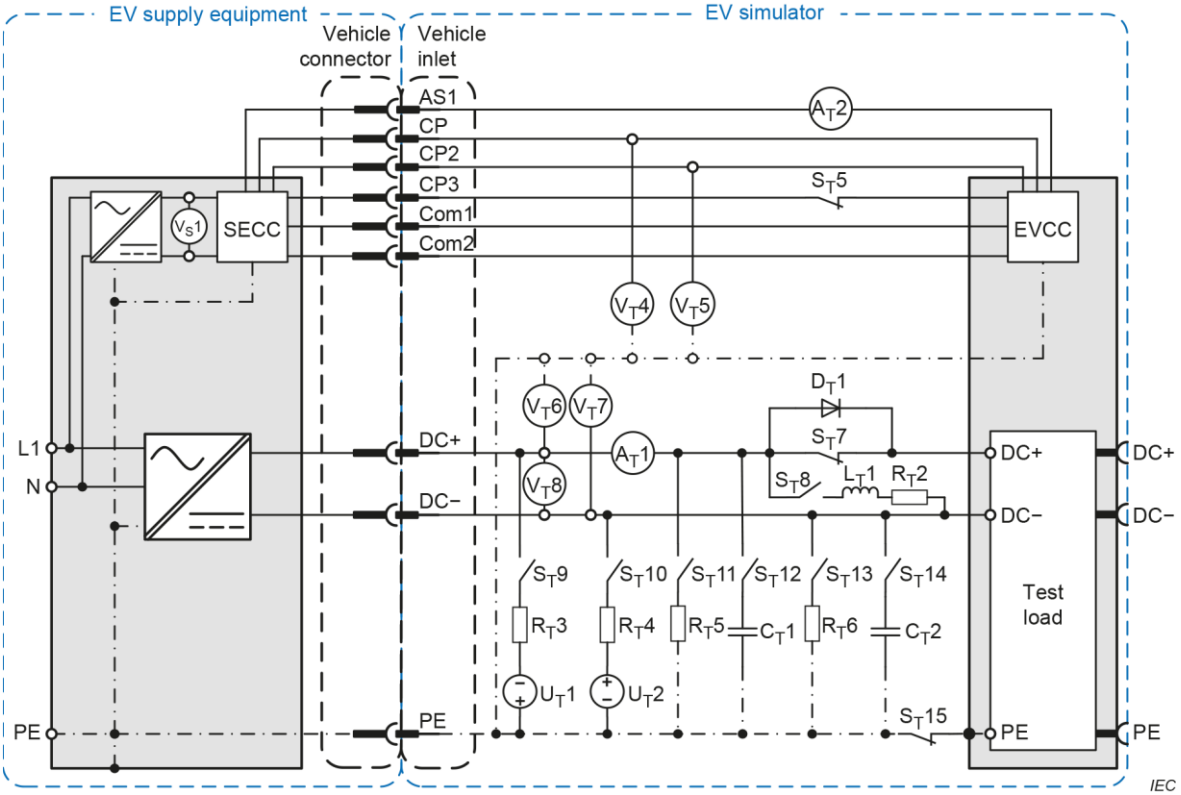
之器量及量測法，以確保每一試驗規定的準確度。針對類比儀表，此讀值表示應取最小刻度的三分之一，任何其他量測儀表，可用於提供同等級的準確度。

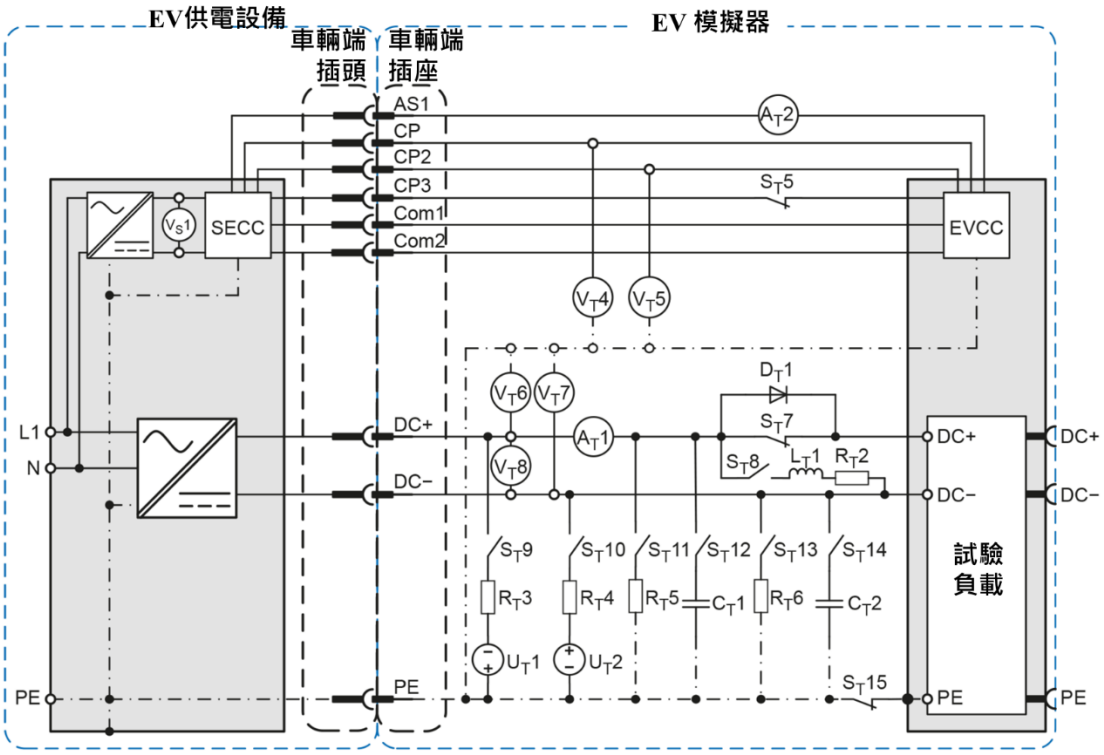
For system B, the following requirements also apply: the instruments used shall enable the values of voltage and current to be measured. The calibre of these instruments and measuring methods shall be chosen so as to ensure the accuracy specified for each test. For analogue instrument, this implies that readings shall be taken in the last third of the graduated scale. Any other measuring instruments may be used provided they give an equivalent accuracy.

102.2.3 試驗裝置 Test setups

系統 A 之一般試驗裝置如圖 129。

The general test setup for system A is shown in Figure 129.






說明 Key

| | | | |
|---|---|---|---|
| L1, N | AC or DC supply network<br>AC 或 DC 電網 | $D_T$ | diode in the test setup<br>試驗裝置之二極體 |
| PE | protective conductor contact<br>保護性導體接點 | $S_T$ | switch or relay in the test setup<br>試驗裝置之開關或繼電器 |
| CP,<br>CP2,<br>CP3 | control pilot conductor contacts of system A<br>系統 A 之控制導引接點 | $C_T$ | capacitor in the test setup<br>試驗裝置之電容 |
| Com1,<br>Com2 | digital communication conductor contacts<br>數位通訊導體接點 | $V_T$ | voltmeter in the test setup<br>試驗裝置之電壓表 |
| DC+ | positive terminal of side B<br>B 側之正極端子 | $R_T$ | resistor in the test setup<br>試驗裝置之電阻 |
| DC– | negative terminal of side B<br>B 側之負極端子 | $L_T$ | inductor in the test setup<br>試驗裝置之電感 |
| SECC | supply equipment communication controller<br>供電設備通訊控制器 | $U_T$ | voltage source in the test setup<br>試驗裝置之電壓源 |
| EVCC | electric vehicle communication controller | $V_S$ | voltmeter in the EV supply equipment |

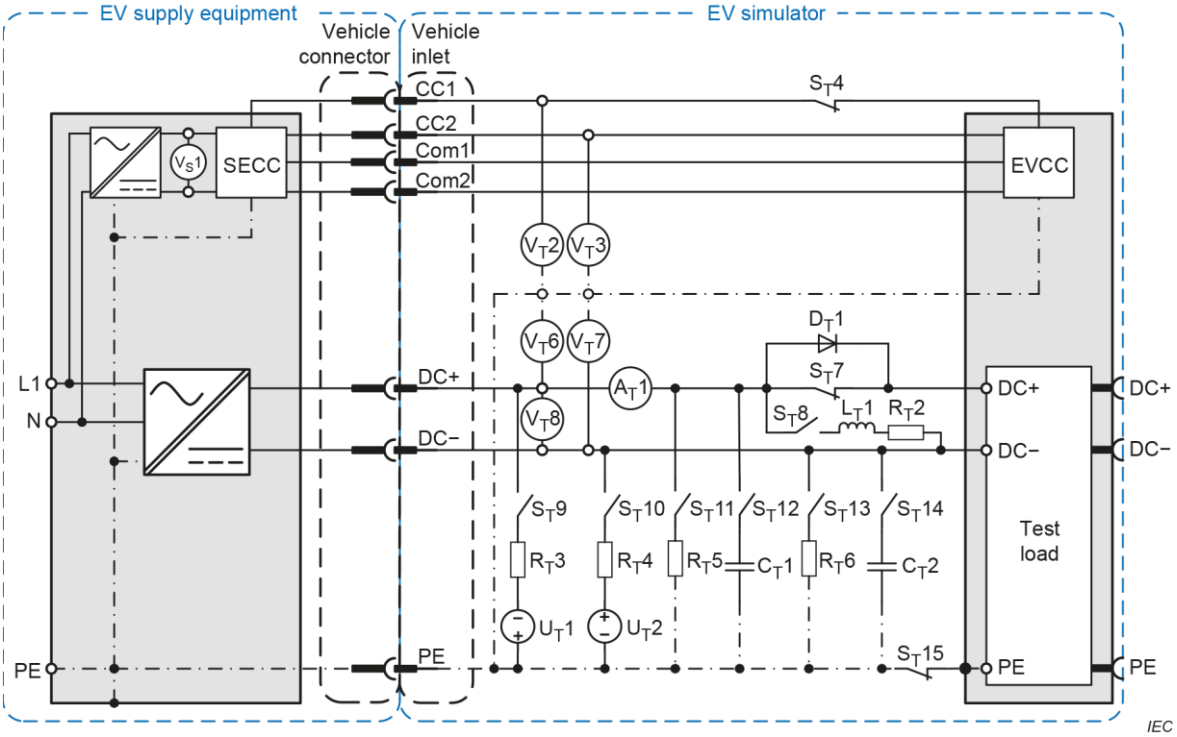
| | EV 通訊控制器 | | EV 供電設備之電壓表 |
|---|---|---|---|
| Test load<br>試驗負載 | test load according to 102.2.4 unless otherwise specified (see Figure 132)<br>依 102.2.4 之試驗負載，除另有規定(參照 132) | $A_T$ | ammeter in the test setup<br>試驗裝置之電流表 |

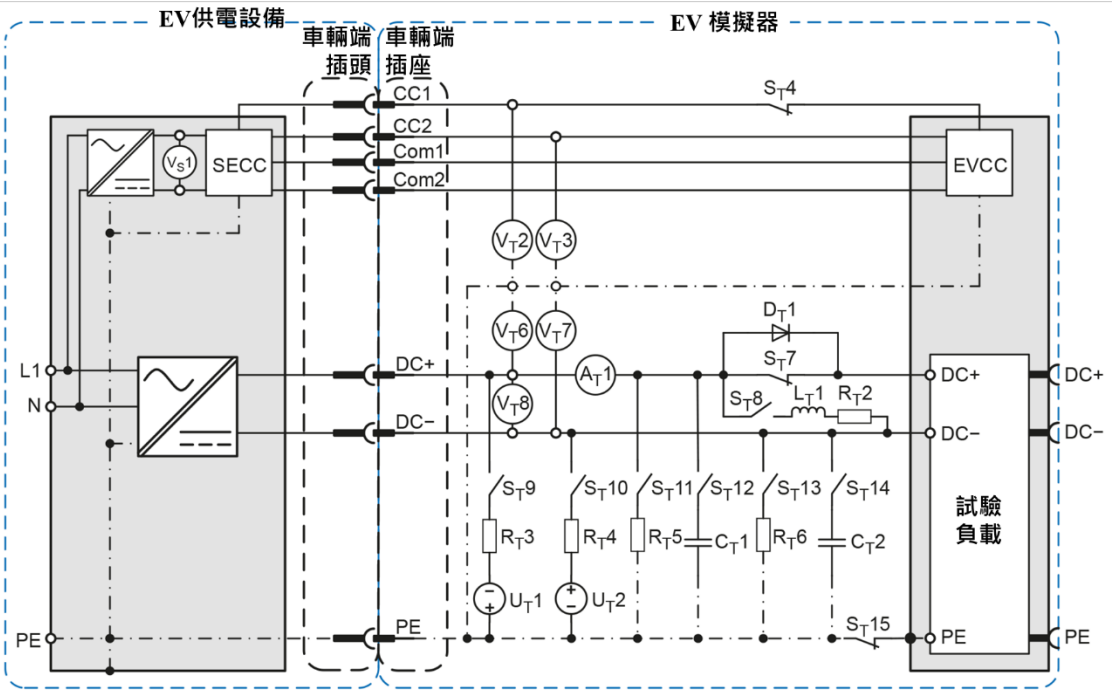
圖 129 系統 A 之一般試驗裝置

Figure 129 – General test setup for system A

系統 B 一般試驗裝置圖 130。

The general test setup for system B is shown in Figure 130.






說明 key

| | | | |
|---|---|---|---|
| L1, N | AC or DC supply network<br>AC 或 DC 電網 | $D_T$ | diode in the test setup<br>試驗裝置之二極體 |
| PE | protective conductor contact<br>保護性導體接點 | $S_T$ | switch or relay in the test setup<br>試驗裝置之開關或繼電器 |
| CC1, CC2 | control pilot conductor contacts of system B<br>系統 B 之控制導引接點 | $C_T$ | capacitor in the test setup<br>試驗裝置之電容器 |
| Com1, Com2 | digital communication conductor contacts<br>數位通訊導體接點 | $V_T$ | voltmeter in the test setup<br>試驗裝置之電壓表 |
| DC+ | positive terminal of side B<br>B 側之正極端子 | $R_T$ | resistor in the test setup<br>試驗裝置之電阻 |
| DC– | negative terminal of side B<br>B 側之負極端子 | $L_T$ | inductor in the test setup<br>試驗裝置之電感 |
| SECC | supply equipment communication controller<br>供電設備通訊控制器 | $U_T$ | voltage source in the test setup<br>試驗裝置之電壓源 |
| EVCC | electric vehicle communication controller<br>EV 通訊控制器 | $V_S$ | voltmeter in the EV supply equipment<br>EV 供電設備之電壓表 |
| Test | test load according to 102.2.4 | $A_T$ | ammeter in the test setup |

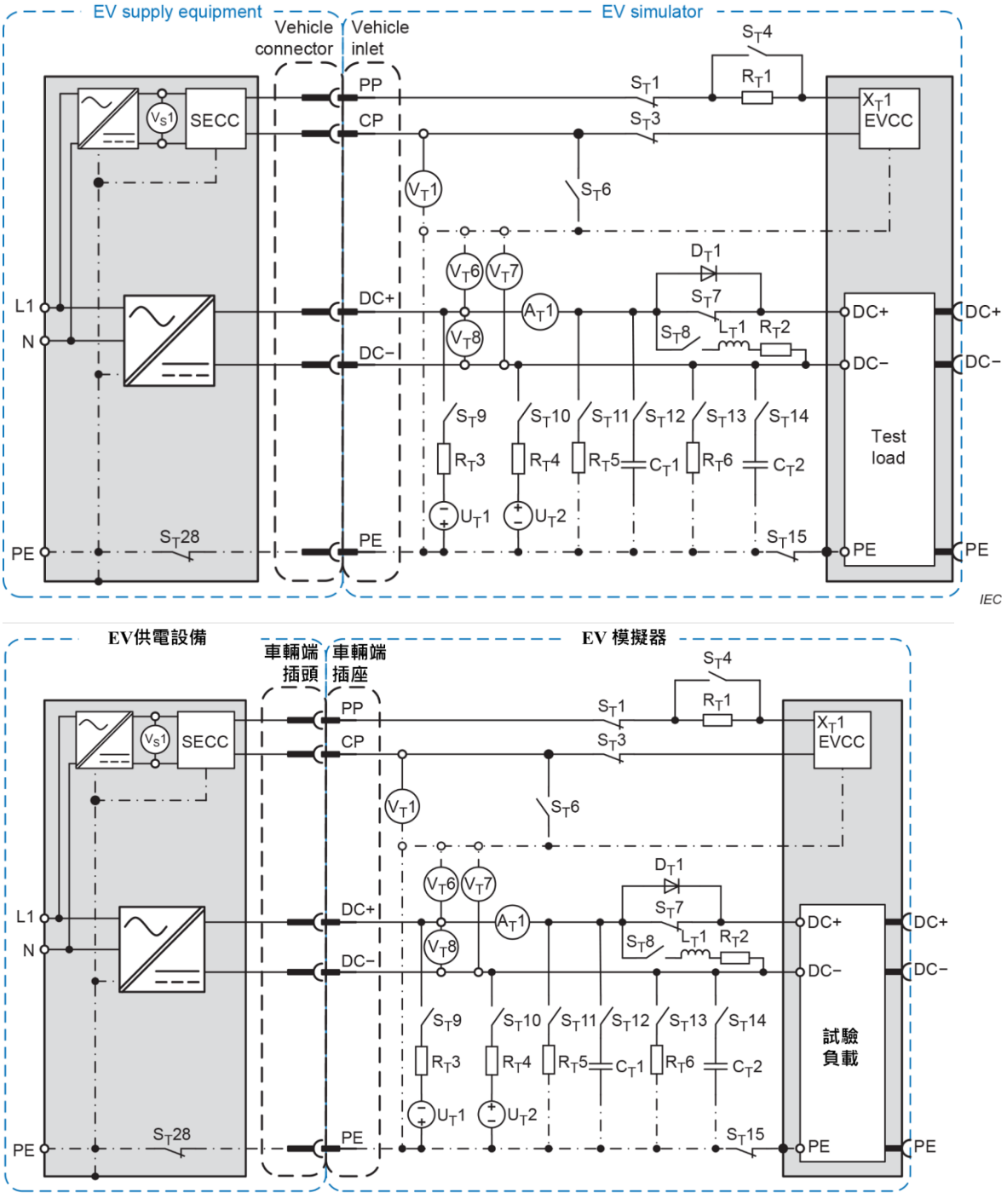
| | | | |
|---|---|---|---|
| load<br>試驗<br>負載 | unless otherwise specified (see Figure 132)<br>依 102.2.4 之試驗負載，除另有規定(參照 132) | | 試驗裝置之電流表 |

圖 130 系統 B 一般試驗裝置

Figure 130 – General test setup for system B

系統 C 之一般試驗裝置如圖 131。

The general test setup for system C is shown in Figure 131.




Key

| | | | |
|---|---|---|---|
| L1, N | AC or DC supply network<br>AC 或 DC 電網 | $D_T$ | diode in the test setup<br>試驗裝置之二極體 |
| PE | protective conductor contact<br>保護性導體接點 | $S_T$ | switch or relay in the test setup<br>試驗裝置之開關或繼電器 |
| PP | proximity pilot conductor contact<br>接近導引線接點 | $C_T$ | capacitor in the test setup<br>試驗裝置之電容器 |
| CP | control pilot conductor contact of system C<br>系統 C 之控制導引接點 | $V_T$ | voltmeter in the test setup<br>試驗裝置之電壓表 |
| DC+ | positive terminal of side B<br>B 側之正極端子 | $R_T$ | resistor in the test setup<br>試驗裝置之電阻 |
| DC– | negative terminal of side B<br>B 側之負極端子 | $L_T$ | inductor in the test setup<br>試驗裝置之電感器 |
| SECC | supply equipment communication controller<br>供電設備之通訊控制器 | $U_T$ | voltage source in the test setup<br>試驗裝置之電壓源 |
| EVCC | electric vehicle communication controller<br>EV 通訊控制器 | $V_S$ | voltmeter in the EV supply equipment<br>EV 供電設備之電壓表 |
| Test load<br>試驗負載 | test load according to 102.2.4 unless otherwise specified (see Figure 132)<br>依 102.2.4 之試驗負載，除另有規定(參照 132) | $X_T$ | 接近導引電路之電壓源<br>voltage source for the proximity pilot circuit |
| $A_T$ | ammeter in the test setup<br>試驗裝置之電流表 | | |

圖 131 系統 C 之一般試驗裝置

Figure 131 – General test setup for system C

**102.2.4 試驗負載(Test load)**

圖 132 所示為規定用於電能傳輸之簡化 EV 等效電路圖的試驗負載範例。

此簡化等效電路圖用於針對本標準規定試驗情形相關的特定試驗條件。

The test load shown in Figure 132 specifies an example of a simplified equivalent circuit diagram of the EV used for energy transfer. This simplified equivalent circuit diagram is used for specific test conditions relevant to the test cases specified in this document.

應使用如電阻負載、電子負載或電壓源(例：電池系統)為試驗負載。

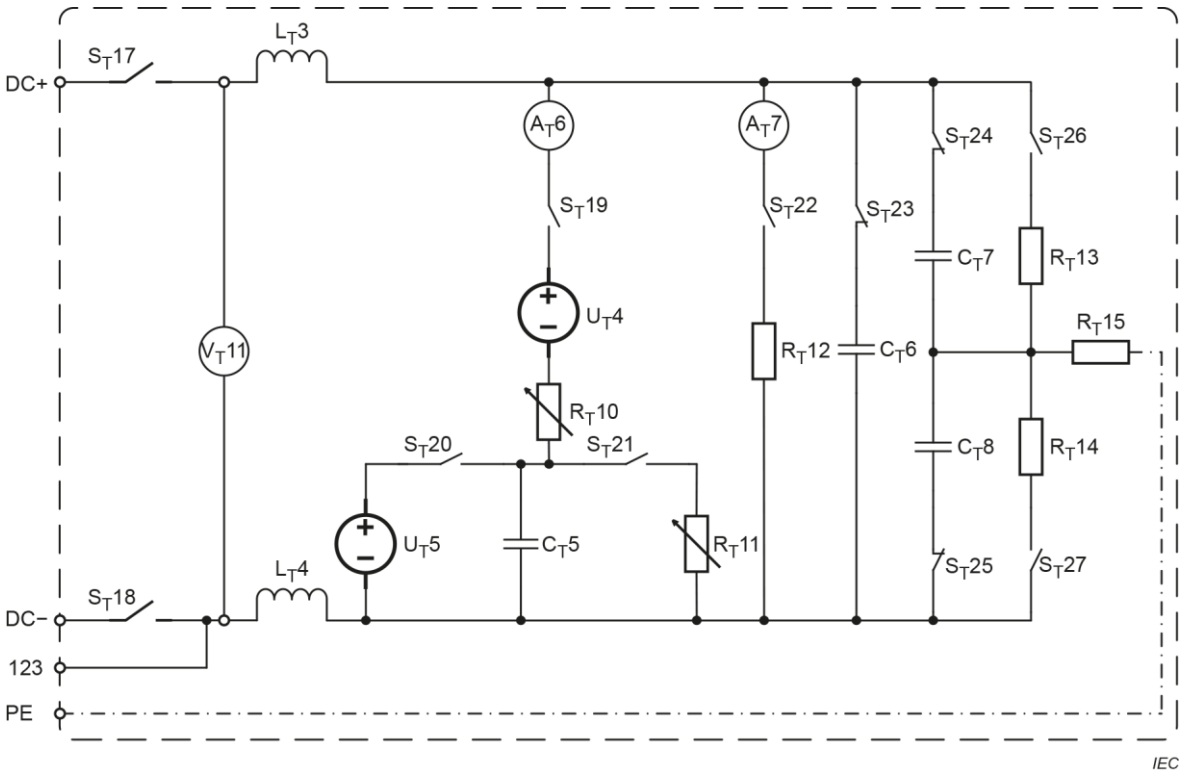
於固定電阻下操作之電子負載，不視為電阻負載。

試驗負載係 EV 模擬器一部分，需與 EV 供電設備間建立基本訊號及/或數位通訊。

A test load such as a resistive load, an electronic load or a voltage source (for example, a battery system) shall be used. An electronic load operating under constant resistance is not considered as a resistive load. The test load is part of an EV simulator, required to establish basic signalling and/or digital communication with the EV supply equipment.

除有其他規定外，符合性試驗應使用電阻負載或電子負載進行。

Unless otherwise specified, a resistive load or an electronic load shall be used for the compliance tests.




說明 Key

| | | | |
|---|---|---|---|
| $S_T17$, $S_T18$ | test load disconnection device<br>試驗負載斷接裝置 | PE | protective conductor<br>保護性導體 |
| $C_T5$ | capacitor for emulating the battery system<br>仿電池之電容器 | $U_T4$ | ideal voltage source<br>理想電壓源系統 |
| $C_T6$ | X-capacitor<br>X-電容器 | $U_T5$ | electronic load/controlled voltage source<br>電子負載/控制電壓源 |
| $C_T7$, $C_T8$ | Y-capacitor<br>Y-電容器 | $R_T10$, $R_T11$ | variable resistor to set operating voltage point |

| | | | |
|---|---|---|---|
| | | | 設定操作電壓點之可變電阻 |
| $V_T11$ | side B voltage of EV supply equipment (test load side)<br>EV 供電設備之 B 側電壓(試驗負載側) | $R_T12$ | resistor for emulating auxiliary load<br>仿輔助負載之電阻器 |
| $A_T6$ | emulated current to the battery system<br>仿電流至電池系統 | $R_T15$ | resistor for emulating the voltage surge between DC+ and DC–, and between DC+/DC– and PE |
| $A_T7$ | emulated current to the auxiliary load<br>仿電流至輔助負載 | 123 | contact after the DC– disconnection device<br>DC+與 DC-間及 DC+/DC-與 PE 間之仿電壓突波電阻器 |
| $S_T$ | switch, contactor or relay<br>開關，接觸器或繼電器 | $L_T3$, $L_T4$ | inductance of the test load, including cabling. The total inductance is LT = LT3+ LT4.<br>試驗負載之電感器，包括纜線。總電感 LT = LT3+ LT4 |
| $R_T13$, $R_T14$ | resistor for emulating asymmetric loads<br>仿非對稱負載之電阻 | DC+, DC– | side B terminals<br>B 側端子 |

圖 132 試驗負載範例

Figure 132 – Test load example

針對每一系統之試驗負載建議的電路參數示於表 120。試驗負載阻抗應符合附錄 EE 要求。

Recommended circuit parameters of the test load for each system are shown in Table 120. The test load impedance shall comply with the requirements in Annex EE.

表 120 試驗負載建議之電路參數

Table 120 – Recommended circuit parameters of the test load

| 符號<br>Symbol | 系統 A<br>System A | 系統 B<br>System B | 系統 C<br>System C |
|---|---|---|---|
| LT3 + | 1 µH to 3 µH | 1 µH to 3 µH | 1 µH to 3 µH |

| | | | |
|---|---|---|---|
| LT4 | | | |
| CT5 | 5 600 µF | 5 600 µF | 5 600 µF |
| CT6 | 不使用<br>Not used | 不使用<br>Not used | 470 µF |
| CT7,<br>CT8 | 4,7 nF | 2 uF | 2 uF |
| ST17,<br>ST18 | 依代表性試驗規定<br>As specified in respective test | | |
| ST19 | 依代表性試驗規定<br>As specified in respective test | | |
| ST20 | 斷開或閉合(依代表性試驗規定)<br>Open or closed (as specified in respective test) | 斷開 Open | 斷開 Open |
| ST21 | 斷開或閉合(依代表性試驗規定)<br>Open or closed (as specified in respective test) | 閉合 Closed | 閉合 Closed |
| ST22 | 斷開 Open | 斷開 Open | 依代表性試驗規定<br>As specified in respective test |
| ST23,<br>ST24,<br>ST25,<br>ST26,<br>ST27 | 依代表性試驗規定<br>As specified in respective test | | |
| RT10 | 可變 Variable<br>（10 mΩ 至 2 000 mΩ）<br>（10 mΩ to 2 000 mΩ） | 可變 Variable<br>（20 mΩ 至 200 mΩ）<br>（20 mΩ to 200 mΩ） | 可變 Variable<br>（50 mΩ 至 100 mΩ）<br>（50 mΩ to 100 mΩ） |
| RT11 | 可變 Variable<br>(依電壓要求設定之操作點)<br>(set by the required voltage operating point) | 可變 Variable<br>（0,1 mΩ to 2 mΩ） | 可變 Variable<br>（0.1 mΩ 至 2 mΩ）<br>（0,1 mΩ to 2 mΩ） |

| | | | |
|---|---|---|---|
| $R_T12$ | 不使用 Not used | 不使用 Not used | 10 Ω (< 500 V)<br>50 Ω (500 V 至 1 000 V)<br>50 Ω (500 V to 1 000 V) |
| RT13, RT14 | 不使用 Not used | 不使用 Not used | As specified in respective test |
| RT15 | 50 Ω | 0 Ω | 0 Ω |
| UT4 | 不使用 Not used | 0 V 至 950 V<br>0 V to 950 V | 0 V 至 1 000 V<br>0 V to 1 000 V |
| UT5 | 0 V 至 1 000 V<br>0 V to 1 000 V | 不使用 Not used | 不使用 Not used |

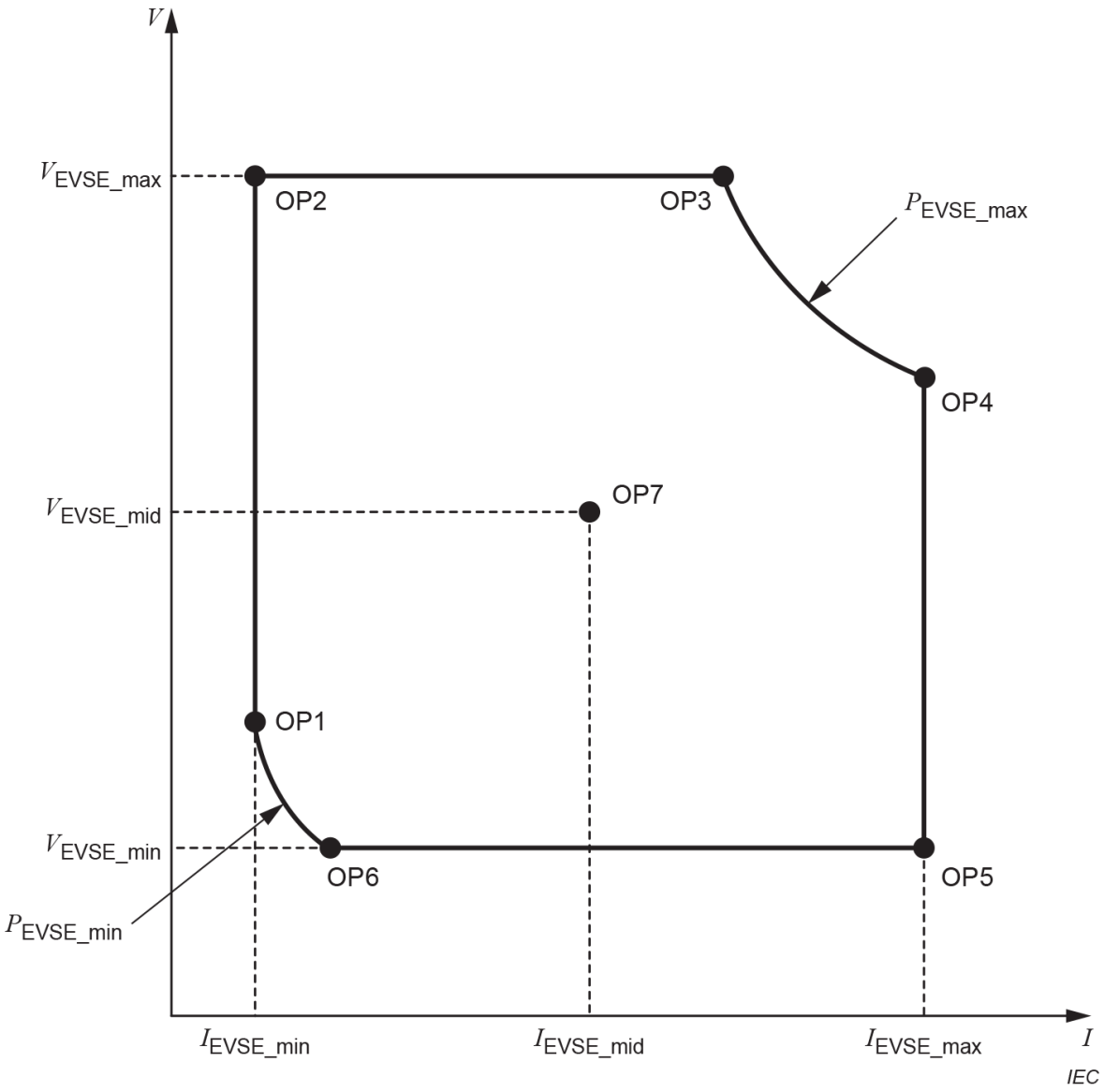
**102.2.5 試驗操作點(Operating points for tests)**

圖 133 所示為 EV 供電設備 B 側當下電壓及當下電流範圍，及特定操作點 OP1 至 OP7。此等操作點用於某些試驗作為試驗點。

Figure 133 shows the range of present voltage and present current at side B of the EV supply equipment, as well as specific operating points OP1 to OP7. These operating points are used as test points in some tests.

若 EV 供電設備於其操作範圍顯示任何不連續行為，可能需要追加額外的試驗點，例：PEC 級聯架構。

If the EV supply equipment shows any discontinuous behaviour in its operating range, for example, in case of cascaded architecture of PECs, it might be necessary to add additional test points.




說明 Key

| | | | |
|---|---|---|---|
| $I_{EVSE_max}$ | maximum operating current of EV supply equipment<br>EV 供電設備之最大操作電流 | OP1 | *V*EVSE_min 及 *P*EVSE_min<br>*V*EVSE_min and *P*EVSE_min |
| $I_{EVSE_mid}$ | (*I*EVSE_max + *I*EVSE_min) / 2 | OP2 | *V*EVSE_max 及 *I*EVSE_min<br>*V*EVSE_max and *I*EVSE_min |
| $I_{EVSE_min}$ | minimum operating current of EV supply equipment<br>EV 供電設備之最小操作電流 | OP3 | *V*EVSE_max 及 *P*EVSE_max<br>*V*EVSE_max and *P*EVSE_max |

| | | | |
|---|---|---|---|
| $V_{EVSE_max}$ | maximum operating voltage of EV supply equipment<br>EV 供電設備最高操作電壓 | OP4 | *I*EVSE_max 及 *P*EVSE_max<br>*I*EVSE_max and *P*EVSE_max |
| $V_{EVSE_mid}$ | (*V*EVSE_max + *V*EVSE_min) / 2 | OP5 | *V*EVSE_min 及 *I*EVSE_max<br>*V*EVSE_min and *I*EVSE_max |
| $V_{EVSE_min}$ | minimum operating voltage of EV supply equipment<br>EV 供電設備之最小操作電壓 | OP6 | *V*EVSE_mid 及 *P*EVSE_mid<br>*V*EVSE_mid and *P*EVSE_mid |
| OP | operating point<br>操作點 | OP7 | *V*EVSE_mid 及 *I*EVSE_mid<br>*V*EVSE_mid and *I*EVSE_mid |
| $OP_n$ | voltage and current depending on test conditions<br>決定試驗條件之電壓及電流 | | |

圖 133 操作點

Figure 133 – Operating points

附錄 Annexes

IEC 61851-1:2017 之附錄適用

The annexes of IEC 61851-1:2017 apply.

增加附錄

Additional annexes:

# 附錄 AA
# Annex AA
# (規定)
# (normative)
# 系統 A 之 EV 供電設備
# EV supply equipment of system A

## AA.1 一般 General

附錄 AA 提供系統 A 之 EV 供電設備之特性要求，另外，一般要求依本標準之本文規定。

Annex AA provides the specific requirements for the EV supply equipment of system A, in addition to the general requirements as defined in the body text of this document.

系統 A 是可調式 EV 供電設備，使用專用 CAN 通訊電路，在 EV 供電設備與 EV 間之控制電能傳輸的數位通訊。

CNS 15700-3(或 IEC 62196-3)或 IEC TS 62196-3-1 規定的 AA 架構的車輛耦合器適用於系統 A。

數位通訊之具體要求及通訊作動及系統 A 參數的細節，在 CNS 15511-24(或 IEC 61851-24:2023)之附錄 A 定義。

System A is a regulated EV supply equipment using a dedicated CAN communication circuit for digital communication between an EV supply equipment and an EV to control energy transfer.

The vehicle coupler of configuration AA as specified in IEC 62196-3 or IEC TS 62196-3-1 is applicable to system A. The specific requirements for digital communication and details of the communication actions and parameters of system A are defined in IEC 61851-24:2023, Annex A.

備考：系統 A 之 EV 供電設備使用自動連接裝置，參照 IEC 61851-23-1。

NOTE For system A EV supply equipment with automated connection device, see IEC 61851-23-1.

系統 A 之 EV 供電設備 B 側的額定最大輸出電壓≤1000 Vdc。

此系統適合於乘用車及輕型卡車。

The rated maximum voltage of a system A EV supply equipment at side B is ≤ 1 000 V DC.

This system is suitable for the passenger vehicles and light trucks.

附錄 AA 規定系統使用 AC 之 A 側，但不限制 DC 之 A 側。附錄 AA 包括 EV 電路資訊。

Annex AA defines the system with an AC side A, but does not prohibit a DC side A. Annex AA includes information on the circuits on the EV.

附錄 AA 亦可適用系統 A 之 BPT EV 供電設備。除有其他規定，本標準之系統

A 之 EV 供電設備要求，亦可適用於 BPT EV 供電設備。

關於 BPT 一般資訊，依照附錄 DD。

Annex AA is also applicable to the system A BPT EV supply equipment. Unless otherwise specified, the requirements for a system A EV supply equipment in this document are also applicable to the BPT EV supply equipment. For general information regarding BPT, refer to Annex DD.

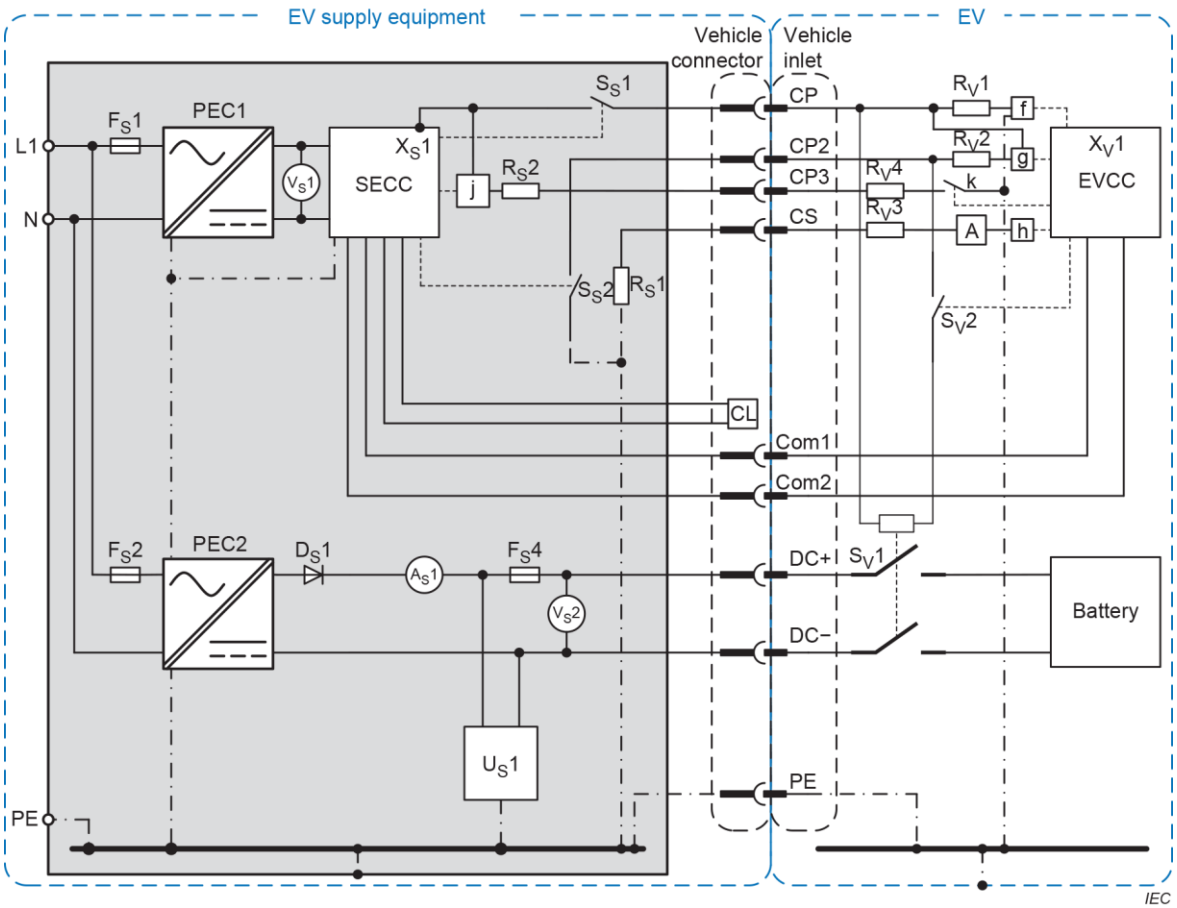
系統 A 更詳細之資訊規定於 IEEE Std 2030.1.1。

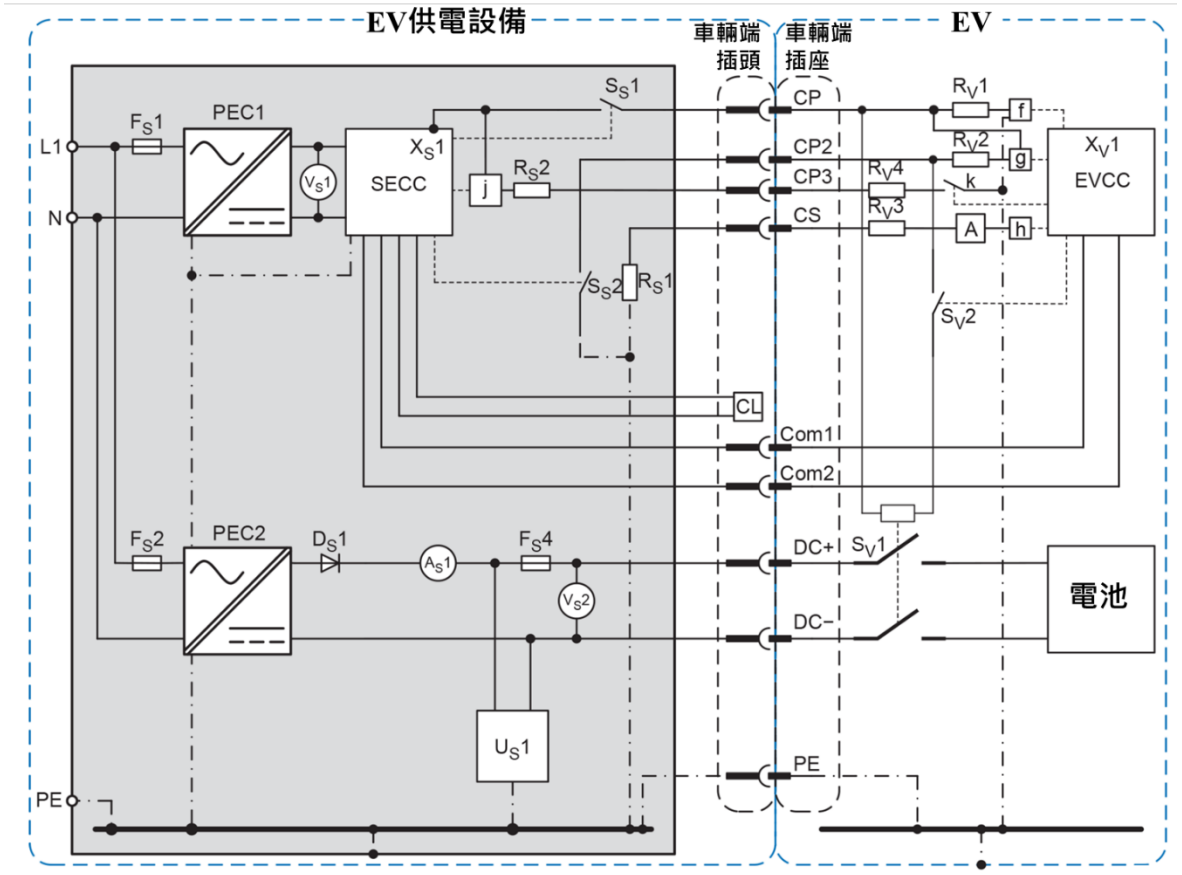
More detailed information on system A is defined in IEEE Std 2030.1.1™.

## AA.2 電路圖 Circuit diagram

系統 A EV 供電設備電路圖如圖 AA.1 所示，包括 EV 供電設備與 EV 間用於電能傳輸控制之電路圖。提供一個 CAN-bus 電路，用於與 EV 數位通訊。圖 AA.1 符號與用語之定義及說明參照表 AA.1。電路圖參數的數值參照表 AA.2。

The system A EV supply equipment circuit diagram is shown in Figure AA.1, including the circuit diagram between the EV supply equipment and the EV for energy transfer control. A CAN-bus circuit is provided for digital communication with the EV. The definition and description of symbols and terms in Figure AA.1 are given in Table AA.1. The values of the parameters for the circuit diagram are given in Table AA.2.






說明：Key

| | | | |
|---|---|---|---|
| L1, N | AC or DC supply network<br>AC 或 DC 電網 | DS1 | diode in the EV supply equipment<br>EV 供電設備之二極體 |
| PE | protective conductor contact<br>保護性導體接點 | $S_S$ | switch or relay in the EV supply equipment<br>EV 供電設備之開關或繼電器 |
| CP,<br>CP2,<br>CP3,<br>CS | control pilot conductor contacts of system A<br>系統 A 之控制導引接觸點 | $S_V$, k | switch or relay in the EV<br>EV 之開關或繼電器 |
| Com1,<br>Com2 | digital communication conductor contacts<br>數位通訊導體接觸點 | $A_S$ | ammeter in the EV supply equipment<br>EV 供電設備之電流表 |
| DC+ | positive terminal of the side B<br>B 側之正極端子 | $R_S$ | resistor in the EV supply equipment<br>EV 供電設備之電阻 |
| DC- | negative terminal of the side | $R_V$ | resistor in the EV |

| | | | |
|---|---|---|---|
| | B<br>B 側之負極端子 | | EV 之電阻 |
| SECC | supply equipment communication controller<br>供電設備通訊控制器 | $U_S$ | earth leakage current measurement device<br>漏電流量測裝置 |
| EVCC | electric vehicle communication controller | $V_S$ | voltmeter in the EV supply equipment<br>EV 供電設備之電壓表 |
| PEC | power electronic converter<br>電力電子轉換器 | FS | over-current protection device<br>過電流保護裝置 |
| f, g, h, j | Optocoupler<br>光耦合器 | A | unintentional current flow prevention circuit<br>意外電流防止電路 |
| $X_V$ | voltage source in the EV<br>EV 之電壓源 | CL | vehicle connector lock and latch monitoring circuit<br>車輛端插頭鎖閂及閂鎖監測電路 |
| $X_S$ | voltage source in the EV supply equipment<br>EV 供電設備之電壓源 | | |

備考：意外電流防止電路(A)由 EV 操作，連接或斷開導引電線(CS)及 EVCC。(a)閉合開關 k (交握手握後)與(b)EV 斷開裝置 SV1 (能量傳送後)間之電能傳輸序列期間，此電路自 CS 斷開 EVCC，參照圖 AA.4 電能傳輸序列圖。

NOTE The unintentional current flow prevention circuit (A), operated by the EV, connects or disconnects the pilot wire (CS) and the EVCC. During the energy transfer sequence between a) the closure of switch k (after handshaking)
and b) the opening of the EV disconnection device SV1 (after energy transfer), this circuit disconnects the EVCC from (CS). See Figure AA.4 for the energy transfer flow diagrams.

圖 AA.1 – 系統 A 之 EV 供電設備及 EV 整體電路圖

Figure AA.1 – Overall circuit diagram of system A EV supply equipment and EV

表 AA.1 系統 A 之 EV 供電設備整體電路符號定義

Table AA.1 – Definition of symbols of the overall circuit diagram of a system A EV supply equipment

| | 符號 Symbols | 定義 Definitions | 要求 Requirements |
|---|---|---|---|
| System A EV supply equipment 系統 A EV 供電設備 | DS1 | 預防逆送電流裝置(例如：二極體，陰極於 EV 側，陽極於 EV 供電設備側)<br>Reverse-current-prevention device (for example, diode: cathode on the EV side, anode on the EV supply equipment side) | AA.3.9 |
| | SS1 | CP 上開關，作為自 EV 供電設備至 EV 電能傳輸啟/停訊號之控制<br>Switch on CP for controlling the energy transfer start/stop signals from the EV supply equipment to the EV | Table AA.2, AA.3.7, Clause AA.4 |
| | SS2 | CP 上開關，作為自 EV 供電設備至 EV 電能傳輸啟/停訊號之控制<br>Switch on CP for controlling the energy transfer start/stop signals from the EV supply equipment to the EV | Table AA.2, AA.3.7, Clause AA.4 |
| | j | 信號感測裝置可偵測 EV 準備好/未準備好電能傳輸<br>Signal sensing device to detect if the EV is ready/not ready for energy transfer | Clause AA.4 |
| | VS2 | 電壓量測裝置<br>Voltage measurement device | AA.3.3, AA.4.4 |
| | AS1 | 電流量測裝置<br>Current measurement device | AA.4.4 |
| | FS1, FS2, FS3, FS4 | 短路保護裝置(例如：限流熔斷器)<br>若車輛端插頭有短路保護裝置，EV 供電設備可無<br>Short-circuit protection device | AA.3.5 |

| | | | |
|---|---|---|---|
| | | (for example, current limiting fuse)<br>In case the vehicle connector has the short-circuit protection device, the EV supply equipment is permitted to not have one. | |
| | RS1 | 電阻器 Resistor | Table AA.2 |
| | RS2 | 電阻器 Resistor | Table AA.2 |
| | XS1 | DC 電源至 EV 斷開裝置<br>DC power supply for the EV disconnection device | Table AA.2, AA.3.12 |
| EV | SV1 | EV 斷開裝置(DC+/DC-)<br>EV disconnection device (DC+/DC–) | AA.3.7, AA.3.8, AA.3.15, Clause AA.4 |
| | SV2 | 接通 EV 斷開裝置之繼電器<br>Relay for turning on the EV disconnection device | Clause AA.4 |
| | f | 偵測 SS1 狀態之訊號感測裝置<br>Signal sensing device to detect the status of SS1 | Clause AA.4 |
| | g | 偵測 SS2 狀態之訊號感測裝置<br>Signal sensing device to detect the status of SS2 | Clause AA.4 |
| | h | 偵測車輛耦合器連結/未連結之訊號感測裝置<br>Signal sensing device to detect mating/un-mating of the vehicle coupler | Clause AA.4 |
| | k | 切換繼續/停止充電<br>Switch to give the go ahead/stop to transfer energy | Clause AA.4 |
| | RV3 | 電阻器<br>Resistor | Table AA.2 |
| | RV4 | 電阻器<br>Resistor | Table AA.2 |
| | XV1 | EV 之 DC 電源<br>DC power supply in the EV | Table AA.2 |

| | | | |
|---|---|---|---|
| Terminal and wire<br>端子及纜線 | DC+ | B 側正極端子<br>Positive terminal of side B | AA.3.15 |
| | DC– | B 側負極端子<br>Negative terminal of side B | AA.3.15 |
| | CP | 控制導引，其表示 EV 供電設備啟/停狀態<br>Control pilot which indicates the start/stop status of EV supply Equipment | Table AA.2 |
| | CP2 | 控制導引，其表示 EV 供電設備啟/停狀態<br>Control pilot which indicates the start/stop status of EV supply Equipment | Table AA.2 |
| | CS | 導引電線，其表示車輛耦合器連接狀態<br>Pilot wire which indicates the status of the vehicle coupler Connection | Table AA.2 |
| | CP3 | 控制導引，其確認 EV 準備好電能傳輸<br>Control pilot which confirms that the EV is ready for energy Transfer | Table AA.2,<br>AA.3.14 |
| | Com1<br>Com2 | Digital communication conductors<br>數位通訊導體 | Table AA.2,<br>AA.3.2, AA.3.8.2 |
| | PE | EV 供電設備及 EV 間保護性導體，偵測 DC+/DC-間第一次故障<br>Protective conductor between the EV supply equipment and EV<br>for detecting the first fault between DC+/DC– and the protective conductor | AA.3.2,<br>Clause AA.4,<br>IEC 61851-24:2023, Annex A |
| | AS1 | 來自 EV 之輔助電源(外部端子)<br>Auxiliary power supply from the EV (in-connector terminal) | Table AA.2,<br>AA.6.3.6 |

| | | | |
|---|---|---|---|
| 車輛端插頭<br>Vehicle connector | CL | 連接器閂鎖及閂鎖機構<br>Connector latching and latching mechanism | AA.3.3, AA.3.6 |

表 AA.2 – 系統 A 充電站之電路圖的參數及值

Table AA.2 – Parameters and values of the circuit diagram for a system A EV supply equipment

| 系統 A EV 供電設備<br>System A EV supply equipment | | | | | |
|---|---|---|---|---|---|
| 端接/電線<br>Terminal/ wire | 參數<br>Parameters | 最小值<br>Minimum value | 一般值<br>Typical value | 最大值<br>Maximum value | 單位<br>Unit |
| CP | XS1 | 10.8 | 12.0 | 13.2 | VDC |
| CS | 電阻器<br>Resistor RS1 | 190 | 200 | 210 | Ω |
| CP3 | 電阻器<br>Resistor RS2 | 950 | 1000 | 1050 | Ω |
| CP | 開關 SS1 負載電流<br>Load current of switch SS1 | 2 | | 2000 | mA DC |
| CP2 | 開關 SS2 負載電流<br>Load current of switch SS2 | 2 | | 2000 | mA DC |
| AS1 | 電壓<br>Voltage | | 12 | 16 | VDC |
| | 電流<br>Current | | | 6.4 | A DC |
| EV | | | | | |
| CP | 負載電流<br>(SS1 及 SS2 | 10 | | 2000 | mA DC |

| | | | | | |
|---|---|---|---|---|---|
| | 閉合)<br>Load current (when SS1 and SS2 are closed) | | | | |
| CP2 | 負載電流 (SS1 及 SS2 閉合)<br>Load current (when SS1 and SS2 are closed) | 10 | | 2000 | mA DC |
| CS | 電阻器<br>Resistor RV3 | 950 | 1000 | 1050 | Ω |
| | XV1 | 8 | 12 | 16 | V |
| CP3 | 電阻器<br>Resistor RV4 | 190 | 200 | 210 | Ω |
| AS1 | 電壓<br>Voltage | | 12 | 16 | V DC |
| | 電流<br>Current | | | 6.4 | A DC |
| | 額定熔線<br>Rated fuse | | | 10 | A DC |
| | 電壓<br>Voltage | | 12 | 16 | V DC |
| 備考：AS1 電壓異於 XS1。<br>NOTE Voltage of AS1 is different from XS1. | | | | | |

對於 BPT 應用，AS1 電阻及保護性導體，每一電阻應不大於電線電阻，導體狀態為溫度 80 ℃、1.25 mm2 及 7.5 m (往返 15 m)。

For a BPT application, resistance of AS1, and protective conductor, each resistance shall be less than the line resistance equivalent to the one on the conditions of conductor temperature 80 °C, 1,25 mm2 and 7,5 m (15 m for round-trip).

**AA.3 特 定 安 全 要 求 Specific safety requirements**

**AA.3.1 B 側之故障保護 Fault protection in side B**

**AA.3.1.1 一般 General**

B 側之故障保護，系統 A 之 EV 供電設備應有以下措施：

For fault protection in side B, the system A EV supply equipment shall have the following measures:

(a) A 側與依 8.105.5 之 B 側間的保護性分隔

a) protective separation between side A and side B according to 8.105.5;

備考：此包括隔離變壓器及 B 側之所有相關電路。

NOTE This includes the isolating transformer and all associated circuits of side B.

(b) B 側帶電部件(DC+/DC-)之 DC±與接地(外殼及底盤)間使用接地電阻量測接地洩漏電流。

b) earth leakage current measurement using a grounding resistor between the side B live parts (DC+/DC–) and the protective conductor (enclosure and vehicle chassis);

(c)接地漏電流監測裝置在第一次故障偵測時，自動斷開 B 側電源

c) automatic disconnection of supply to side B at the first fault detected by the earth leakage current monitoring device;

(d) B 側纜線組包括個別絕緣之線路導體。

d) side B cable assembly consisting of line conductors that are individually insulated.

保護性導體成為 B 側纜線組之一部分時，保護性導體之截面積應依 IEC 60364-5-54:2011 之 543.1.2 公式決定。B 側纜線組之保護性導體的最小截面積應為 0.75 mm2。

When the protective conductor forms part of a side B cable assembly, the cross-sectional area of the protective conductor shall be determined by the formula in IEC 60364-5-54:2011, 543.1.2.

The minimum cross-sectional area of the protective conductor of the side B cable assembly shall be 0,75 mm2.

表 AA.3 顯示故障保護之原則，系統 A 之 EV 供電設備 應符合情形 1。

Table AA.3 shows the principle of fault protection. System A EV supply equipment shall comply with case 1.

故 障 保 護 之 原 則

Table AA.3 – Principle of fault protection

| | 第一次故障為 EV 之供電<br>Power supply to EV in case of the first fault | 第一次故障保護措施<br>Protection measure in case of the first fault | 對應二次側故障防護<br>Protection against the secondary fault |
|---|---|---|---|
| 情形 1<br>Case 1 | 不容許<br>Not allowed | 自動錯誤/緊急 停機<br>Automatic error/emergency shutdown | 第一次故障時禁止操作<br>Prohibition of operation at the first |

| | | | |
|---|---|---|---|
| | | | fault |
| 情形 2<br>Case 2 | 容許<br>Allowed | 使用 IMD，偵測並通知第一次的故障<br>Detection and notice of the first fault using an IMD<br>建議使用最短之實務上延遲消除第一次的故障。<br>Recommendation for elimination of the first fault with the shortest practicable delay | PE 等同 TN 接地要求<br>PE equivalent to TN ground Required<br>對稱之故障偵測，針對操作者之可目視的警告<br>Visible warning for system operator at the detection of symmetric fault |

AA.3.1 要求亦施加於 BPT EV 供電設備。

The requirements in AA.3.1 also apply to the BPT EV supply equipment.

**AA.3.1.2 自動斷開及接地洩漏電流監測 AA.3.1.2 Automatic disconnection and earth leakage current monitoring**

系統 A 之 EV 供電設備應量測 B 側與外殼間，或 B 側與車輛底盤間之接地洩漏電流。

System A EV supply equipment shall measure the earth leakage current between side B and its enclosure, or between side B and the vehicle chassis.

EV 供電設備應於 1 秒或更短時間內偵測 B 側帶電部件（DC+/DC－）與保護性導體間第一次故障，並電能傳輸前及期間進行錯誤停機。

The EV supply equipment shall detect the first fault between side B live parts (DC+/DC–) and the protective conductor before and during energy transfer in 1 s or less, and then shall perform an error shutdown.

電能傳輸前故障偵測之程序規定於 AA.4.3.3

The procedure of this fault detection before energy transfer is provided in AA.4.3.3.

錯誤停機之時間準則的特定要求，規定如表 AA.5。

Specific requirements on the timing criteria for the error shutdowns are given in Table AA.5.

故障電流偵測原則及性能要求，規定於圖 AA.2 及表 AA.3。

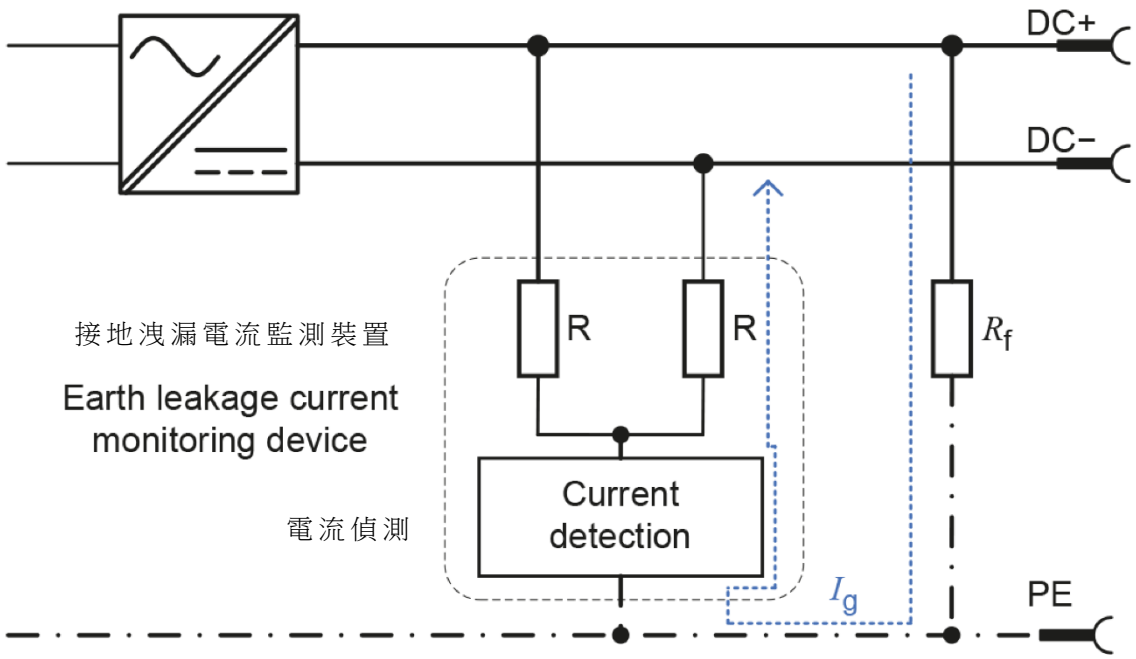
Fault current detection principle and performance requirements are defined in Figure AA.2 and Table AA.4.

若無法測定絕緣電阻， EV 供電設備應觸發並執行錯誤停機。

If the insulation resistance cannot be determined, the EV supply equipment shall trigger and perform an error shutdown.

備考：此可因內部失效或外部因子因素發生，例如：若 EV 超過 ISO 17409:2020 規定之預期電容值。

NOTE This can happen from internal failure or external factors, for example, if the capacitance in the EV is more than the expected value as defined in ISO 17409:2020.




說明 Key

| | |
|---|---|
| DC+, DC– | B 側帶電部件。<br>side B live parts |
| Rf | 第一次故障時，B 側帶電部件(DC+/DC-)及 EV 或外殼間的絕緣電阻。<br>insulation resistance between side B live parts (DC+/DC–) and EV or enclosure at the first fault |
| R | 偵測並限制第一次故障電流之接地電阻。<br>grounding resistor to detect and limit the first fault current |
| Ig | 在第一次故障時，B 側帶電部件(DC+/DC-)及保護性導體間的接地洩漏電流。<br>earth leakage current at the first fault between side B live parts (DC+/DC–) and the protective conductor |

圖 AA.3 DC 洩漏電流偵測之失效偵測原則

Figure AA.2 – Failure detection principle by detection of DC leakage current

表 AA.4 接地洩漏電流故障監測之要求

Table AA.4 – Requirements for earth leakage current fault monitoring

| 項目<br>Item | 偵測性能<br>Detection performance |
|---|---|
| 最長偵測時間<br>Maximum detection time [a] | 小於 1s<br>Less than 1 s |
| 預防擾亂跳脫<br>Nuisance trip prevention | 使用連續門檻閾值監測下，最小響應時間應大於 0.2 s。<br>Minimum response time shall be more than 0,2 s with continuous threshold monitoring |
| 靈敏度 b<br>Sensitivity [b] | 應設計接地洩漏電流量測裝置及接地電阻〝R〞之靈敏度，使 B 側帶電部件（DC+/DC－）與保護性導體間人體電流第一次故障時，於 IEC 60479-1:2018 之圖 22 的 DC-2 區域內。<br>Sensitivity of earth leakage current measuring device and grounding resistor of "R"shall be designed so that the body current of human at the first fault between side B live parts (DC+/DC–) and the protective conductor is within DC-2 zone in IEC 60479-1:2018, Figure 22. |

a 偵測時間不包括 B 側當下電流之停機時間。

a The detection time does not include shutdown time of the present current at side B.

b 實際之人體電流可不同於量測的洩漏電流 Ig，設計 EV 供電設備時宜考量。

b The actual body current may differ from the measured leakage current *I*g, which should be taken into account when designing the EV supply equipment.

範例：

EXAMPLE

設定條件 1：當人體通過電流超過公式(AA.1)計算 DC-2 區域時，有一種量測裝置偵測 Rf 絕緣電阻劣化所造成第一次故障，其方式係量測 B 側帶電部件(DC+/DC-)及保護性導體間之接地洩漏電流，如公式（AA.2）所示。

Set-up condition 1: When the current through the human body *I*h is more than the DC-2 zone calculated by Formula (AA.1), a measurement device is designed to detect the deterioration of insulation resistance *R*f as the first fault between side B live parts (DC+/DC–) and the protective conductor by measuring earth leakage current shown in Formula (AA.2).

$$I_h = \frac{V_s 2}{\frac{R \cdot R_f}{R + R_f}} \qquad \text{(AA.1)}$$

式中，

Where

Ih　　人體通過電流

Ih is the current through the human body;

VS2　B 測 DC+/DC-間當下電壓

VS2 is the present voltage at side B between DC+ and DC–;

R　　接地電阻

R is a grounding resistor;

Rf　　絕緣電阻

Rf is an insulation resistance.

$$I_g = \frac{V_S 2}{R + 2 \cdot R_f} \qquad \text{(AA.1)}$$

式中，

Where

Ig　　量測電流

Ig is the measuring current;

VS2　B 側 DC+/DC-間當下電壓

VS2 is present voltage at side B between DC+ and DC–;

R　　接地電阻

R is a grounding resistor;

Rf　　絕緣電阻

Rf is an insulation resistance.

設定條件 2：除設定條件 1 外，量測裝置係設計用來偵測 DC-2 區域之電流。

Set-up condition 2: The measurement device is designed to detect the current through the human body within DC-2 zone, except the set-up condition 1.

依以下試驗查核符合性。

Compliance is checked by the following test.

(1)　針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 AA.4。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129.

(2)　依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) EV 供電設備於 OP4 操作。

3) The EV supply equipment is operating at OP4.

(4)閉和 ST11 模擬故障。

4) Simulate the fault by closing ST11.

(5)查核 EV 供電設備於第 4 步驟後 1 秒或更短時間觸發錯誤關閉

5) Check that the EV supply equipment triggers error shutdown in 1 s or less after step 4).

(6)查核 VS1 未中斷，直到通訊期間完成且車輛耦合器可靠地解閂鎖，參照 6.3.1.108。

6) Check that VS1 is not interrupted until the communication session is completed and the vehicle coupler is safely unlatched. See 6.3.1.108.

(7) 使用步驟 4)的 ST13 重複測試。

7) Repeat the test using ST13 in step 4).

應調整接地故障電阻 $R_T5/R_T6$，使 EV 供電設備 B 側帶電部件(DC+/DC–)及 PE 間的總絕緣電阻 $R_f$(參照圖 AA.2，包括 $R_T5/R_T6$R – 參照圖 129)小於或等於 100 Ω/V 時能夠檢測到接地故障，依 EV 在 EV 供電設備 B 側之額定最高電壓($V_T8$)及接地電阻 R(參照圖 AA.2)。

The earth-fault resistance RT5/RT6 should be adjusted so that the EV supply equipment detects the earth fault when the total insulation resistance Rf (Figure AA.2) between side B live parts (DC+/DC–) and PE (including RT5/RT6 – See Figure 129) is ≤ 100 Ω/V, based on the rated maximum voltage of the EV supply equipment at side B (VT8) and the grounding resistor R (Figure AA.2).

**AA.3.1.3 接地洩漏電流監測裝置之功能性 Functionality of the earth leakage current monitoring device**

接地洩漏電流監測裝置之完整性，應查核 SS1 = 閉合至 SS2 = 閉合，參照圖 AA.3 及 AA.4

The integrity of the earth leakage current monitoring device shall be checked in the period from

SS1 = closed to SS2 = closed. See Figure AA.3 and Figure AA.4.

若此查核時，偵測到接地洩漏電流監測裝置異常，EV SE 不應繼續通訊期間。

The EV supply equipment shall not proceed with the communication session if an abnormality is detected on the earth leakage current monitoring device by this check.

EV 供電設備應查核以下項目之一做為診斷：

The EV supply equipment shall check one of the following items for the diagnosis:

(a) 接地電阻 R 之失去電氣連續性及短路故障。

a) loss of electrical continuity and short-circuit failure of the grounding resistance R;

(b) 電流偵測電路失去電氣連續性

b) loss of electrical continuity in the current detection circuit;

(c) B 側電路及接地洩漏電流監測裝置間失去電氣連續性

c) loss of electrical continuity between the side B circuit and the earth leakage current monitoring device;

(d) 保護性導體之失去電氣連續性

d) loss of electrical continuity of the protective conductor.

**AA.3.2 對 EV 電源斷電 De-energization of the power supply to the EV**

應依據以下試驗檢查是否符合 6.3.1.5。

Compliance to 6.3.1.5 shall be checked according to the following tests.

試驗 1：

Test 1:

(1) 針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3)停止從 EV 模擬器傳輸數位訊息

3) Stop the digital communication from the EV simulator.

(4)自步驟(3)經過 1 秒或更短時間，查核 EV 供電設備觸發錯誤停機。

4) Check that the EV supply equipment triggers an error shutdown in 1 s or less after step 3).

試驗 2：

Test 2:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3)斷開 ST5

3) Open ST5.

(4)自步驟(3)後，查核 EV 供電設備觸發緊急停機。

4) Check that the EV supply equipment triggers an emergency shutdown after step 3).

備考：亦可依 EV 供電設備製造商指定的試驗查核其符合性。

NOTE The compliance can also be checked according to the test specified by the EV supply equipment manufacturer.

**AA.3.3 車輛端插頭解閂鎖用之 B 側帶電部件(DC+/DC-)之電壓量測 Voltage measurement of side B live parts (DC+/DC–) for vehicle connector unlatch**

依 6.3.1.103，偵測到危險電壓時，車輛端插頭不得解閂鎖。車輛端插頭解閂鎖時，應量測 B 側 DC+及 DC-間當下電壓 Vs2(參照 AA.1)，並確認≤ 30 Vdc。

According to 6.3.1.103, the vehicle connector shall not be unlatched when hazardous voltage is detected. To unlatch the vehicle connector, the present voltage at side B between DC+ and DC– shall be measured at VS2 in Figure AA.1, and be confirmed to be ≤ 30 V DC.

6.3.1.103 之(a)及(b)的符合性，應依以下程序進行試驗查核。

Compliance checks a) and b) in 6.3.1.103 shall be tested by the following procedure.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 查核絕緣電阻前，確認車輛端插頭在車輛端插座已閂鎖。

3) Confirm that the vehicle connector is latched on a vehicle inlet before insulation resistance check.

(4) 查核絕緣電阻後，閉合開關 ST17 及 ST18。

4) After the insulation resistance check, close ST17 and ST18.

(5)依 EV 供電設備製造商指定程序停止電能傳輸。

5) Stop energy transfer with the procedure specified by the EV supply equipment manufacturer.

(6) 若正常狀態試驗，開啟開關 ST17 及 ST18。

若為異常狀態試驗，保持開關 ST17 及 ST18 閉合，並將 UT5 (ST20 閉合、ST21 開啟)應用到 CT5，使得 VT8 > 30 Vdc。

6) In case of the normal condition test, open ST17 and ST18. In case of the abnormal condition

test, keep ST17 and ST18 closed and apply UT5 (ST20: closed, ST21: open) to CT5 so that VT8 is > 30 V DC.

(7) 確認 VT8>30Vdc 時，確認車輛端插頭保持閂鎖於車輛端插座上。

7) Confirm that the vehicle connector remains latched on a vehicle inlet while VT8 is > 30 V DC.

**AA.3.4 B 側之過電流保護 Overcurrent protection of side B**

EV 供電設備應提供一個過電流保護，以保護 EV 供電設備之 B 側及 EV。

若以下條件持續滿足 5 s，EV 供電設備應觸發錯誤停機：

The EV supply equipment shall provide an overcurrent protection to protect the side B of the EV supply equipment and the EV. If the following condition is continuously fulfilled for a duration of 5 s, the EV supply equipment shall trigger an error shutdown:

— B 側當下電流≥ 50 A dc：B 側當下電流超過 EV 電下電流 120%

– at a present current at side B ≥ 50 A DC: the present current at side B is more than 120 % of the target current of the EV;

— B 側當下電流< 50 Adc 時：B 側當下電流超過 EV 當下電流 10Adc 或更多

– at a present current at side B < 50 A DC: the present current at side B is more than the target current of the EV by 10 A DC or more.

藉設計審查查核符合性，以確認是否有此功能。

Compliance is checked by design review to verify that a function is provided.

指示 EVCC 與 A 側及 B 側個別的電路圖，應由 EV 供電設備製造商提供。

A circuit diagram indicating that the EVCC is separated from side A and from side B shall be provided by the EV supply equipment manufacturer.

AA.3.5 B 側之短路保護 Short-circuit protection of side B

在系統 A 之 EV 供電設備的 B 側應提供限流熔線等短路保護裝置，以保護 EV 供電設備及 EV 的電路免於短路。

Short-circuit protection means, such as a current-limiting fuse, shall be provided in side B of the system A EV supply equipment in order to protect the circuits of the EV supply equipment and the EV from short-circuit.

短路保護裝置應滿足以下要求：

The short-circuit protection device shall meet the following requirements:

— 快速斷開型。

– quick-break type;

— 正常融化定額：≤ 400 000 A2s。

– normal melting rating: ≤ 400 000 A2s.

車輛端插頭及 B 側纜線組之 DC+及 DC-導體的截面積，I2t 應至少 6,400,000A2s。

The vehicle connector and the cross-sectional area of the DC+ and DC– conductors of the side B cable assembly shall have a I2t ≥ 6 400 000 A2s.

B 側纜線組之 DC+及 DC-導體的截面積，應各自至少 22mm2

The DC+ and DC– conductors of the side B cable assembly shall each have the cross-sectional area of ≥ 22 mm2.

車輛端插頭配備短路保護措施時，B 側充電纜線組之 I2t 可降低。

When the vehicle connector is equipped with short-circuit protection means, the I2t of the side B cable assembly may be reduced.

備考 1.電池系統短路，電纜被反接等，引起很大的短路電流。

NOTE 1 A battery system short-circuit, by reverse connection of the cable, causes a very high short-circuit current.

備考 2. 系統 A EV 提供短路保護裝置，以 2 500 000 A2s 的 I2t 保護 B 側纜線組件。參照 ISO 17409。

NOTE 2 The system A EV provides short-circuit protection device, which protects the side B cable assembly with I2t of 2 500 000 A2s. See ISO 17409.

依檢驗及試驗查核符合性。

Compliance is checked by inspection.

**AA.3.6 車輛端插頭閂鎖監測 Latch monitoring for the vehicle connector**

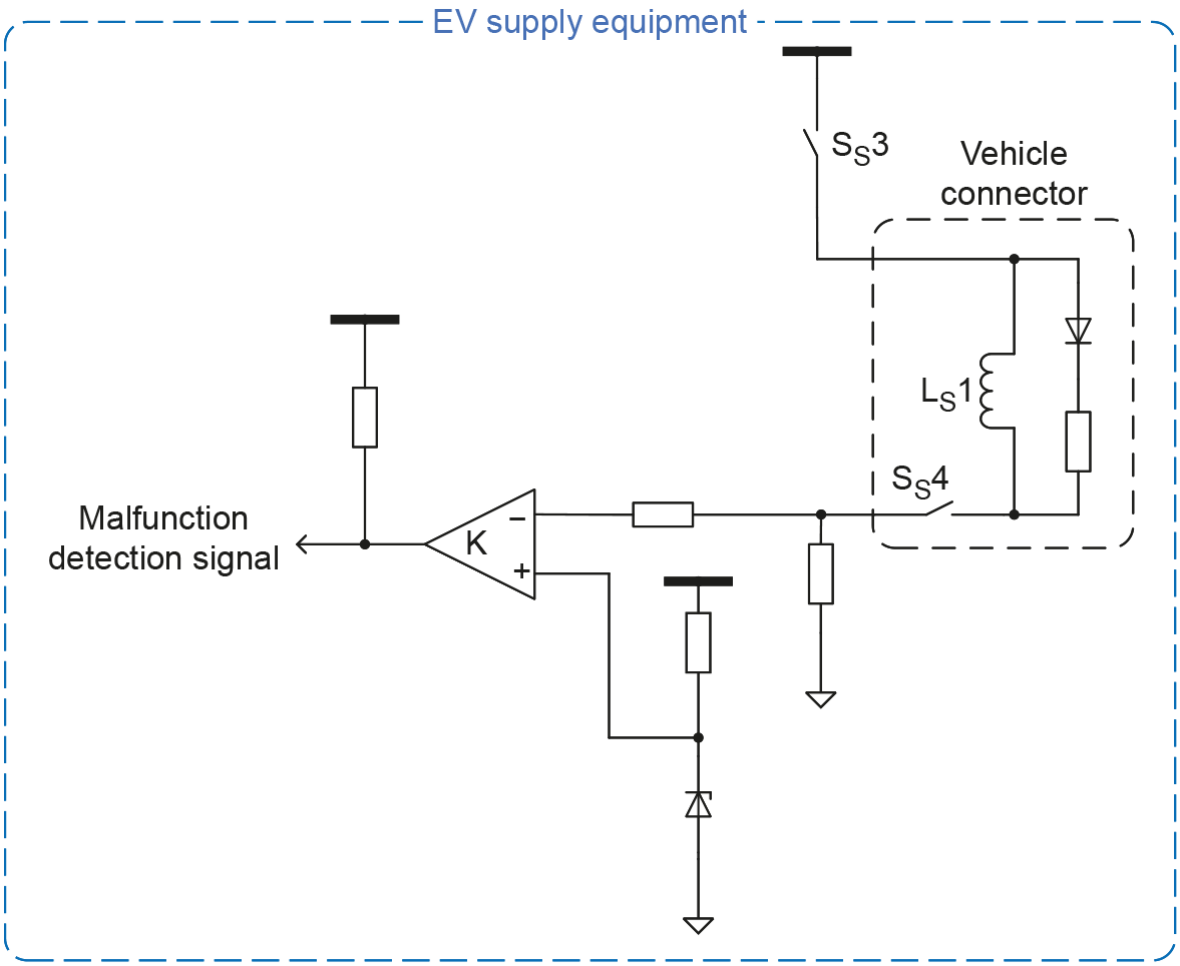
**AA.3.6.1 一般 General**

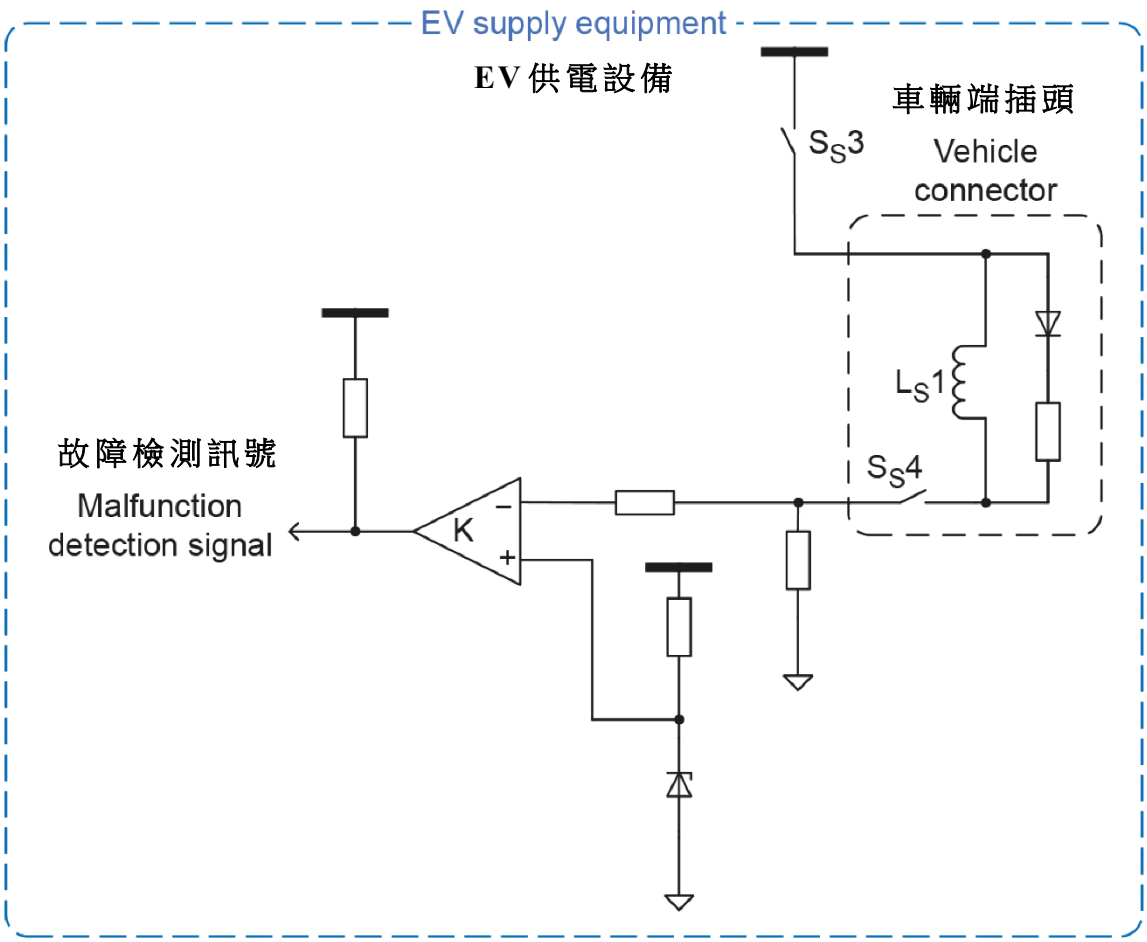
車輛端插頭應有機械性閂鎖、電氣閂鎖及閂鎖監測之措施。

The vehicle connector shall have a means of mechanical latching, electrical latching, and latch monitoring.

對於監測閂鎖及電氣閂鎖異常偵測時，亦應提供系統 A 之 EV 供電設備使用資訊的方法。圖 AA.3 顯示在車輛端插頭及系統 A 之 EV 供電設備的偵測方法之案例。

The vehicle connector shall also have a means to provide system A EV supply equipment with information on anomaly detection in monitoring of latch and electrical latching. Figure AA.3 shows an example of a detection means in the vehicle connector and system A EV supply equipment.


EV supply equipment
$S_S3$
Vehicle connector
$L_S1$
$S_S4$
Malfunction detection signal
K
–
+
IEC




說明 Key

K 比較器

K comparator

SS4 開關或繼電器，與閂鎖功能之互鎖

SS4 switch or relay, interlocked with latching

SS3 開關或繼電器

SS3 switch or relay

LS1 電磁線圈

LS1 solenoid

圖 AA.3 車輛端插頭閂鎖監測電路之範例

Figure AA.3 – Example of vehicle connector latch monitoring circuit

### AA.3.6.2 未配備短路保護之車輛端插頭的閂鎖監測

Latch monitoring for vehicle connector not equipped with short-circuit Protection

未配備短路保護措施之車輛端插頭，通訊期間應不斷地監測鎖閂保持電路之狀態。

Vehicle connectors not equipped with short-circuit protection means shall constantly monitor the state of the latch holding circuit during the communication session.

若車輛端插頭之機械閂鎖或電氣閂鎖失效，EV 供電設備不得為連接車輛端插頭的 B 側帶電部件(DC+/DC-)供電。若電能傳輸期間偵測到故障，EV 供電設備應於 2 s 或更少時間降低 B 側當下電流至≤ 5 Adc，然後，應斷開 SS1 開關。

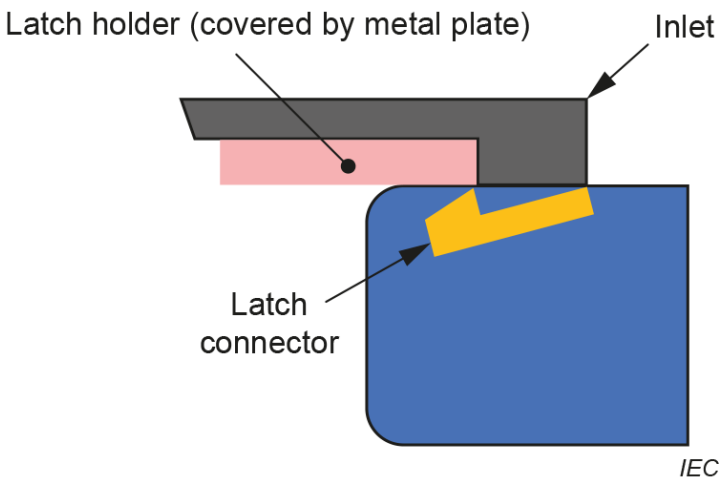
In case of failure of mechanical latching or electrical latching of the vehicle connector, the EV supply equipment shall not energize the side B live parts (DC+/DC–) connected to the vehicle connector. If a failure is detected during energy transfer, the EV supply equipment shall reduce the present current at side B to ≤ 5 A DC in 2 s or less. Then, SS1 shall be opened.

依以下試驗查核其符合性。

Compliance is checked by the following test.

(1)車輛端插座應進行修改，其中車輛端插座的閂鎖支架（孔）由金屬板或等效的硬質材料覆蓋，以抑制車輛端插頭的閂鎖固定。 參照圖 AA.4。

1) A vehicle inlet shall be prepared with a modification in which the latch holder (hole) of the vehicle inlet is covered by a metal plate or an equivalent hard material that inhibits the latch holding of the vehicle connector. See Figure AA.4.



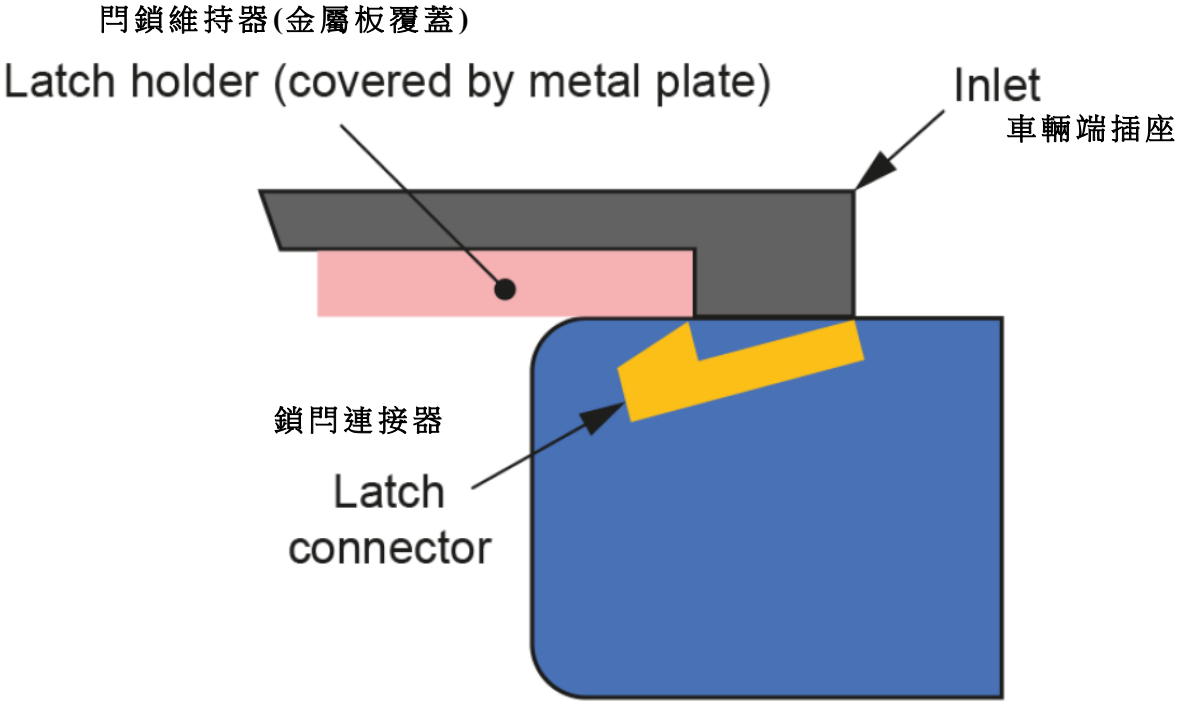



圖 AA.6 – 車輛端插座使用閂鎖維持器支架涵蓋抑制閂鎖維持之金屬板範例

Figure AA.4 – Example of vehicle inlet with the latch holder covered by a metal plate that inhibits latch holding

(2)將 EV 供電設備連接至專用於 EV 模擬器之及試驗負載。參照圖 129。圖 132 試驗負載的設置如表 120。

2) Connect the EV supply equipment to a test load and a dedicated EV simulator. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(3)依 EV 供電設備製造商指定程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4)確認 VT8 ≤ 60 Vdc，且 EV 供電設備觸發錯誤停機，若有，則顯示相關警報或錯誤資訊。

4) Confirm that VT8 is ≤ 60 V DC and that the EV supply equipment triggers an error shutdown, displaying a relevant alarm or error information, if any.

**AA.3.6.3 配備短路保護之車輛端插頭的閂鎖監測 Latch monitoring for vehicle connector equipped with short-circuit protection**

配備短路保護措施之車輛端插頭，應使用自我保持機構的閂鎖裝置。車輛端插頭之 DC+/DC-出現危險電壓時，若車輛端插頭的閂鎖保持電路失效，車輛端插頭應保持閂鎖於車輛端插座。

The vehicle connector equipped with short-circuit protection means shall have a latching device with a self-holding mechanism. When hazardous voltage is present at DC+/DC– of the vehicle connector, the vehicle connector shall be kept latched to the vehicle inlet if the latch holding circuit of the vehicle connector fails.

有自我保持機構之車輛端插頭，不需要在通訊期間不須要經常斷地監測閂鎖保持

電路的狀態或偵測其錯誤。

The vehicle connector which has the self-holding mechanism does not need to constantly monitor the state of, or detect an error in, the latch holding circuit during the communication session.

**AA.3.7 EV 斷開裝置之保護 Protection of the EV disconnection device**

為防止 EV 斷開裝置之熔接，若電流 > 5 A DC 時，開關 $S_S1$ 及 $S_S2$ 不得斷開。

In order to prevent welding the EV disconnection device, switches $S_S1$ and $S_S2$ shall not open if the current is > 5 A DC.

**AA.3.8 傳送錯誤及緊急停機之故障狀態及準則 Fault conditions and criteria for transfer to error and emergency shutdown**

**AA.3.8.1 錯誤停機 Error shutdown**

系統 A 之 EV 供電設備應依 6.3.1.113.3 執行錯誤停機。

表 AA.5 提供錯誤停機之時間及準則。

System A EV supply equipment shall perform an error shutdown according to 6.3.1.113.3.

Table AA.5 provides the shutdown times and criteria of error shutdown.

表 AA.5 – 錯誤停機時間及準則

Table AA.5 – Error shutdown times and criteria

| 故障<br>Fault | EV供電設備開始關機之響應時間<br>Response time of EV supply equipment to start shutdown | B側當下電流下降率<br>Present current at side B descending rate | 停機觸發<br>Shutdown triggered by | 一般<br>General | B側當下電壓下降率<br>Present voltage at side B descending rate | 車輛端插頭解閂鎖狀態<br>Condition to unlatch vehicle connector |
|---|---|---|---|---|---|---|
| 數位通訊喪失[a](6.3.1.5, AA.3.2))<br>Loss of digital communication [a] (6.3.1.5, AA.3.2) | 1 s | ΔIout > 200 A/s DC | EV supply equipment | EV供電設備應降低其B側至：<br>B側當下電流≤ 5 Adc。c<br>DC+及DC-間、DC+/DC-及保護性導體之B側當下電壓≤ 60 V dc。[d]<br>參照AA.3。<br>The EV supply equipment shall reduce side B to:<br>– present current at side B ≤ 5 A DC; | 參照 AA.3.15<br>See AA.3.15 | 停機完成後且B側當下電壓≤ 30 Vdc。<br>參照AA.3<br>After shutdown process is completed and the present voltage at side B ≤ 30 V DC.<br>See Figure AA.3. |
| 400ms期間在車輛端插頭之過電壓(6.3.1.106)<br>Overvoltage at the vehicle connector during 400 ms (6.3.1.106) | 1,6 s | | | | | |
| 若單一第一次接地故障，B側帶電部件(DC+/DC-)及保護性導體間之過電壓。(6.3.1.112.2)<br>Overvoltage between side B live parts (DC+/DC–) and protective conductor in case of single first fault (6.3.1.112.2) | 5s | | | | | |

| 故障<br>Fault | EV供電設備開始關機之響應時間<br>Response time of EV supply equipment to start shutdown | B側當下電流下降率<br>Present current at side B descending rate | 停機觸發<br>Shutdown triggered by | 一般<br>General | B側當下電壓下降率<br>Present voltage at side B descending rate | 車輛端插頭解閂鎖狀態<br>Condition to unlatch vehicle connector |
|---|---|---|---|---|---|---|
| DC接腳組合之過溫(101.2.3, 101.2.4.3, Clause AA.9)<br>Over temperature of DC contact assemblies<br>(101.2.3, 101.2.4.3, Clause AA.9) | 9 s | | | [c]<br>– present voltage at side B ≤ 60 V DC between DC+ and DC–, between DC+/DC– and the protective conductor.[d]<br>See Figure AA.3. | | |
| 熱感測故障(101.2.3.3)<br>Thermal sensing fault (101.2.3.3) | 9 s | | | | | |
| B側帶電部件(DC+/DC-)及保護性導體間接地洩漏電流故障(AA.3.1)<br>Earth leakage current fault between side B live parts (DC+/DC–) and protective conductor | 1 s | | | | | |

| 故障<br>Fault | EV供電設備開始關機之響應時間<br>Response time of EV supply equipment to start shutdown | B側當下電流下降率<br>Present current at side B descending rate | 停機觸發<br>Shutdown triggered by | 一般<br>General | B側當下電壓下降率<br>Present voltage at side B descending rate | 車輛端插頭解閂鎖狀態<br>Condition to unlatch vehicle connector |
|---|---|---|---|---|---|---|
| (AA.3.1) | | | | | | |
| B側之過電流<br>Over current of side B (AA.3.4) | 5 s | | | | | |
| 閂鎖裝置故障(功能失效)(閂鎖位置)<br>(AA.3.6.1、AA.3.6.2)<br>Malfunction of latch device (latch position)<br>(AA.3.6.1, AA.3.6.2) | 0.1 s<br>0,1 s | | | | | |
| 閂鎖裝置故障(功能失效)(閂鎖保持電路)<br>(AA.3.6.1、AA.3.6.2)<br>Malfunction of latch device (latch holding circuit)<br>(AA.3.6.1, AA.3.6.2) | 0.1 s<br>0,1 s | | | | | |

| 故障<br>Fault | EV供電設備開始關機之響應時間<br>Response time of EV supply equipment to start shutdown | B側當下電流下降率<br>Present current at side B descending rate | 停機觸發<br>Shutdown triggered by | 一般<br>General | B側當下電壓下降率<br>Present voltage at side B descending rate | 車輛端插頭解閂鎖狀態<br>Condition to unlatch vehicle connector |
|---|---|---|---|---|---|---|
| 依EV供電設備製造商指定錯誤停機，包括 AC 一次側電路及 AC 一次側短路<br>Error shutdown specified by the EV supply equipment manufacturer including earth fault on the AC primary circuit, and short-circuit on the AC primary circuit | 依EV供電設備製造商指定<br>Specified by the EV supply equipment manufacturer | | | | | |
| 車輛端插頭欠電壓[b](AA.6.3.7)<br>Under-voltage at the vehicle connector [b] (AA.6.3.7) | 2 s | | | | | |
| B側短路<br>Short-circuit of side B (13.3) | 3 s | 依EV供電設備製造商指定 | | | | |

| 故障<br>Fault | EV供電設備開始關機之響應時間<br>Response time of EV supply equipment to start shutdown | B側當下電流下降率<br>Present current at side B descending rate | 停機觸發<br>Shutdown triggered by | 一般<br>General | B側當下電壓下降率<br>Present voltage at side B descending rate | 車輛端插頭解閂鎖狀態<br>Condition to unlatch vehicle connector |
|---|---|---|---|---|---|---|
| | | 參照AA.3.3<br>Specified by the EV supply equipment manufacturer. See AA.3.3 | | | | |
| EV送出請求錯誤停機<br>H’102.4.X = 1或 H’102.5.2 = 1 或 開關 k = OFF<br>EV requested error shutdown by sending:<br>H’102.4.X = 1, or H’102.5.2 = 1, or switch k = OFF | 1 s: CAN<br>0.1s：開關 k<br>0,1 s: switch k | ΔIout > 200 A/s | EV | | | |

| 故障<br>Fault | EV供電設備開始關機之響應時間<br>Response time of EV supply equipment to start shutdown | B側當下電流下降率<br>Present current at side B descending rate | 停機觸發<br>Shutdown triggered by | 一般<br>General | B側當下電壓下降率<br>Present voltage at side B descending rate | 車輛端插頭解閂鎖狀態<br>Condition to unlatch vehicle connector |
|---|---|---|---|---|---|---|
| 註：<br>[a]喪失 CAN 通訊意指 1 s 連續中斷且無 CAN 通訊數據訊框。<br>a Loss of digital communication means 1 s continuous disruption and no data frame of CAN communication.<br>[b]強制性BPT。<br>b Mandatory for BPT.<br>[c]EV應在B側當下電流≤ 5 Adc 時，斷開 EV 斷開裝置，斷開EV供電設備與EV間的B側。<br>c EV should disconnect side B between the EV supply equipment and EV by opening the EV disconnection device when the present current at side B ≤ 5 A DC.<br>[d]在車輛端插頭端子之電壓，EV供電設備可在 EV 斷開裝置斷開後降低B側當下電壓。<br>d Voltage at the vehicle connector. The EV supply equipment can reduce the present voltage at side B after the EV disconnection device is opened. | | | | | | |

偵測到錯誤後，系統 A 之 EV 供電設備應藉數位通訊送出訊息至 EV(依 IEC 61851-24:2023 之表 A.3)。

After detection of errors, the system A EV supply equipment shall send the messages to the EV by digital communication (refer to IEC 61851-24:2023, Table A.3).

表 AA.6 及表 AA.7 提供錯誤停機之訊息參數交換及相關行動。

Table AA.6 and Table AA.7 provide the message parameter exchanges and relevant actions of error shutdown.

表 AA.6 由 EV 供電設備觸發錯誤停機之行動及訊息參數

Table AA.6 – Action and message parameter for error shutdown triggered by the EV supply equipment

| **步驟**<br>**Step** | **行動**<br>**Action** | **訊息參數**<br>**Message parameter** | **準則**<br>**Criterion** |
|---|---|---|---|
| 1 | 故障偵測<br>Fault detected | 不適用<br>n.a | 不適用<br>n.a |
| 2 | 啟動錯誤停機程序並通知 EV<br>Start error shutdown process and notification to the EV | H’ 109.5.1 = 1，或 H’ 109.5.4 = 1，及 H’109.5.5 = 1<br>H’109.5.1 = 1, or H’109.5.4 = 1, and H’109.5.5 = 1 | 送出訊息參數至 EV<br>Send message parameters to the EV |
| 3 | 電能傳輸電流控制<br>Energy transfer current control | 不適用<br>n.a | ≤ 3 s 且 ΔAS1 ≥ – 200 A/s<br>≤ 3 s and ΔAS1 ≥ – 200 A/s |
| 4 | EV 供電設備不容許由 EV 偵測熔接時，通知 EV 並移至步驟 6<br>Notification to the EV and move to step 6, when the EV supply equipment cannot allow welding detection by the EV | H’ 108.0.0 = 0，及 H’109.5.0 = 1<br>H’108.0.0 = 0, and H’109.5.0 = 1 | B 側當下電流≤ 5 Adc 時，送出訊息參數至 EV<br>Send message parameter to the EV when the present current at side B is ≤ 5 A DC |
| 5 | EV 供電設備容許由 EV 偵測熔接<br>Notification to the EV | H’ 108.0.0 = 1，及 H’109.5.0 = 1 | B 側當下電流≤ 5 Adc 時，送出訊息 |

| | | | |
|---|---|---|---|
| | and move to Table AA.7, step 6, when the EV supply equipment can allow welding detection by the EV | H'108.0.0 = 1, and H'109.5.0 = 1 | 參數至 EV<br>Send message parameter to the EV when the present current at side B is ≤ 5 A DC |
| 6 | SS1, SS2 = 斷開<br>SS1, SS2 = open | 不適用<br>n.a | 自步驟 4，≤ 1 s<br>≤ 1 s from step 4 |
| 7 | 電壓除去<br>Voltage removal | 不適用<br>n.a | 自步驟 5 結束，≤ 2 s 及 VS2 ≤ 30 Vdc<br>≤ 2 s and VS2 ≤ 30 V DC from the end of the step 5 |
| 8 | 解閂鎖或維持鎖閂<br>Unlatched or remain latched | 不適用<br>n.a | 依 EV 供電設備製造商指定<br>Specified by the EV supply equipment manufacturer |

表 AA.7 – 由 EV 觸發錯誤停機之行動及訊息參數

Table AA.7 – Action and message parameter for error shutdown triggered by the EV

| **步驟 Step** | EV | | | EV 供電設備<br>EV supply equipment | | |
|---|---|---|---|---|---|---|
| | 行動<br>Action | 訊息參數<br>Message parameter | 準則<br>Criterion | 行動<br>Action | 訊息參數<br>Message parameter | 準則<br>Criterion |
| 1 | 故障偵測<br>Fault detected | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a |
| 2 | 請求錯誤停機<br>Request for error shutdown | H'102.4.X = 1 或 H'102.5.2 = 1 或 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 開關 (k) = 閉合<br><br>H'102.4.X = 1, or H'102.5.2 = 1, or switch (k) = off | | | | |
| 3 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 啟動錯誤停機程序<br>Start error shutdown process | H'109.5.5 = 1 | 送出訊息參數至 EV<br>Send message parameters to the EV |
| 4 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 電能傳輸電流控制<br>Energy transfer current control | 不適用<br>n.a | ≤ 3 s and ΔAS1 ≥ –200 A/s |
| 5 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 通知 EV<br>Notification to the EV | H'108.0.0 = 1<br>H'109.5.0 = 1 | B 側當下電流≤ 5 Adc 時，送出訊息參數至 EV<br>Send message parameters to the EV when the present current at side B is ≤ 5 A DC |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Welding detection | H'102.5.3 = 1 | 熔接偵測時間≤ 4s，結束熔接偵測後，送出訊息至 EV 供電設備<br>Welding detection time ≤ 4s<br>Send the message to the EV supply equipment after finishing welding detection | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a |
| 7 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | $S_S1$, $S_S2$ = 斷開<br>SS1, SS2 = open | 不適用<br>n.a | 自步驟 6，≤ 1 s<br>≤ 1 s from step 6 |
| 8 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 電壓除去<br>Voltage removal | 不適用<br>n.a | ≤ 2 s 及 $V_S2 \leq 30$ Vdc<br>自步驟 7 結束<br>≤ 2 s and VS2 ≤ 30 V DC<br>From the end |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | of the step 7 |
| 9 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 解閂或維持鎖閂<br>Unlatched or remain latched | 不適用<br>n.a | 依 EV 供電設備製造商指定<br>Specified by the EV supply equipment manufacturer |

**AA.3.8.2 控制導引斷開後緊急停機 Emergency shutdown after control pilot disconnection**

控制導引 CP3 喪失電氣連續性(斷開)後，系統 A 之 EV 供電設備應 ≤30 ms 內降低 B 側當下電流至不大於 5 Adc。

The system A EV supply equipment shall decrease the present current at side B to ≤ 5 A DC in 30 ms or less after the loss of electrical continuity (disconnection) of the control pilot CP3.

表 AA.8 及 AA.9 提供緊急停機時間、行動及準則。

Table AA.8 and Table AA.9 provide the emergency shutdown times, actions and criteria.

表 AA.8 – 緊急停機之時間及準則

Table AA.8 – Emergency shutdown times and criteria

| 故障<br>Fault | 觸發緊急停機<br>Trigger of emergency shutdown | EV 供電設備開始緊急停機之響應時間<br>Response time of EV supply equipment to start emergency shutdown process | 從故障發生後，B 側當下電流 ≤ 5Adc 最長時間。<br>Maximum time to the present current at side B ≤ 5 A DC from fault occurrence | 從故障發生後達到安全電壓最長時間<br>Maximum time to reach safe voltage from fault occurrence |
|---|---|---|---|---|
| 保護性導體喪失 | 控制導引 | 故障後立即 | < 30 ms | < 1 s |

| | | | | |
|---|---|---|---|---|
| 電氣連續性<br>(6.3.1.2)<br>Loss of electrical continuity of protective conductor<br>(6.3.1.2)<br>電能傳輸期間段開車輛耦合器<br>(9.101,AA.4.3.5.3)<br>Disconnection of vehicle coupler during energy transfer (9.101, AA.4.3.5.3) | CP3 失去電氣連續性<br>Loss of electrical continuity of the control pilot CP3 | Immediately after the fault | | DC+/DC- 間及 DC+/DC-與保護性導體間之電壓<br>≤ 60 Vdc<br>< 1 s<br>≤ 60 V DC between DC+ and DC–, between DC+/DC– and protective conductor |

表 AA.9 緊急停機之行動及準則

Table AA.9 – Actions and criteria for emergency shutdown

| **步驟**<br>**Step** | **行動**<br>**Action** | 準則<br>Criterion |
|---|---|---|
| 1 | 偵測到故障，控制導引 CP3 喪失電氣連續性<br>Fault detected<br>Loss of electrical continuity of the control pilot CP3 | 不適用 n.a |
| 2 | B 側當下電流減少<br>Reduction of the present current at side B | 從步驟 1，30 ms 或更少時間內≤ 5 A dc<br>≤ 5 A DC in 30 ms or less from step 1 |
| 3 | DC+/DC-間及 DC+/DC-與保護性導體間之電壓≤ 60 Vdc<br>≤ 60 V DC between DC+ and DC–, between DC+/DC– and protective conductor | 從步驟 1，≤ 1 s<br>≤ 1 s from step 1 |

**AA.3.8.3 短路故障緊急停機 Emergency shutdown for short-circuit fault**

B 側偵測到短路電流時，系統 A 之 EV 供電設備應觸發緊急停機。

The system A EV supply equipment shall trigger an emergency shutdown when a short-circuit is detected at side B.

依以下試驗查核其符合性

Compliance is checked by the following test.

(1) 針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) EV 供電設備操作於 OP4。

3) The EV supply equipment is operated at OP4.

(4) 閉合 ST8。使用 RT2 = 100 mΩ及 LT1 = 0 mH。

4) Close ST8. Use RT2 = 100 mΩ and LT1 = 0 mH.

(5) 查核 EV 供電設備是否觸發緊急停機。

5) Check that the EV supply equipment triggered an emergency shutdown.

(6)查核

6) Check that

(a)步驟 5 後，30ms 內 AT1 降至≤ 5 Adc，及

a) AT1 ≤ 5 A DC in 30 ms or less after step 5), and

(b)步驟 5 後，30ms 內 VT8 降至≤ 5 Adc

b) VT8 ≤ 60 V DC in 1 s or less after step 5).

(7) 查核 FPT 不中斷，直到充電序列是否完成及車輛耦合器安全解閂鎖，參照 6.3.1.108。

7) Check that VS1 is not interrupted until the FPT sequence is completed and the vehicle coupler is safely unlatched. See 6.3.1.108.

**AA.3.9 EV 供電設備之湧浪電流限制 Inrush current limitation by the EV supply equipment**

EV 斷開裝置閉合時，經由系統 A EV 供電設備之 B 側帶電部件(DC+/DC-)的浪湧電流，在車輛端插頭應< 20 A dc。

When the EV disconnection device is closed, the inrush current through the side B live parts (DC+/DC–) of system A EV supply equipment shall be < 20 A DC at the vehicle connector.

浪湧電流在 EV EV 供電設備之限制應藉以下之一達成：

The limitation of inrush current shall be achieved on the EV supply equipment by either

依圖 AA.1 及表 AA.1 規定之反向電流防止裝置及，或

– reverse-current prevention device as defined in Figure AA.1 and Table AA.1, or

— 依圖 AA.11 及 AA.6.2.8 規定之預充電單元。

– pre-charge circuit as defined in Figure AA.11 and AA.6.3.4.

備考 1.EV 負責防止因車輛故障導致的不受控制的反向電力傳輸，例如： EV 斷路裝置焊接。

NOTE The EV is responsible for preventing the uncontrolled reverse power transfer (RPT) due to an EV failure, for example, the welding of EV disconnection device.

依以下試驗查核符合性。

Compliance is checked by the following test.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2)閉合 ST20 並調整 UT5，將充電 CT5 至 EV 供電設備 B 側之額定最高電壓

2) Charge CT5 to the rated maximum voltage of the EV supply equipment at side B by closing ST20 and adjusting UT5.

(3) 依 EV 供電設備製造商提供之程序開始通訊期間。

3) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(4) EV 供電設備完成絕緣電阻查核程序之後，閉合 ST17 及 ST18，參照圖 AA.4。

4) Close ST17 and ST18 after the EV supply equipment finished the insulation resistance check. See Figure AA.4.

(5) 查核 AT1< 20 A dc.

5) Check that AT1 < 20 A DC.

**AA.3.10 CCM 之 B 側當下電流調節 Regulation of the present current at side B in CCM**

操作應在以下範圍內進行：若 EV 目標電流< 50 A，則操作範圍為±2.5 A dc；若 EV 目標電流 ≥50 A，則操作範圍為目標電流的±5%。

The deviation of the present current at side B from the target current of the EV in steady state operation shall be between ±2,5 A DC if the target current of the EV < 50 A, and between ±5 % of the target current of the EV if the target current of the EV ≥ 50 A.

系統 A 於 101.1.2.1 之符合性試驗的特定試驗條件如下所示。

System A specific test conditions for compliance test in 101.1.2.1 are shown below.

試驗負載之設定示於表 AA.10 及圖 132。

The setup of the test load is shown in Table AA.10 and Figure 132.

表 AA.10 系統 A 之 CCM 於 B 側當下電流調節的試驗負載設定

Table AA.10 – System A setup of the test load for regulation of the present current at side B in CCM

| 開關 Switches | | | | | 電路參數設定 Circuit parameter setup |
|---|---|---|---|---|---|
| ST17, ST18 | **ST19** | **ST20** | **ST21** | **ST22** | LT: 0 H<br>RT10: 0 Ω (繞過)<br>UT4: 未使用<br>UT5: 電子負載操作應使用定電壓模式<br><br>LT: 0 H<br>RT10: 0 Ω (bypassed)<br>UT4: not used<br>UT5: an electronic load operating under constant voltage mode shall be used |
| 閉合 Closed | 閉合 Closed | 閉合 Closed | 開啟 Open | 開啟 Open | |

對於 101.1.2.1 之(4)，在下列各項的操作位置記錄 $I_{EV_target}$ 及 $I_{EVSE_SideB}$：OP1、OP2、OP3、OP4、OP5、OP6 及 OP7。

For 101.1.2.1, step 4), record IEV_target and IEVSE_SideB at the following operating points: OP1,OP2, OP3, OP4, OP5, OP6 and OP7.

掃描 B 側當下電壓及電流之建議步驟如表 AA.11。

Recommended steps for sweeping the present voltage at side B and present current at side B are shown in Table AA.11.

表 AA.11 系統 B 之 CCM 於 B 側當下電流調節的建議步驟

Table AA.11 – System A recommended steps for regulation of the present current at side B in CCM

| **步 驟 Step** | **行動 Action** | **說明 Description** |
|---|---|---|

| | | |
|---|---|---|
| 1 | 設定 $U_T5 = V_{EVSE_min}$.<br>Set $U_T5 = V_{EVSE_min}$. | 傳輸<br>Communicate;<br>電池目標電流= 0 A<br>Target battery current = 0 A |
| 2 | 設定 $I_{EV_target} = I_{EVSE_min}$ 以查核 OP1<br>Set *I*EV_target = $I_{EVSE_min}$ to check OP1. | 傳輸<br>Communicate;<br>電池目標電流=0A<br>Target battery current = 5 A |
| 3 | 設定 $I_{EV_target} = I_{EVSE_max}$ 以查核 OP5<br>Set $I_{EV_target} = I_{EVSE_max}$ to check OP5. | 傳輸<br>Communicate;<br>電池目標電流= $I_{EVSE_max}$ (A)<br>Target battery current = $I_{EVSE_max}$ (A) |
| 4 | 增加 $U_T5$ 至 $V_{EVSE_SideB} = P_{EVSE_max}/I_{EVSE_max}$ 以查核 OP4<br>Increase $U_T5$ up to $V_{EVSE_SideB} = P_{EVSE_max}/I_{EVSE_max}$ to check OP4. | - |
| 5 | 設定 $U_T5 = V_{EVSE_max}$ 以查核 OP3<br>Set $U_T5$ to $V_{EVSE_max}$ to check OP3. | $U_T5$ 設定為 $V_{EVSE_max}$ 前，請通訊<br>Before setting $U_T5$ to $V_{EVSE_max}$,communicate;<br>目標電池電流= $P_{EVSE_max}/V_{EVSE_max}$ – 5 A<br>Target battery current = $P_{EVSE_max}/V_{EVSE_max}$ – 5 A |
| 6 | 設定 UT5 = VEVSE_min 以查核 OP2<br>Set UT5 = VEVSE_min to check OP2. | - |

**AA.3.11 週期性及隨機偏差(B 側期間之 CCM 的電流漣波)Periodic and random deviation (current ripple at side B during CCM)**

應依據以下試驗查核是否符合 101.1.5。

Compliance to 101.1.5 shall be checked according to the following tests.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in

Table 120.

(2) 依操作選擇符合 $I_{EVSE_max}$ 及圖 133 中 OP4 之電壓的 RT10 值。例：若 $I_{EVSE_max}$ = 200 A 且 OP4 電壓=400V,則 RT10=400V/200A=2Ω

2) Select the value of RT10 in accordance with $I_{EVSE_max}$ and the voltage at which the OP4 in Figure 133 shall be operated. For example, if $I_{EVSE_max}$ = 200 A and the voltage at OP4 = 400 V, RT10 = 400 V / 200 A = 2 Ω.

(3)使用示波器和電流探針量測 AT1，如表 AA.12 規定

3) Measure AT1 with an oscilloscope and current probe as specified in Table AA.12.

(4)依充電器製造商指定程序開始電能傳輸，使用

4) Start energy transfer according to the procedure specified by the EV supply equipment manufacturer, with

$$IEV_target1 = IEVSE_min$$

式中

where

IEV_target1 是圖 133 中 OP1 之 EV 模擬器初始目標電流。

IEV_target1 is the initial target current of the EV simulator for OP1 in Figure 133.

5)等候 Tdmax1 直至達到穩態操作。

5) Wait for Tdmax1 until the steady state operation is reached.

$$T_{dmax1} > 1 + \frac{I_{EV_target1}}{20} \qquad \text{(AA.3)}$$

式中

where

Tadmin1 是 B 側當下電流達到 IEV_target1 且穩態所需的時間，以秒 (s) 為單位表示。

Tdmax1 is the time for the present current at side B to reach IEV_target1 and the steady state, expressed in seconds (s).

(6)設定 EV 模擬器之目標電流= IEV_target2，EV 供電設備在 OP4 操作。

6) Set the target current of the EV simulator = IEV_target2 to operate the EV supply equipment at OP4.

(7) 等候 Tdmax2 直至達到穩態操作。

7) Wait for Tdmax2 until the steady state operation is reached.

$$T_{dmax2} > 1 + \frac{I_{EV_target2} - I_{EV_target1}}{20} \qquad \text{(AA.4)}$$

式中 where

Tdmax2 是 B 側當下之電流達到 IEV_target2 且穩態的時間，以 s 表示。

Tdmax2 is the time for the present current at side B to reach IEV_target2 and the steady state, expressed in seconds (s).

8)量測階低通濾波(LPF)後 B 側當下電流之最大峰對峰值。

8) Measure the maximum peak-to-peak value of the present current at side B after the first order low pass filtering.

9)查核最大峰對峰值是否不大於限制值，每個截止頻率之限制範圍內。

9) Check that the maximum peak-to-peak value is less than or equal to the limit for each cutoff frequency in Table 118.

量測儀表及條件應符合表 AA.12 規定要求。

The measuring instrument and conditions shall comply with the requirements specified in Table AA.12.

表 AA.12-量測儀器之規格

Table AA.12 – Specification of measuring instrument

| 項目 Item | 性能 Performance |
|---|---|
| 示波器<br>Oscilloscope | 帶寬：DC - 20 MHz 或以上。<br>Bandwidth: DC – 20 MHz or more<br>取樣率：1 MS/s 或更多。<br>Sampling rate: 1 MS/s or more<br>紀錄長度：1 M 點或更多。<br>Record length: 1 M point or more<br>紀錄幅度：1.1 s 或更多。<br>Record span: 1,1 s or more<br>垂直解析度：12 位元或更多。<br>Vertical resolution: 12 bits or more |
| 電流探針<br>Current probe | 額定電流：EV 供電設備 B 側額定提高電流以上。<br>Rated current: Rated boost current of the EV supply equipment at side B or more<br>帶寬：DC - 300 kHz 或更多。<br>Bandwidth: DC – 300 kHz or more<br>量測準確度：± 1%範圍之內<br>Measurement accuracy: between ±1 % |

**AA.3.12 包括負載突降之過電壓保護 Overvoltage protection including load dump**

EV 供電設備應藉軟體方法控制 B 側當下電壓，不大於由 EV 目標電壓 110%或目標電壓+50V，取其較大者。

The EV supply equipment shall control the present voltage at side B by software means to be less than or equal to 110 % of the target voltage of the EV, or target voltage of the EV + 50 V, whichever is more.

在首次故障的情況下，下列適用

In case of the first fault, the following applies.

— B 側當下電壓連續 400ms 更多最高電壓，EV 供電設備應於 1.6s 或更少觸發錯誤停機(參照 6.3.1.106)

– When the present voltage at side B is more than the rated maximum voltage of the EV for 400 consecutive ms, the EV supply equipment shall trigger an error shutdown in 1,6 s or less (see 6.3.1.106).

—另外，EV 供電設備應依表 AA.13 所示，藉硬體方法偵測 B 側當下電壓(例：專用過電壓量測電路)以截斷 PEC 並觸發緊急停機。設定點應依數位通訊決定，依據 EV 之目標電壓。

– In addition, the EV supply equipment shall detect the present voltage at side B as shown in Table AA.13 by hardware means (for example, a dedicated overvoltage measurement circuit) to disable the PEC and trigger an emergency shutdown. The setpoints shall be determined by digital communication, based on the target voltage of the EV.

表 AA.13 – 緊急停機之電壓閾值

Table AA.13 – Voltage threshold for emergency shutdown

| EV 之目標電壓 a<br>U<br>Target voltage a of the EV<br>U | 電 壓 閾 值<br>V<br>Voltage threshold<br>V |
|---|---|
| U ≤ 500 V | 600 |
| 500 V < U ≤ 750 V | 900 |
| 750 V < U ≤ 1 000 V | 1 200 |
| a 參照 IEC 61851-24:2022 表 A.2<br>a See IEC 61851-24:2023, Table A.2. | |

依以下試驗查核符合性。

Compliance is checked by the following tests.

試驗 1：

Test 1:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) EV 供電設備操作於圖 133 之 OP4 操作點，且車輛之目標電池組電壓依

OP4 電壓設定。

3) The EV supply equipment is operated at the operating point OP4 in Figure 133 and the target voltage of the EV is set at the voltage according to OP4.

(4)斷開 ST17 及 ST18

4) Open ST17 and ST18.

(5) 查核 VT8≤max(目標電壓之 110%，目標電壓+50V)

5) Check that VT8 ≤ max (110 % of target voltage of the EV; target voltage of the EV + 50 V).

試驗 2：

Test 2:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) EV 供電設備操作於圖 133 之 OP4 操作點，且 EV 之目標電壓依 OP4 電壓設定

3) The EV supply equipment is operating at the operating point OP4 in Figure 133 and the target voltage of the EV is set at the voltage according to OP4.

(4)設定 UT5，使 VT8 超過表 AA.13 顯示閥值

4) Set UT5 so that VT8 is more than the voltage threshold shown in Table AA.13.

(5)設定(4)之 UT5 後，查核 EV 供電設備於 10 ms 或小於內傳送緊急停機

5) Check that the EV supply equipment transfers to emergency shutdown in 10 ms or less after setting UT5 in step 4).

**AA.3.13 用於驅動 EV 斷開裝置的 EV 電源 Power supply to the EV for the actuation of EV disconnection device**

系統 A 之 EV 供電設備應經由端子 CP 向 EV 提供電源，用於驅動 EV 斷開裝置(SV1)，額定電壓 12 Vdc 且額定最大功率>24W

System A EV supply equipment shall provide a power supply to the EV via terminal CP for the actuation of the EV disconnection device (SV1), with a rated voltage of 12 V DC and the rated maximum power of > 24 W.

備考 1. 由 EV 供電設備取得 12 V dc 電源，作為 EV 斷開裝置的驅動電源，可防止車輛端插頭未嚙合車輛端插座時，EV 斷開裝置意外斷開。

NOTE By using the 12 V DC power supply from the EV supply equipment as a power source for the actuation of the EV disconnection device, the unexpected closure of the EV disconnection device when the vehicle connector is not mated to the vehicle

inlet can be prevented.

代替使用來自 EV 供電設備取得 12 Vdc 電源，EV 可提供作為驅動 EV 斷開裝置之電源，如以下情形：

Instead of using the 12 V DC power supply from the EV supply equipment, the EV may provide the power source for the actuation of the EV disconnection device. In such case:

— 車輛端插頭從車輛端插座拔掉後，EV 應於 1 s 或更少時間內，降低 B 側帶電部件(DC+/DC-)電壓< 60 Vdc，包括：DC-及保護導體、DC+及保護導體、DC+/DC-之間。

– the EV should be capable of reducing the voltage of the side B live parts (DC+/DC–) to < 60 V DC between DC+ and DC–, between DC+ and protective conductor, and DC– and protective conductor in 1 s or less after un-mating of the vehicle connector from the vehicle inlet;

— EV 可藉查核信號 CP、CP2、COM1 及 COM2 中之一個以上的狀態，以持續監控車輛端插頭之近接情況。

– the EV can continuously monitor the status of the vehicle connector proximity by checking the condition of one or more of the signals CP, CP2, Com1 and Com2.

— 當車輛端插頭未嚙合車輛端插座時，EV 不宜閉合 EV 斷開裝置。

– the EV should not close the EV disconnection device when the vehicle connector is not mated to the vehicle inlet.

**AA.3.14 輸出電路阻抗 Impedance of the side B circuit**

在圖 AA.6 中之 T3 與 T4 間的時間週期，從系統 A 之 EV 供電設備對車輛端插頭之 B 側逆向電流防止裝置 DS1 的 DC+與 DC-間 B 側電路阻抗，應如下：

In the time period between T3 and T4 in Figure AA.6, the side B circuit impedance between DC+ and DC– from the reverse current prevention device DS1 in side B of system A EV supply equipment to the vehicle connector shall be as follows:

– 電容：≤ 1uF

– capacitance: ≤ 1 μF;

– 電阻：≥ 40 kΩ

– resistance: ≥ 40 kΩ.

以設計審查及檢驗查核其符合性。

Compliance is checked by design review and inspection．

EV 供電設備製造商應提供顯示電容與電阻元件之電路圖及數據圖表。

The EV supply equipment manufacturer shall provide circuit diagram and data sheet of the components showing the resistance and the capacitance.

**AA.3.15 熔接偵測之輔助 Assistance of welding detection**

從車輛端插座至斷開 EV 斷開裝置，DC+及 DC- 間之電容 ≤1 μF 時，EV 供電設備應符合以下條件：

The EV supply equipment shall fulfil the following conditions when, from the vehicle inlet to the open EV disconnection device, the capacitance between DC+ and DC– is ≤ 1 uF:

– B 側當下電壓之電能傳輸結束時，EV 斷開裝置斷開後 1s 或更少時間內，B 側當下電壓應小於 25%

– in 1 s or less after opening the EV disconnection device, the present voltage at side B shall be less than 25 % of the present voltage at side B at the end of the energy transfer;

– EV 斷開裝置斷開 2s 或更少時間內，B 側當下電壓應< 30 Vdc

– in 2 s or less after opening the EV disconnection device, the present voltage at side B shall be < 30 V DC.

依以下試驗查核符合性。

Compliance is checked by the following test:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2)本試驗，CT6 應設定 1uF

2) In this test, CT6 shall be set to 1 uF.

(3)依 EV 供電設備製造商指定程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4)設定試驗負載及 EV 模擬器之參數，使 VT8 在電能傳輸期間為 B 側，EV 供電設備之最高額定電壓。

4) Set the parameters of the test load and the EV simulator so that VT8, is the rated maximum voltage of the EV supply equipment at side B during energy transfer.

(5) 依 EV 供電設備製造商提供之程序停止電能傳輸。

5) Stop energy transfer as specified by the EV supply equipment manufacturer.

(6)若 AT1 < 5 Adc，但 VT8 仍為 EV 供電設備之最高額定電壓的 B 側時，斷開 ST17 及 ST18

6) If AT1 is < 5 A DC but VT8 is still the rated maximum voltage of the EV supply equipment at side B, open ST17 and ST18.

(7) 記錄電壓對時間之輪廓(波形)以查核要求。

7) Record the voltage vs time waveform to check the requirement.

AA.3.16 溫度控制電能傳輸的具體要求 Specific requirements for temperature-controlled energy transfer

允許 EV 供電設備 B 側額定提高電流的 EV 供電設備（參照 101.3）應實施以下一項或多項措施，以確保安全運行，即使在發生第一個故障情況下，其中 B 側纜線

組之溫度監控功能的電能傳輸過程中失效

EV supply equipment that allows a rated boost current of the EV supply equipment at side B (see 101.3) shall implement one or more of the following measures in order to ensure safe operation, even under the first fault condition in which the temperature monitoring function of the side B cable assembly has failed during energy transfer.

EV 供電設備 B 側的額定提高電流應不大於表 AA.14 中規定的上限值及最長持續時間。當最長持續時間過後，EV 供電設備 B 側的額定提高電流應在 30 秒或更短時間內降低至 EV 供電設備 B 側的額定連續電流。在 B 側纜線組之接觸溫度達到預設狀態之前，該狀態下 EV 供電設備 B 側的額定提高電流可以在正常情況下持續最長時間且不超過 90° C，EV 供電設備不得再次提供 B 側的額定提高電流。

– The rated boost current of the EV supply equipment at side B shall be less than or equal to the upper limit and the longest duration specified in Table AA.14. The rated boost current of the EV supply equipment at side B shall be reduced to the rated continuous current of the EV supply equipment at side B in 30 s or less after the longest duration has passed.The EV supply equipment shall not supply the rated boost current of the EV supply equipment at side B again until the contact temperature of the side B cable assembly has reached a default state in which the rated boost current of the EV supply equipment at side B can be supplied for the longest duration without being > 90 °C under normal condition.

表 AA.14 – 系統 A 之 EV 供電設備的最大提高電流

Table AA.14 – Maximum boost current for system A EV supply equipment

| 依 IEC 62196-3-1 符合之額定最大電流<br>Maximum rated current according to IEC 62196-3-1 | 最大提高電流<br>Maximum boost current | |
|---|---|---|
| | 上限值<br>Upper limit | 最長持續時間<br>Longest duration |
| 400 A DC | 600 A DC | 5 分鐘<br>5 min |
| | 500 A DC | 15 分鐘<br>15 min |

一個冗餘的溫度監控功能，例：每個 B 側纜線組之 B 側電路上安裝多個溫度感測器，每個感測器都連接到 EV 供電設備的專用溫度量測電路。

– A redundant temperature monitoring function, for example, multiple temperature sensors per side B circuit on the side B cable assembly, each of which is connected to a dedicated temperature measurement circuit in the EV supply equipment.

任何其他由 EV 供電設備製造商與 B 側纜線組製造商共同同意的方式。

– Any other means mutually agreed between the EV supply equipment manufacturer and the side B cable assembly manufacturer.

藉設計審查查核符合性。

Compliance is checked by design review.

### AA.4 FPT 過程與 EV 供電設備及 EV 間的通訊，用於電能傳輸控制

FPT process and communication between the EV supply equipment and the EV for energy transfer control

#### AA.4.1 正向功率傳輸狀態 Forward power transfer states

表 AA.15 定義 EV 供電設備的電能傳輸狀態。這些電能傳輸狀態顯示 EV 供電設備的物理狀態。EV 供電設備應通過控制導引功能及數位通訊與 EV 交換其電能傳輸狀態。

Table AA.15 defines the energy transfer states of the EV supply equipment. The energy transfer states show the physical status of the EV supply equipment. The EV supply equipment shall exchange its energy transfer state with the EV through the control pilot functions and the digital communication.

表 AA.15 FPT EV 供電設備之 FPT 狀態

Table AA.15 – FPT states of the FPT EV supply equipment

| 狀態 State | | EV 連接 EV connected | EV 斷開裝置 EV disconnection device | 可以進行電能傳輸 Energy transfer possible | 說明 Description |
|---|---|---|---|---|---|
| DC-A | 未連接 Un-mated | 否 No | 斷開 Open | 否 No | EV 未連結 EV un-mated |
| DC-B1 | 初始化 Initialization | 是 Yes | 斷開 Open | 否 No | EV 已連接/未準備好電能傳輸/通訊未建立/車輛端插頭解鎖或閂鎖/斷開 EV 斷開裝置/ EV connected / not ready for energy transfer / communication not established |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | / vehicle connector unlatched or latched / EV disconnection device open |
| DC-B2 | | 是 Yes | 斷開 Open | 否 No | EV 已連接/未準備好電能傳輸/數位通訊已建立/車輛端插頭解鎖或閂鎖/EV 斷開裝置斷開 EV connected / not ready for energy transfer/ digital communication established / vehicle connector unlatched or latched / EV disconnection device open |
| DC-B3 | | 是 Yes | 斷開 Open | 否 No | EV 已連接/未準備好電能傳輸/數位通訊已建立/車輛端插頭閂鎖/EV 斷開裝置斷開/其他輔助程序未完成 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | EV connected / not ready for energy transfer / digital communication established / vehicle connector latched / EV disconnection device open / other supplemental processes not completed |
| DC-C | Energy transfer | 是<br>Yes | 閉合<br>Closed | 是<br>Yes | EV 已連接/準備好電能傳輸/數位通訊已建立/車輛端插頭閂鎖/EV 斷開裝置閉合/其他輔助程序已完成<br>EV connected / ready for energy transfer / digital communication established / vehicle connector latched / EV disconnection device closed / other supplemental processes |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | completed |
| DC-D | | 是<br>Yes | 閉合<br>Closed | 是<br>Yes | EV 已連接/準備好電能傳輸/需要室內電能傳輸區通風/數位通訊已建立/車輛端插頭閂鎖/EV 斷開裝置閉合/其他輔助程序已完成<br>EV connected / ready for energy transfer / digital communication established / vehicle connector latched / EV disconnection device closed / other supplemental processes completed |
| DC-B'1 | Shutdown | 是<br>Yes | 閉合<br>Closed | 是<br>Yes | EV 已連接/電能傳輸完成/保持數位通訊/連接器閂鎖/EV 斷開裝置閉合<br>EV connected / energy transfer finished / digital communication maintained / connector latched / EV |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | disconnection device closed |
| DC-B'2 | | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 已連接/電能傳輸完成/保持數位通訊/車輛端插頭閂鎖/EV 斷開裝置斷開/其他輔助程序已完成<br>EV connected / energy transfer finished / digital communication maintained / vehicle connector latched / EV disconnection device open / other supplemental processes completed |
| DC-B'3 | | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 已連接/電能傳輸完成/保持數位通訊/車輛端插頭解鎖/EV 斷開裝置斷開<br>EV connected / energy transfer finished / digital communication maintained / vehicle connector unlatched / EV |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | disconnection device open |
| DCB’3-1 | | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 已連接/電能傳輸完成/保持數位通訊/車輛端插頭閂鎖/EV 斷開裝置斷開<br>EV connected / energy transfer finished / digital communication maintained / vehicle connector latched / EV disconnection device open |
| DC-B’4 | | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 已連接/電能傳輸完成/完成數位通訊/車輛端插頭解鎖/EV 斷開裝置斷開<br>EV connected / energy transfer finished / digital communication finished / vehicle connector unlatched / EV disconnection device open |
| DCB’4-1 | | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 已連接/電能傳輸完成/完成數位通訊/車 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 輛端插頭閂鎖/EV 斷開裝置斷開<br>EV connected / energy transfer finished / digital communication finished / vehicle connector latched / EV disconnection device open |
| DCB’ 4-2 | | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 已連接/電能傳輸完成/完成數位通訊/車輛端插頭解鎖/EV 斷開裝置斷開<br>EV connected / energy transfer finished / digital communication finished / vehicle connector unlatched / EV disconnection device open |
| DC-E | 錯誤<br>Error | 是<br>Yes | 斷開<br>Open | 否<br>No | EV 及 EV 供電設備未連接/EV 供電設備及電網斷開連接、EV 供電設備失去電網或控制導引短路到保護導體 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | EV supply equipment un-mated from the EV / EV supply equipment disconnected from the supply network, EV supply equipment loss of supply network power or control pilot short-circuit to the protective conductor |
| DC-F | 功能失效<br>Malfunction | 是<br>Yes | 斷開<br>Open | 否<br>No | 其他 EV 供電設備問題<br>Other EV supply equipment problem |

FPT 控制程序及狀態，如表 AA.16 所示。

FPT control process and states are shown in Table AA.16.

表 AA.16 FPT EV 供電設備狀態及 FPT 控制程序

Table AA.16 – FPT control process and states of the FPT EV supply equipment

| **FPT 控制程序**<br>**FPT control process** | | 狀態<br>State | 高位準行動 a<br>High level action a |
|---|---|---|---|
| 初始化<br>Initialization | 交握<br>Handshaking | DC-A | 車輛端插頭未連結<br>Vehicle connector un-mated |
| | | DC-B1 | 車輛端插頭連結<br>Vehicle connector mated |
| | | DC-B1 | 喚醒 SECC 及 EVCC<br>Wake up of the SECC and EVCC |
| | | DC-B1 | 數位通訊啟動 |

| | | | |
|---|---|---|---|
| | | | Digital communication setup |
| | | DC-B1→DC-B2 | 數位通訊、參數交換及相容性查核已完成<br>Digital communication established, parameters exchanged, and compatibility check successfully completed |
| | 電能傳輸準備<br>Energy transfer preparation | DC-B2→DC-B3 | 車輛端插頭閂鎖<br>Vehicle connector latched |
| | | DC-B3 | B 側帶電部件(DC+及 DC-)之絕緣電阻查核<br>Insulation resistance check for side B live parts (DC+ and DC–) |
| 電能傳輸<br>Energy transfer | | DC-C or DC-D | EV 斷開裝置閉合<br>EV disconnection device closed |
| | | DC-C or DC-D | 依電流需求電能傳輸<br>Energy transfer by current demand (CCM) |
| | | DC-C or DC-D | 依電壓需求電能傳輸(CVM)(研議中)<br>Energy transfer by voltage demand (CVM) (under consideration |
| | | DC-C or DC-D→DC-B'1 | 電流抑制<br>Current suppression |
| | | DC-C or DC-D | 再協商參數限制值(選項)<br>Renegotiate parameter limits (option) |
| 停機 (情形 1)<br>Shutdown (case 1) | | DC-B'1 | 確認零電流<br>Zero current confirmed |
| | | DC-B'1→DC-B'2 | 熔著偵測(由 EV，選項)<br>Welding detection (by EV, option) |
| | | DC-B'2 | EV 斷開裝置斷開<br>EV disconnection device open |
| | | DC-B'2 | B 側當下電壓之電壓查證<br>Present voltage at side B voltage verification |

| | | |
|---|---|---|
| | DC-B'3 | 車輛端插頭解鎖<br>Vehicle connector unlatched |
| | DC-B'4 | 數位通訊層次之充電結束<br>End of charge at digital communication level |
| | DC-A | 車輛端插頭未連結<br>Connector un-mated |
| 停機 (情形 2)b<br>Shutdown (case 2) b | DC-B'1 | 確認零電流<br>Zero current confirmed |
| | DC-B'1→DC-B'2 | 熔著偵測(由 EV，選項)<br>Welding detection (by EV, option) |
| | DC-B'2 | EV 斷開裝置斷開<br>EV disconnection device open |
| | DC-B'2 | B 側當下電壓之電壓查證<br>Present voltage at side B voltage verification |
| | DC-B'3-1 | 車輛端插頭保持閂鎖<br>Vehicle connector remains latched |
| | DC-B'4-1 | 通訊層次之充電結束<br>End of charge at communication level |
| | DC-B'4-2 | 車輛端插頭解鎖或維持閂鎖<br>Vehicle connector unlatched or remain latched |
| | DC-A or DC-B1 | 車輛端未連結或維持連結<br>Vehicle connector un-mated or remain mated |
| 註(a) 動作順序非指充電控制過程之程序。<br>a The order of actions does not refer to the procedure of FPT control process.<br>註(b) 在某些使用情形下，如計費服務，車輛端插頭於電能傳輸完成後可繼續維持鎖閂。<br>b In some use cases, such as billing service, the vehicle connector can continue to be latched after energy transfer is finished. | | |

**AA.4.2 通 訊 措 施 Communication measures**

EV 供電設備與 EV 間之通訊，經由控制導引 CP、CP2 與 CP3、近接電路( CS)及數位通訊電路 COM1 及 COM2。CP 及 CP2 從充電站傳送訊號至車輛，如〝準備好充電〞及〝充電結束〞。CP3 用於從車輛傳送開始充電或停機命令至充電站，

IEC 61851-24:2022 附錄 A 之數位參數如充電站輸出定額及經由 COM1 及 COM2 交換電池組的最高電壓。

Communication between the EV supply equipment and the EV is carried out through the control pilots (CP, CP2 and CP3), proximity circuit (CS), and the circuits for digital communication (Com1 and Com2). CP and CP2 communicate signals such as "ready to charge" and "end of charge" from the EV supply equipment to the EV. CP3 is used to communicate instructions to start energy transfer or shutdown, from the EV to the EV supply equipment. Numerical parameters in IEC 61851-24:2023, Annex A, such as rated values of the EV supply equipment and rated maximum voltage of the EV are exchanged through Com1 and Com2.

**AA.4.3 正向電力傳輸控制程序 Forward power transfer control process**

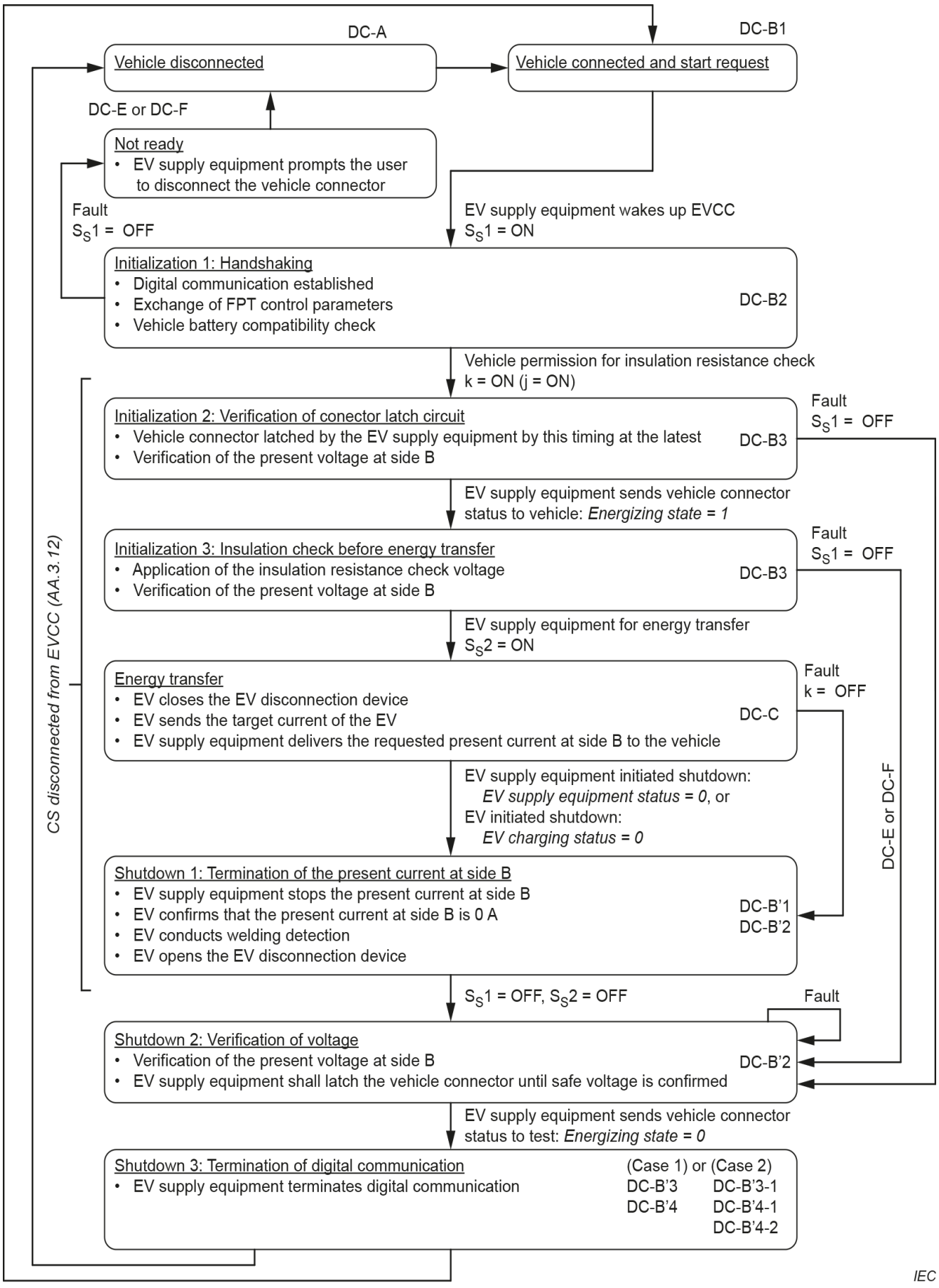
**AA.4.3.1 正向電力功能傳輸流程圖及順序圖 Forward power transfer flow diagram and sequence diagram**

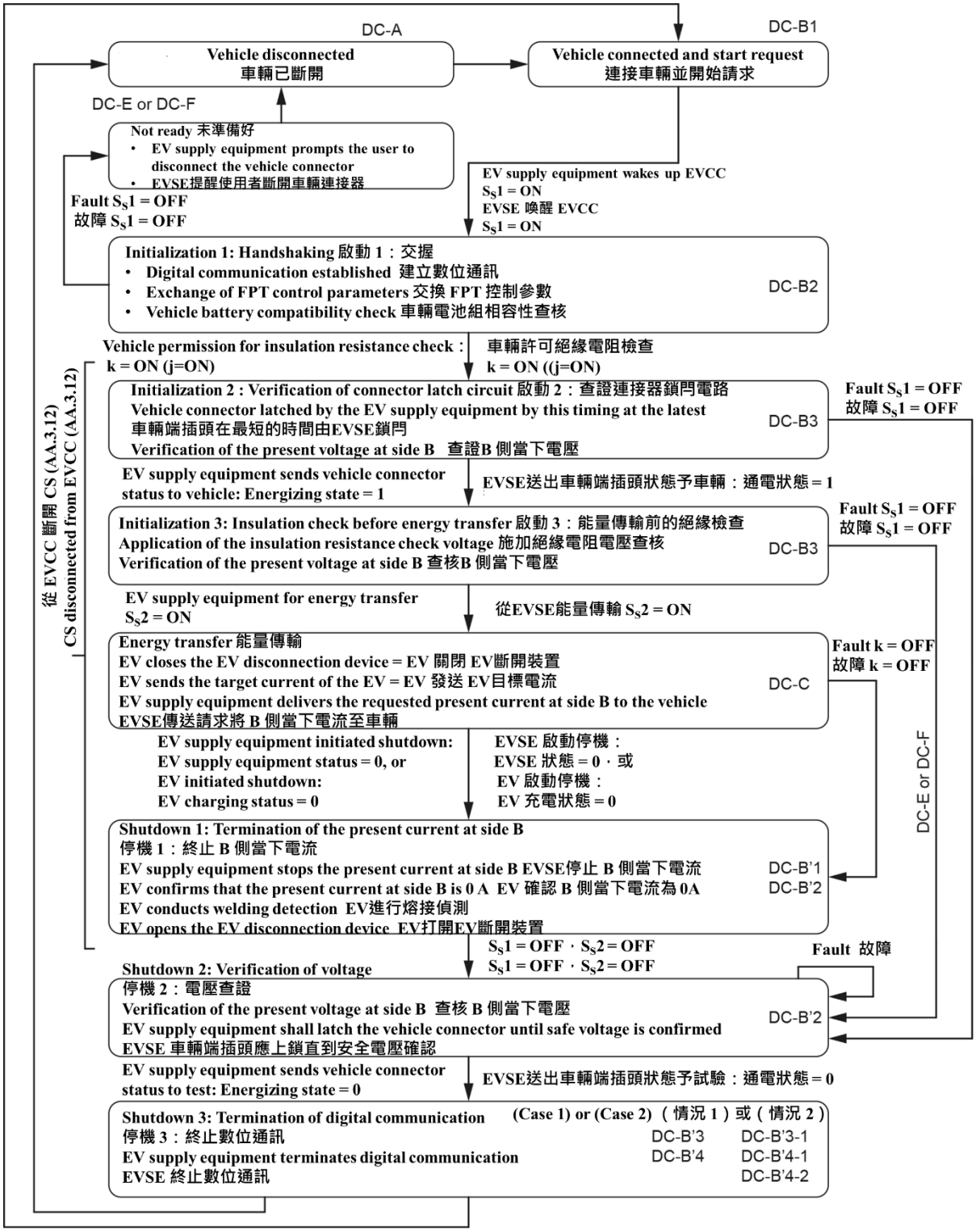
系統 A 之 FPT 程序應符合圖 AA.5 所示之流程圖。

The FPT process of system A shall conform to the flow diagram as shown in Figure AA.5.

圖 AA.6 給正常狀態下之 FPT 控制程序

Figure AA.6 gives the FPT control sequence under normal conditions.


DC-A
DC-B1
Vehicle disconnected
Vehicle connected and start request
DC-E or DC-F
Not ready
• EV supply equipment prompts the user to disconnect the vehicle connector
Fault
$S_S1$ = OFF
EV supply equipment wakes up EVCC
$S_S1$ = ON
Initialization 1: Handshaking
• Digital communication established
• Exchange of FPT control parameters
• Vehicle battery compatibility check
DC-B2
Vehicle permission for insulation resistance check
k = ON (j = ON)
Initialization 2: Verification of conector latch circuit
• Vehicle connector latched by the EV supply equipment by this timing at the latest
• Verification of the present voltage at side B
DC-B3
Fault
$S_S1$ = OFF
EV supply equipment sends vehicle connector status to vehicle: Energizing state = 1
Initialization 3: Insulation check before energy transfer
• Application of the insulation resistance check voltage
• Verification of the present voltage at side B
DC-B3
Fault
$S_S1$ = OFF
EV supply equipment for energy transfer
$S_S2$ = ON
Energy transfer
• EV closes the EV disconnection device
• EV sends the target current of the EV
• EV supply equipment delivers the requested present current at side B to the vehicle
DC-C
Fault
k = OFF
EV supply equipment initiated shutdown:
EV supply equipment status = 0, or
EV initiated shutdown:
EV charging status = 0
Shutdown 1: Termination of the present current at side B
• EV supply equipment stops the present current at side B
• EV confirms that the present current at side B is 0 A
• EV conducts welding detection
• EV opens the EV disconnection device
DC-B'1
DC-B'2
$S_S1$ = OFF, $S_S2$ = OFF
Fault
Shutdown 2: Verification of voltage
• Verification of the present voltage at side B
• EV supply equipment shall latch the vehicle connector until safe voltage is confirmed
DC-B'2
EV supply equipment sends vehicle connector status to test: Energizing state = 0
Shutdown 3: Termination of digital communication
• EV supply equipment terminates digital communication
(Case 1) or (Case 2)
DC-B'3 DC-B'3-1
DC-B'4 DC-B'4-1
DC-B'4-2
CS disconnected from EVCC (AA.3.12)
DC-E or DC-F
IEC

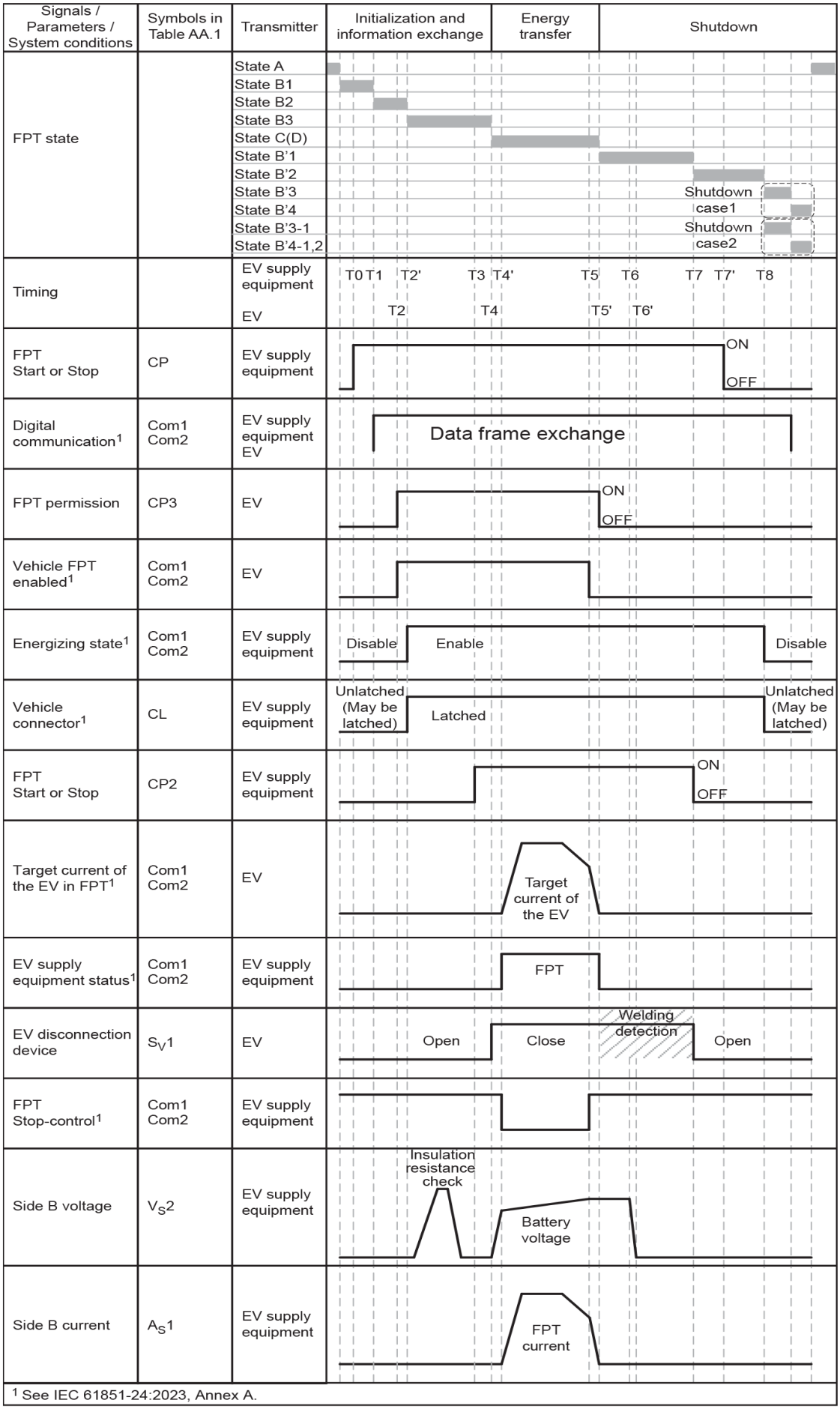



備考：斜體表示通過數位通訊交換之參數，依 IEC 61851-24:2023 附錄 A 之定義。

NOTE Italic means the parameters exchanged via digital communication as defined in IEC 61851-24:2023, Annex A.

圖 AA.5 正向電力傳輸之流程圖

Figure AA.5 – Flow diagram for forward power transfer




1 See IEC 61851-24:2023, Annex A.

IEC

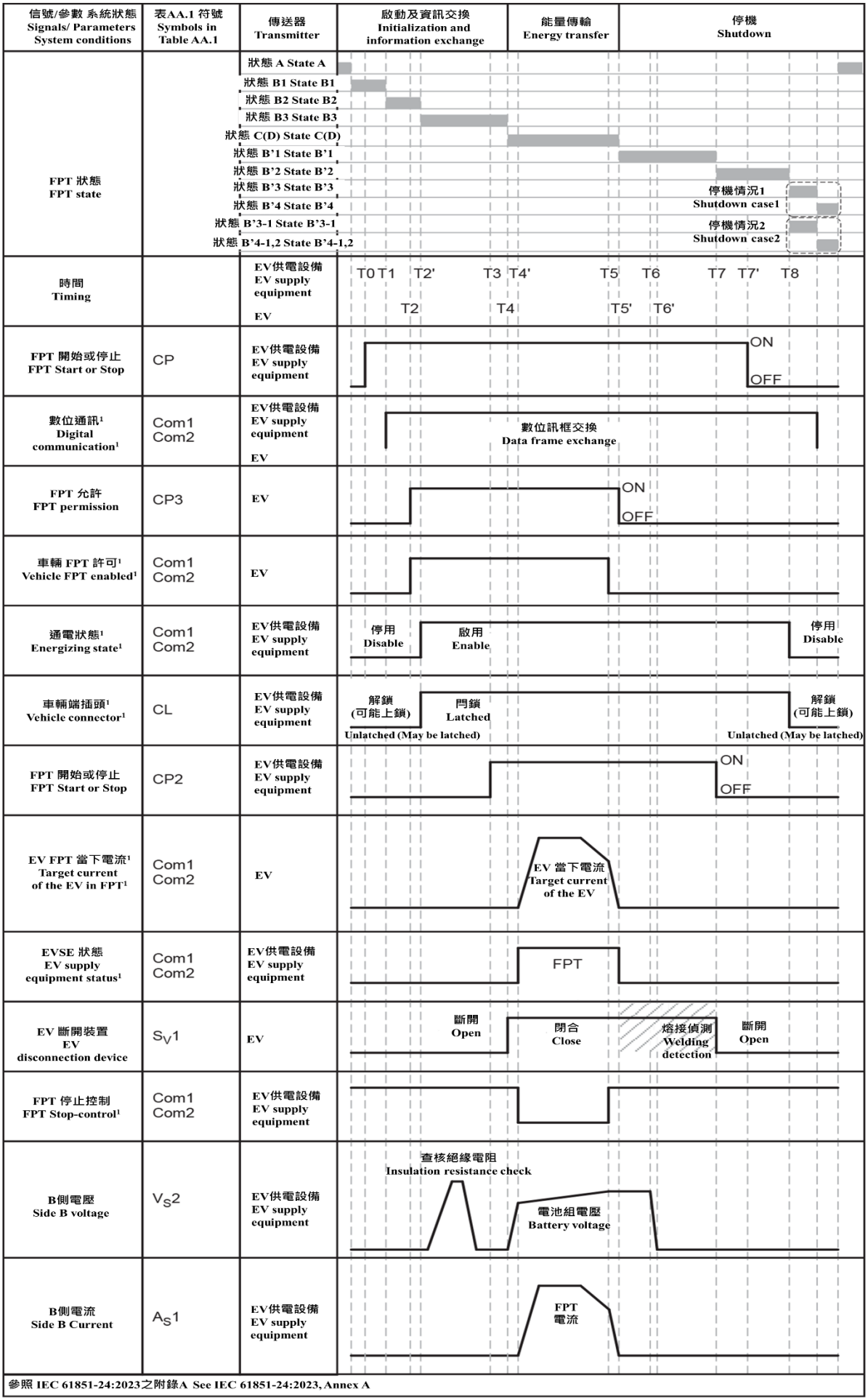

信號/參數 系統狀態 Signals/ Parameters System conditions
表AA.1 符號 Symbols in Table AA.1
傳送器 Transmitter
啟動及資訊交換 Initialization and information exchange
能量傳輸 Energy transfer
停機 Shutdown
FPT 狀態 FPT state
狀態 A State A
狀態 B1 State B1
狀態 B2 State B2
狀態 B3 State B3
狀態 C(D) State C(D)
狀態 B'1 State B'1
狀態 B'2 State B'2
狀態 B'3 State B'3
狀態 B'4 State B'4
狀態 B'3-1 State B'3-1
狀態 B'4-1,2 State B'4-1,2
停機情況1 Shutdown case1
停機情況2 Shutdown case2
時間 Timing
EV供電設備 EV supply equipment
EV
T0 T1 T2' T3 T4' T5 T6 T7 T7' T8
T2 T4 T5' T6'
FPT 開始或停止 FPT Start or Stop
CP
ON
OFF
數位通訊[1] Digital communication[1]
Com1 Com2
數位訊框交換 Data frame exchange
FPT 允許 FPT permission
CP3
車輛 FPT 許可[1] Vehicle FPT enabled[1]
通電狀態[1] Energizing state[1]
停用 Disable
啟用 Enable
車輛端插頭[1] Vehicle connector[1]
CL
解鎖 (可能上鎖) Unlatched (May be latched)
閂鎖 Latched
FPT 開始或停止 FPT Start or Stop
CP2
EV FPT 當下電流[1] Target current of the EV in FPT[1]
EV 當下電流 Target current of the EV
EVSE 狀態 EV supply equipment status[1]
FPT
EV 斷開裝置 EV disconnection device
$S_V1$
斷開 Open
閉合 Close
熔接偵測 Welding detection
FPT 停止控制 FPT Stop-control[1]
B側電壓 Side B voltage
$V_S2$
查核絕緣電阻 Insulation resistance check
電池組電壓 Battery voltage
B側電流 Side B Current
$A_S1$
FPT 電流
參照 IEC 61851-24:2023之附錄A See IEC 61851-24:2023, Annex A

圖 AA.6 正向電力傳輸序列圖

Figure AA.6 – Sequence diagram for forward power transfer

**AA.4.3.2 開始正向電力傳輸 Start of forward power transfer**

系統 A 之 EV 供電設備啟動通訊期間時，SS1 應閉合。開關 SS2 應斷開直到 AA.4.3.3 絕緣電阻查核結束為止。

When the communication session is initiated by system A EV supply equipment, SS1 shall be closed. The switch SS2 shall be open until the end of insulation resistance check in AA.4.3.3.

依試驗負載及 EV 模擬器操作下量測電壓 a)及 b)查核符合性。

針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

Compliance is checked by measuring the voltages a) and b) under the operation with a test load and EV simulator.

Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129.

a) VT4 用於 SS1

a) VT4 for SS1.

b) VT5 用於 SS2

b) VT5 for SS2.

針對此試驗，EV 模擬器應配備圖 AA.1 之 EV 部分的介面電路，且應依圖 132 及圖 120 控制模擬負載及 EV 供電設備。

For this test, the EV simulator shall be equipped with the EV part of the circuit diagram in Figure AA.1, and shall control the test load and the EV supply equipment according to the FPT sequence specified in Figure AA.5 and Figure AA.6. The setup of the test load in Figure 132 is in Table 120.

**AA.4.3.3 電能傳輸前查核絕緣電阻 Insulation resistance check before energy transfer**

絕緣電阻查核時，不得 EV 通過 CP3 向系統 A 之 EV 供電設備提供容許信號及通過數位通訊提供允許參數（如 IEC 61851-24:2023 附錄 A 所示）之前開始。進行絕緣電阻查核前，車輛端插頭閂鎖應由系統 EV 供電設備透過數位通訊通知 EV。

The insulation resistance check shall not start until the EV provides system A EV supply equipment with a permission signal through CP3, and permission parameters by digital communication as shown in IEC 61851-24:2023, Annex A. Before the insulation resistance check, system A EV supply equipment shall inform the EV through digital communication that the vehicle connector is latched.

絕緣查核應依 6.3.1.105 及以下程序執行。

The insulation resistance check shall be performed according to 6.3.1.105 and the following procedure.

(a) 絕緣查核前，EV 供電設備應量測 VS2 及確認 EV 斷開裝置為斷開。VS2 應小於 30Vdc。若 VS2≥ 30 Vdc，EV 供電設備應觸發錯誤停機(參照圖 AA.5)

a) Before the insulation resistance check, the EV supply equipment shall measure VS2 and confirm that the EV disconnection device is open. VS2 shall be < 30 V DC. If VS2 is ≥ 30 V DC, the EV supply equipment shall trigger an error shutdown (see Figure AA.5).

(b) B 側當下電壓應：

EV 供電設備可用最高電壓(H’ 108.1,H108.2)或 EV 目標地壓(H’ 102.1,H’ 102.2)間較低值，若系統 A 之 EV 及 EV 供電設備相容於 IEC 61851-24「高壓控制」(H’ 118.0.2,H’ 110.0.2)及 B 側當下電壓>500Vdc 或

b) The present voltage at side B shall be

– the lower value between the "target voltage of the EV" (H’102.1, H’102.2) or the "available maximum voltage of the EV supply equipment" (H’108.1, H’108.2), if both the system A EV supply equipment and EV are compatible with "high voltage control" (H’118.0.2, H’110.0.2) according to IEC 61851-24, and are compatible with a present voltage at side B > 500 V DC, or

– 500 V DC.

針對上述兩種情況，B 側當下電壓準確度應±5 %，且電壓須在 B 側持續施加 1 秒或更長時間。

For both cases, the accuracy of the present voltage at side B shall be between ±5 % and the voltage shall be continuously applied at side B for 1 s or more.

(c)絕緣電阻查核時，應依 AA.3.1.2 監控 B 側帶電部件(DC+/DC-)及保護導體間的故障。

偵測 B 側帶電部件(DC+/DC-)及保護導體間的故障時，應執行錯誤停機。

c) During the insulation resistance check, the fault between side B live parts (DC+/DC–) and the protective conductor shall be monitored according to AA.3.1.2. When a fault between side B live parts (DC+/DC–) and the protective conductor is detected, an error shutdown shall be performed.

(d)絕緣電阻查核後，應確認 VS2 電壓≤ 30 Vdc。

然後，EV 供電設備應通過斷開 SS2 通知絕緣電阻查核之終止。

d) After the insulation resistance check, it shall be confirmed that the voltage at VS2 is ≤ 30 V DC. Then, the EV supply equipment shall inform the EV of the termination of insulation resistance check by closing SS2.

備考 1：EV 供電設備 B 側之額定最高電壓及絕緣電阻查核電壓能依地方法規而限制較低的電壓。

NOTE 1 The rated maximum voltage of the EV supply equipment at side B and thus the insulation resistance check voltage can be limited to lower voltage by local

regulations.

絕緣電阻查核功能之符合性，應依下列試驗確認：

The compliance of the insulation resistance check function shall be confirmed with the following test.

1) 針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

試驗期間，試驗負載開關 ST17 及 ST18 應保持斷開狀態。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

Switches ST17 and ST18 in the test load shall remain open during the test.

2)DUT 應依表 AA.17 規定之所有試驗情境下查核。

2) The DUT shall be checked under all test scenarios specified in Table AA.17.

表 AA.17 試驗情境

Table AA.17 – Test scenarios

| 試驗情境<br>Test scenarios | 故障電組(RT5 及 RT6)<br>Fault resistances (RT5 and RT6) | 觸發故障開關<br>Switch to trigger the fault |
|---|---|---|
| 情境 1<br>Scenario 1 | 未使用<br>Not used | - |
| 情境 2<br>Scenario 2 | $U^a \times 100$ | ST11 |
| 情境 3<br>Scenario 3 | 足夠低之電阻 b<br>Sufficiently low resistance [b] | ST11 |
| 情境 4<br>Scenario 4 | $U^a \times 100$ | ST13 |
| 情境 5<br>Scenario 5 | 足夠低之電阻 b<br>Sufficiently low resistance [b] | ST13 |
| 註：(a) 依 AA.4.3.3 b。<br>a According to AA.4.3.3 b).<br>(b) 選擇足夠低之電阻以代表 0 Ω絕緣故障，檢查者可針對電阻選擇適當值。<br>b Select sufficiently low resistance to represent 0 Ω insulation fault. The examiner can select the appropriate value for the resistance. | | |

(3) 結果：DUT 應滿足下列要求：

3) The DUT shall satisfy the following requirements.

(a)絕緣電阻查核電壓：絕緣電阻查核電壓應符合情境試驗 1 之 AA.4.3.3(b)。DUT 於電壓達到要求值後，應保持絕緣電阻查核電壓超過 0.2s。

a) Insulation resistance check voltage: Insulation resistance check voltage shall comply with the requirement in AA.4.3.3 b) in test scenario 1. The DUT shall keep the insulation resistance check voltage for more than 0,2 s after the voltage reached the required value.

備考 2：有些 DUT 需要一定期間能達到絕緣電阻查核電壓。

NOTE 2 Some DUT needs a certain time period to reach the insulation resistance check voltage.

(b)絕緣故障之偵測：於情境 2、3、4 及 5，DUT 應於絕緣電阻查核電壓達到要求值後 1s 內判斷絕緣故障

b) Detection of an insulation fault: In the scenarios 2, 3, 4 and 5, the DUT shall judge the insulation fault in 1 s or less after the insulation resistance check voltage reached the required value.

(c)情境 1：DUT 應轉換至下一個充電狀態。

c) For scenario 1, the DUT shall transition to the next FPT state.

(d)情境 2、3、4 及 5：DUT 應執行下列程序。

d) For scenarios 2, 3, 4 and 5, the DUT shall perform the following process.

應經由數位通訊通知 EV(EV 模擬器)之絕緣故障。

DUT 應使用 IEC 61851-24：2023 附錄 A 之數據位元 H’ 109.5(1)

- Notify the EV (EV simulator) the insulation fault by digital communication. The DUT shall use data bit H’109.5.(1) specified in IEC 61851-24:2023, Annex A.

- 於 1s 或更少內降低 B 側當下電壓。

- Reduce the present voltage at side B in 1 s or less.

- 觸發錯誤停機

- Trigger an error shutdown.

**AA.4.3.4 電能傳輸 Energy transfer**

系統 A 之 EV 供電設備應連續監測 EV 要求之目標電流。B 側當下電流應 EV 要求值變更，符合 101.1.2.1 及 101.1.3 之 CCM 要求。B 側當下電流之特性應滿足 AA.5。

System A EV supply equipment shall continuously monitor the target current of the EV. The present current at side B shall be changed to the target current of the EV, according to CCM requirements in 101.1.2.1 and 101.1.3. The characteristics of present current at side B shall meet the requirements in Clause AA.5.

**AA.4.3.5 停機 Shutdown**

**AA.4.3.5.1 正常停機 Normal shutdown**

系統 A 之 EV 供電設備應符合下列正常停機程序：

System A EV supply equipment shall comply with the following procedure for normal shutdown.

(a) 除 EV 及用戶之請求停機之外,若 B 側當下電壓達到或超過 EV 目標電壓+10 Vdc 時，EV 供電設備於 30s 內終止電能傳輸。

a) In addition to the request from the EV and the user-requested shutdown, the EV supply equipment shall terminate energy transfer in 30 s or less after the present voltage at side B becomes more than or equal to the target voltage of the EV + 10 V DC.

(b) EV 供電設備應藉由數位通訊通知 EV 開始停機程序

b) The EV supply equipment shall notify the EV of the start of the shutdown process by digital communication.

(c) EV 供電設備應按表 AA.21 規定之電流下降速度,將 B 側當下電流降低至 ≤ 5 A dc

c) The EV supply equipment shall reduce the present current at side B to ≤ 5 A DC with the current descending speed specified in Table AA.21.

(d) EV 完成 EV 斷開裝置之熔著偵測前，SS1 及 SS2 不得斷開，熔著偵測狀態通過數位通訊顯示。

d) SS1 and SS2 shall not be open until the welding detection of the EV disconnection device by the EV is finished. The status of the welding detection is indicated via digital communication.

(e) SS1 及 SS2 斷開後，應確認 VS2 之電壓 ≤30 V dc。若 VS2 之電壓>30Vdc，EV 供電設備應維持車輛端插頭閂鎖。

e) After SS1 and SS2 open, it shall be confirmed that VS2 is ≤ 30 V DC. The EV supply equipment shall keep the vehicle connector latched, if the voltage at VS2 is > 30 V DC.

B 側當下電壓超過 EV 目標電壓後，EV 供電設備可隨時終止 FPT。

The EV supply equipment may stop FPT any time after the present voltage at side B is more than the target voltage of the EV.

EV 額定最高電壓應大於或等於 EV 目標電壓+10V(加上車輛端插座及電池系統間電壓降)

The rated maximum voltage of the EV should be more than or equal to the target voltage of the EV + 10 V (+ voltage drop between the vehicle inlet and battery system).

表 AA.18 及表 AA.19 規定正常停機時間、行動及準則

Table AA.18 and Table AA.19 define the normal shutdown time, actions and criteria.

表 AA.18 正常停機時間及準則

Table AA.18 – Normal shutdown times and criteria

| 觸發<br>Trigger | 開始正常停機程序之 EV 供電設備響應時間 | 自開始正常停機程序，接近零電流 | 達到車輛端插頭解鎖之最大時間 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | Response time of EV supply equipment to start normal shutdown process | (5A)之最長時間<br>Maximum time to near zero current (5 A) from the start of normal shutdown process | Maximum time to reach connector unlatched |
| EV | 觸發後 ≤ 0.5s<br>≤ 0,5 s from trigger | ≤ 3 s and ΔAS1 ≥ – 100 A/s | ≤ 7,5 s |
| EV 供電設備<br>EV supply equipment | 依 EV 供電設備規定之規格<br>According to the specification given by the EV supply equipment manufacturer | | |

表 AA.19 正常停機之作動及訊息參數

Table AA.19 – Actions and message parameters for normal shutdown

| 步驟<br>Step | EV | | | EV 供電設備<br>EV supply equipment | | |
|---|---|---|---|---|---|---|
| | 動作<br>Action | 訊息參數<br>Message parameter | 準則<br>Criterion | 動作<br>Action | 訊息參數<br>Message parameter | 準則<br>Criterion |
| 1 | 正常停機之請求<br>Request of normal shutdown | H’102.5.0 = 0 或 H’102.5.1 = 1 及 H’102.3 = 0<br><br>H’102.5.0 = 0 or H’102.5.1 = 1 and H’102.3 = 0 | 送出參數至 EV 供電設備<br>Send the parameters to the EV supply equipment | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a |
| 2a | 不適用 | 不適用 | 不適用 | 通知 EV 開 | H’109.5.5 = 0 | 送出參數至 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | n.a | n.a | n.a | 始正常停機<br>Notify the EV of start of normal shutdown | | EV<br>Send the parameter to the EV |
| 3 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | FPT 電流控制<br>FPT current control | 不適用<br>n.a | ≤ 3 s 及 ΔAS1 ≥ –100 A/s<br><br>≤ 3 s and ΔAS1 ≥ –100 A/s |
| 4 | 不適用<br>n.a | 不適用<br>n.a | 不適用 n.a | 通 知 EV<br>Notification to the EV | H’109.5.0 = 1 | 電流下降≤ 5 Adc 時，發送消息至 EV<br>Send the message to the EV when the current drops to ≤ 5 A DC |
| 5 | 熔著偵測<br>Welding detection | H’102.5.3 = 1 | 熔著偵測時間≤ 4 s 結束熔著偵測後，發訊息至 EV 供電設備<br>Welding detection time ≤ 4 s Send the message to the EV supply equipment | 不適用<br>n.a | 不適用<br>n.a | 不適用 n.a |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | after finishing welding detection | | | |
| 6 | 不適用<br>n.a | 不適用<br>n.a | 不適用 n.a | SS1, SS2 = 斷開<br>SS1, SS2 = Open | 不適用<br>n.a | 自≤ 1.5 s 結束步驟 5<br>≤ 1,5 s from the<br>end of step 5 |
| 7 | 不適用<br>n.a | 不適用<br>n.a | 不適用<br>n.a | 電壓去除<br>Voltage removal | 不適用<br>n.a | 自≤ 2 s 及 VS2 ≤ 30 Vdc 結束步驟 6<br>≤ 2 s and VS2<br>≤ 30 V DC from the end of<br>step 6 |
| 8 | 不適用<br>n.a | 不適用<br>n.a | 不適用 n.a | 解鎖或維持閂鎖<br>Unlatched or<br>remain latched | 不適用<br>n.a | 依 EV 供電設備製造商規定<br>Specified by the<br>EV supply equipment<br>manufacturer |
| 註：(a) EV 供電設備觸發正常停機時，停機程序自步驟 2 開始。<br>a When the EV supply equipment triggers normal shutdown, the shutdown process starts from step 2. | | | | | | |

依以下試驗查核符合性。

Compliance is checked by the following test.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 於 OP4 操作。

3) Operate at OP4.

(4) 開始量測 AT1 及 VT8

4) Start measuring AT1 and VT8.

(5) 自 EV 模擬器送出訊息參數(參照表 AA.19)至 EV 供電設備觸發正常停機

5) Send a message parameter, see Table AA.19, from the EV simulator to the EV supply equipment to trigger normal shutdown.

(6) 表 AA.21 規定值查核 B 側當下電流之下降速度

6) Check the descending speed of the present current at side B with the required value specified in Table AA.21.

(7) AT1 下降<5Adc 後，量測 VT4 及 VT5 之電壓，以查核 SS1 及 SS2 是否斷開，直到 EV 模擬器向 EV 供電設備送出 H102.5.3=1 訊息。

7) After AT1 drops to < 5 A DC, measure VT4 and VT5 to check that SS1 and SS2 are not open until the EV simulator sent message ‘H102.5.3=1’ to the EV supply equipment.

(8) ST17 及 ST18 斷開時，EV 模擬器向 EV 供電設備發送 H102.5.3=1 消息。確認 SS1 及 SS2 斷開。

8) Open ST17 and ST18 and send message ‘H102.5.3=1’ from the EV simulator to the EV supply equipment. Confirm that SS1 and SS2 opened.

(9) 查核車輛端插頭是否維持閂鎖直到 VT8< 30 Vdc

9) Check that the vehicle connector remains latched until VT8 is < 30 V DC.

(10) 重複從步驟 1 至步驟 9 試驗，但步驟 5 替換下列內容：將 UT5 更改一個電壓，該電壓大於 EV 目標電壓+10Vdc，但小於 EV 額定最高電壓觸發正常停機。

10) Repeat the test from step 1) to step 9), replacing step 5) with the following. Change UT5 to a voltage more than the target voltage of the EV + 10 V DC but less than the rated maximum voltage of the EV to trigger a normal shutdown.

**AA.4.3.5.2 錯誤停機 Error shutdown**

系統 A 之 EV 供電設備的錯誤停機應符合下列程序

System A EV supply equipment shall comply with the following procedure for error shutdown.

(a) EV 供電設備由數位通訊通知 EV 開始錯誤停機程序

a) The EV supply equipment shall notify the EV of start of an error shutdown process by digital communication.

(b) EV 供電設備應減少 B 側當下電流 ≤ 5 A dc，下降速率依表 AA.21 規定

b) The EV supply equipment shall reduce the present current at side B to ≤ 5 A DC with the current descending speed specified in Table AA.21.

(c)若錯誤停機由 EV 觸發，於 EV 對 EV 斷開裝置之完成熔著偵測前之 SS1 及 SS2 開關不得斷開。

熔著偵測的狀態通過數位通訊進行指示。

c) If the error shutdown is triggered by the EV, SS1 and SS2 shall not open until the welding detection of the EV disconnection device by the EV is finished. The status of welding detection is indicated via digital communication.

(d) 若錯誤停機由 EV 供電設備觸發 SS1 及 SS2 開關，應於(b) 發生後不大於 0.5s 斷開

d) If the error shutdown is triggered by system A EV supply equipment, SS1 and SS2 shall be opened in 0,5 s or less after b).

(e) SS1 及 SS22 斷開後，應確認電壓 Vdc≤ 30 V dc。若電壓 VS2 is > 30 V dc，EV 供電設備應維持車輛端插頭閂鎖。

e) After SS1 and SS2 open, it shall be confirmed that VS2 is ≤ 30 V DC. The EV supply equipment shall keep the vehicle connector latched, if the voltage at VS2 is > 30 V DC.

依以下試驗查核符合性。

Compliance is checked by the following test.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3)於 OP4 操作

3) Operate at OP4.

(4) 參照 AA.7，自 EV 模擬器送出參數至 EV 供電設備以觸發錯誤停機

4) Send a message parameter, see Table AA.7, from the EV simulator to the EV supply equipment to trigger error shutdown.

(5) 量測 AT1 及 VT8 持續

5) Measure AT1 and VT8 continuously.

(6) B 側當下電流之查核電流下降速率 > 200 A/s

6) Check that the current descending speed of the present current at side B is > 200 A/s.

(7) AT1 下降<5Adc 後，等待 4s，然後送出"H102.5.3=1"訊息至 EV 供電設備

7) After AT1 drops to < 5 A DC, wait 4 s, then send the message "H102.5.3=1" to the EV supply equipment.

(8) 斷開 ST17 及 ST18 後，SS1 及 SS2 斷開，

8) Open ST17 and ST18 after SS1 and SS2 are opened.

(9) 查核車輛端插頭維持閂鎖，直到 VT8 < 30V dc。

9) Confirm that the vehicle connector remains latched until VT8 is < 30 V DC.

**AA.4.3.5.3 緊急停機 Emergency shutdown**

偵測到失去電氣連續性 CP3，系統 A 之 EV 供電設備應依以下步驟啟動緊急停機程序。

System A EV supply equipment shall start an emergency shutdown as follows, when detecting the loss of electrical continuity of CP3.

(a) EV 供電設備應 30ms 或小於內減少 B 側當下電流≤ 5 A dc

a) The EV supply equipment shall reduce the present current at side B to ≤ 5 A DC in 30 ms or less.

(b) EV 供電設備使用 CP3 作為緊急停機偵測，開關 SS1 及 SS2 於接收來自 EV 之熔接偵測狀態(旗標=1)前不得斷開。

b) If the EV supply equipment uses CP3 as emergency shutdown detection, SS1 and SS2 shall not open until the status (flag = 1) of the welding detection is received from the EV.

(c) SS1 及 SS2 斷開後，應確認電壓 VS2≤ 30 V dc。若電壓 VS2> 30 V dc，EV 供電設備應維持車輛端插頭閂鎖。

c) After SS1 and SS2 open, it shall be confirmed that VS2 is ≤ 30 V DC. The EV supply equipment shall keep the vehicle connector latched, if the voltage at VS2 is > 30 V DC.

依以下試驗查核符合性。

Compliance is checked by the following test.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

(1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system

under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始通訊期間。

2) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(3) 於 OP4 操作

3) Operate at OP4.

(4) 於 ST5 操作

4) Open ST5.

(5) 量測 AT1 及 VT8 持續

5) Measure AT1 and VT8 continuously.

(6) 從步驟(4)開始查核是否於 30ms 內達到 < 5 A dc

6) Check that AT1 drops to < 5 A DC in 30 ms or less from step 4).

(7) 量測 VT4 及 VT5 以查核 SS1 及 SS2 於 EV 模擬器項 EV 供電設備發送訊息 "H102.5.3=1"前是否未斷開

7) Measure VT4 and VT5 to check that SS1 and SS2 are not open until the EV simulator sent message "H102.5.3=1" to the EV supply equipment.

(8) ST17 及 ST18 斷開後，SS1 及 SS2 斷開

8) Open ST17 and ST18 after SS1 and SS2 are opened.

(9) 查核車輛端插頭維持閂鎖，直到 VT8 < 30V dc。

9) Confirm that the vehicle connector remains latched until VT8 is < 30 V DC.

**AA.4.4 量測 B 側電壓及電流 Measuring current and voltage at side B**

B 側當下電壓及電流應持續監測於 0.5s 內或小於紀錄，包括量測延遲及數位通訊傳送延遲，參照圖 AA.7。

The present voltage and present current at side B shall be continuously monitored and reported in 0,5 s or less including measurement delay and digital communication transmission delay. See Figure AA.7.

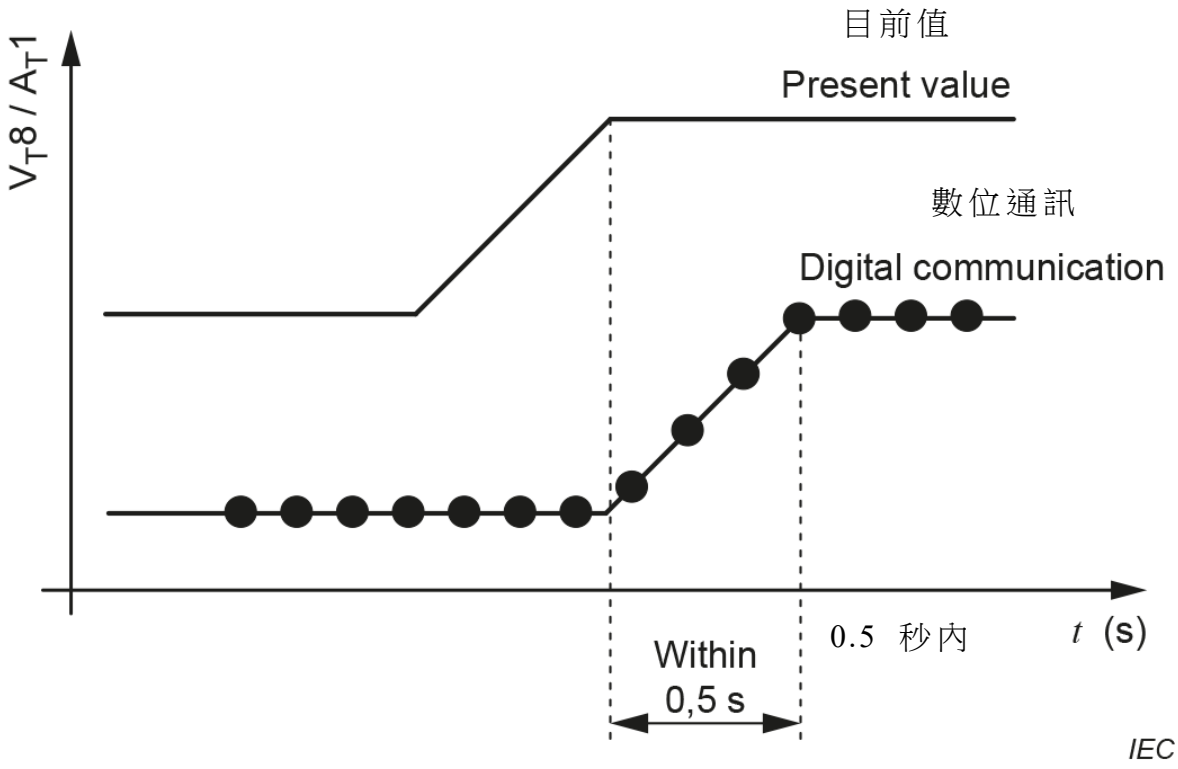



圖 AA.7-系統 A 量測及數位通訊傳輸間延遲表示

Figure AA.7 – Representation of the delay between the measurement and the digital communication transmission for system A

依以下試驗查核符合性。

Compliance is checked by the following tests.

試驗 1：

Test 1:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3)在 OP4 操作。

3) Operate at OP4.

(4) 確認於 OP4 操作後，EV 模擬器應使用表 AA.20 規定之速率要求值變更要求電流，設定目標 EV 到 $I_{EVSE_MAX}$ – 20 Adc

4) After confirming operation at OP4, the EV simulator shall change the target current of the EV to $I_{EVSE_MAX}$ – 20 A DC with the rate of demand value specified in Table AA.20.

(5) 量測 AT1 及數位通訊

5) Measure AT1 and digital communication.

(6) 確認數位通訊延遲 0.5s 或小於

6) Confirm that the digital communication delay is 0,5 s or less.

試驗 2：

Test 2:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) OP1 操作

3) Operate at OP1.

(4)確認於 OP1 操作後，EV 模擬器應使用表 AA.20 規定之速率要求值變更要求電流，設定目標 EV 到 $I_{EVSE_MAX}$ + 20 Adc

4) After confirming operation at OP1, the EV simulator shall change the target current of the EV to IEVSE_MIN + 20 A DC with the rate of demand value specified in Table AA.20.

(5) 量測 AT1 及數位通訊

5) Measure AT1 and digital communication.

(6) 確認數位通訊延遲 0.5s 或小於

6) Confirm that the digital communication delay is 0,5 s or less.

試驗 3：

Test 3:

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2)依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) OP1 操作

3) Operate at OP1.

(4)確認 OP1 操作後，將 EV 目標電壓設置為 VEVSE_MAX

4) After confirming operation at OP1, set the target voltage of the EV to VEVSE_MAX.

(5)量測 VT8 及數位通訊

5) Measure VT8 and digital communication.

(6) 確認數位通訊延遲 0.5s 或小於

6) Confirm that the digital communication delay is 0,5 s or less.

試驗 4：

Test 4:

(1) 針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 在 OP3 操作。

3) Operate at OP3.

(4)確認 OP3 模式操作後，通過數位通訊將 EV 目標電壓設置為 VEVSE_min。

4) After confirming operation at OP3, set the target voltage of the EV to VEVSE_MIN.

(5)量測 VT8 及數位通訊

5) Measure VT8 and digital communication.

(6) 確認數位通訊延遲 0.5s 或小於

6) Confirm that the digital communication delay is 0,5 s or less.

經由系統 A 數位通訊報告之 B 側電流及電壓量測準確度應介於下列數值間：

The accuracy of measure current and voltage at side B measurement reported via digital communication of system A shall be between the following values:

- B 側量測電流：± (B 側當下電流 1.5 % + 1) A
- measured current at side B: ±(1,5 % of the present current at side B + 1) A;
- 量測 B 側電壓≤ 500 V: ±5 V
- measured voltage at side B ≤ 500 V: ±5 V;

量測 B 側電壓> 500 V: ±10 V

- measured voltage at side B > 500 V: ±10 V.

符合性試驗依 6.3.1.102 規定。

Compliance test is specified in 6.3.1.102.

關於 101.1.2.1 定義 B 側當下電流及 EV 目標電流之 B 側量測準確度的更精確定義，參照圖 AA.8。

See Figure AA.8 for a more precise definition of the accuracy of side B measurement with respect to the target current of the EV and the present current at side B defined in 101.1.2.1.

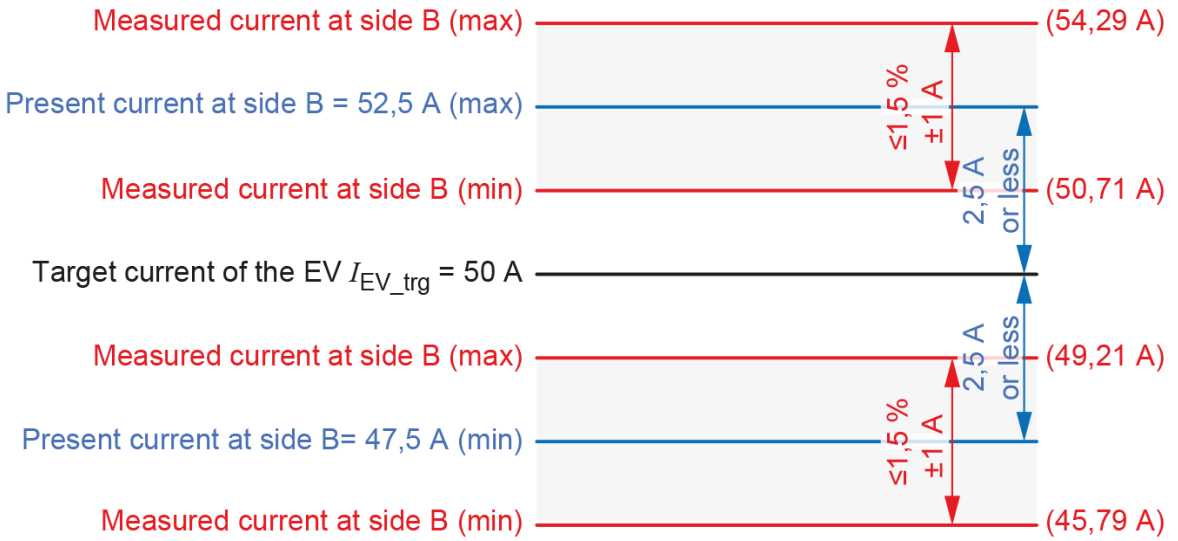





圖 AA.8 量測 B 側電流之允收範圍(EV 目標電流 IEV_trg = 50A)

Figure AA.8 – Acceptable range of the measured current at side B (target current of the EV IEV_trg = 50 A)

**AA.5 充電電流響應之 EV 命令 Response to an EV command on charge current**

系統 A 之 EV 供電設備應以車輛為主及 EV 供電設備為從，使 CCM 供應 B 側當下電流予 EV。

由 EV 目標電流及系統 A 之 EV 供電設備響應性能之規格建議於表 AA.20，且表 AA.12 針對 EV 及表 AA.20 與圖 AA.13 針對系統 A 之 EV 供電設備

System A EV supply equipment shall supply a present current at side B to the EV using CCM with the EV as the master and EV supply equipment as the slave. Recommended specification for the target current of the EV and the response performance of system A EV supply equipment are given in Table AA.20 and Table AA.12 for the EV, and in Table AA.21 and Figure AA.10 for system A EV supply equipment.

備考：表 AA.20 及圖 AA.5 亦適用於 BPT 無縫切換模式下操作之 BPT 的 EV 供電設備 B 側的可用最大電流。

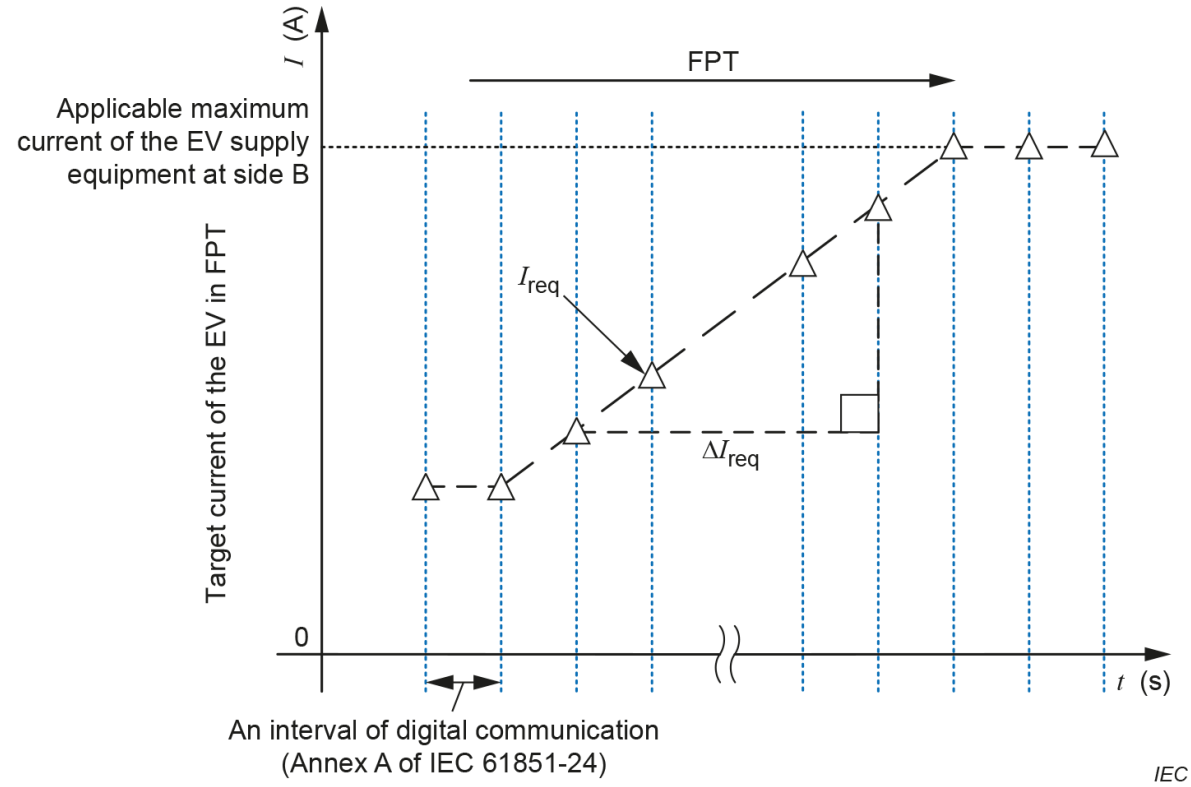
NOTE Table AA.20 and Figure AA.5 also apply to the applicable maximum current of the EV supply equipment at side B in BPT operating under BPT seamless-switchover mode.

表 AA.20 EV 目標電流之建議規格

Table AA.20 – Recommended specification of target current of the EV

| 項目<br>Item | 符號<br>Symbol | 狀態<br>Condition | 規格<br>Specification | | |
|---|---|---|---|---|---|
| | | | 最小<br>Minimum | 最大<br>Maximum | 單位<br>Unit |

| | | | | | |
|---|---|---|---|---|---|
| EV 目標電流範圍<br>Range for the target current of the EV | Ireq | 不適用<br>n.a. | 0 | EV 供電設備之可用最大電流 (IEC 61851-24：2023，附錄 A)<br>Applicable maximum current of the EV supply equipment (IEC 61851-24:2023, Annex A) | A |
| 需求值變化率<br>Rate of demand value change | ΔIreq1 | 不適用<br>n.a. | -20 | 20 | A/s |



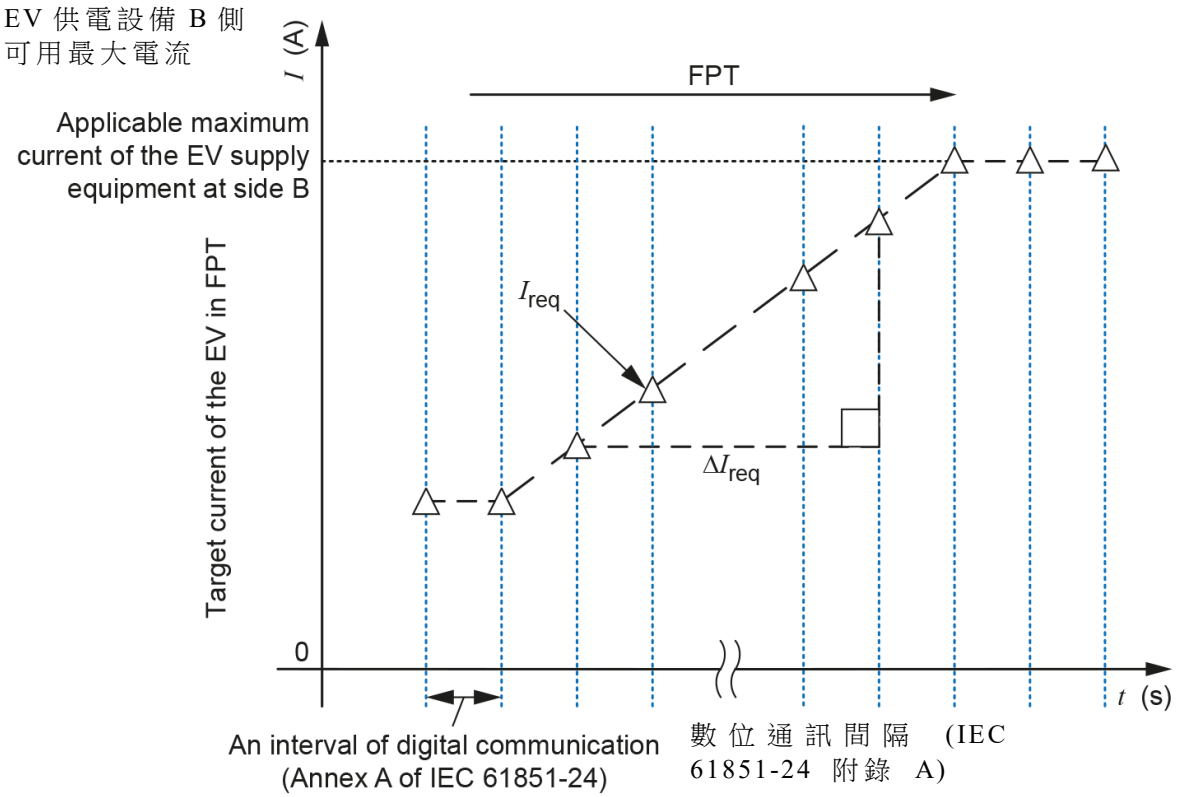




圖 AA.9 EV 要求之充電目標電流

Figure AA.9 – Change in the target current requested by the EV

表 AA.21 EV 供電設備之 B 側性能之要求

Table AA.21 – Requirements for the side B performance of EV supply equipment

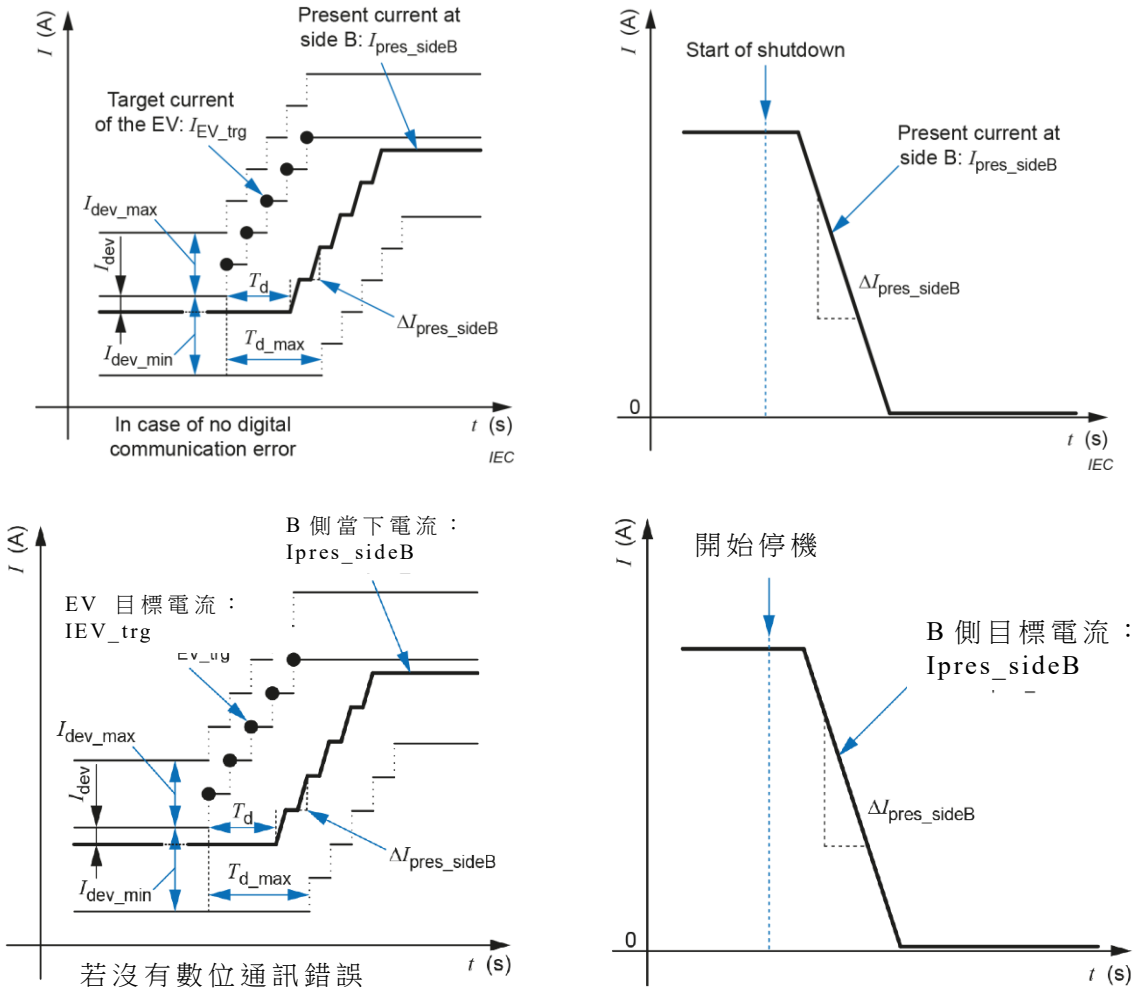
| 項目<br>Item | 符號<br>Symbol | 狀態<br>Condition | | 規格<br>Specification | | |
|---|---|---|---|---|---|---|
| | | | | 最小<br>Minimum | 最大<br>Maximum | 單位<br>unit |
| B 側當下電流之準確度<br>Accuracy of the present current at side B | *I*dev | EV 目標電流<br>Target current of the EV | 0 A 至 5 A<br>0 A to 5 A | 0<br>(Idev_Min) | I + 2,5 A<br>(Idev_Max) | A<br>DC |
| | | | 5 A 至 50 A<br>5 A to 50 A | I – 2,5 A<br>(Idev_Min) | I + 2,5 A<br>(Idev_Max) | |
| | | | 50 A 至 400 A<br>50 A to 400 A | I × 95 %<br>(Idev_Min) | I × 105 %<br>(Idev_Max) | |
| EV 目標電流至控制延遲<br>Control delay to the target current of the EV | Td | 不適用 n.a. | | 不適用<br>n.a. | 1,0<br>(Td _Max) | s |
| B 側當下電流響應速率<br>Present current at side B response speed | Δ<br>Ipres_sideB1 | 電能傳輸期間<br>During energy transfer | | 20 | 不適用<br>n.a. | A/s |
| B 側當下電流下降速率 b<br>Present current at side B descending speed b | Δ<br>Ipres_sideB2 | 正常停機<br>Normal shutdown | | 100 | 200 | |
| | | 錯誤停機<br>Error shutdown | | 200 | 不適用<br>n.a. | |
| | | 緊急停機<br>Emergency shutdown | | 200 a | 不適用<br>n.a. | |

註：[a] 電能傳輸期間若 CP、CP2 或 CP3 斷開，要求較快速終止 B 側當下電流，參照 AA.3.8.2

a In case of disconnection of CP, CP2 or CP3 during energy transfer, faster reduction of the present current at side B is required. See AA.3.8.2.

[b] 降低 B 側當下電流速率要求亦適用於 BPT 之 EV 供電設備。本表之其他所有值不適用於 BPT 之 EV 供電設備。

b The requirement for the present current at side B descending speed also applies to the BPT EV supply equipment. All the other values in this table are not applicable to the BPT EV supply equipment.




a) 電能傳輸　　b) 停機

a) Energy transfer　　b) Shutdown

圖 AA.10 EV 供電設備之 B 側性能

Figure AA.10 – Side B performance of EV supply equipment

## AA.6 雙向電力傳輸(選項)Bidirectional power transfer (optional)

### AA.6.1 一般 General

車輛傳輸到負載(V2L)、車輛傳輸到房子(V2H)及車輛傳輸到電網(V2G)之實現/使

用案例正在研議中

Vehicle-to-load (V2L), vehicle-to-home (V2H) and vehicle-to-grid (V2G) implementations/use cases are under consideration.

備考：下列國家，RPT EV 供電設備要求屬於國家之考量，例如：電動車輛 V2H/L 直流版充放電系統指南所述：日本(JP)

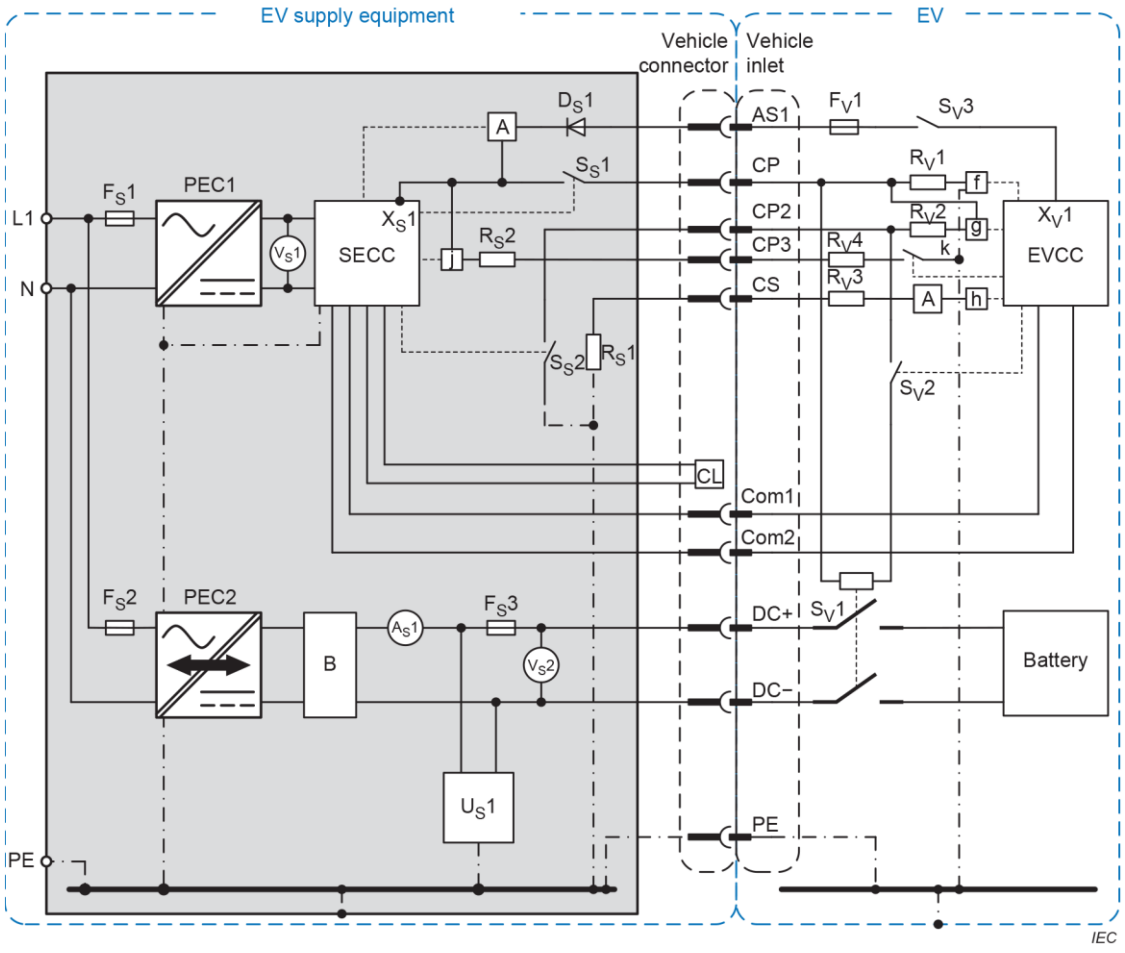
NOTE In the following country, the requirements for RPT EV supply equipment are a matter of national consideration, for example, as described in the Guidelines of charge/discharge system for electric vehicle V2H/L DC

version: JP.

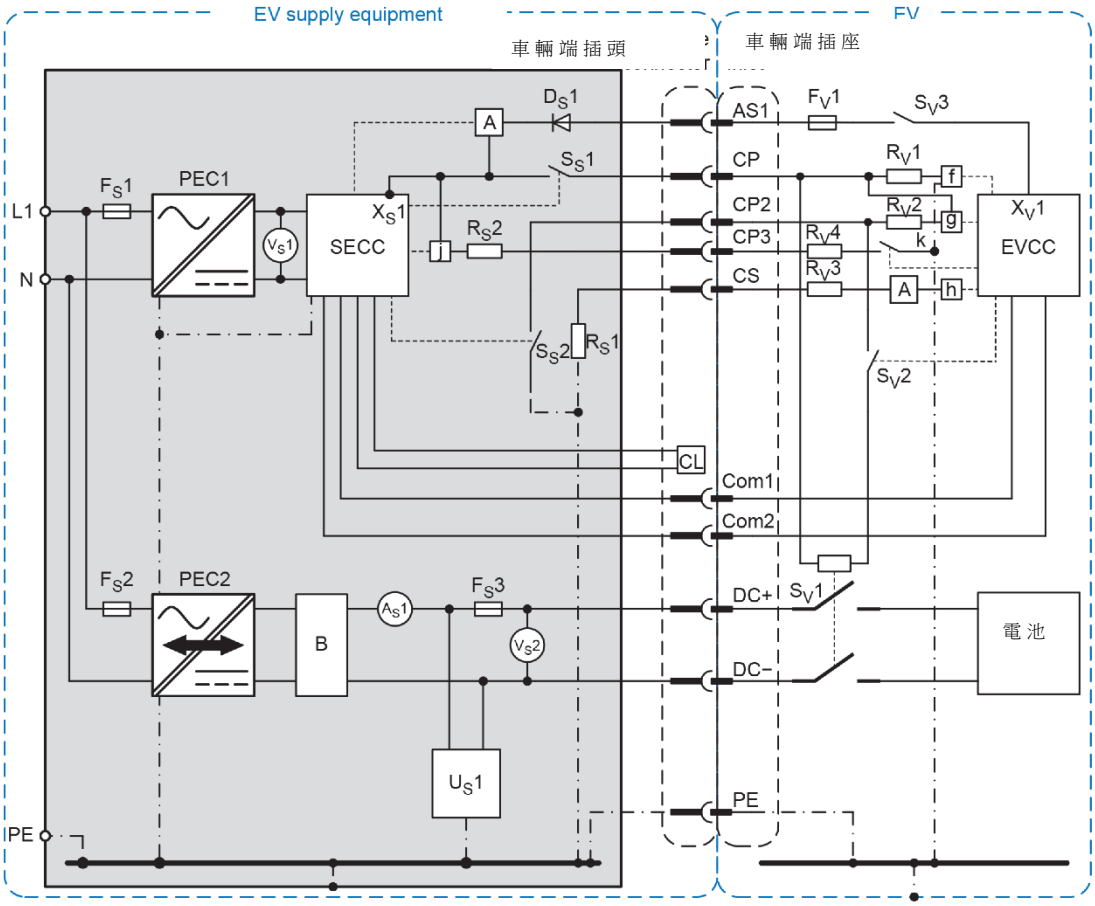
### AA.6.2 電路圖 Circuit diagram

系統 A 之 BPT EV 供電設備範例如圖 AA.11 所示。

An example for a system A BPT EV supply equipment is shown in Figure AA.11.




EV 供電設備　　EV




說明：

Key

| | | | |
|---|---|---|---|
| L1, N | AC 或 DC 電網<br>AC or DCsupply network | DS | EV 供電設備之二極體<br>diode in the EV supply equipment |
| PE | 保護性導體接點<br>protective conductor contact | SS | EV 供電設備之開關或繼電器<br>switch or relay in the EV supply equipment |
| CP, CP2, CP3, CS | 系統 A 之控制導引接觸點<br>control pilot conductor contacts of system A | SV, k | EV 之開關或繼電器<br>switch or relay in the EV |
| Com1, Com2 | 數位通訊導體接觸點<br>digital communication conductor contacts | AS | EV 供電設備之電流表<br>ammeter in the EV supply equipment |
| DC+ | B 側之正極端子<br>positive terminal of | RS | EV 供電設備之電阻<br>resistor in the EV supply |

| | | | |
|---|---|---|---|
| | side B | | equipment |
| DC– | B 側之負極端子<br>negative terminal of side B | RV | EV 之電阻<br>resistor in the EV |
| SECC | 供電設備通訊控制器<br>supply equipment communication controller | US | 漏電流量測裝置<br>earth leakage current measurement device |
| EVCC | EV 通訊控制器<br>electric vehicle communication controller | VS | EV 供電設備之電壓表<br>voltmeter in the EV supply equipment |
| PEC | 電力電子轉換器<br>power electronic converter | FS | 過電流保護裝置<br>over-current protection device |
| f, g, h, j | 光耦合器<br>optocoupler | A | 意外電流防止電路<br>unintentional current flow prevention circuit |
| XV | EV 之電壓源<br>voltage source in the EV | CL | 車輛端插頭鎖閂及閂鎖監測電路<br>vehicle connector lock and latch monitoring circuit |
| XS | EV 供電設備之電壓源<br>voltage source in the EV supply equipment | B | 預充電電路<br>pre-charge circuit |

備考 1：DS1 為參考範例。防止反向電流至輔助電池。

NOTE 1 DS1 is a reference example. It prevents reverse current to the auxiliary battery.

備考 2：AS1 為選項。

NOTE 2 AS1 is optional

圖 AA.11 EV 及 BPT 之 EV 供電設備系統 A 的電路圖

Figure AA.11 – Circuit diagram of a system A BPT EV supply equipment and EV

圖內符號、術語之定義及說明參照表 AA.1

電路圖之參數值參照表 AA.2。

The definition and description of symbols and terms in figures are specified in Table AA.1. The values of the parameters for the circuit diagram are specified in Table AA.2.

**AA.6.3 功能性要求 Functional requirements**

**AA.6.3.1 一般 General**

除 6.3.1.1 規定之功能要求，BPT 之 EV 供電設備應 EV 的 RPT 汲取電流，依 EV(例如：最大可用電流、最大可用電壓)及電網傳達的限制。

In addition to the functional requirements specified in 6.3.1.1, the BPT EV supply equipment shall draw a current from the EV in RPT, according to the limits communicated by the EV (for example, maximum available current, maximum available voltage) and the supply network.

備考：電池系統之最大可用電流參照 IEC 61851-24:2023，表 A.7。

NOTE The maximum available current of the battery system is shown in IEC 61851-24:2023, Table A.7.

EV 及 BPT 之 EV 供電設備應依 EV、用戶或電網之請求實現停用 BPT 的方法。

The BPT EV supply equipment and the EV shall also implement a means to disable BPT according to the requests from the EV, user or the supply network.

關於 BPT 資訊參照附錄 DD。

Additional information for BPT is shown in Annex DD.

下列功能應由 BPT 之 EV 供電設備提供：

The following functions shall be provided by the BPT EV supply equipment:

- BPT 相容性查核
- compatibility check for BPT (AA.6.3.2);
- 通知 BPT 之 EV 供電設備與 RTP 符合性(AA.6.3.2、AA.6.3.3)
- information that the BPT EV supply equipment is compatible with RPT (AA.6.3.2, AA.6.3.3);
- 耦合器閂鎖之特定要求(AA.3.6)
- specific requirements for the latching of the vehicle connector (AA.3.6).

**AA.6.3.2 BPT 之相容性查核 Compatibility check for BPT**

BPT 應由 EV 及 BPT 之 EV 供電設備共同管理。只有在 EV 與 BPT 之 EV 供電設備間相容查核完成後，BPT 才可被啟用。

BPT shall be managed by both the EV and the BPT EV supply equipment. The BPT shall only be activated if the compatibility check between the EV and the BPT EV supply equipment is successfully completed.

**AA.6.3.3 連續不支援反向電力傳輸(RPT)之 EV 的特定要求 Specific requirements for connection with a EV which does not support reverse power transfer (RPT)**

除有其他規定，BPT 之 EV 供電設備應能夠電能傳輸不支援 RPT 之 EV。

Unless otherwise specified, the BPT EV supply equipment shall be capable to provide energy transfer to an EV which does not support RPT.

不具備為不支援 RTP 的 EV 提供電能傳輸的 BPT 之 EV 供電設備，應顯示標籤，

明確標示其不具此功能。

A BPT EV supply equipment which is not capable to provide energy transfer to an EV which does not support RPT should display a written label that clearly indicates the incapability.

備考：AA.6.3.3 不適用於 RPT 之 EV 供電設備或特別設計 RTP 設備，例如：可攜帶式車輛對負載(V2L)設備。

NOTE AA.6.3.3 is not applicable to the RPT EV supply equipment or equipment specifically designed for RPT, for example, a portable vehicle-to-load (V2L) equipment.

**AA.6.3.4 BPT 之預充電以限制突波電流 Pre-charge for BPT to limit the inrush current**

預充電電路應設計確保當 EV 斷路裝置閉合時，突波電流應 ＜20A (參照 AA.3.9)

The pre-charge circuit shall be designed so that the inrush current shall be < 20 A when the EV disconnection device is closed (see AA.3.9).

**AA.6.3.5 EV 輔助電源(選項)Auxiliary power supply from the EV (optional)**

EV 可提供選項功能，EV 供電設備之輔助電力源經由充電連接器的選項針腳或點菸器插座供應。

在此情形下，BPT 之 EV 供電設備可由 EV 供應的輔助電力源啟動(及操作)，且 BPT 之 EV 供電設備應透過圖 AA.7 所示之端子 AS1 汲取。

The EV may provide an optional function in which the auxiliary power to the EV supply equipment is supplied through the optional pin of the vehicle connector. In such cases, the BPT EV supply equipment may be started (and operated) by the auxiliary power supplied from the EV, and the BPT EV supply equipment shall draw the auxiliary power through the terminal AS1 shown in Figure AA.7.

備考：若 BPY 之 EV 供電設備相容於來自 EV 配備之 12V 點菸器電纜組件，則可連接於車輛點菸器插座。

為了連接後啟動 BPT，使用者可能需要將 EV 設置為輔助模式，例如：壓一次電力元按鈕。

NOTE The cigarette lighter socket can be used if the BPT EV supply equipment compatible with the auxiliary power

supply from the EV is equipped with a 12 V cigarette-lighter cable assembly which can be connected to the cigarette lighter socket of the EV. In order to start BPT after the connection, it is possible the user needs to activate the EV in the accessory mode, for example, by pressing the power button once.

若使用操作功能，BPT 之 EV 供電設備應於輔助電源線 AS1 之連接配備意外電流防止電路，參照圖 AA.9 左上部，以防止電能傳輸階段的意外電流流動。

若不滿足要求，BPT 之 EV 供電設備應傳送停機程序。

If the optional function is used, the BPT EV supply equipment shall be equipped with the unintentional current prevention circuit at the connection of the auxiliary power

line AS1, see top left of Figure AA.9, to prevent an unintentional current flow during the energy transfer stage.

If the requirements are not satisfied, the BPT EV supply equipment shall transfer to shutdown stage.

若輔助電源 DC/DC 之 PEC，應於 EV 斷開裝置閉合後 1s 或更長時間內啟動

The DC/DC PEC for auxiliary power supply, if any, shall be activated in 1 s or more after the closure of the EV disconnection device.

依以下試驗查核其符合性：

Compliance is checked by the following test.

(1) 將 BPT 之 EV 供電設備連接至試驗負載，並使用專用 EV 模擬器對系統進行試驗。請參照圖.129

1) Connect the BPT EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129.

(2) 供應 12Vdc 至 AS1

2) Supply 12 V DC to AS1.

(3) 啟動 FPT 或 RPT

3) Start FPT or RPT.

(4) 電流經 B 側時，量測 AT2 之電流

4) Measure AT2 while the current is flowing through the side B circuit.

(5) 確認(3)之 AT2 為零

5) Confirm that AT2 is zero in 3).

(6) 繞過 BPT 之 EV 供電設備的意外電流防止電路(連接電路之輸入及輸出)，以模擬電路故障(功能失效)。

6) Bypass the unintentional current flow prevention circuit for the EV supply equipment (connect input and output of the circuit) in BPT EV supply equipment to simulate malfunction of the circuit.

(7) 確認 BPT 之 EV 供電設備終止電能傳輸並轉換至停機階段

7) Confirm that the BPT EV supply equipment terminates energy transfer and transfers toshutdown stage.

(5)及(6)，可依認證機構及 BPT 之 EV 供電設備製造商間的協議，採用替代之符合性試驗，並考慮到 BPT 之 EV 供電設備之意外電流防止電路配置。

For 5) and 6), an alternative compliance test decided between the certification body and the BPT EV supply equipment manufacturer may be applied with considering the configuration of unintentional current flow prevention circuit for the BPT EV supply equipment.

若電路為 2 極接觸器組成且該電路可用於監測極檢查，則可藉由檢驗是否符合要求。

If the circuit is consisted with 2 pole contactor and operation of that circuit can be

checked with the pole for monitoring, compliance may be checked by the inspection.

**AA.6.3.6 控制電路電源完整性 Control circuit supply integrity**

除 6.3.1.108 外，當補助電路之電壓丟失可能導致 SECC 無法執行預定功能時，應提供確保輔助電路繼續運行的手段，至少應持續運行值到通訊期間結束(BDC-B,4)，例如 AA.6.4.2 之定義。

In addition to 6.3.1.108, where loss of voltage of the auxiliary circuit for the SECC could unable the SECC to perform its intended function, means to ensure continued operation of the auxiliary circuit at least until the termination of the communication session (BDC-B'4) as defined in AA.6.4.2 shall be provided.

備考：BPT 之 EV 供電設備有獨立於電網的操作功能，則可以實現電池支援或控制電路之交流電源等措施。

NOTE If a BPT EV supply equipment has grid-independent operating function, means such as battery backup or an AC power supply for the control circuit can be implemented.

目前正考慮將電池用作輔助電路之電源供應

The use of batteries as a power supply for auxiliary circuits is under consideration.

**AA.6.3.7 車輛端插頭之欠電壓保護 Protection against under-voltage at the vehicle connector**

若車輛端插頭之電壓降至 EV 送出的最低限制值，BPT 之 EV 供電設備應執行錯誤停機並斷開 B 側連接，以防止電池系統欠電壓。

The BPT EV supply equipment shall perform an error shutdown and disconnect side B to prevent under-voltage at the battery system, if the voltage at the vehicle connector drops to a value less than the minimum limit sent by the EV.

依以下試驗查核其符合性

Compliance is checked by the following test.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 AA.22。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table AA.22.

表 AA.22 於車輛端插頭欠電壓保護之試驗負載設定

Table AA.22 – Setup of test load for protection against under-voltage at the vehicle connector

| 開關 Switches | | | | | 電路參數設定 Circuit parameter setup |
|---|---|---|---|---|---|
| ST17,ST18 | ST19 | ST20 | ST21 | ST22 | |

| | | | | | |
|---|---|---|---|---|---|
| 閉合<br>Close | 閉合<br>Close | 閉合<br>Close | 斷開<br>Open | 斷開<br>Open | LT: 0 H<br>RT10: 0 Ω (bypassed) ( 略過 bypassed)<br>UT4: 未使用 Not used<br>UT5: 定電壓模式下應使用操作電源。<br><br>LT: 0 H<br>RT10: 0 Ω (bypassed)<br>UT4: Not used<br>UT5: A power supply operating under constant voltage mode shall be used |

(2) 量測 AT1 及 VT8 持續

2) Measure AT1 and VT8 continuously.

(3) BPT 之 EV 供電設備製造商規定程序開始 RPT

3) Start RPT with the procedure specified by the BPT EV supply equipment manufacturer.

(4) 使用 EV 模擬器，經由數位通訊傳送下列數據或訊息至 BPT 之 EV 供電設備

4) Using the EV simulator, communicate the following data or message to the BPT EV supply equipment via digital communication.

-最低電池電壓：250 Vdc

– Minimum battery voltage: 250 V DC

-RPT 最大可用電流：BPT 之 EV 供電設備的最大操作電流。

– Maximum available current for RPT: maximum operating current of BPT EV supply equipment.

(5) 確認 VT8 於額定電壓下通過，且 BPT 之 EV 供電設備指定電壓及電流操作。

5) Confirm that VT8 is energized at the rated voltage and the BPT EV supply equipment is operating at the designated voltage and current.

(6) 如下列模擬車輛端插頭之欠電壓並查核其結果

6) Simulate under-voltage at the vehicle connector as follows and check the results.

–設定 UT5 為電壓低於最低電池電壓

- Set UT5 to a voltage less than the minimum battery voltage.

– 查核準則：參照表 AA.5

- Verification criterion: see Table AA.5.

(7) 查核 BPT 之 EV 供電設備是否終止 RPT 並轉移至停機接斷、若有顯示相關警報或錯誤信息

7) Check that the BPT EV supply equipment terminates RPT and transfers to shutdown stage, displaying a relevant alarm or error information, if any.

### AA.6.4 雙向電力傳輸控制程序 Bidirectional power transfer control process

#### AA.6.4.1 雙向電力傳輸狀態 Bidirectional power transfer states

表 AA.23 定義 BPT 之 EV 供電設備狀態。BPT 狀態顯示 BPT 之 EV 供電設備物理狀態。

Table AA.23 defines the BPT states of the BPT EV supply equipment. The BPT states show physical status of the BPT EV supply equipment.

BPT 之 EV 供電設備及 EV 可通過訊號通訊及數位通訊交換狀態。

The BPT EV supply equipment and the EV can exchange their state through the signal communication and the digital communication.

表 AA.23 EV 供電設備之 BPT 狀態

Table AA.23 – BPT states of BPT EV supply equipment

| 狀態<br>State | | EV 連接<br>EV connected | EV 斷開裝置<br>EV disconnection device | 可以進行 BPT<br>BPT possible | 說明<br>Description |
|---|---|---|---|---|---|
| BDC-A | 未連結<br>Un-mated | 否 No | 斷開<br>Open | 否 No | EV 未連結<br>EV un-mated |
| BDC-B1 | 初始化<br>Initialization | 是 Yes | 斷開<br>Open | 是 No | EV 連接/未準備 FPT 或 RPT/通訊未建立/車輛端插頭解鎖或閂鎖/EV 斷開裝置之斷開<br>EV connected / not ready for FPT or RPT / communication not established / connector unlatched or |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | latched / EV disconnection device open |
| BDC-B2 | | 是 Yes | 斷 開 Open | 否 No | EV 連接/未準備 FPT 或 RPT/通訊未建立/車輛端插頭解鎖或閂鎖/EV 斷開裝置之斷開 EV connected / not ready for FPT or RPT / communication established / connector unlatched or latched / EV disconnection device open |
| BDC-B3 | | 是 Yes | 斷 開 Open | 否 No | EV 連接/未準備 FPT 或 RPT/通訊未建立/車輛端插頭閂鎖/EV 斷開裝置之斷開/其他輔助程序未完成 EV connected / not ready for FPT or RPT / communication established / connector latched / EV disconnection device open / other supplemental processes not completed |
| BDC-C | Energy transfer | 是 Yes | 閉合 Close | 是 Yes | EV 連接/未準備 FPT 或 RPT/通訊未建立/車輛端插頭閂鎖/EV 斷開裝置之斷開/其他輔助程序未完成 EV connected / ready for FPT or RPT / communication established / |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | connector latched / EV disconnection device close / other supplemental processes completed |
| BDC-D | | 是 Yes | Close | 是 Yes | EV 連接/未準備 FPT 或 RPT/EV 斷開裝置之斷開/其他輔助程序未完成<br>EV connected / ready for FPT or RPT / indoor ventilation required / communication established / connector latched / EV disconnection device close / other supplemental processes completed |
| BDC-B'1 | 停機<br>Shutdown | 是 Yes | 閉合<br>Close | 是 Yes | EV 連接/FPT 或 RPT 完成/保持通訊/車輛端插頭閂鎖/EV 斷開裝置之閉合<br>EV connected / FPT or RPT finished / communication maintained / connector latched / EV disconnection device close |
| BDC-B'2 | | 是 Yes | 斷開<br>Open | 否 No | EV 連接/FPR 或 RPT 完成/保持通訊/車輛端插頭閂鎖/EV 斷開裝置之斷開/其他輔助程序完成<br>EV connected / FPT or RPT finished / communication |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | maintained / connector latched / EV disconnection device open / other supplemental processes completed |
| BDC-B'3 | | 是 Yes | 斷開 Open | 否 No | EV 連接/FPT 或 RPT 完成/保持通訊/車輛端插頭解鎖或閂鎖/EV 斷開裝置之斷開<br>EV connected / FPT or RPT finished / communication maintained / connector unlatched or latched / EV disconnection device open |
| BDC-B'4 | | 是 Yes | 斷開 Open | 否 No | EV 連接/FPT 或 RPT 完成/保持通訊/車輛端插頭解鎖或閂鎖/EV 斷開裝置之斷開<br>EV connected / FPT or RPT finished / communication finished / connector unlatched or latched / EV disconnection device open |
| BDC-E | 錯誤 Error | 是 Yes | 斷開 Open | 否 No | BPT 之 EV 供電設備自 EV 未連接/BPT 之 EV 供電設備自電網斷開/BPT 之 EV 供電設備失去電網或控制導引及保護導體間發生短路<br>BPT EV supply equipment un-mated |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | from the EV / BPT EV supply equipment disconnected from the supply network, BPT EV supply equipment loss of supply network power or a short-circuit between the control pilot and the protective conductor |
| BDC-F | 功能失效<br>Malfunction | 是 Yes | 斷 開<br>Open | 否 No | 其他 BPT 之 EV 供電設備問題<br>Other BPT EV supply equipment problem |
| 備考：控制導引功能可使用 IEC 61851-1 敘述之 PWM 控制導引或任一提供相同結果的其他系統達成。<br>NOTE The control pilot functions can be achieved using PWM pilot control as described in IEC 61851-1 or any other system that provides the same results. | | | | | |

**AA.6.4.2 雙向電力傳輸控制程序及狀態 Bidirectional power transfer control process and state**

表 AA.24 BPT 之 EV 供電設備的 BPT 控制程序 FPT 控制程序參照 AA.4.1

Table AA.24 defines the BPT control process of the BPT EV supply equipment. For FPT control process, see AA.4.1.

表 AA.24 BPT 之 EV 供電設備的 BPT 控制程序

Table AA.24 – BPT control process of BPT EV supply equipment

| BPT 控制階段(程序)<br>BPT control stage (process) | | 狀態<br>State | 高位準作動 a<br>High level action a |
|---|---|---|---|
| 初始化<br>Initialization | 交握<br>Handshaking | BDC-A | EV 未連結<br>EV un-mated |
| | | BDC-B1 | 車輛端插頭配對<br>Vehicle connector mated |
| | | BDC-B1 | 喚醒 EVCC 及 SECC<br>Wake up of the SECC and EVCC |
| | | BDC-B1 | 通訊啟動 |

| | | | |
|---|---|---|---|
| | | | Communication setup |
| | | BDC-B1→<br>BDC-B2 | 建立通訊、參數交換及相容性查核已完成<br>Communication established, parameters exchanged, and compatibility check successfully completed |
| | 準備電能傳輸<br>Energy transfer preparation | BDC-B2→<br>BDC-B3 | 車輛端插頭閂鎖<br>Vehicle connector latched |
| | | BDC-B3 | DC 電力線之絕緣電阻查核<br>Insulation resistance check for DC power line |
| 電能傳輸<br>Energy transfer | | BDC-C or<br>BDC-D | EV 斷開裝置之閉合<br>EVdisconnection device closed |
| | | BDC-C or<br>BDC-D | 預充電<br>Pre-charge |
| | | BDC-C or<br>BDC-D | 依電流需求 FPT(CCM)或電池之最大可用電流 RPT(針對 MCC，參照 AA.6.4.3)<br>FPT by current demand (CCM) or RPT by the maximum available current of the battery system (for MCC, see AA.6.4.3) |
| | | BDC-C or<br>BDC-D | 依電壓需求 FPT(CVM)<br>FPT by voltage demand (CVM) |
| | | BDC-C or<br>BDC-D →<br>BDCB’ 1 | 電流抑制<br>Current suppression |
| | | BDC-C or<br>BDC-D | 再協商參數限制值(選項)<br>Renegotiate parameter limits (optional) |
| 停機<br>Shutdown | | BDC-B’1 | 確認零電流<br>Zero current confirmed |
| | | BDC-B’ 1<br>→BDC- | 熔著偵測(由 EV,選項)<br>Welding detection (by the EV, optional) |

| | | |
|---|---|---|
| | B’ 2 | |
| | BDC-B’2 | EV 斷開裝置斷開<br>EV disconnection device open |
| | BDC-B’2 | B 側電壓查證<br>Side B voltage verification |
| | BDC-B’3 | 車輛端插頭可解鎖<br>Vehicle connector may be unlatched |
| | BDC-B’4 | FPT/RPT 通訊等級結束<br>End of FPT/RPT at communication level |
| | BDC-A | 車輛端插座未連接<br>Vehicle connector unmated |
| 備考：(a)作動次序不依 BPT 控制過程之程序<br>a The order of actions does not refer to the procedure of BPT control process. | | |

**AA.6.4.3 反向電力傳輸期間之電流控制 Current control during reverse power transfer**

在此過程中，EV 持續送出 RPT 電流之最大可用電流值或 BPT 之 EV 供電設備經由 RPT 程序之最低容許電壓值。

應使用下列算法。

In this process, the EV continues to send the maximum available current value of RPT current or the minimum allowable voltage to the BPT EV supply equipment throughout the RPT process.

The following algorithms should be used.

MCC (最大電流控制)

MCC (maximum current control)

— 在 EV 限制及電網需求下，BPT 之 EV 供電設備可使用 MCC 調節汲取的電流。

– The BPT EV supply equipment can regulate the drawn current using MCC under both EV constraints and supply network needs.

-在整個放電控制程序中， DC EV 充電/放電站宜接收車輛傳送之最大可用電流值 (最大限制值)。

– The BPT EV supply equipment should receive the maximum available current value the EV communicated (the maximum limit), throughout the RPT control process.

– BPT 之 EV 供電設備應依電網要求設定控制目標，並調節 RPT 電流於不大於

最大限制值。

– The BPT EV supply equipment should set the control target based on the supply network requirements and regulate the RPT current to less than or equal to the maximum limit.

–若最大限制值下降低於電網要求，BPT 之 EV 供電設備應調節響應至最大限制值之 RPT 電流

– The BPT EV supply equipment should regulate the RPT current responding to the change of the maximum limit of the EV, if the maximum limit drops to a value less than the supply network requirement.

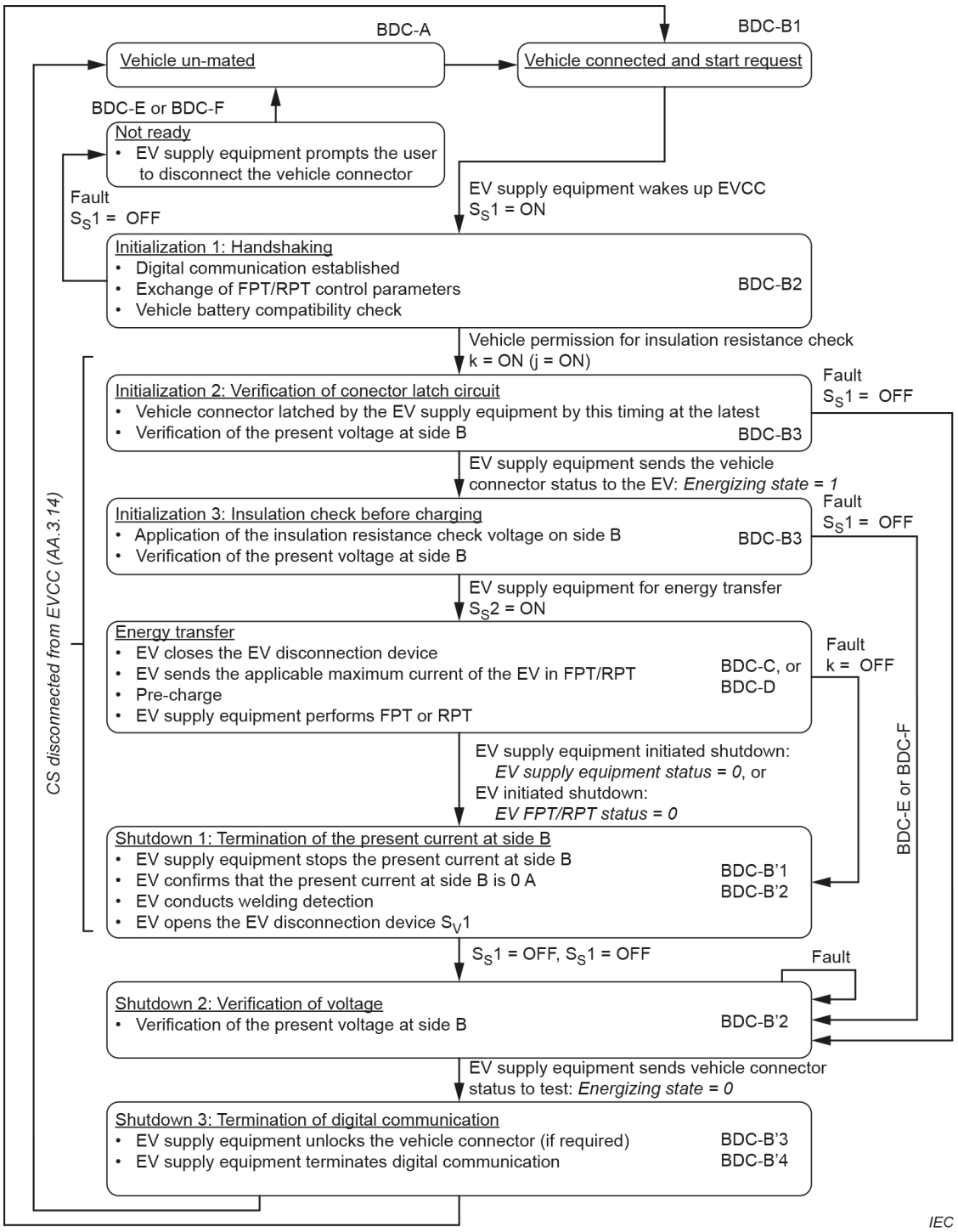
**AA.6.4.4 雙向電力傳輸流程圖 Bidirectional power transfer flow diagram**

系統 A 之 BPT 程序流程圖應符合 AA.12，圖 AA.13 規定正常條件 BPT 之時序圖

The BPT process of system A shall conform to the flow diagram as shown in Figure AA.12.

圖 AA.13 規定正常條件 BPT 之時序圖

Figure AA.13 gives the BPT sequence diagram under normal conditions.




| 以下表格依 Figure AA.12 所列 |
|---|
| 車輛未連接<br>Vehicle un-mated |
| 連接車輛並開始請求<br>Vehicle connected and start request |
| 未準備好<br>Not ready<br>EV 供電設備提醒使用者斷開車輛端插頭<br>EV supply equipment prompts the user to disconnect the vehicle |

| |
|---|
| connector |
| 故障 SS1 = OFF<br>Fault SS1 = OFF |
| EV 供電設備喚醒 EVCC<br>SS1 = ON<br>EV supply equipment wakes up EVCC<br>SS1 = ON |
| 初始化 1：交握 Initialization 1: Handshaking<br>建立數位通訊 Digital communication established<br>交換 FPT/RPT 控制參數 Exchange of FPT/RPT control parameters<br>車輛電池組相容性查核 Vehicle battery compatibility check |
| Vehicle permission for insulation resistance check<br>k = ON (j=ON) |
| 車輛許可絕緣電阻檢查<br>k = ON ((j=ON) |
| 初始化 2：查證連接器鎖閂電路 Initialization 2: Verification of conector latch circuit<br>車輛端插頭在最短的時間由 EV 供電設備鎖閂<br>Vehicle connector latched by the EV supply equipment by this timing at the latest<br>查證 B 側當下電壓 Verification of the present voltage at side B |
| 故障 SS1 = OFF<br>Fault SS1 = OFF |
| EVSE 送出車輛端插頭狀態予 EV：通電狀態 = 1<br>EV supply equipment sends the vehicle<br>connector status to the EV: Energizing state = 1 |
| 初始化 3：充電前的絕緣檢查 Initialization 3: Insulation check before charging<br>B 側施加絕緣電阻電壓查核<br>Application of the insulation resistance check voltage on side B<br>查核 B 側當下電壓 Verification of the present voltage at side B |
| 故障 SS1 = OFF<br>Fault SS1 = OFF |
| 從 EV 供電設備電能傳輸 SS2 = ON<br>EV supply equipment for energy transfer<br>SS2 = ON |
| Energy transfer 電能傳輸<br>EV closes the EV disconnection device EV 關閉 EV 斷開裝置<br>EV 於 FPT/RPT 發送 EV 可用最大電流<br>EV sends the applicable maximum current of the EV in FPT/RPT<br>Pre-charge 預充電<br>EV supply equipment performs FPT or RPT EVSE 執行 FPT 或 RPT |
| Fault k = OFF<br>故障 k = OFF |
| EV supply equipment initiated shutdown: |

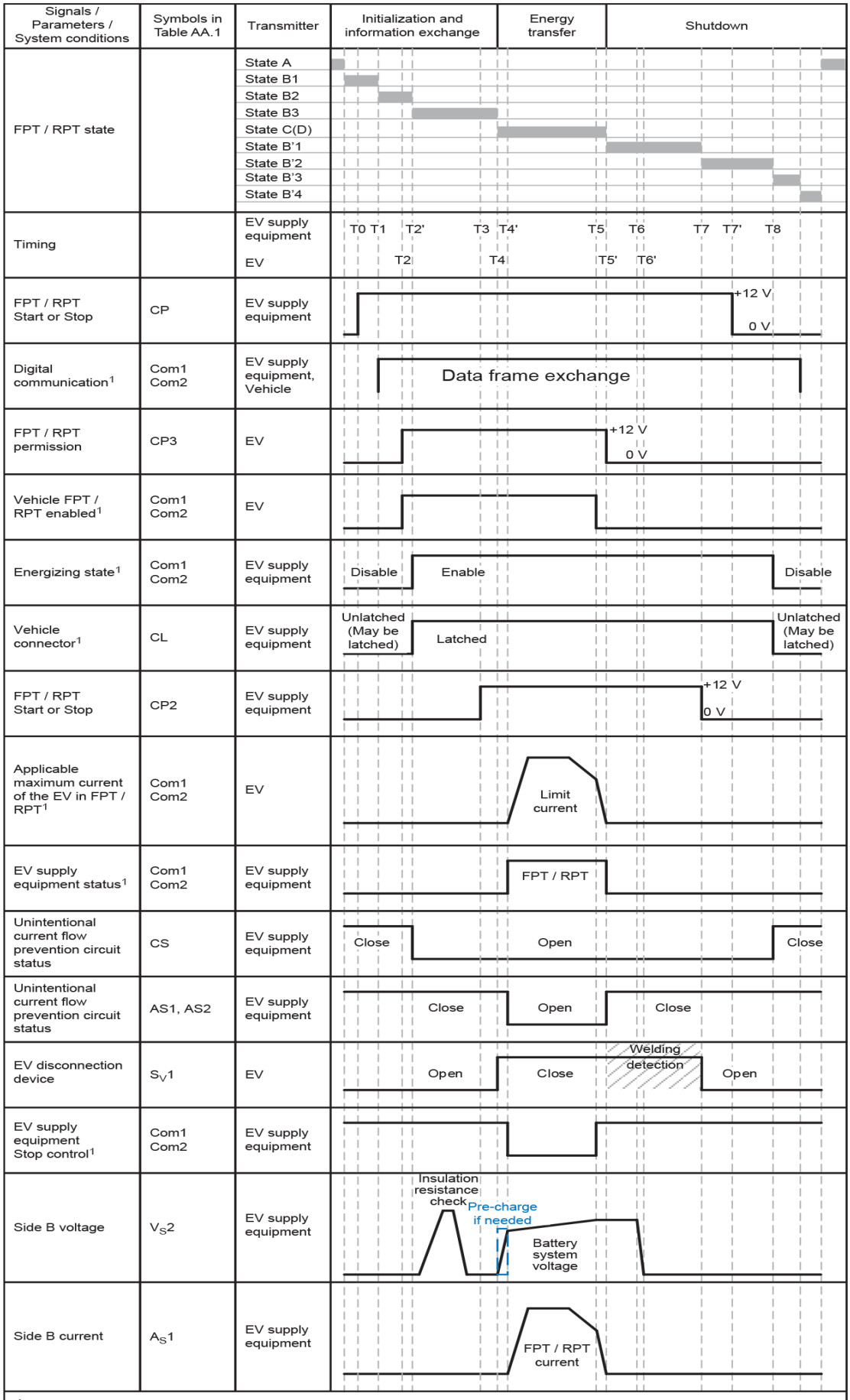
| |
|---|
| EV 供電設備啟動停機：<br>EV supply equipment status = 0, or<br>EVSE 狀態 = 0，或<br>EV initiated shutdown:<br>EV 啟動停機：<br>EV FPT/RPT status = 0<br>EV FPT/RPT 狀態 = 0 |
| Shutdown 1: Termination of the present current at side B<br>停機 1：終止 B 側當下電流<br>EV supply equipment stops the present current at side B<br>EVSE 停止 B 側當下電流<br>EV confirms that the present current at side B is 0 A<br>EV 確認 B 側當下電流為 0A<br>EV conducts welding detection EV 進行熔接偵測<br>EV opens the EV disconnection device<br>SV1 EV 斷開 EV 斷開裝置 SV1 |
| SS1 = OFF，SS1 = OFF<br>SS1 = OFF，SS1 = OFF |
| Fault 故障 |
| Shutdown 2: Verification of voltage 停機 2：電壓查證<br>Verification of the present voltage at side B 查核 B 側當下電壓 |
| EVSE 送出車輛端插頭狀態予試驗：通電狀態 = 0<br>EV supply equipment sends vehicle connector status to test: Energizing state = 0 |
| Shutdown 3: Termination of digital communication<br>停機 3：終止數位通訊<br>EV supply equipment unlocks the vehicle connector (if required)<br>EV 供電設備解鎖車輛端插頭(若需要)<br>EV supply equipment terminates digital communication EVSE<br>終止數位通訊 |

備考：依 IEC 61851-24:2023 附錄 A 定義，參數交換經由數位通訊

NOTE Italic means the parameters exchanged via digital communication as defined in IEC 61851-24:2023,Annex A.

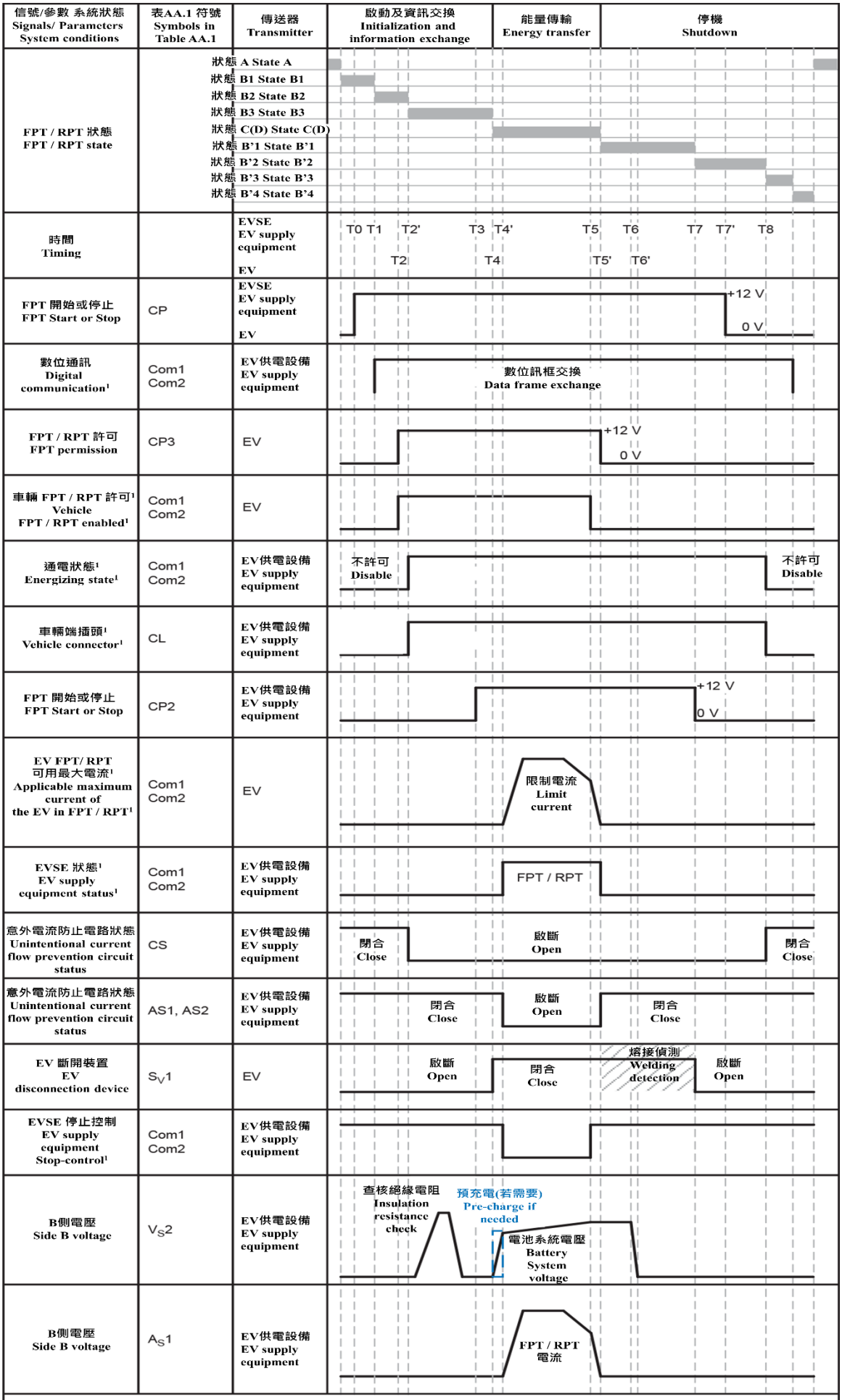
圖 AA.12 雙向電力傳輸之流程圖

Figure AA.12 – Flow diagram for bidirectional power transfer




[1] See IEC 61851-24:2023, Annex A. The EV supply equipment may keep the lock throughout the process as indicated **by the dotted line.**

*IEC*




[1]參照 IEC 61851-24:2023,附錄A See IEC 61851-24:2023, Annex A. EVSE可於整個過程保持鎖住，如虛線所示。The EV supply equipment may keep the lock throughout the process as indicated by the dotted line.

圖 AA.13 雙向電力傳輸之時序圖

Figure AA.13 – Sequence diagram for bidirectional power transfer

## AA.7 選項功能 Optional functions

### AA.7.1 一般 General

EV 供電設備可有些可選功能：通訊會議之動態控制可用最大電流的 EV 供電設備 B 側動態控制傳送至 EV

The EV supply equipment may have some optional functions, for example, dynamic control in which the applicable maximum current of the EV supply equipment at side B communicated to an EV is dynamically controlled during the communication session.

### AA.7.2 相容性查核 Compatibility check

EV 供電設備於初始化 1 之 FPT 狀態應滿足下列要求：

The EV supply equipment shall satisfy the following requirements in the FPT state of initialization 1:

-通知 EV 該站與 IEC 61851-24:2023 附錄 A 規定之每個可選功能相容

– notify the EV that the EV supply equipment is compatible with each optional function as defined in IEC 61851-24:2023, Annex A;

-查核 EV 是否與每一可選功能相容。

– check that the EV is compatible with each optional function.

僅當 EV 供電設備及 EV 可選功能相容時，才能執行每一可選功能。

Each optional function shall be performed only if both the EV supply equipment and the EV are compatible with the optional function.

### AA.7.3 動態控制 Dynamic control

正常操作下，EV 供電設備電能傳輸階段應滿足下列要求：

The EV supply equipment shall satisfy the following requirements in the energy transfer stage under normal operation:

-IEC 61851-24:2023 附錄 A 規定可用最大電流、數位訊息參數更改為速率限制±20 A/s 內規定值。

– change the applicable maximum current of the EV supply equipment at side B, digital message parameter defined in IEC 61581-24:2023, Annex A, to a designated value between the rate limit ±20 A/s;

-於變更 EV 供電設備 B 側之可用最大電流時，不會偵測到與動態控制相關的任一錯誤。

– not detect any errors associated with the dynamic control during changing the applicable maximum current of the EV supply equipment at side B.

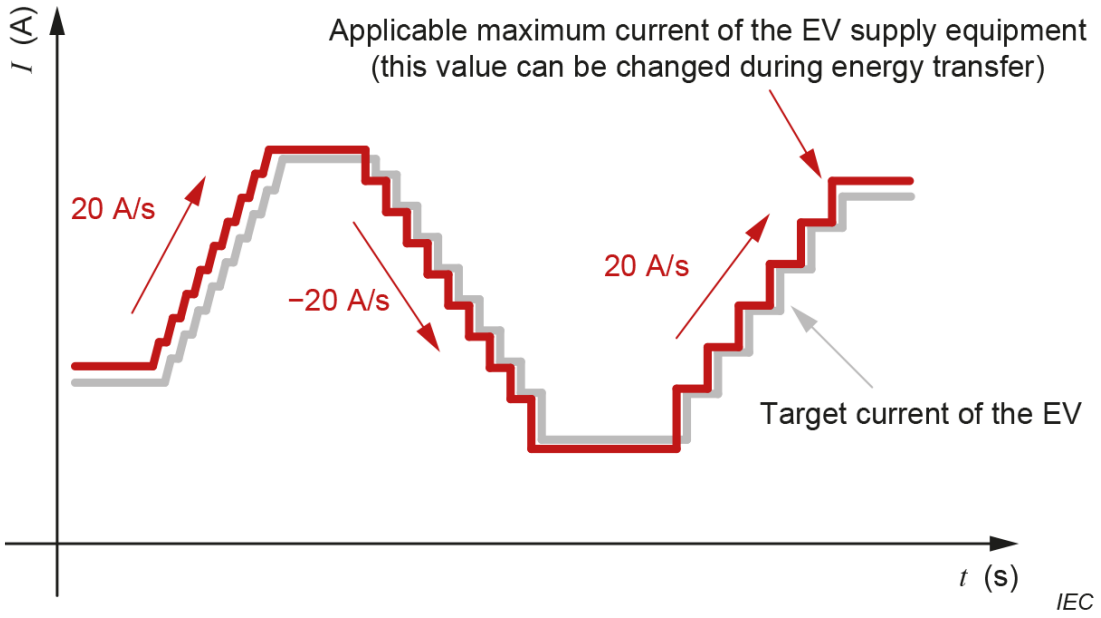
於響應內，EV 將使用 AA.5 規定之變更率，將目標電流調整至不大於 EV 供電設

備 B 側適用最大電流值。若 EV 供電設備 B 側可用最大電流增加，EV 亦可將目標電流不大於可用目標電流。

In response, the EV will change the target current of the EV to a value less than or equal to the applicable maximum current of the EV supply equipment at side B with the rate of change defined in Clause AA.5. If the applicable maximum current of the EV supply equipment at side B is increased, the EV may also increase the target current of the EV up to the target current of the EV.

EV 供電設備應依 EV 之目標電流於 B 側當下電流。

The EV supply equipment shall then supply a present current at side B according to the target current of the EV (see Figure AA.14).



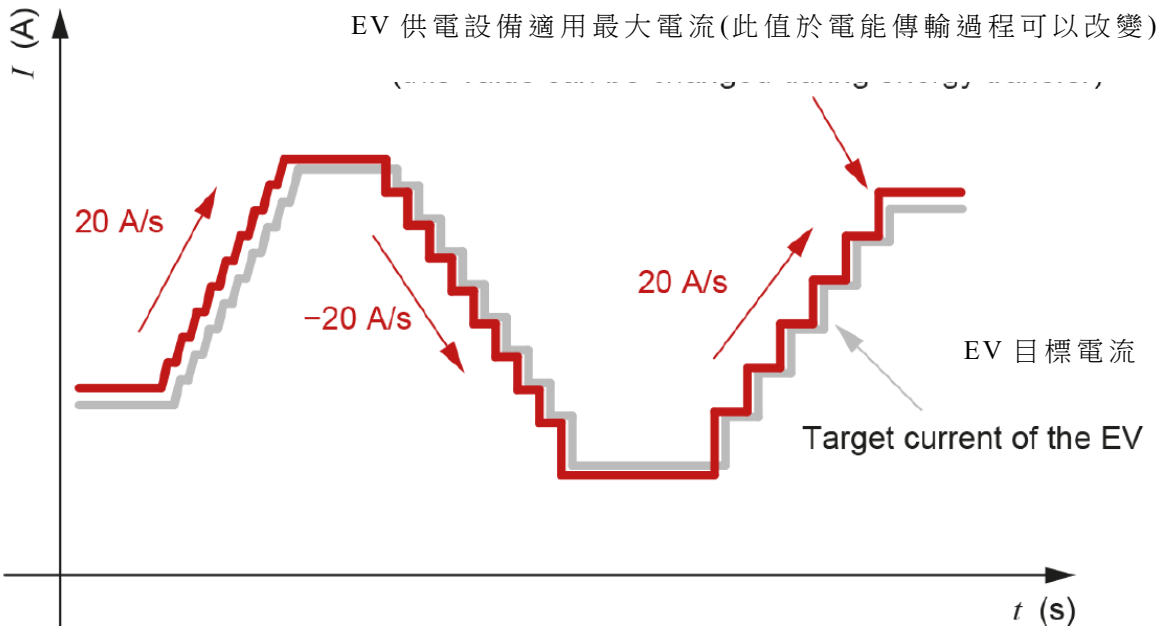




圖 AA.14 －EV 動態控制期間之 EV 供電設備 B 側及目標電流傳送可用最大電流

Figure AA.14 – Transition of applicable maximum current of the EV supply equipment at side B and target current of the EV during dynamic control

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 於 OP3 操作

3) Operate at OP3.

(4) OP3 確認操作後，藉由外部請求目標操作點 OP2，例如：EV 供電設備 B 側之充電目標電流

4) After confirming operation at OP3, set target operating point OP2 by external request, such as the changing the target current of the EV supply equipment at side B.

(5) 開始記錄 EV 供電設備及 EV 間之數位凸訊

5) Start recording digital communication between the EV supply equipment and the EV.

(6) 確認 EV 供電設備 B 側可用最大電流下降率於≤ 20 A/s

6) Confirm that the descending rate of the applicable maximum current of the EV supply equipment at side B is ≤ 20 A/s.

(7) 確認操作 OP2 操作後，藉由外部請求設置目標操作點 OP3，例如：調整 EV 供電設備 B 側目標電流

7) After confirming operation at OP2, set target operating point OP3 by external request, such as changing the target current of the EV supply equipment at side B.

(8) 確認 EV 供電設備 B 側適用最大電流上升速率為 ≤ 20 A/s

8) Confirm that the increasing rate of the applicable maximum current of the EV supply equipment at side B is ≤ 20 A/s.

若電壓驟降，EV 供電設備之操作參照 IEC 61851-21-2：2018 表 3

In case of a voltage dip, see IEC 61851-21-2:2018, Table 3, for the operation of the EV supply equipment.

### AA.7.4 高電流控制 High-current control

高電流控制為系統 A 之 EV 供電設備與 EV 間通訊方法，使用一套專用數位通訊，能夠 >200 Adc 且≤ 400 A dc 的 B 側當下電流。

正常操作下，系統 A 之 EV 供電設備之 B 側當下電流> 200 A dc，應使用高電流控制功能並針對數位通訊用於車輛執行此功能，依 IEC 61851-24:2023 附錄 A 之

使用適當的訊息 High-current control is a means of communication between a system A EV supply equipment and an EV capable of present current at side B of > 200 A DC and ≤ 400 A DC by using a dedicated set of digital communication messages. System A EV supply equipment capable of a present current at side B of > 200 A DC under normal operation shall implement the high-current control function and use the appropriate messages according to IEC 61851-24:2023, Annex A, for digital communication with the EV implementing this function.

**AA.7.5 高電壓控制 High-voltage control**

高電壓控制為系統 A 之 EV 供電設備及 EV 間之通訊方法，使用專用數位通訊，能夠 > 500 Vdc 及 ≤ 1 000 V dc。

在正常操作下，系統 A 之 EV 供電設備 B 側>500 Vdc，應使用高電壓控制功能並針對數位通訊用於車輛執行此功能，依 IEC 615851-24:2022 附錄 A 使用適當的訊息。

High-voltage control is a means of communication between a system A EV supply equipment and an EV capable of a present voltage at side B of > 500 V DC and ≤ 1 000 V DC by using a dedicated set of digital communication messages. System A EV supply equipment capable of a present voltage at side B of > 500 V DC under normal operation shall implement the highvoltage control function and use the appropriate messages according to IEC 61851-24:2023, Annex A, for digital communication with the EV implementing this function.

**AA.8 使用者觸發停機符合性試驗 Compliance test for user-initiated shutdown**

若通訊時間由使用者觸發停機終止，本試驗應評估 EV 供電設備之行為符合 6.3.1.110 要求。

This test shall evaluate the behaviour of the EV supply equipment in case that the communication session is terminated by user-initiated shutdown, according to the requirements in 6.3.1.110.

本試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1)針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載，參照圖 129。圖 132 試驗負載的設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 129. The setup of the test load in Figure 132 is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 確認 VT8 為 EV 供電設備 B 側之額定最高電壓

3) Confirm that VT8 is at the rated maximum voltage of the EV supply equipment at

side B.

(4) 依 EV 供電設備製造商指定之方法停止電能傳輸，例：按下停止按鈕

4) Stop energy transfer by the method specified by the EV supply equipment manufacturer, for example, pressing the stop button.

(5) 查核 EV 供電設備停止電能傳輸不顯示任何警報或錯誤訊息。

5) Check that the EV supply equipment stops energy transfer without displaying any alarm or error information.

(6) 確認 VT8 is ≤ 30 V dc

6) Confirm that VT8 is ≤ 30 V DC.

AA.9 熱管理系統之電能傳輸的特殊要求 Specific requirement for energy transfer with thermal management system

針對車輛端插頭之 DC 接腳組合的過溫防護，EV 供電設備應提供表 AA.25 之一保護情形，且 B 側纜線組依 B 側電流範圍充電。

表 AA.26 提供表 AA.25 每一措施的要求。

The EV supply equipment shall provide one of the protection cases in Table AA.25 for protection against over-temperature of DC contact assembly of the vehicle connector and side B cable assembly according to the side B current range of EV supply equipment. Table AA.26 provides the requirements of each measure in Table AA.25.

表 AA.25 過溫防護措施之選擇

Table AA.25 – Selection of protection measures against over-temperature

| B 側電流範圍 Side B current range | 保護案例 Protection case | 所需措施(參照表 AA.26) Required measures (see Table AA.26) | | | |
|---|---|---|---|---|---|
| | | a | b | c | d |
| 0 A to 200 A | A | R | NR | R | NR |
| 0 A to 200 A | B1 | NR | R | R | NR |
| 0 A to 200 A | B2 | NR | R[a] | NR | R |
| 0 A to 400 A | C1 | R | NR | NR | R |
| 0 A to 400 A | D1 | NR | R | R | NR |
| 0 A to 400 A | D2 | NR | R[a] | NR | R |

說明：

Key

R 要求(強制)

R Required (mandatory)

NR 不要求

NR Not required

Ra 若 B 側纜線組亦同時受到車輛端耦合器 (要求〝d〞)之保護措施的保護，則可省略要求〝b〞。

| |
|---|
| Ra Requirement "b" may be omitted if a side B cable assembly is also protected concurrently by the protective means of the vehicle coupler (requirement "d") |

表 AA.26 過溫保護措施

Table AA.26 – Protection measures against over-temperature

| 型式 Type | 保護措施 Protection measures |
|---|---|
| a | 應使用額定電流不小於 EV 供電設備 B 側之額定最大電流的 B 側纜線組。<br>A side B cable assembly having a rated current more than or equal to the rated maximum current of the EV supply equipment at side B shall be used. |
| b | 藉由監測或估計 B 側纜線組的表面溫度，應限制或是停止 B 側當下電流以防止過熱。對於 B 側當下電流限制，應適用 AA.7.3 規定之動態控制功能。<br>By using either monitoring or estimating the surface temperature of the side B cable assembly, the present current at side B shall be limited or stopped to prevent an over-temperature. For the limitation of the present current at side B, the dynamic control function defined in AA.7.3 shall be applied. |
| c | 車輛端插頭之額定電流(依車輛端插頭製造商指定)，應使用不小於 EV 供電設備 B 側之額定最大電流。<br>A vehicle connector having a rated current (specified by each vehicle connector manufacturer) more than or equal to the rated maximum current of the EV supply equipment at side B shall be used. |
| d | 使用溫度感測器或等同方法 1，監測車輛端插頭 DC+及 DC-端子兩者溫度，B 側當下電流應降低或停止以防止過溫。針對限制 B 側當下電流，應適用 AA.7.3 定義之動態控制功能。<br>By monitoring the temperature of both the DC+ and DC– contacts of the vehicle connector, with a temperature sensor or an equivalent means1, the present current at side B shall be reduced or stopped to prevent an over-temperature. For the limitation of the present current at side B, the dynamic control function defined in AA.7.3 shall be applied. |
| 註：1 等同方法之範例：若熱溫度超過設計限制值，車輛端插頭使用啟動 | |

閂鎖電路功能(例：溫度保險絲、繼電器)

1 Example of an equivalent means: a vehicle connector with a function to open the latch circuit (for example,
temperature fuse, relay) in case the contact temperature is more than the design limit value.

# 附錄 BB
# Annex BB
# (規定)
# (normative)
# 系統 B 之 EV 供電設備
# EV supply equipment of system B

## BB.1 一般 General

附錄 BB 所示系統 B 之 EV 供電設備規範，使用符合 IEC 62196-3 或 IEC TS 62196-3-1 架構 BB 之專用車輛耦合器。

Annex BB shows the specification of the EV supply equipment of system B, using the dedicated vehicle coupler of configuration BB of IEC 62196-3 or IEC TS 62196-3-1.

系統 B 之 EV 供電設備應設計為 B 側之額定最高電壓 ≤ 950 V。

System B EV supply equipment shall be designed for the rated maximum voltage of the EV supply equipment at side B ≤ 950 V.

## BB.2 電路圖 BB.2 Circuit diagrams

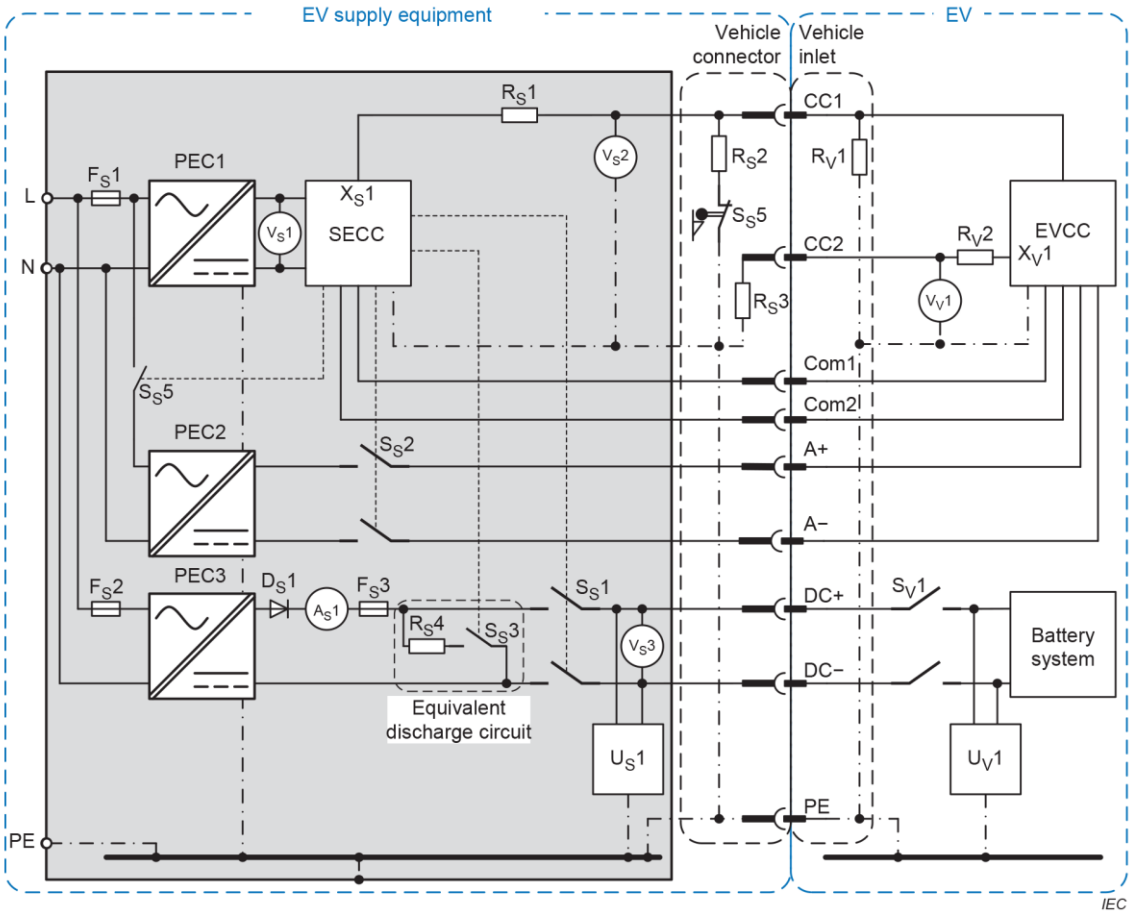
### BB.2.1 電路圖 BB.2.1 Circuit diagram

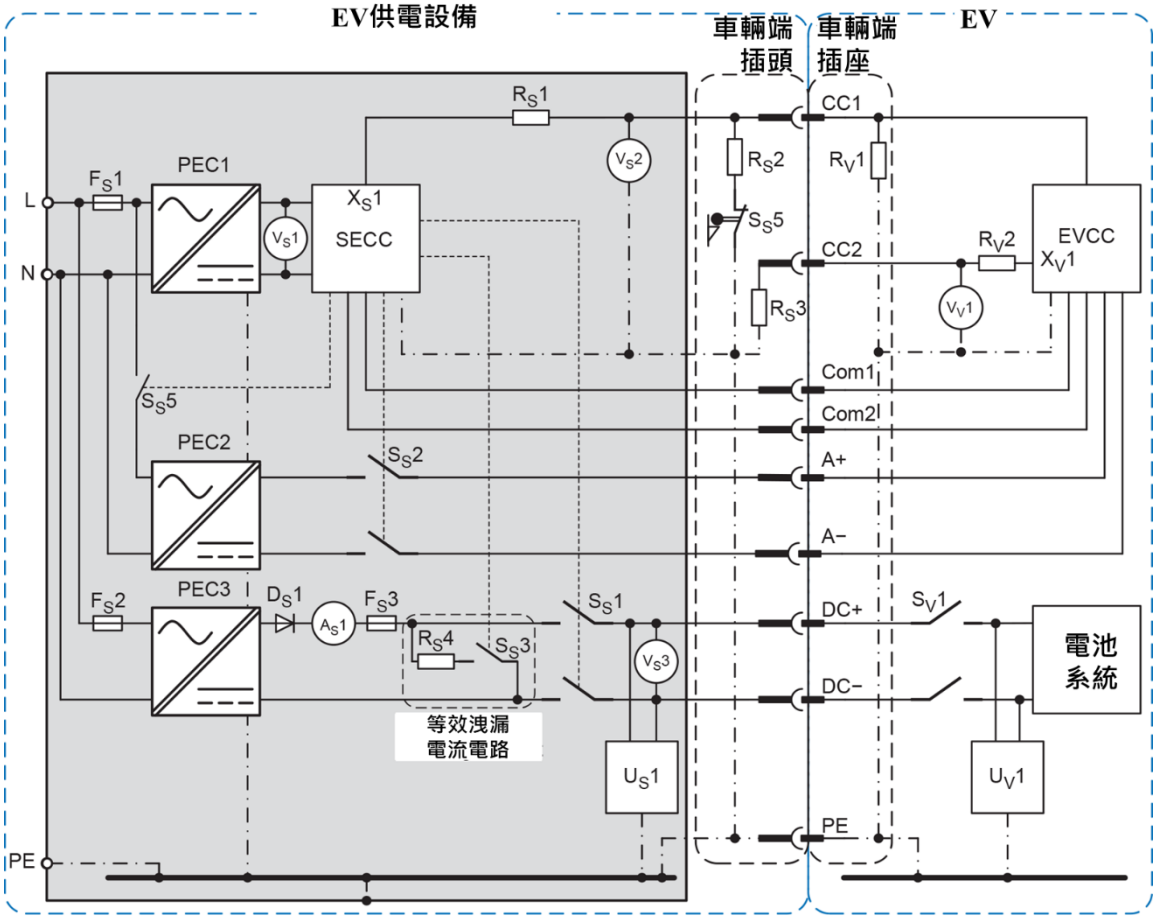
圖 BB.1 所示模式 4 系統 B 之 EV 供電設備的電路圖。SS5 開關為選項，且用於節能。當車輛端插頭嚙合時，SS5 應處於閉合狀態。在整個通訊過程中，SECC 應偵測並控制 SS1 及 SS2 之狀態，而 EVCC 應偵測並控制 SV1。

Figure BB.1 shows the circuit diagram of a system B EV supply equipment for mode 4. Switch SS5 is optional and is used for energy saving. SS5 shall be closed when the vehicle connector is mated. During the whole communication session, the SECC should detect and control the states of SS1 and SS2, while the EVCC should detect and control SV1.

I 類 EV 供電設備具有 CCM 及 CVM 之 EV 供電設備，其 $I_{EVSE_CPM}$ 等於 $I_{EVSE_Max}$。II 類 EV 供電設備是具有 CCM、CVM 及 CPM 之 EV 供電設備，其 $I_{EVSE_CPM}$ 不等於 $I_{EVSE_Max}$。

A type I EV supply equipment is an EV supply equipment with CCM and CVM, and IEVSE_CPM is equal to $I_{EVSE_Max}$. Type II EV supply equipment is an EV supply equipment with CCM, CVM and CPM, and IEVSE_CPM is not equal to $I_{EVSE_Max}$.


EV supply equipment
EV
Vehicle connector
Vehicle inlet
L
N
PE
PEC1
PEC2
PEC3
SECC
EVCC
Equivalent discharge circuit
Battery system
CC1
CC2
Com1
Com2
A+
A−
DC+
DC−
PE
IEC


EV供電設備
車輛端插頭
車輛端插座
EV
L
N
PE
PEC1
PEC2
PEC3
SECC
EVCC
等效洩漏電流電路
電池系統
CC1
CC2
Com1
Com2
A+
A−
DC+
DC−
PE

說明

Key

| | | | |
|---|---|---|---|
| L1, N | AC 或 DC 電網<br>AC or DC supply network | DS | EV 供電設備之二極體<br>diode in the EV supply equipment |
| PE | 保護性導體接點<br>protective conductor contact | SS | EV 供電設備之開關或繼電器<br>switch or relay in the EV supply equipment |
| CC1, CC2 | 系統 B 之控制導引接觸點<br>control pilot conductor contacts of system B | SV | EV 之開關或繼電器<br>switch or relay in the EV |
| Com1, Com2 | 數位通訊導引接觸點<br>digital communication conductor contacts | AS | EV 供電設備之電流表<br>ammeter in the EV supply equipment |
| DC+ | B 側正極端子<br>Positive terminal of side B | RS | EV 供電設備之電阻<br>resistor in the EV supply equipment |
| DC− | B 側負極端子<br>Negative terminal of side B | RV | EV 之電阻<br>resistor in the EV |
| SECC | 供電設備通訊控制器<br>supply equipment communication controller | US | EV 供電設備之 IMD<br>IMD of the EV supply equipment |
| EVCC | EV 通訊控制器<br>electric vehicle communication controller | UV | EV 之 IMD<br>IMD of the EV |
| PEC | 電力電子轉換器<br>power electronic converter | VS | EV 供電設備之電壓表<br>voltmeter in the EV supply equipment |
| A+ | 輔助 B 側電路之正極端子<br>positive terminal of the auxiliary side B circuit | VV | EV 之電壓表<br>voltmeter in the EV |
| XV | EV 之電壓源 | FS | 過電流保護裝置 |

| | | | |
|---|---|---|---|
| | voltage source in the EV | | over-current protection device |
| XS | EV 供電設備之電壓源<br>voltage source in the EV supply equipment | A- | 輔助 B 測電路之負極端子<br>negative terminal of the auxiliary side B circuit |

圖 BB.1 – 系統 B 之 EV 供電設備電路圖

Figure BB.1 – System B EV supply equipment circuit diagram

**BB.2.2 Requirements of IMD and discharge circuit**

SV1 閉合前，EV 供電設備將執行絕緣電阻檢查，而電能傳輸階段，EV 將負責絕緣電阻檢查。

Before closing SV1, the EV supply equipment will perform the insulation resistance check, while the EV will be responsible for the insulation resistance check during the energy transfer stage.

絕緣電阻 (R) 應於下列方式進行評估：

The insulation resistance R shall be evaluated as follows:

- R >(500 Ω/V × U):：絕緣應視為安全。
- R > (500 Ω/V × U): the insulation shall be considered as safe;
- (100 Ω/V × U) < R ≤ (500 Ω/V × U): 異常絕緣警報可能被觸發。
- (100 Ω/V × U) < R ≤ (500 Ω/V × U): the abnormal insulation alarm may be triggered;
- R ≤ (100 Ω/V × U):初始化階段應通過觸發錯誤停機來停止。
- R ≤ (100 Ω/V × U): the initialization stage shall be stopped by triggering an error shutdown.

其中 where

R 為以下兩者間較小之絕緣電阻值，以歐姆表示： DC+及保護導體間之絕緣電阻，DC－及保護導體間之絕緣電阻。

R is the smaller value of the insulation resistance between DC+ and the protective conductor, and the insulation resistance between DC– and the protective conductor, expressed in ohms;

U 為 EV 供電設備於 B 側額定最高電壓，並以伏特表示。

U is the rated maximum voltage of the EV supply equipment at side B, expressed in volts.

EV 供電設備執行絕緣電阻偵測後，應及時降低 B 側當下電壓，以避免對 EV 電池系統產生電壓突波。電能傳輸結束後，EV 供電設備應及時降低 B 側當下電壓，以避免對使用者造成電擊。

After the EV supply equipment performs the insulation resistance check, the present voltage at side B shall be reduced in time to avoid generating a voltage surge on the EV battery system.After energy transfer finishes, the EV supply equipment shall

reduce the present voltage at side B in time to avoid an electric shock on the user.
放電電路（RS4）參數應設定為確保 B 側當下電壓於 1 秒或更短時間內降至小於 60 Vdc。
The parameter of the discharge circuit (RS4) shall be set to ensure the present voltage at side B will be < 60 V DC in 1 s or less.

**BB.3 控制導引電路之參數 BB.3 Parameters of control pilot circuit**

表 BB.1 針對 FPT 控制導引電路之參數值。
Table BB.1 shows the parameter values of the control pilot circuit for FPT.

表 BB.1 – FPT 控制電路之參數值
Table BB.1 – Parameters values of the control circuit for FPT

| 標的 Object | 參數 [a] Parameters [a] | 符號 Symbol | 單位 Unit | 標稱值 Nominal | 最大值 Max. | 最小值 Min. |
|---|---|---|---|---|---|---|
| EV 供電設備控制單元之要求 Requirements of EV supply equipment control unit | 等效電阻 RS1 Equivalent resistance RS1 | RS1 | Ω | 1000 | 1030 | 970 |
| | 電壓源 Voltage source | XS1 | V DC | 12 | 12.6 | 11.4 |
| | 電壓偵測點 1 Voltage at detection point 1 | VS2 (a) | V DC | 12 | 12.8 | 11.2 |
| | | VS2 (b) | V DC | 6 | 6.8 | 5.2 |
| | | VS2 (c) | V DC | 4 | 4.8 | 3.2 |
| 車輛端插頭之要求 Requirements of vehicle connector | 等效電阻 RS2 Equivalent resistance RS2 | RS2 | Ω | 1000 | 1030 | 970 |
| | 等效電阻 RS3 Equivalent resistance RS3 | RS3 | Ω | 1000 | 1030 | 970 |
| 車輛端插座之要求 Requirements | 等效電阻 RV1 Equivalent | RV1 | Ω | 1000 | 1030 | 970 |

| | | | | | | |
|---|---|---|---|---|---|---|
| of vehicle inlet | resistance RV1 | | | | | |
| EV 之要求 Requirements of EV | 等效電阻 RV2 Equivalent resistance RV2 | XV1 b | V DC | 12 | 12.6 | 11.4 |
| | 電壓源 Voltage source | VV1 (a) b | V DC | 12 | 12.8 | 11.2 |
| | 電壓偵測點 2 Voltage at detection point 2 | VV1 (b) b | V DC | 6 | 6.8 | 5.2 |
| (a) 在適用環境條件及使用壽命下，應維持準確度。<br>a The accuracy shall be maintained under applicable environmental conditions and service life.<br>(b) 可依 EV 製造商定義。<br>b It can be defined by the EV manufacturer. | | | | | | |

**BB.4 正常條件下的正向功率傳輸控制流程**

**BB.4 Forward power transfer control process under normal condition**

**BB.4.1 B 側調節 BB.4.1 Side B regulation**

系統 B 之 B 側量測電流及量測電壓之準確度應於下列數值範圍內：

The accuracy of the measured current and measured voltage at side B of system B shall be between the following values:

- 電壓量測：± 0.5 %。
- voltage measurement: ±0,5 %;
- 電流量測：
- current measurement:
  - 若 B 側之當下電流>30 Adc 時，其精確度應為 ±1%。
  - ±1 % of the present current at side B if the present current at side B is > 30 A DC;
  - 若 B 側當下電流 ≤ 30 Adc 時，其精確度應為 ±0.3 A。
  - ±0,3 A if the present current at side B is ≤ 30 A DC.

**BB.4.2 量測電流及電壓 BB.4.2 Measuring current and voltage**

B 側當下電壓及當下電流應連續監測並於 1s 或更短時間內傳輸，包括量測延遲及數位通訊（CAN）傳輸延遲。

The present voltage and present current at side B shall be continuously monitored

and communicated in 1 s or less, including measurement delay and digital communication (CAN) transmission delay.

經由系統 B 之數位通訊回報 B 側之量測電流及電壓準確度應於下列數值範圍內:

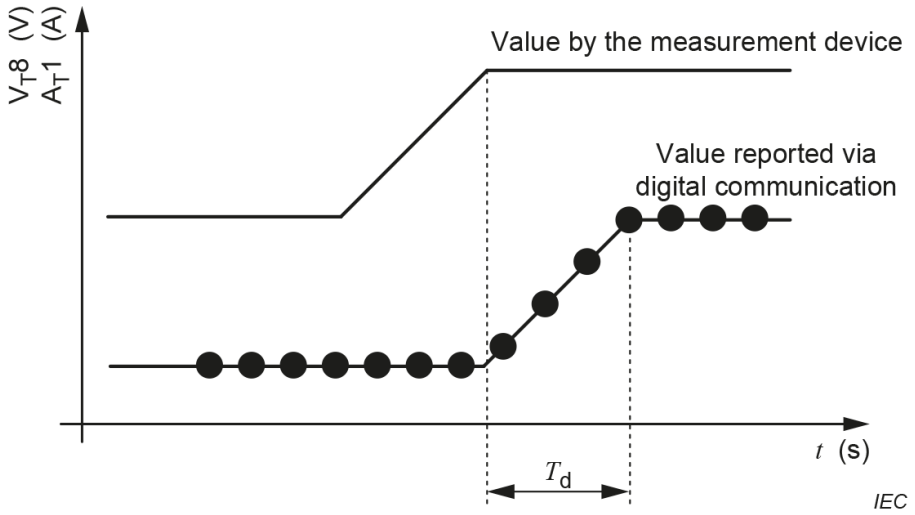
The accuracy of the measured current and voltage at side B reported via digital communication of system B shall be between the following values:

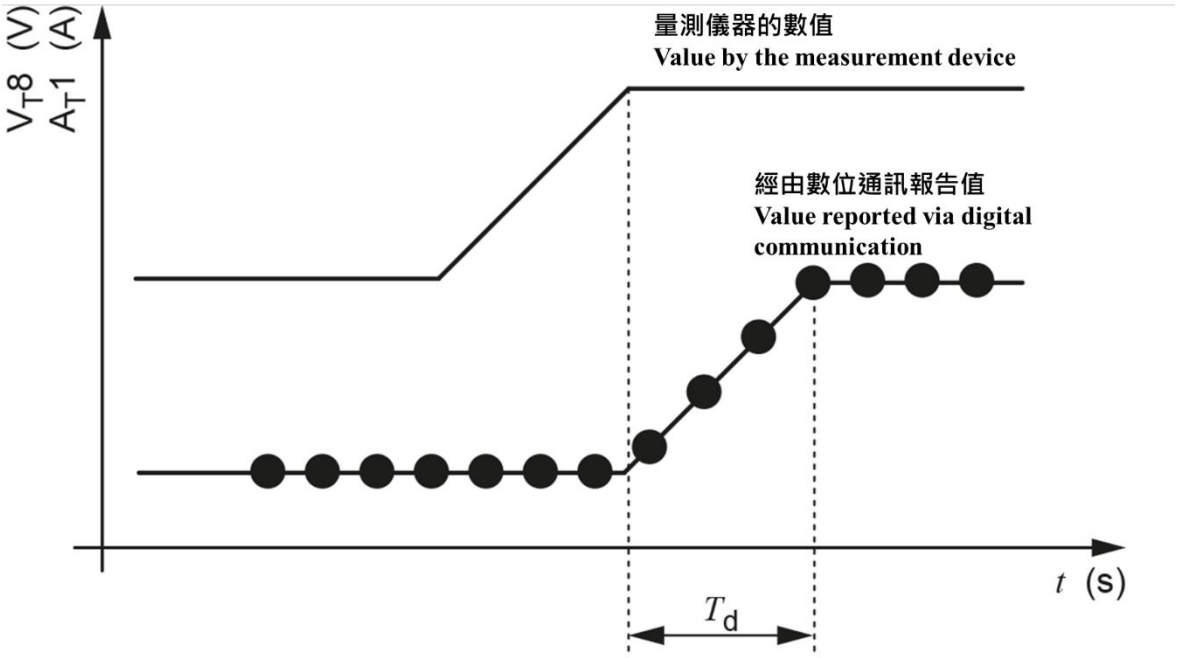
B 側量測電流：±1.5%當下電流 + 1 A。

- measured current at side B: ±1,5 % of present current at side B + 1 A ;
- B 側量測電壓< 500 V：±5 V。
- measured voltage at side B < 500 V: ±5 V;
- B 側量測電壓 > 500 V： EV 供電設備 B 側之額定最高電壓 ±1%。
- measured voltage at side B > 500 V: ±1 % of the rated maximum voltage of the EV supply equipment at side B.

依以下試驗查核其符合性。

Compliance is checked by the following test.






說明 Key

Td 量測延遲及數位通訊傳輸延遲

Td Measurement delay and digital communication transmission delay

圖 BB.2 – 系統 B 之 B 側量測電流及電壓與數位通訊傳輸間延遲表示

Figure BB.2 – Representation of delay between the measures current and voltage at side B and the digital communication transmission for system B

試驗 1：

Test 1:

(1)在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 依 EV 供電設備製造商指定的程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) OP3 模式操作（適用於 I 類 EV 供電設備），或 OP4 模式操作（適用於 II 類 EV 供電設備）。

3) Operate at OP3 (for a type I EV supply equipment) or OP4 (for a type II EV supply equipment)

(4) 於確認 I 類 EV 供電設備操作於 OP3 模式或 II 類 EV 供電設備操作於 OP4 模式後，EV 模擬器應通過數位通訊將 EV 目標電流設置為 $I_{EVSE_max}$-20 A。

4) After confirming operation at OP3 (for a type I EV supply equipment) or OP4 (for a type II EV supply equipment), the EV simulator shall set the target current of the EV to $I_{EVSE_max}$ – 20 A via digital communication.

(5) 量測 AT1 及數位通訊。

5) Measure AT1 and digital communication.

(6) 確認量測延遲及數位通訊傳輸延遲 1 s 或更短時間。參照圖 BB.2。

6) Confirm that the measurement delay and digital communication transmission delay is 1 s or less. See Figure BB.2.

試驗 2：

Test 2:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) OP1 操作 3) Operate at OP1.

3) Operate at OP1.

(4) 在確認 OP1 模式運行後，電動車模擬器應通過數字通信將電動車的目標電流設置為 IEVSE_min + 20 A。

4) After confirming operation at OP1, EV simulator shall set the target current of the EV to IEVSE_min + 20 A via digital communication.

(5) 量測 AT1 及數位通訊。

5) Measure AT1 and digital communication.

(6) 確認量測延遲及數位通訊傳輸延遲 1 s 或更短時間。參照圖 BB.2。

6) Confirm that the measurement delay and digital communication transmission delay is 1 s or less. See Figure BB.2.

試驗 3：

Test 3:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3) 在 OP1 操作。

3) Operate at OP1.

(4) 確認 OP1 模式操作後，通過數位通訊將 EV 目標電壓設置為 VEVSE_min。

4) After confirming operation at OP1, set the target voltage of the EV to VEVSE_max via digital communication.

(5) 量測 VT8 及數位通訊

5) Measure VT8 and digital communication.

(6) 確認量測延遲及數位通訊傳輸延遲 1 s 或更短時間。參照圖 BB.2。

6) Confirm that the measurement delay and digital communication transmission delay is 1 s or less. See Figure BB.2.

試驗 4：

Test 4:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 依 EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3)在 OP3 操作。

3) Operate at OP3.

(4) 確認 OP3 模式操作後，通過數位通訊將 EV 目標電壓設置為 VEVSE_min。

4) After confirming operation at OP3, set the target voltage of the EV to VEVSE_min via digital communication.

(5) 量測 VT8 及數位通訊

5) Measure VT8 and digital communication.

(6)確認量測延遲及數位通訊傳輸延遲 1 s 或更短時間。參照圖 BB.2。

6) Confirm that the measurement delay and digital communication transmission delay is 1 s or less. See Figure BB.2.

**BB.4.3 車輛耦合器連接確認 BB.4.3 Vehicle coupler mating confirmation**

當車輛耦合器連接時，EV 供電設備量測 VS2 應於表 BB.1 定義 VS2(c) 範圍內。

When the vehicle coupler is mated, VS2 measured by the EV supply equipment shall be between the range of VS2(c) defined in Table BB.1.

當車輛耦合器連接時，EV 量測 VV1 應在表 BB.1 定義 VV1(b) 範圍內。

When the vehicle coupler is connected, VV1 measured by the EV shall be between the range of VV1(b) defined in Table BB.1.

車輛耦合器連接確認之符合性試驗應依下列程序。

The compliance test for the vehicle coupler mating confirmation shall be performed according to the following procedure.

(1) 針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接至試驗負載。參

照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 確認 A 側當下電壓已經加載至 EV 供電設備 A 側之額定最高電壓。

2) Confirm that the present voltage at side A is energized at the rated maximum voltage of the EV supply equipment at side A.

(3) 量測 VT2 及 VT3。

3) Measure $V_T2$ and $V_T3$.

(4) 確認 VT2 於表 BB.1 定義 VS2(c) 範圍內，且 VT3 於表 BB.1 定義 VV1(b) 範圍內。

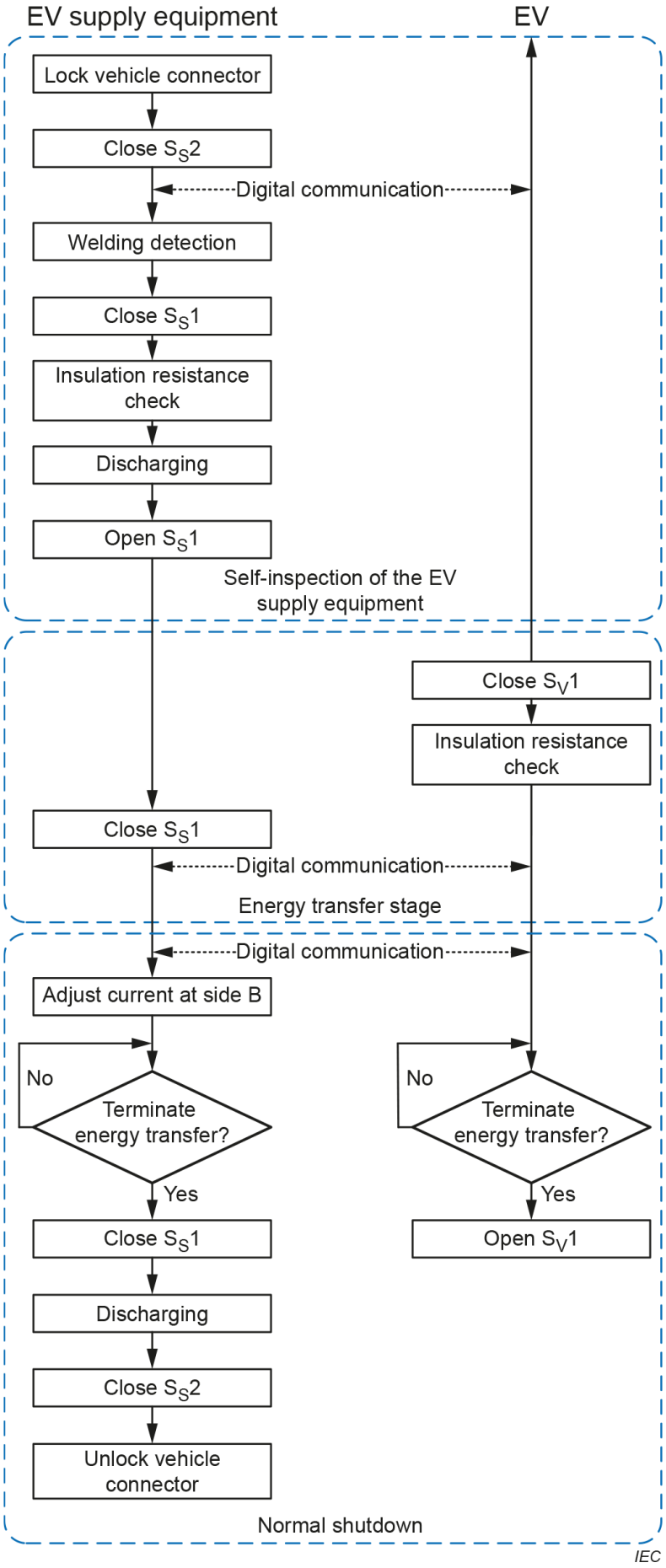
4) Confirm that VT2 is between the range of VS2(c) defined in Table BB.1, and that VT3 shall be between the range of VV1(b) defined in Table BB.1.

**BB.4.4 正向功率傳輸控制順序 BB.4.4 Forward power transfer control sequence**

圖 BB.3 顯示正常條件下之正向功率傳輸控制順序圖。

Figure BB.3 shows the FPT control sequence diagram under normal conditions.

This file


EV supply equipment
EV
Lock vehicle connector
Close $S_S2$
Digital communication
Welding detection
Close $S_S1$
Insulation resistance check
Discharging
Open $S_S1$
Self-inspection of the EV supply equipment
Close $S_V1$
Insulation resistance check
Close $S_S1$
Digital communication
Energy transfer stage
Digital communication
Adjust current at side B
No
Terminate energy transfer?
Yes
Close $S_S1$
Discharging
Close $S_S2$
Unlock vehicle connector
No
Terminate energy transfer?
Yes
Open $S_V1$
Normal shutdown
IEC

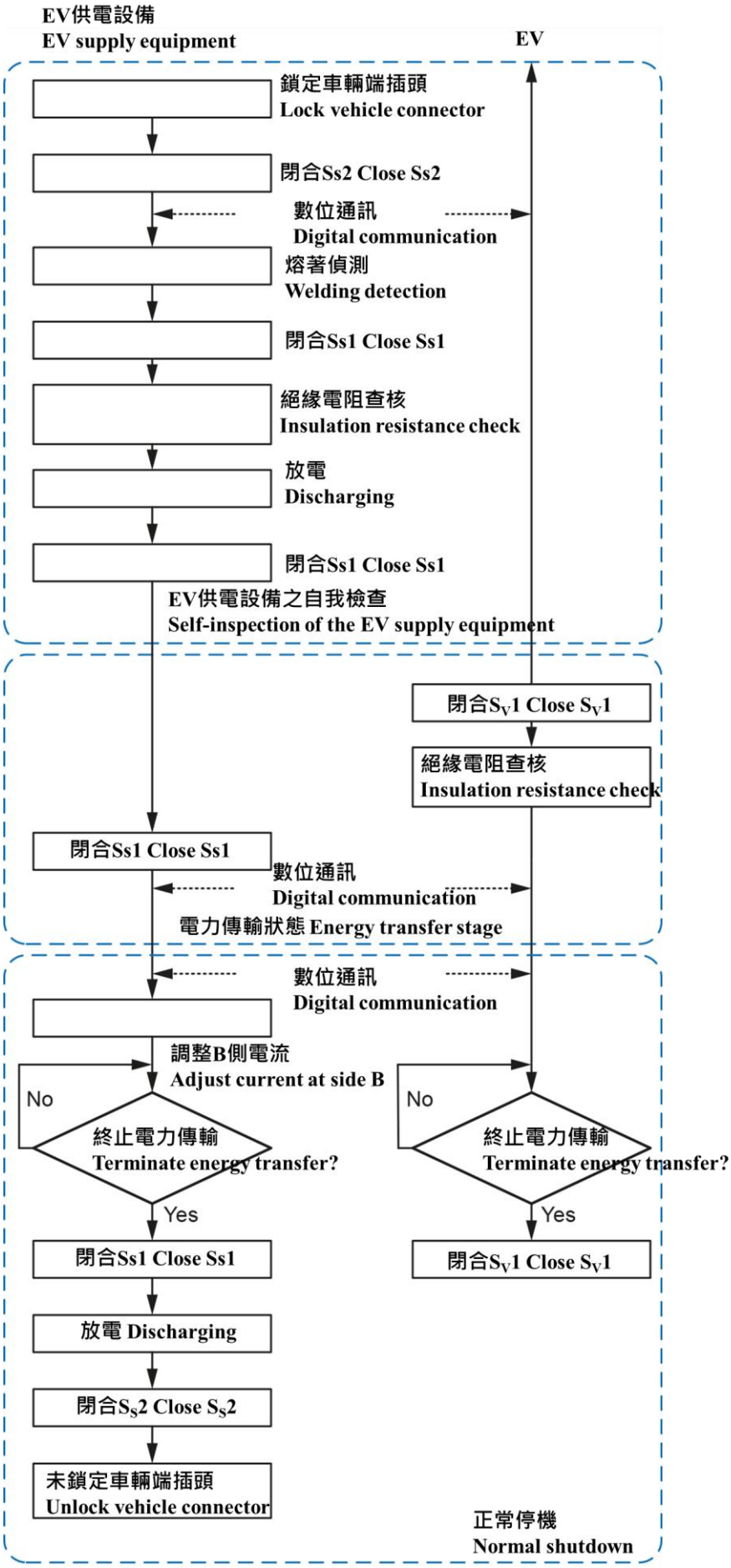

EV供電設備
EV supply equipment
EV
鎖定車輛端插頭
Lock vehicle connector
閉合Ss2 Close Ss2
數位通訊
Digital communication
熔著偵測
Welding detection
閉合Ss1 Close Ss1
絕緣電阻查核
Insulation resistance check
放電
Discharging
閉合Ss1 Close Ss1
EV供電設備之自我檢查
Self-inspection of the EV supply equipment
閉合SV1 Close SV1
絕緣電阻查核
Insulation resistance check
閉合Ss1 Close Ss1
數位通訊
Digital communication
電力傳輸狀態 Energy transfer stage
數位通訊
Digital communication
調整B側電流
Adjust current at side B
No
終止電力傳輸
Terminate energy transfer?
Yes
No
終止電力傳輸
Terminate energy transfer?
Yes
閉合Ss1 Close Ss1
閉合SV1 Close SV1
放電 Discharging
閉合SS2 Close SS2
未鎖定車輛端插頭
Unlock vehicle connector
正常停機
Normal shutdown

圖 BB.3 – 系統 B 之正向功率傳輸控制順序

Figure BB.3 – FPT control sequence for system B

(a) EV 供電設備執行絕緣偵測時，B 側當下電壓應為 EV 額定最高電壓及 EV 供電設備 B 側之額定最高電壓兩者間較低。

a) When the EV supply equipment performs the insulation detection, the present voltage at side B for insulation detection shall be the lower one between the rated maximum voltage of the EV and the rated maximum voltage of the EV supply equipment at side B.

(b) 預充電僅在以下情況下進行：

b) The pre-charge shall be carried out only when

- EV 電池系統電壓相較於預充電請求訊息之變化範圍 ±5%內，及
- the variation of the EV battery system voltage from the pre-charge request message is between ±5 %, and
- EV 電池系統電壓介於 EV 供電設備 B 側之額定最高電壓及額定最低電壓間，可執行預充電。
- the EV battery system voltage is between the rated maximum voltage of the EV supply equipment at side B and rated minimum voltage of the EV supply equipment at side B.

**BB.4.5 正常停機 BB.4.5 Normal shutdown**

EV 供電設備應符合下列程序進行正常停機。

The EV supply equipment shall comply with the following procedure for normal shutdown.

(a) EV 正常停機

a) EV normal shutdown

(1) 若 EV 供電設備於收到「車輛停止命令」無效代碼時，應透過數位通訊發送「充電器停止命令」，並 EV 供電設備之 B 側當下電流應降至 ≤5 Adc，且電流下降速度 ≥ 100 A/s。

1) The EV supply equipment shall send "Charger stopping command" by digital communication if it receives "Vehicle stopping command" without a failure code, and the EV supply equipment shall reduce the present current at side B to ≤ 5 A DC with the current descending speed of ≥ 100 A/s.

(2) EV 供電設備 SS1 開關應該斷開，且 EV 供電設備應釋放 B 側當下電壓。EV 供電設備開關 SS2 應保持斷開，直到數位通訊完成。

2) Switch SS1 of the EV supply equipment shall be open and the EV supply equipment shall bleed the present voltage at side B. Switch SS2 of the EV supply equipment shall be open until digital communication is finished.

(b) 使用者觸動停機

b) User-initiated shutdown

(1) 當達到停止電能傳輸之條件，或使用者透過人機界面（HMI）停止傳輸時，

EV 供電設備應經由數位通訊發送「充電器停止命令」，通知 EV 開始正常停機過程。

1) When a stop energy transfer condition is reached or the user stops energy transfer by interacting with the HMI, the EV supply equipment shall send "Charger stopping command" by digital communication to notify the EV of start of a normal shutdown process.

(2) EV 供電設備之 B 側當下電流應降至 ≤ 5 A dc，並電流下降速度 ≥ 100 A/s。

2) The EV supply equipment shall reduce the present current at side B to ≤ 5 A DC with the current descending speed of ≥ 100 A/s.

(3) EV 供電設備之開關 SS1 應該斷開，並 EV 供電設備應釋放 B 側當下電壓。EV 供電設備開關 SS2 應斷開，直到數位通訊完成。

3) Switch SS1 of the EV supply equipment shall be open and the EV supply equipment shall bleed the present voltage at side B. Switch SS2 of the EV supply equipment shall be open until digital communication is finished.

正常停機之符合性試驗應依下列程序。

The compliance test for normal shutdown shall be performed according to the following procedure.

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) EV 供電設備製造商指定程序開始電能傳輸。

2) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(3)確認 VT8 為 EV 供電設備 B 側之額定最高電壓。

3) Confirm that VT8 is at the rated maximum voltage of the EV supply equipment at side B.

(4)選擇停止方法：例如：在電能傳輸前預設電能傳輸條件，或透過人機界面（HMI）停止電能傳輸。

4) Select stopping methods: for example, pre-setting energy transfer conditions before energy transfer or stop energy transfer by interacting with the HMI.

(5)查核 EV 供電設備停止電能傳輸不顯示任何警報或錯誤訊息。

5) Check that the EV supply equipment stops energy transfer without displaying any alarm or error information.

(6)確認 VT8 ≤ 60 Vdc。

6) Confirm that VT8 is ≤ 60 V DC.

**BB.5 失效模式下之安全要求 Safety requirements under failure mode**

**BB.5.1 錯誤停機及緊急停機 Error shutdown and emergency shutdown**

若發生表 BB.2 所列任一錯誤，EV 供電設備應依 6.3.1.113.3 執行錯誤停機。表 BB.2 亦提供響應性能之建議規範。

If one of the errors specified in Table BB.2 occurs, the EV supply equipment shall perform an error shutdown according to 6.3.1.113.3. Recommended specification for the response performance is also given in Table BB.2.

表 BB.2 – 錯誤停機時間及準則

Table BB.2 – Error shutdown times and criteria

| 故障<br>Fault | 故障開始後，EV 供電設備之偵測時間<br>Detection time of EV supply equipment after the start of the fault | 停機觸發者<br>Shutdown trigger by | 故障開始後 B 側<br>Side B after the start of the fault | | 觸發車輛端插頭之條件<br>Condition to unlatch the vehicle connector |
|---|---|---|---|---|---|
| 數位通訊逾時 (6.3.1.5、BB.5.4)<br>Digital communication timeout (6.3.1.5, BB.5.4) | 9.5s | EV 供電設備<br>EV supply Equipment | 10s | EV 供電設備應降低：<br>The EV supply equipment shall reduce:<br>– B 側當下電流< 5 Adc<br>– present current at side B < 5 A DC;<br>– B 側 DC+及 DC-間當下電壓 ≤ 60 Vdc，DC+/DC-及保護導體<br>– present voltage at side | 停機程序完成後，B 側 DC+及 DC-間當下電壓 ≤ 60 Vdc<br>After the shutdown process is completed and the present voltage at side B between DC+ and DC– ≤ 60 V DC |
| 過電壓故障 (101.1.7、6.3.1.106、BB.5.6)<br>Overvoltage fault (101.1.7，6.3.1.106, BB.5.6) | 500ms | EV 供電設備<br>EV supply equipment | 1s | | |
| DC 連接之過電流保護 - 二次側過電流保 | 1 s | EV 供電設備<br>EV supply | 1.5s | | |

| | | | | | |
|---|---|---|---|---|---|
| 護<br>Overcurrent protection of the DC connection-Secondary overcurrent protection (BB.5.10) | | equipment | | B ≤ 60 V DC between DC+ and DC–,DC+/DC– and protective conductor | |
| 負載突降 Load dump (101.1.7, BB.5.7) | 500 ms | EV 供電設備<br>EV supply equipment | 1s | | |
| 保護導體之故障<br>Fault to protective conductor (BB.5.11) | EV 接收到停止電能傳輸訊息 1s 後<br>1 s after receiving the stop energy transfer message from the EV | EV | 1.5s | | |

當發生下列表 BB.3 規定錯誤之一時，系統 B 之 EV 供電設備應依 6.3.1.113.4 執行緊急停機，，針對響應性能之規格規範亦規定於表 BB.3。

When one of the following errors in Table BB.3 occurs, the system B EV supply equipment shall perform an emergency shutdown according to 6.3.1.113.4. Recommended specifications for the response performance are also given in Table BB.3.

表 BB.3 – 緊急停機時間及準則

Table BB.3 – Emergency shutdown times and criteria

| 故障<br>Fault | 故障開始後，EV 供電設備之偵測時間<br>Detection time of EV | 停機觸發者<br>Shutdown trigger by | 故障開始後 B 側<br>Side B after the start of the fault | 車輛端插頭解鎖之條件<br>Condition to unlatch vehicle |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | supply Equipment after the start of the fault | | | connector |
| EV 供電設備故障終止電能傳輸 (6.3.1.5，9.101，BB.5.2) Terminate energy transfer due to EV supply equipment Fault (6.3.1.5, 9.101, BB.5.2) | 70 ms | EV 供電設備 EV supply equipment | B 側當下電流應於 100ms 或小於內 ≤ 5 A The present current at side B shall be ≤ 5 A DC in 100 ms or less. B 側當下電壓應 570ms 或小於內≤ 60 Vdc The present voltage at side B shall be ≤ 60 V DC in 570 ms or less. | 停機程序完成後，B 側 DC+及 DC-間當下電壓≤ 60 Vdc After shutdown process is completed and the present voltage at side B between DC+ and DC– ≤ 60 V DC |
| 車輛故障終止電能傳輸 (BB.5.3) Terminate energy transfer due to an EV fault (BB.5.3) | EV 接收到停止電能傳輸資訊後 20ms 20 ms after receiving the stop energy transfer message from the EV | EV | EV 接收到停止電能傳輸資訊: After receiving the stop energy transfer message from the EV: B 側當下電流應於 50ms 或小於內≤ 5 Adc The present current at side B shall be ≤ 5 A DC in 50 ms or less. B 側當下電壓應於 520ms 或小於內≤ 60 Vdc | |

| | | | | |
|---|---|---|---|---|
| | | | The present voltage at side B shall be ≤ 60 V DC in 520 ms or less. | |
| 控制導體之失去電氣連續性(BB.5.5)<br>Loss of electrical continuity of the control pilot<br>(BB.5.5) | 20 ms | EV 供電設備<br>EV supply equipment | B 側當下電流應於 50ms 或小於內≤ 5 Adc<br>The present current at side B shall be ≤ 5 A DC in 50 ms or less.<br>B 側當下電壓應於 520ms 或小於內≤ 60 V dc<br>The present voltage at side B shall be ≤ 60 V DC in 520 ms or less. | |
| 過電壓故障<br>(BB.5.6)<br>Overvoltage fault<br>(BB.5.6) | 10 ms | EV 供電設備<br>EV supply equipment | B 側當下電流應於 40ms 或小於內≤ 5 Adc<br>The present current at side B shall be ≤ 5 A DC in 40 ms or less.<br>B 側當下電壓應於 510ms 或小於內≤ 60 Vdc<br>The present voltage at side B shall be ≤ 60 V DC in 510 ms or less. | |

| | | | | |
|---|---|---|---|---|
| DC 連結之過載電流保護-初級側過載電流保護：<br>Overcurrent protection of the DC connection-Primary overcurrent protection: (BB.5.10) | 500 ms | EV 供電設備<br>EV supply equipment | B 側當下電流應於 530ms 或小於≤ 5 A<br>The present current at side B shall be ≤ 5 A in 530 ms or less.<br>B 側當下電壓應於 1s 或小於≤ 60Vdc<br>The present voltage at side B shall be ≤ 60 V DC in 1 s or less. | |
| 保護性導體之失去電氣連續性 (6.3.1.2)<br>Loss of electrical continuity of the protective conductor (6.3.1.2) | 70 ms | EV 供電設備<br>EV supply equipment | B 側當下電流應於 100 ms 或小於≤ 5 A<br>The present current at side B shall be ≤ 5 A in 100 ms or less.<br>B 側當下電壓應於 570ms 或小於≤60Vdc<br>The present voltage at side B shall be ≤ 60 V DC in 570 ms or less. | |
| DC 連接之短路保護<br>Short-circuit protection of the DC connection | 1 s | EV 供電設備<br>EV supply equipment | B 側當下電流應於 1.03s 或小於≤ 5 A<br>The present current at side B shall be ≤ 5 A in 1,03 s or | |

| | | | | |
|---|---|---|---|---|
| (13.101, BB.5.8) | | | less.<br>B 側當下電壓 1.5s 或小於≤ 60 Vdc<br>The present voltage at side B shall be ≤ 60 V DC in 1,5 s or less. | |

BB.5.2 因 EV 供電設備故障終止電能傳輸

BB.5.2 Terminate energy transfer due to an EV supply equipment fault

在電能傳輸期間，關於 EV 供電設備製造商規定之任何失效狀態，除本標準涵蓋內容外，EV 供電設備應於 70ms 內觸發緊急停機（參照 6.3.1.113.3），並發送停止電能傳輸訊息至 EV。

For any conditions of failure of the EV supply equipment during energy transfer, specified by the EV supply equipment manufacturer, in addition to what is covered in this document, the EV supply equipment shall trigger an emergency shutdown (see 6.3.1.113.3) in 70 ms or less, and send the stop energy transfer message to the EV.

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1)在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2)A 側當下電壓為 EV 供電設備 A 側之額定最高電壓

2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(3) 依 EV 供電設備製造商規定每種故障，試驗期間逐一試驗。查核 EV 供電設備觸發執行緊急停機，並顯示相關警報或錯誤資訊（若有）。

3) Simulate every failure specified by the EV supply equipment manufacturer, one at a time during this test. Check that the EV supply equipment triggers and performs an emergency shutdown, displaying a relevant alarm or error information, if any.

(4) 查核 B 側當下電流之最大停機時間 tshutdown 符合下列要求：

4) Check that the maximum shutdown time of the present current at side B tshutdown is as follows:

發生 EV 供電設備故障後 tshutdown = ttrigger +tperform =100 ms。

tshutdown = ttrigger + tperform = 100 ms after the EV supply equipment fails

式中

where

ttrigger = 70 ms;

tperform = 30 ms.

tshutdown = 100ms 後，AT1 電流應 ≤ 5 A dc。

After tshutdown = 100 ms, AT1 shall be ≤ 5 A DC.

(5)查核 EV 供電設備故障發生後 570ms，VT8 電壓 ≤ 60 Vdc。

5) Check that, 570 ms after the occurrence of the fault of the EV supply equipment, VT8 is ≤ 60 V DC.

**BB.5.3 車輛故障終止電能傳輸 Terminate energy transfer due to an EV fault**

若 EV 在電能傳輸故障期間，EVCC 將週期送出 EV 供電設備發送停止能量轉移的訊息並附上故障原因。EV 供電設備在接收到來自電動車的停止能量轉移訊息後，應在 20 毫秒內觸發緊急停機（參照 6.3.1.113.3），並將停止能量轉移的訊息發送至電動車。

If the EV fails during energy transfer, the EVCC will periodically send the stop energy transfer message with the fault reason to the EV supply equipment. The EV supply equipment shall trigger an emergency shutdown (see 6.3.1.113.3) in 20 ms or less after receiving the stop energy transfer message from the EV and send the stop energy transfer message to the EV.

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應依據以下程序執行。

The test shall be performed according to the following procedure.

(1)在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓

2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(3) 在電能傳輸過程中，模擬 SV1 斷開並停止電能傳輸的訊息發送至 EV 供電設備。查核 EV 供電設備觸發執行緊急停機，並顯示相關警報或錯誤資訊（若有）。

3) Simulate opening SV1 during energy transfer and send the stop energy transfer message to the EV supply equipment. Check that the EV supply equipment triggers and performs an emergency shutdown, displaying a relevant alarm or error information, if any.

(4) 查核電壓超越量是否符合 BB.5.7 負載突降的要求。

4) Check that the voltage overshoot is according to the requirements of the load dump in BB.5.7.

(5) 查核 B 側當下電流之最大停機時間 tshutdown 符合下列要求：

5) Check that the maximum shutdown time of the present current at side B tshutdown is as follows:

EV 接收到停止充電訊息後 tshutdown = ttrigger + tperform = 50 ms

tshutdown = ttrigger + tperform = 50 ms after receiving the stop energy transfer message from the EV

式中

where

ttrigger = 20 ms;

tperform = 30 ms.

tshutdown = 50ms 後，AT1 電流應 ≤ 5 Adc。

After tshutdown = 50 ms, AT1 shall be ≤ 5 A DC.

(6) EV 接收到停止電能傳輸訊息 520ms 後查核 VT8 電壓 ≤ 60 Vdc

6) Check that, 520 ms after receiving the stop energy transfer message from the EV, VT8 is ≤ 60 V DC.

**BB.5.4 Digital communication timeout**

SECC 通訊期間，若遇到數位通訊超時，EV 供電設備應 9.5s 或小於內觸發錯誤停機（參照 6.3.1.113.3）並斷開 SS1。

If the SECC encounters a digital communication timeout during the communication session, the EV supply equipment shall trigger an error shutdown (see 6.3.1.113.3) in 9,5 s or less and open SS1.

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應按照以下程序進行。

The test shall be performed according to the following procedure.

(1) )在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。

2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(3) 模擬失去電氣連續性、數位通訊連接器（Com1 及 Com2）間短路或數位通訊超時。查核 EV 供電設備觸發並執行錯誤停機，並顯示相關的警報或錯誤信息（若有。查核故障發生後 10 秒內或小於斷開 SS1。

3) Simulate a loss of electrical continuity, a short-circuit between the digital communication conductors (Com1 and Com2) or a digital communication timeout. Check that the EV supply equipment triggers and performs an error shutdown, displaying a relevant alarm or error information, if any. Check that SS1 is opened in 10 s or less after the occurrence of the fault.

(4) 查核 B 側當下電流之最大停機時間 tshutdown 符合下列要求：

4) Check that the maximum shutdown time of the present current at side B tshutdown is as follows:

數位通訊線路導線失去電氣連續性或發生通訊逾時後 10 秒內 = tshutdown = ttrigger + tperform

tshutdown = ttrigger + tperform = 10 s after losing electrical continuity of the digital communication conductor(s) or a digital communication timeout

式中

where

ttrigger = 9.5 s;

ttrigger = 9,5 s;

tperform = 500 ms.

tshutdown = 10 秒後，AT1 應 ≤ 5 A dc。

After tshutdown = 10 s, AT1 shall be ≤ 5 A DC.

(5) 查核故障發生後 10 秒，VT8 ≤ 60 Vdc。

5) Check that, 10 s after the occurrence of the fault, VT8 ≤ 60 V DC.

(6) 查核故障發生後 10 秒內或小於，SS1 是否被斷開。

6) Check that SS1 opens in 10 s or less after the occurrence of the fault.

**BB.5.5 控制導引斷開 Loss of electrical continuity of the control pilot**

通訊期間，控制導引 CC1 發生錯誤時，導致偵查點 1 之量測電壓超過表 BB.1 規定範圍 VS2 或開關 SS5 斷開，EV 供電設備應於 20ms 內觸發緊急停機，並將停止電能傳輸訊息發送至 EV。

When an error in the control pilot CC1 occurs during the communication session such that the measured voltage of detecting point 1 is beyond the range of VS2 defined in Table BB.1, or switch SS5 is opened, the EV supply equipment shall trigger an emergency shutdown in 20 ms or less, and send the stop energy transfer message to the EV.

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 在正常操作下，將 EV 供電設備連接到系統 B 的專用 EV 模擬器測試負載。請參照圖 130。系統 B 的測試負載設置，請參照圖 132 和表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for system B under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。

2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(3) 模擬關閉 XS1 或斷開 SS5，查核 EV 供電設備觸發執行緊急停機，並顯示相關警報或錯誤資訊（若有）。

3) Simulate turning off XS1 or opening SS5. Check that the EV supply equipment triggers and performs an emergency shutdown, displaying a relevant alarm or error information, if any.

(4) 查核 B 側當下電流之最大停機時間 tshutdown 符合下列要求：

4) Check that the maximum shutdown time of the present current at side B tshutdown is as follows:

EV 供電設備故障後，tshutdown = ttrigger + tperform = 50 ms

tshutdown = ttrigger + tperform = 50 ms after the EV supply equipment fails

使用

with

ttrigger = 20 ms;

tperform = 30 ms.

tshutdown = 50ms 後，AT1 應 ≤ 5 Adc。

After tshutdown = 50 ms, AT1 shall be ≤ 5 A DC.

(5) 查核故障發生後，520ms， VT8 ≤ 60 V dc 。

5) Check that, 520 ms after the occurrence of the fault, VT8 ≤ 60 V DC.

**BB.5.6 過電壓故障 Overvoltage fault**

EV 供電設備應藉硬體措施（例：專用過電壓量測電路）偵測 B 側當下電壓，如表 BB.4 所示，以停用 PEC 於 10ms 內轉換至緊急停機。依 EV 供電設備 B 側額定最低電壓及額定最高電壓，應依初始化階段傳送的 EV 額定最高電壓，經數位通訊確定設定點。

The EV supply equipment shall detect the present voltage at side B as shown in Table BB.4 by hardware means (for example, a dedicated overvoltage measurement circuit) to disable the PEC and transfer to emergency shutdown in 10 ms or less. According to the rated minimum voltage of the EV supply equipment at side B and the rated maximum voltage of the EV supply equipment at side B, the setpoints shall be determined by digital communication based on rated maximum voltage of the EV sent during the initialization phase.

表 BB.4 – 緊急停機反應試驗之 EV 模擬器電壓範圍

Table BB.4 – EV simulator voltage ranges emergency shutdown reaction test

| EV 初始化階段之額定最高電壓<br>Rated maximum voltage of the EV at the initialization phase<br>U | 電能傳輸期間 $U_T4$ 值<br>Value of $U_T4$ during energy transfer<br>V | 緊急停機反應 $U_T4$ 值<br>Value of UT4 for emergency shutdown reaction<br>V |
|---|---|---|
| U ≤ 500 V | 最低(EV 供電設備 B 側之額定最高電壓，450V)<br>Minimum (rated maximum voltage of the EV supply equipment at side B, 450 V) | 550 |
| 500 V < U ≤ 750 V | 最低(EV 供電設備 B 側之額定最高電壓，700V)<br>Minimum (rated maximum voltage of the EV supply equipment at side B, 700 V) | 825 |
| 750 V < U ≤ 850 V | - | 935 |
| 850 V < U ≤ 1 000 V | EV 供電設備 B 側之額定最高電壓<br>Rated maximum voltage of the EV supply equipment at side B | 1100 |

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應依以下程序執行：

The test shall be performed according to the following procedure.

(1) 將 EV 供電設備連接到專用的 EV 模擬器測試負載，並在 CCM 操作下進行測試。請參照圖 130。圖 132 中系統 B 的測試負載設置如表 120 所示。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under CCM operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。

2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(3) 模擬 EV 初始階段之 EV 額定最高電壓 ≤500 V。在電能傳輸期間，調整 $U_T4$

至 EV 供電設備 B 側之額定最高電壓或 450 Vdc，取最小值。然後 $U_T4$ 增加至 550 Vdc。查核 EV 供電設備觸發執行緊急停機，並顯示相關警報或錯誤資訊（若有）。

3) Simulate an EV with a rated maximum voltage of the EV at the initialization phase ≤ 500 V.Adjust UT4 during energy transfer to the rated maximum voltage of the EV supply equipment at side B or 450 V DC, whichever is less. Then, increase UT4 to 550 V DC. Check that the EV supply equipment triggers and performs an emergency shutdown, displaying a relevant alarm or error information if any.

(4) 查核 B 側當下電流之最大停機時間 tshutdown 符合下列要求：

4) Check that the maximum shutdown time of the present current at side B tshutdown is as follows:

過電壓故障發生後， tshutdown = ttrigger + tperform = 40 ms

tshutdown = ttrigger + tperform = 40 ms after the occurrence of overvoltage fault

其中

where

ttrigger = 10 ms;

tperform = 30 ms.

tshutdown = 40ms 後，AT1 應≤ 5 Adc。

After tshutdown = 40 ms, AT1 shall be ≤ 5 A DC.

(5) 查核過電壓發生後 510ms，VT8 ≤ 60 V dc。

5) Check that, 510 ms after the occurrence of overvoltage, VT8 is ≤ 60 V DC.

(6) 重複試驗步驟(1)至步驟(5)，EV 模擬器範圍依表 BB.4。

6) Repeat this test from step 1) to step 5) with EV simulator rated maximum voltage of the EV according to Table BB.4.

**BB.5.7 負載突降 Load dump**

任何負載拋載情況下，電壓超越量應小於拋載前 EV 最後目標電壓 110%，或小於 EV 目標電壓加 50Vdc，取較大值。

In any case of load dump, the voltage overshoot shall be less than 110 % of the last target voltage of the EV before the load dump, or less than the target voltage of the EV + 50 V DC, whichever is more.

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation See Figure 130. The setup of the

test load in Figure 132 for system B is in Table 120.

(2) 持續測量 VT8。

2) Measure VT8 continuously.

(3) 依 EV 供電設備製造商指定程序開始電能傳輸

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) 確認 $V_T8$ 為 EV 供電設備 B 側之額定最高電壓，EV 供電設備操作於圖 133 之 OP4 操作點。

4) Confirm that VT8 is at the rated maximum voltage of the EV supply equipment at side B, and that the EV supply equipment is operating at the operating point OP4 in Figure 133.

(5) 斷開 ST17 及 ST18。

5) Open ST17 and ST18.

(6) 查核 EV 供電設備觸發執行緊急停機，並顯示相關警報或錯誤資訊（若有）。

6) Check that the EV supply equipment triggers and performs an emergency shutdown, displaying a relevant alarm or error information, if any.

(7) 透過(4)至(6)查核要求之參數：

7) Check the parameters for the requirement through 4) to 6):

VT8 最高電壓應滿足以下條件：

VT8 ≤ 最大值 (110% × EV 目標電壓, EV 目標電壓 + 50Vdc)

The maximum voltage of VT8 ≤ max (110 % × target voltage of the EV, target voltage of the EV + 50 V DC)

備考：負載突降後可能出現的持續長達 10 ms 暫態電壓可忽略。

NOTE The transient voltage lasting for ≤ 10 ms, which can appear after the load dump, can be ignored.

**BB.5.8 B 側短路保護 Short-circuit protection of side B**

EV 供電設備應保護 B 側及 B 側纜線組免受短路影響。短路保護裝置應滿足正常融化額定值≤ 500,000 $A^2s$。

The EV supply equipment shall protect side B and the side B cable assembly against shortcircuits.The short-circuit protection device shall meet a normal melting rating of ≤ 500 000 A2s.

藉設計審查查核符合性，以檢驗查證正常融化定額。

Compliance is checked by design review to verify normal melting rating.

B 側偵測短路後，EV 供電設備應 1 秒內或更短時間內觸發緊急停機。

The EV supply equipment shall trigger an emergency shutdown in 1 s or less after the shortcircuit is detected at side B.

緊急停機之時間準則的特定要求規定於表 BB.3 (參照 BB.5.1)。

Specific requirements on the timing criteria for the emergency shutdowns are given

in Table BB.3 (see BB.5.1).

依以下試驗查核其符合性：

Compliance is checked by the following test.

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) 斷開 ST7。設置 LT1= 0 mH 及 RT2=100 mΩ 。

2) Open ST7. Set LT1 = 0 mH and RT2 = 100 mΩ.

(3) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。

3) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(4) 依 EV 供電設備製造商指定程序開始電能傳輸。

4) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(5) EV 供電設備操作 OP3。

5) The EV supply equipment is operated at OP3.

(6) 閉合 ST8。

6) Close ST8.

(7) 依下列(a)及(b)查核輸出之最長停機時間 tshutdown：

7) Check that the maximum shutdown time of side B tshutdown follows a) and b):

tshutdown = ttrigger + tperform = after the occurrence of short-circuit fault

其中

where

ttrigger = 1 s.

a) AT1：tshutdown = 1.030 s 或更短時間內應 ≤ 5 A

a) AT1: ≤ 5 A DC in tshutdown = 1,030 s or less.

VT8：tshutdown = 1.5 s 或更短時間內應≤ 60 V dc 。

b) VT8: ≤ 60 V DC in tshutdown = 1,5 s or less.

(8)查核 VS1 之供電不中斷，直到電能傳輸順序完成且車輛耦合器安全解鎖，參照 6.3.1.108。

8) Check that VS1 is not interrupted until the energy transfer sequence is completed and the vehicle coupler is safely unlatched. See 6.3.1.108.

**BB.5.9 車輛端插頭的閂鎖及閂鎖監控 Lock and latch monitoring for vehicle connector**

依 6.3.1.103，若電壓>60Vdc，使用車輛端插頭閂鎖在車輛插座上。

According to 6.3.1.103, a vehicle connector used shall be latched on a vehicle inlet

if the voltage is > 60 V DC.

依以下試驗查核其符合性：

Compliance is checked by the following test.

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system

under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) 查核電子鎖狀態與鎖閂位置相應。

2) Check if the electronic lock status corresponds to the latch position.

(3) 電能傳輸前，通過按下開關 SS5 或拔掉車輛端插頭模擬異常情況，查核 EV 供電設備不應開始電能傳輸。

3) Before energy transfer, simulate the abnormal conditions by pressing the switch SS5 or un-mating the vehicle connector, check that the EV supply equipment does not start energy transfer.

(4) 電能傳輸期間，查核電子鎖應有效上鎖且不能開鎖。

4) During energy transfer, check that the electronic lock shall be effectively locked and cannot be unlocked.

(5) 電能傳輸結束時，若 VT8 > 60Vdc，查核電子鎖保持鎖定狀態。

5) At the end of energy transfer, if VT8 is > 60 V DC, check that the electronic lock remains locked.

**BB.5.10 B 側過電流保護 Overcurrent protection of side B**

EV 供電設備應提供過電流保護，以保護 A 側及 B 側。

The EV supply equipment shall provide overcurrent protection to protect side A and side B.

- 緊急過電流保護
- Emergency overcurrent protection

EV 供電設備應下列一項或兩項條件持續滿足 0.5s 後，於 0.5 秒內觸發緊急停機：

The EV supply equipment shall trigger an emergency shutdown in 0,5 s or less after one or both of the following conditions are continuously fulfilled for 0,5 s:

- B 側當下電流超過 EV 供電設備 B 側可用最大電流 120%；
- the present current at side B is more than 120 % of the applicable maximum current of the EV supply equipment at side B;
- 電能傳輸期間，B 側當下電壓低於 EV 供電設備 B 側之可用最低電壓 80%。
- during energy transfer, the present voltage at side B is less than 80 % of the applicable minimum voltage of the EV supply equipment at side B.

- 錯誤過電流保護
- Error overcurrent protection

若電能傳輸期間，下列條件持續滿足 1s，EV 供電設備應觸發錯誤停機：

If the following conditions are continuously fulfilled for a duration of 1 s during energy transfer, the EV supply equipment shall trigger an error shutdown:

- B 側當下電流 ≥ 30 Adc：B 側當下電流超過 EV 車目標電流 102%
- present current at side B ≥ 30 A DC: present current at side B is more than 102 % of the target current of the EV;
- B 側當下電流< 30Adc，例：B 側當下電流超過 EV 目標電流 0.6Adc 或更多。
- present current at side B < 30 A DC: present current at side B is more than the target current of the EV by 0,6 A DC or more.

藉設計審查查核符合性，以確認是否有此功能。

Compliance is checked by design review to verify that a function is provided.

**BB.5.11 絕緣故障監控 Insulation fault monitoring**

若 B 側帶電部件（DC+/DC－）與保護導體間發生故障情況下，EV 供電設備應接收到停止 EV 的停止電能傳輸訊息後 1 秒內或更短時間內觸發錯誤停機。

In the case of a fault between side B live parts (DC+/DC–) to protective conductor, the EV supply equipment shall trigger an error shutdown in 1 s or less after receiving the stop energy transfer message from the EV.

錯誤停機之時間準則的特定要求規定於表 BB.3 (參照 BB.5.1)。

Specific requirements on the timing criteria for the error shutdowns are given in Table BB.3 (see BB.5.1).

依以下試驗查核其符合性：

Compliance is checked by the following test.

試驗應依以下程序執行：

The test shall be performed according to the following procedure.

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。

2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(3) 依 EV 供電設備製造商指定程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) EV 供電設備操作 OP3。

4) The EV supply equipment operates at OP3.

(5) EV 模擬器將停止電能傳輸訊息發送給 EV，並指出 DC+/DC－與保護導體間故障。

5) The EV simulator sends the EV the stop energy transfer message with the fault between DC+/DC– to the protective conductor.

(6) 查核 EV 供電設備觸發錯誤停機。

6) Check that the EV supply equipment triggers an error shutdown.

(7) 依(a)及(b)查核輸出之最長停機時間 tshutdown：

7) Check that the maximum shutdown time of side B tshutdown follows a) and b):

DC+/DC－與保護導體間故障發生後，tshutdown = ttrigger + tperform。

tshutdown = ttrigger + tperform = after the occurrence of the fault between DC+/DC– to protective conductor

其中

where

ttrigger = 1 s;

tperform = 0.5 s.

tperform = 0,5 s.

(a) AT1：tshutdown ≤ 5 Adc = 1.5s 或更短時間內。

a) AT1: ≤ 5 A DC in tshutdown = 1,5 s or less.

(b) VT8：在 tshutdown = 1.5 秒或更短時間內應小於或等於 60 伏直流電。

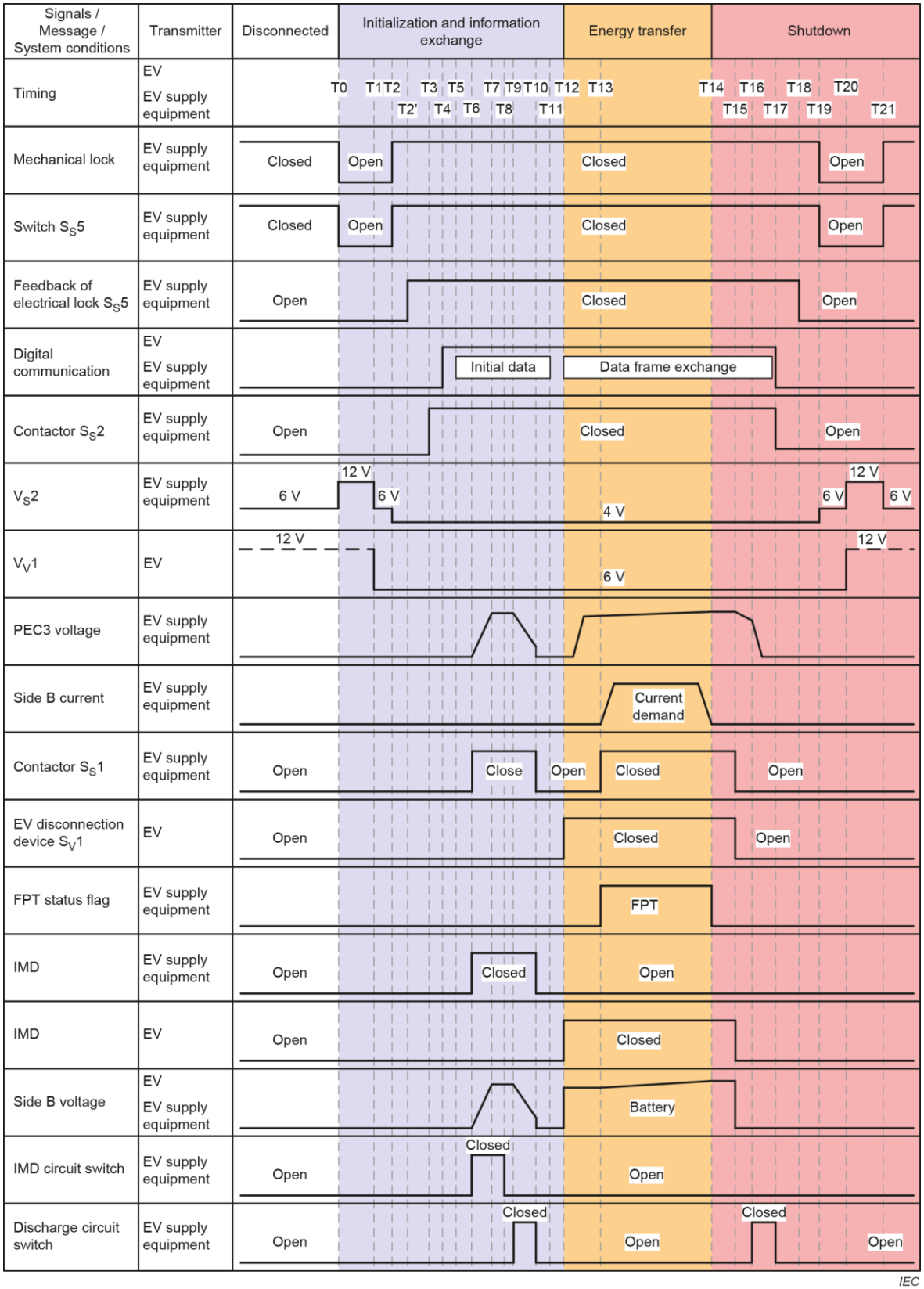
b) VT8: ≤ 60 V DC in tshutdown = 1,5 s or less.

(8)查核電能傳輸序列完成並且車輛耦合器安全脫鉤之前，VS1 是否沒有被中斷。請參照 6.3.1.108。

8) Check that VS1 is not interrupted until the energy transfer sequence is completed and the vehicle coupler is safely unlatched. See 6.3.1.108.

## BB.6 正向電能傳輸的時間序列圖 Timing sequence diagram of forward power transfer

圖 BB.4 顯示了 FPT 之序列圖。Figure BB.4 shows the sequence diagram of FPT.


Signals / Message / System conditions
Transmitter
Disconnected
Initialization and information exchange
Energy transfer
Shutdown
Timing
EV
EV supply equipment
T0 T1 T2 T2' T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21
Mechanical lock
EV supply equipment
Closed
Open
Closed
Open
Switch $S_S5$
EV supply equipment
Closed
Open
Closed
Open
Feedback of electrical lock $S_S5$
EV supply equipment
Open
Closed
Open
Digital communication
EV
EV supply equipment
Initial data
Data frame exchange
Contactor $S_S2$
EV supply equipment
Open
Closed
Open
$V_S2$
EV supply equipment
12 V
6 V
6 V
4 V
12 V
6 V
6 V
$V_V1$
EV
12 V
6 V
12 V
PEC3 voltage
EV supply equipment
Side B current
EV supply equipment
Current demand
Contactor $S_S1$
EV supply equipment
Open
Close
Open
Closed
Open
EV disconnection device $S_V1$
EV
Open
Closed
Open
FPT status flag
EV supply equipment
FPT
IMD
EV supply equipment
Open
Closed
Open
IMD
EV
Open
Closed
Side B voltage
EV
EV supply equipment
Battery
IMD circuit switch
EV supply equipment
Closed
Open
Open
Discharge circuit switch
EV supply equipment
Closed
Closed
Open
Open
Open
IEC

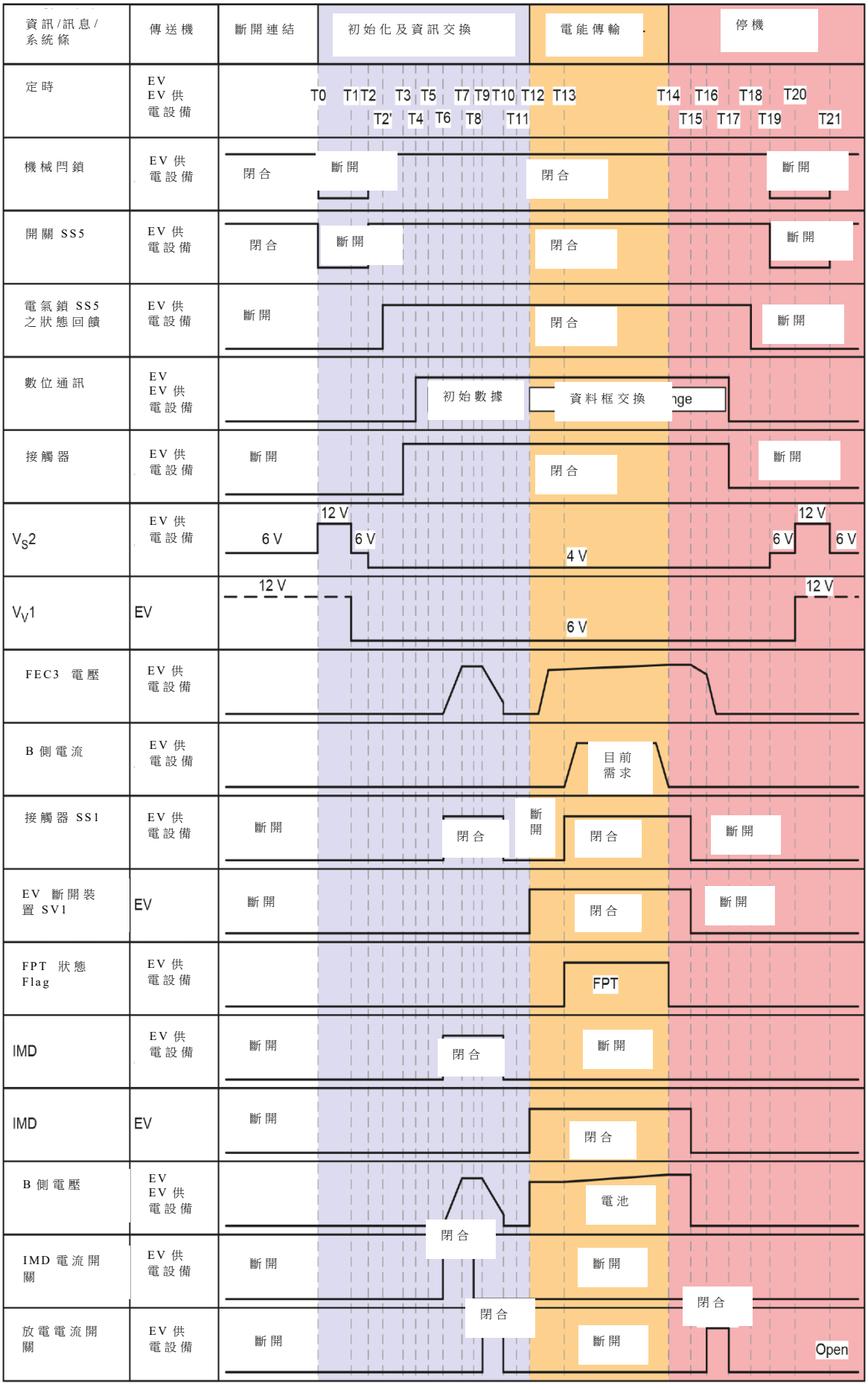

資訊/訊息/系統條
傳送機
斷開連結
初始化及資訊交換
電能傳輸
停機
定時
EV
EV 供電設備
T0 T1 T2 T2' T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21
機械閂鎖
EV 供電設備
閉合
斷開
閉合
斷開
開關 SS5
EV 供電設備
閉合
斷開
閉合
斷開
電氣鎖 SS5 之狀態回饋
EV 供電設備
斷開
閉合
斷開
數位通訊
EV
EV 供電設備
初始數據
資料框交換
接觸器
EV 供電設備
斷開
閉合
斷開
$V_S2$
EV 供電設備
12 V
6 V
6 V
4 V
12 V
6 V
6 V
$V_V1$
EV
12 V
6 V
12 V
FEC3 電壓
EV 供電設備
B 側電流
EV 供電設備
目前需求
接觸器 SS1
EV 供電設備
斷開
閉合
斷開
閉合
斷開
EV 斷開裝置 SV1
EV
斷開
閉合
斷開
FPT 狀態 Flag
EV 供電設備
FPT
IMD
EV 供電設備
斷開
閉合
斷開
IMD
EV
斷開
閉合
B 側電壓
EV
EV 供電設備
電池
閉合
IMD 電流開關
EV 供電設備
斷開
斷開
閉合
閉合
放電電流開關
EV 供電設備
斷開
斷開
Open

圖 BB.4 FPT 時間序列圖

Figure BB.4 – Timing sequence diagram of FPT

**BB.7 B 側 CCM 之電流調節 Side B current regulation in CCM**

表 BB.5 為 101.1.2.1 符合性試驗之試驗負載設定。

Table BB.5 shows the test load setup for the compliance test in 101.1.2.1.

圖 BB.5 B 側 CCM 之電流調節試驗負載之設定

Table BB.5 – Setup of the test load for side B current regulation in CCM

| 開關 Switches | | | | | 電路參數設定 Circuit parameter setup |
|---|---|---|---|---|---|
| ST17, ST18 | ST19 | ST20 | ST21 | ST22 | |
| 閉合 Closed | 閉合 Closed | 斷開 Open | 閉合 Closed | 斷開 Open | LT: 0 mH<br>RT10: 0 Ω<br>RT11: 變數 Variable<br>UT4: 受控電壓源<br>CT5：5600μF(視情況而定)<br>Controlled voltage source<br>CT5: 5 600 μF (different case depended) |

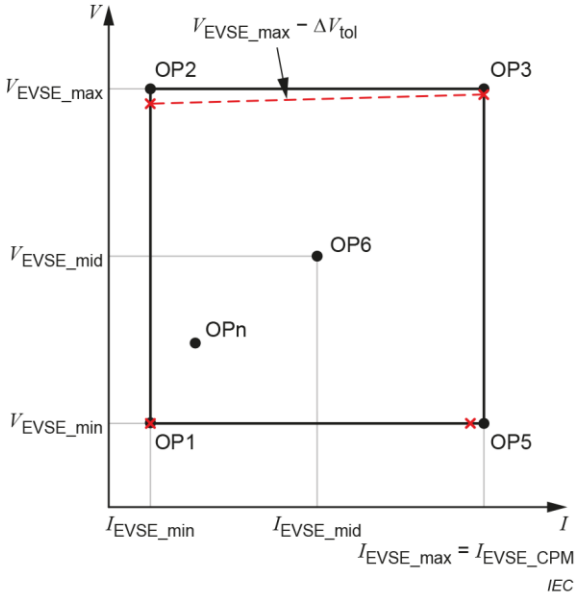
在 101.1.2.1 第 4 點中，記錄 IEV_target 和 AT1，操作點如圖 BB.5 所示。

In 101.1.2.1 4), record IEV_target and AT1 at the following operating points (see Figure BB.5):

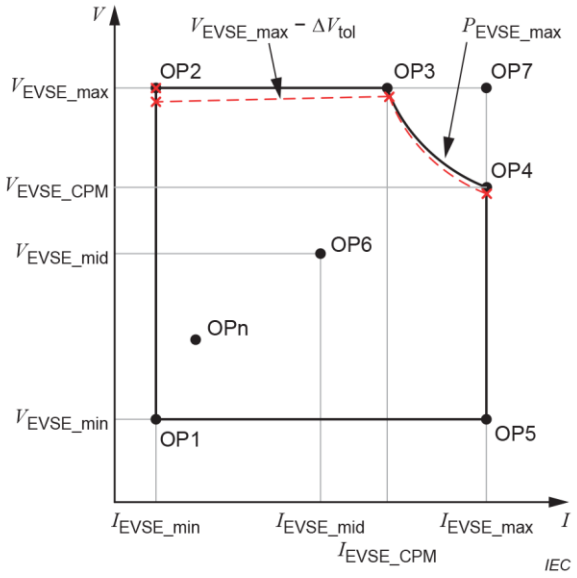
- OP1、OP2、OP3、OP5（適用於 type I EV 供電設備）；
- OP1, OP2, OP3, OP5 (for a type I EV supply equipment);
- OP1、OP2、OP3、OP4、OP5（適用於 type II EV 供電設備）。
- OP1, OP2, OP3, OP4, OP5 (for a type II EV supply equipment).

~~備考 1：在以下國家，CPM 的功能可以由各 EV 供電設備製造商自行規定，並非強制要求：中國（CN）。~~

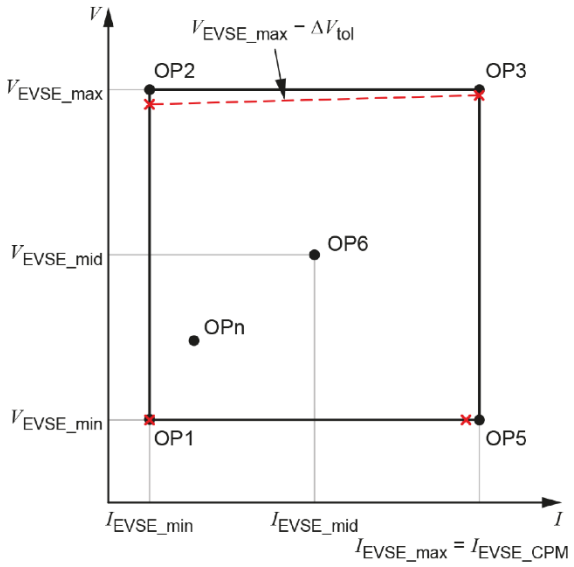
NOTE 1 In the following countries, the function of CPM can be specified by each EV supply equipment manufacturer and is not mandatory: CN.



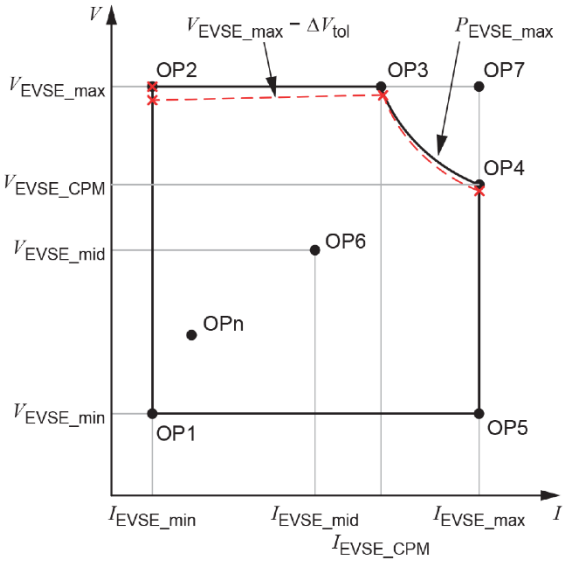

a) Type I EV supply equipment




b) Type II EV supply equipment




(a) EV 供電設備類型 type I




(b) EV 供電設備類型 type II

說明 Key

● 操作點 operating point

× 試驗點 test point

圖 BB.5 – B 側電流調節 CCM 之操作點及試驗點

Figure BB.5 – Operating points and test points for side B current regulation in CCM

備考 2：ΔVtol 為達成 B 側電流調節 CCM 所需的條件。

NOTE 2 ΔVtol is needed in order to achieve side B current regulation (CCM).

建議步驟，用於調整 EV 供電設備 B 側之電壓和電流，如表 BB.6 所示。

Recommended steps for sweeping the voltage and current at side B of the EV supply equipment are shown in Table BB.6.

表 BB.6 – CCM 達成最小 B 側電流調節之建議步驟

Table BB.6 – Recommended steps for minimum side B current regulation in CCM

| 步驟<br>Step | 行動<br>Action | 說明<br>Description |
|---|---|---|
| 1 | 設定 $V_{EV_target} = V_{EVSE_max}$<br>Set $V_{EV_target} = V_{EVSE_max}$ | 傳輸：<br>Communicate:<br>EV 目標電壓=EV 供電設備 B 側額定最高電壓<br>Target voltage of the EV = rated maximum voltage of the EV supply equipment at side B |
| 2 | 設定 $U_T4 = V_{EVSE_min} - I_{EV_target} \times (R_T10 + R_T11)$，$I_{EV_target} = I_{EVSE_min}$ 以查核 OP1<br>Set $U_T4 = V_{EVSE_min} - I_{EV_target} \times (R_T10 + R_T11)$; $I_{EV_target} = I_{EVSE_min}$ to check OP1 | 傳輸：<br>Communicate:<br>EV 目標電流= EV 供電設備 B 側之額定最小電流及 5A 間最大值<br>Target current of the EV = greater value of 5 A and rated minimum current of the EV supply equipment at side B |
| 3 | 設定 $U_T4 = V_{EVSE_min} - I_{EV_target} \times (R_T10 + R_T11)$，$I_{EV_target} = I_{EVSE\ rated\ max}$ 以查核 OP5<br>Set $U_T4 = V_{EVSE_min} - I_{EV_target} \times (R_T10 + R_T11)$; $I_{EV_target} = I_{EVSE\ rated\ max}$ to check OP5 | 傳輸：<br>Communicate:<br>EV 目標電流=EV 供電設備 B 側額定連續電流<br>Target current of the EV = rated continuous current of the EV supply equipment at side B |
| 4 | 設定 $U_T4 = (V_{EVSE_max} - \Delta V_{tol}) - I_{EV_target} \times (R_T10 + R_T11)$，$I_{EV_target} = I_{EVSE_min}$ 以查核 OP2.<br>Set UT4 = (VEVSE_max – ΔVtol) – IEV_target × (RT10 +RT11); IEV_target = IEVSE_min to check OP2.<br>Δ Vtol = 0.02 × VEVSE_max + 5 V 依據 | 傳輸：<br>Communicate:<br>EV 目標電流=EV 供電設備 B 側額定連續電流<br>Target current of the EV = rated continuous current of the EV supply equipment at side B |

| | | |
|---|---|---|
| | 101.1.2.2 及 101.1.6<br>$\Delta$ Vtol = 0,02 × VEVSE_max + 5 V<br>derived from 101.1.2.2 and 101.1.6 | |
| 5 | 設定 $U_T4=(V_{EVSE_max} - \Delta V_{tol}) - I_{EV_target} \times (R_T10 + R_T11)$<br>Set $U_T4 = (V_{EVSE_max} - \Delta V_{tol}) - I_{EV_target} \times (R_T10 + R_T11)$<br>$I_{EV_target} = I_{EVSE_max}$ 以查核 OP3<br>$I_{EV_target} = I_{EVSE_max}$ to check OP3<br>針對 EV 供電設備 type I：$I_{EV_target} = I_{EVSE_max}$ 以查核 OP3<br>For a type I EV supply equipment: $I_{EV_target} = I_{EVSE_max}$ to check OP3<br>針對 type II EV 供電設備：IEV_target = $I_{EVSE\ CPM}$ 以查核 OP3<br>For a type II EV supply equipment: $I_{EV_target} = I_{EVSE\ CPM}$ to check OP3 | 傳輸：<br>Communicate:<br>針對 type I 充電：EV 目標電流=EV 供電設備 B 側之額定連續電流<br>For a type I charger: Target current of the EV = rated continuous current of the EV supply equipment at side B<br>針對 type II 充電：EV 目標電流= IEVSE CPM = PEVSE_max /VEVSE_max<br><br>For a type II charger: Target current of the EV = IEVSE CPM = PEVSE_max /VEVSE_max |
| 針對 EV 供電設備 type II 亦請進行步驟 6<br>For a type II EV supply equipment, also go to step 6. | | |
| 6 | 設定 $U_T4 = (P_{EVSE_max} /$ IEVSE_max-ΔVtol) － IEV_target × (RT10 + RT11)，<br>IEV_target = IEVSE_max 以查核 OP4<br><br>Set UT4 = (PEVSE_max / IEVSE_max-ΔVtol) － | 傳輸：<br>Communicate:<br>EV 目標電流=EV 供電設備 B 側之額定連續電流<br>Target current of the EV = rated continuous current of the EV supply equipment at side B |

| | | |
|---|---|---|
| | IEV_target × (RT10 + RT11); IEV_target = IEVSE_max, to check OP4. | |

**BB.8 電能傳輸前查核絕緣電阻 Insulation resistance check before energy transfer**

在電能傳輸前電纜檢查期間，應執行不對稱與對稱絕緣試驗。

During the cable-check phase before energy transfer, asymmetrical and symmetrical insulation tests shall be performed.

符合性依以下試驗查核。

Compliance is checked by the following test.

不對稱試驗：

Asymmetrical test:

情況 1：

Case 1:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 在進行絕緣電阻查核前，僅需關閉開關 ST11 並設置 RT5 ≤ (100 Ω/V × U)。

2) Before the insulation resistance check, only close switch ST11 and set RT5 ≤ (100 Ω/V × U).

(3) 依 EV 供電設備製造商指定程序開始通訊期間。

3) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(4) 查核電纜檢查階段 VT8，應設為 EV 額定最高電壓及 EV 供電設備 B 側額定最高電壓間較低，並保持 1 秒或更長時間，確保 EV 供電設備觸發並執行錯誤關閉。

4) Check that the VT8 for the cable-check phase shall be the lower one between the rated maximum voltage of the EV and the rated maximum voltage of the EV supply equipment at side B for 1 s or more, and that the EV supply equipment triggers and performs an error shutdown.

(5) 當 VT8 在 1 秒或更短時間內小於 60 V DC 時，斷開 SS1。

5) After VT8 is < 60 V DC in 1 s or less, open SS1.

(6) 對於步驟 2) 中僅關閉開關 ST13 並設置 RT6 ≤ (100 Ω/V × U) 的情況，重複步驟 2) 至 5)。

6) Repeat steps 2) to 5) for the case in which only close switch ST13 and set RT6 ≤ (100 Ω/V× U) in step 2).

其中 U 為 EV 供電設備 B 側之額定最高電壓。

where U is the rated maximum voltage of the EV supply equipment at side B.

情況 2：

Case 2:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 在進行絕緣電阻檢查之前，僅需關閉開關 ST11 並設置 (100 Ω/V × U) < RT5 ≤ (500 Ω/V × U)。

2) Before the insulation resistance check, only close switch ST11 and set (100 Ω/V × U) < RT5 ≤ (500 Ω/V × U).

(3) 依 EV 供電設備製造商指定程序開始通訊期間。

3) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(4) 檢查電纜檢查階段 VT8，應設為 EV 額定最高電壓及 EV 供電設備 B 側之額定最高電壓間較低，並保持 1 秒或更長時間。

4) Check that VT8 for the cable-check shall be the lower one between the rated maximum voltage of the EV and the rated maximum voltage of the EV supply equipment at side B for 1 s or more.

(5) EV 供電設備不應觸發錯誤關閉，可能會觸發異常絕緣警報。

5) The EV supply equipment shall not trigger an error shutdown. The abnormal insulation alarm may be triggered.

(6) 對於步驟 2) 中僅關閉開關 ST13 並設置 (100 Ω/V × U) < RT6 ≤ (500 Ω/V × U) 的情況，重複步驟 2) 至 5)。

6) Repeat steps 2) to 5) for the case in which only close switch ST13 and set (100 Ω/V × U) < RT6 ≤ (500 Ω/V × U) in step 2).

其中 U 為 EV 供電設備 B 側之額定最高電壓。

where U is the rated maximum voltage of the EV supply equipment at side B.

對稱試驗：

Symmetrical test:

情況 1：

Case 1:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 在進行絕緣電阻檢查之前，關閉 ST11 和 ST13，並設置 RT5 = RT6 ≤ (100 Ω/V × U)。

2) Before the insulation resistance check, close ST11 and ST13, and set RT5 = RT6 ≤ (100 Ω/V × U).

(3) 依 EV 供電設備製造商指定程序開始通訊期間。

3) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(4) 檢查電纜檢查階段 VT8，應設為 EV 額定最高電壓及 EV 供電設備 B 側之額定最高電壓間較低，並保持 1 秒或更長時間。

4) Check that VT8 for the cable-check shall be the lower one between the rated maximum voltage of the EV and the rated maximum voltage of the EV supply equipment at side B for 1 s or more.

(5) EV 供電設備應觸發錯誤關閉。

5) The EV supply equipment shall trigger an error shutdown.

(6) 當 VT8 在 1 秒或更短時間內小於 60 V DC 時，斷開 SS1。

6) After VT8 is < 60 V DC in 1 s or less, open SS1.

其中 U 為 EV 供電設備側 B 的額定最高電壓。

where U is the rated maximum voltage of the EV supply equipment at side B.

情況 2：

Case 2:

(1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is in Table 120.

(2) 在進行絕緣電阻檢查之前，關閉開關 ST11 和 ST13，並設置 (100 Ω/V × U) < RT5 = RT6 ≤ (500 Ω/V × U)。

2) Before the insulation resistance check, close switch ST11 and ST13, and set (100 Ω/V × U) < RT5 = RT6 ≤ (500 Ω/V × U).

(3) 依 EV 供電設備製造商指定程序開始通訊期間。

3) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

(4) 檢查電纜檢查階段 VT8，應設為 EV 額定最高電壓及 EV 供電設備 B 側之額定最高電壓間較低，並保持 1 秒或更長時間。

4) Check that VT8 for the cable-check shall be the lower one between the rated maximum voltage of the EV and the rated maximum voltage of the EV supply equipment at side B for 1 s or more.

(5) EV 供電設備不應觸發錯誤關閉，可能會觸發異常絕緣警報。

5) The EV supply equipment shall not trigger an error shutdown. The abnormal insulation alarm may be triggered.

其中 U 為 EV 供電設備 B 側之額定最高電壓。

where U is the rated maximum voltage of the EV supply equipment at side B.

**BB.9 B 側電壓調節 CVM Side B voltage regulation in CVM**

101.1.2.2 要求之符合性依以下試驗查核。

Compliance for the requirements in 101.1.2.2 is checked by the following test.

試驗應依以下程序執行。

The test shall be performed according to the following procedure.

(1) 針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接至試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120，或者試驗負載亦可為電阻負載。

1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120, or the test load can also be a resistive load.

(2)持續量測 $V_T8$ 及 $A_T1$。

2) Measure VT8 and AT1 continuously.

(3) 依 EV 供電設備製造商指定程序開始電能傳輸。

3) Start energy transfer with the procedure specified by the EV supply equipment manufacturer.

(4) 在以下操作點記錄 UEV_target 和 VT8：

4) Record UEV_target and VT8 at the following operating points:

- OP1, OP2、OP3、OP5 (I 類充電器)。
- OP1, OP2, OP3, OP5 (for a type I EV supply equipment);
- OP1、OP2、OP3、OP4、OP5 (Ⅱ類充電器 for Type II charger)。
- OP1, OP2, OP3, OP4, OP5 (for a type II EV supply equipment).

表 BB.7 為掃描 EV 供電設備 B 側當下電壓及電流建議步驟。

Recommended steps for sweeping the present voltage and current of the EV supply equipment at side B are shown in Table BB.7.

表 BB.7 B 側電壓調節 CVM 之建議步驟

Table BB.7 – Recommended steps for side B voltage regulation in CVM

| | 行動<br>Action | 說明<br>Description |
|---|---|---|
| 試驗步驟<br>Test setup | (1) 在正常操作下，針對被測試系統，使用專用 EV 模擬器將 EV 供電設備連接到試驗負載。參照圖 130。圖 132 系統 B 之試驗負載設置如表 120。<br>1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test, under normal | |

| | | |
|---|---|---|
| | operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.<br>(2) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。<br>2) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.<br>(3) $I_{Target}$ and $V_{Target}$ 分別為 EV(或 EV 模擬器)之目標電流及目標電壓，經由數位通訊傳送至 EV 供電設備。<br>3) $I_{Target}$ and $V_{Target}$ are the target current and target voltage of the EV (or EV simulator) sent to the EV supply equipment through digital communication. | |
| 情況 1<br>Case 1 | 步驟 1：設定 UT4= VEVSE_min – IEVSE_min × (RT10 + RT11)<br>Step 1: Set UT4 = VEVSE_min – IEVSE_min × (RT10 + RT11);<br>步驟 2：設定 ITarget = IEVSE_max 及 VTarget = VEVSE_min<br>Step 2: Set ITarget = IEVSE_max and VTarget = VEVSE_min;<br>步驟 3：調整 UT4，使 AT6 = IEVSE_min + ΔItol<br>Step 3: Adjust UT4 to make AT6 = IEVSE_min + ΔItol;<br>步驟 4：B 側電壓調節之查核 OP1。<br>Step 4: To check the side B voltage regulation under OP1. | 傳輸：<br>Communicate:<br>EV 目標電流 $I_{Target}$ =EV 供電設備 B 側之額定提高電流<br>Target current of the EV $I_{Target}$ = rated boost current of the EV supply equipment at side B.<br>EV 目標電流 $V_{Target}$ = EV 供電設備 B 側之額定最低電壓<br>Target voltage of the EV VTarget = rated minimum voltage of the EV supply equipment at side B. |
| 情況 2<br>Case 2 | 步驟 1：設定 UT4 = VEVSE_max – IEVSE_min × (RT10 + RT11)<br>Step 1: Set UT4 = VEVSE_max – IEVSE_min × (RT10 + RT11);<br>步驟 2：設定 ITarget = IEVSE_max 及 VTarget = VEVSE_max | 傳輸：<br>Communicate:<br>EV 目標電流 $I_{Target}$ = EV 供電設備 B 側之額定提高電流<br>Target current of the EV ITarget = rated boost current of the EV supply equipment at side B.<br>EV 目標電流 $V_{Target}$ =EV 供電設備 B 側之額定最高電壓 |

| | | |
|---|---|---|
| | Step 2: Set ITarget = IEVSE_max and VTarget = VEVSE_max;<br>步驟 3：調整 UT4，使 AT6 = IEVSE_min + ΔItol<br>Step 3: Adjust UT4 to make AT6 = IEVSE_min + ΔItol;<br>步驟 4：B 側電壓調節之查核 OP2<br>Step 4: To check the side B voltage regulation under OP2. | Target voltage of the EV VTarget = rated maximum voltage of the EV supply equipment at side B. |
| 情況 3<br>Case 3 | 步驟 1：<br>Step 1:<br>針對 EV 供電設備 type I：設定 UT4 = VEVSE_max – IEVSE_max × (RT10 + RT11)<br>For a type I EV supply equipment: Set UT4 = VEVSE_max – IEVSE_max × (RT10 + RT11);<br>針對 EV 供電設備 type II：設定 UT4 = UT4 = VEVSE_max – IEVSE cpm × (RT10 + RT11)<br>For a type II EV supply equipment: Set UT4 = VEVSE_max – IEVSE cpm × (RT10 + RT11);<br>步驟 2：設定 ITarget = IEVSE_max 及 VTarget = VEVSE_max<br>Step 2: Set ITarget = IEVSE_max and VTarget = VEVSE_max;<br>步驟 3：<br>針對 EV 供電設備 type I：調整 UT4，使 AT6= IEVSE_max – ΔItol – 1 A<br>Step 3: | 傳輸：<br>Communicate:<br>EV 目標電流 $I_{Target}$ = EV 供電設備 B 側之額定提高電流<br>Target current of the EV ITarget =rated boost current of the EV supply equipment at side B.<br><br>EV 目標電流 $V_{Target}$ = EV 供電設備 B 側之額定最高電壓<br>Target voltage of the EV VTarget =rated maximum voltage of the EVsupply equipment at side B. |

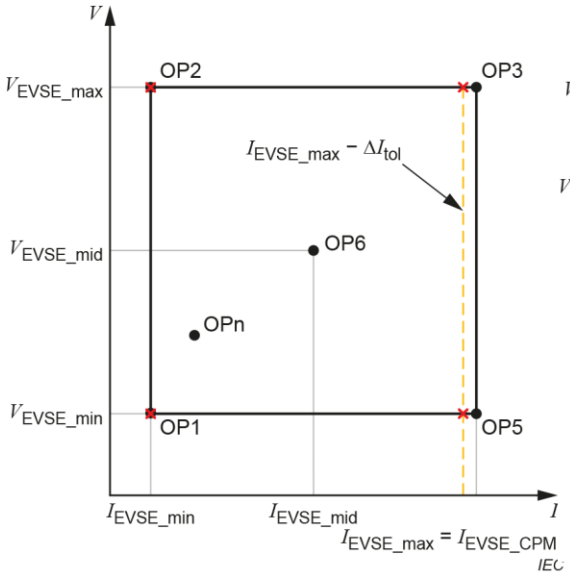
| | | |
|---|---|---|
| | For a type I EV supply equipment: Adjust UT4 to make AT6 = IEVSE_max – ΔItol – 1 A;<br>針對 EV 供電設備 type II：調整 UT4，使 AT6= IEVSE cpm – ΔItol – 1 A<br>For a type II EV supply equipment: Adjust UT4 to make AT6 = IEVSE cpm – ΔItol – 1 A;<br>步驟 4：B 側電壓調節之查核 OP3<br>Step 4: To check the side B voltage regulation under OP3. | |
| 情況 4<br>Case 4 | 步驟 1：設定 UT4= VEVSE_min – IEVSE_max × (RT10 + RT11)<br>Step 1: Set UT4 = VEVSE_min – IEVSE_max × (RT10 + RT11);<br>步驟 2：設定 $I_{Target}$= IEVSE_max 及 VTarget = VEVSE_min;<br>Step 2: Set ITarget = IEVSE_max and VTarget = VEVSE_min;<br>步驟 3：調整 UT4，使 AT6= IEVSE_max – ΔItol – 1 A<br>Step 3: Adjust UT4 to make AT6 = IEVSE_max – ΔItol – 1 A;<br>步驟 4：B 側電壓調節之查核 OP5<br>Step 4: To check the side B voltage regulation under OP5. | 傳輸：<br>Communicate:<br>EV 目標電流 $I_{Target}$=EV 供電設備 B 側之額定提高電流<br>Target current of the EV ITarget =rated boost current of the EV supply equipment at side B.<br>EV 目標電流 $V_{Target}$ =EV 供電設備 B 側額定最低電壓<br>Target voltage of the EV VTarget =<br>rated minimum voltage of the EV supply equipment at side B. |
| 針對 EV 供電設備 type II 亦請進行步驟 5<br>For a type II EV supply equipment, also do case 5. | | |
| 情況 5<br>Case 5 | 步驟 1：針對 EV 供電設備 | 傳輸：<br>Communicate: |

| | | |
|---|---|---|
| | type II：設定 UT5 = PEVSE_max / IEVSE_max – IEVSE_max × (RT10 + RT11)<br>Step 1: For a type II EV supply equipment: Set UT4 = PEVSE_max / IEVSE_max – IEVSE_max × (RT10 + RT11);<br>步驟 2：設定 $I_{Target}$= $I_{EVSE_max}$ 及 $V_{Target}$ = $P_{EVSE_max}$ / $I_{EVSE_max}$;<br>Step 2: Set ITarget = IEVSE_max and VTarget = PEVSE_max / IEVSE_max;<br>步驟 3：EV 供電設備 type II：調整 UT4，使 AT6= IEVSE_max – ΔItol – 1 A<br>Step 3: For a type II EV supply equipment: Adjust UT4 to make AT6 = IEVSE_max – ΔItol – 1 A;<br>步驟 4：B 側電壓調節之查核 OP4<br>Step 4: To check the side B voltage regulation under OP4. | EV 供電設備 type II：EV $I_{Target}$ =EV 供電設備 B 側額定提高電流<br>For a type II EV supply equipment:<br>Target current of the EV $I_{Target}$ = rated boost current of the EV supply equipment at side B.<br><br>EV $V_{Target}$ < EV 供電設備 B 側額定最高電壓之目標電壓<br>Target voltage of the EV $V_{Target}$ < rated maximum voltage of the EVsupply equipment at side B. |
| 若 B 側當下電流> 30 A dc，則 Δ Itol 為 B 側當下電流 1%。<br>Δ Itol = 1 % of the present current at side B if the present current at side B is > 30 A DC.<br>依據 BB.4.1，若 B 側當下電流≤ 30 A dc，則 Δ Itol 為 0.3A dc。<br>Δ Itol = 0,3 A DC if the present current at side B is ≤ 30 A DC, derived from BB.4.1.<br>依據 101.1.2.2 及 101.1.6，Δ Vtol = 0.02*$V_{EVSE_max}$ + 5 V dc。<br>Δ Vtol = 0,02 × VEVSE_max + 5 V DC derived from 101.1.2.2 and 101.1.6. | | |

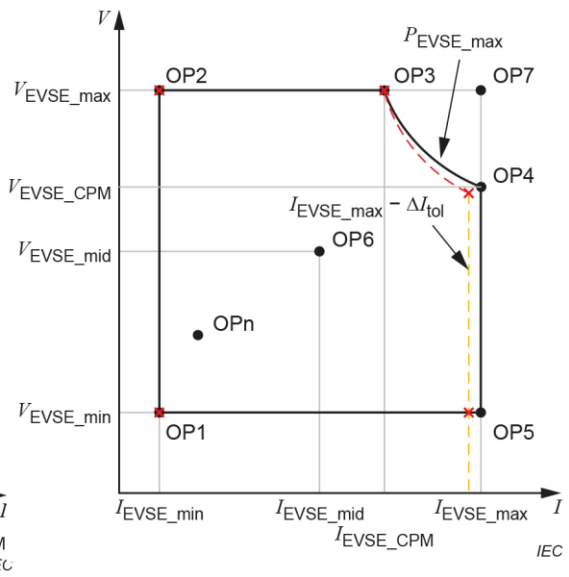
(5) 在電壓/電流掃描過程（從一個操作點轉換到另一個操作點）及對於每個操作點，查核量測電壓值與 EV 模擬器發送之目標值間的差異是否在 101.1.2.2 規定限制範圍內（參照圖 BB.6）。

5) During the voltage/current sweep (transition from one OP to another OP) and for each operating point, check that the difference between the measured voltage values and the target value sent by the EV simulator are between the limits

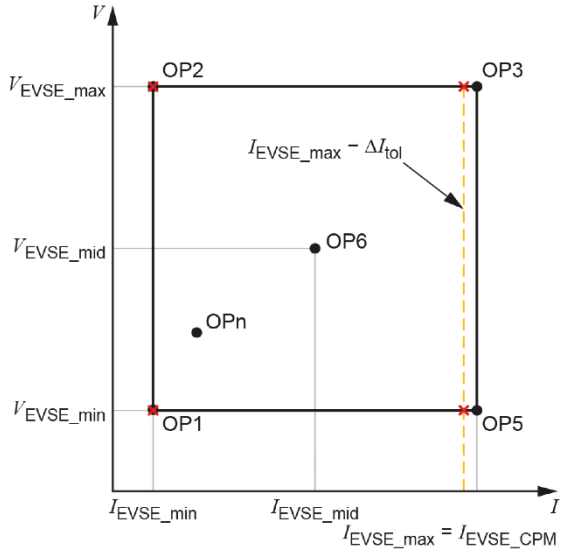
specified in 101.1.2.2 (see Figure BB.6).



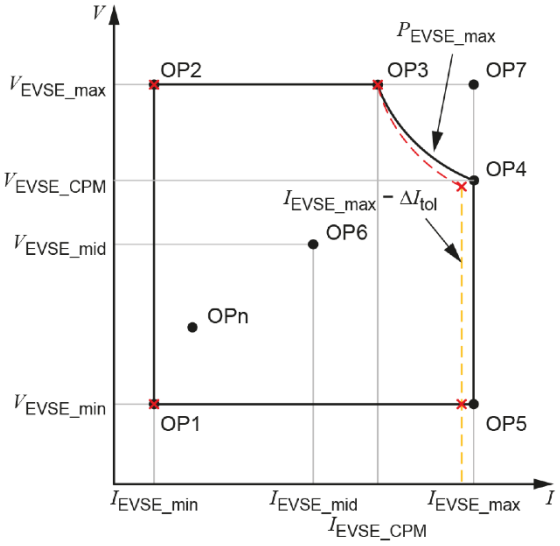

a) Type I EV supply equipment




b) Type II EV supply equipment




(a) EV 供電設備 Type I




b) EV 供電設備 Type II

說明

Key

● 操作點 operating point

× 試驗點 test point

圖 BB.6 – B 側電壓調節 CVM 之操作點與試驗點

Figure BB.6 – Operating points and test points for side B voltage regulation in CVM

備考：ΔItol 為達成 B 側電壓調節(CVM)所需的條件。

NOTE ΔItol is needed in order to achieve side B voltage regulation (CVM).

**BB.10 週期性及隨機偏差(B 側期間之 CVM 的電流漣波) Periodic and random**

**deviation (voltage ripple at side B in CVM)**

101.1.6 之符合性依以下試驗查核。

Compliance to 101.1.6 is checked by the following test.

(1) 在正常操作下，將 EV 供電設備連接到帶有專用 EV 模擬器的測試負載進行測試。請參照圖 130。系統 B 的測試負載設置，如圖 132 所示，詳細設置請參照表 120。

1) The EV supply equipment is connected to a test load with a dedicated EV simulator for the system under test, under normal operation. See Figure 130. The setup of the test load in Figure 132 for system B is shown in Table 120.

(2) EV 供電設備應在適當的操作點運行，並且測試案例應按照以下步驟逐步執行。在每個步驟中，EV 應依(3) 所述發出電流請求。

2) The EV supply equipment shall operate at the proper operating points and the test case shall be executed in single steps as indicated below. In each step, the EV shall issue a current request as given in 3).

(3) 要求 OPn，對 IEV target 及 VEV target 有以下限制：

3) Request OPn with following restrictions to IEV_target and VEV_target:

- OP1, OP2、OP3、OP5 (I 類充電器 for Type I charger)
- OP1, OP2, OP3, OP5 (for a type I EV supply equipment);
- OP1、OP2、OP3、OP4、OP5 (Ⅱ類充電器 for Type II charger)
- OP1, OP2, OP3, OP4, OP5 (for a type II EV supply equipment).

(4) 在每一操作點，量測 EV 供電設備之電壓漣波。

4) Measure the EV supply equipment present voltage ripple at side B under each operating point.

(5) 示波器要求：頻率帶寬 20 MHz，水平掃描速度 0.5 s/ DIV。

5) Oscilloscope requirements: frequency bandwidth of 20 MHz, the horizontal scanning speed of 0,5 s / division.

(6) B 側電壓漣波應小於或等於 101.1.6 規定的限制值。

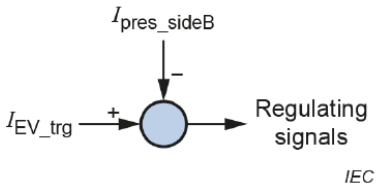
6) Present voltage ripple at side B shall be less than or equal to the limits specified in 101.1.6.

**BB.11 電能傳輸控制模式 Energy transfer control mode**

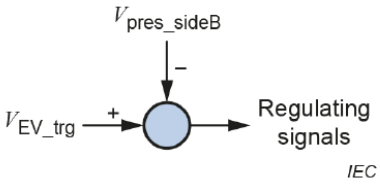
**BB.11.1 定義 Definition**

電能傳輸控制模式 CCM、CVM 和 CPM 如圖 BB.7 所示。

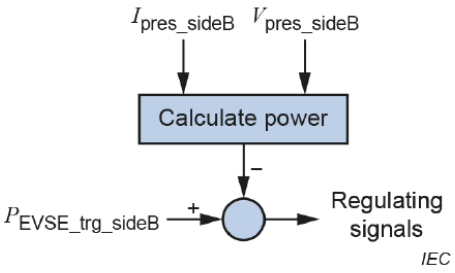
The energy transfer control modes CCM, CVM and CPM are shown in Figure BB.7.



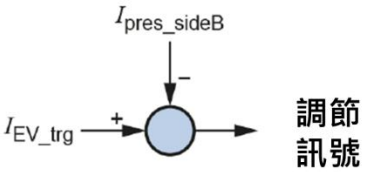

a) CCM



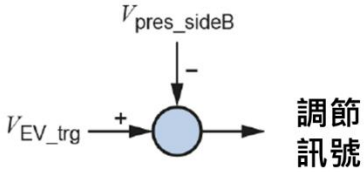

b) CVM



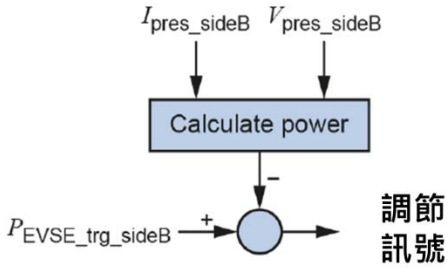

c) CPM




a) CCM




b) CVM




c) CPM

說明

Key

| | |
|---|---|
| Ipres_sideB,<br>Vpres_sideB | 當下電流/B 側電壓<br>present current/voltage at side B |
| IEV_trg | EV 目標電流或其他來源，例：EV 供電設備內部熱控單元<br>target current of the EV or other sources like thermal control unit inside the EV supply equipment |
| VEV_trg | EV 目標電壓 |

| | |
|---|---|
| | target voltage of the EV |
| PEVSE_trg_sideB | EV 供電設備 B 側之目標功率<br>target power of the EV supply equipment at side B |
| regulating signals | 調整 B 側數位訊號(通常適用於驅動 MOSFET 或 IGBT 之 PWM 訊號)<br>signal that is used to adjust the side B value (it is usually the PWM signal to drive the MOSFET or IGBT) |

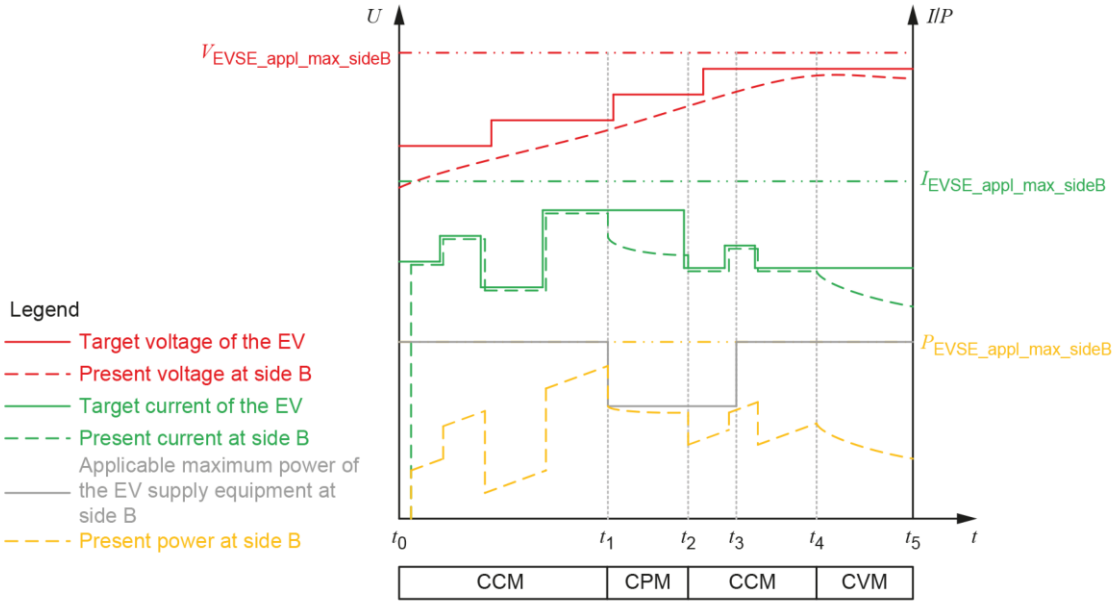
圖 BB.7 – CCM、CVM 及 CPM 之定義

Figure BB.7 – Definition of CCM, CVM and CPM

**BB.11.2 標準的正向功率傳輸過程 Typical forward power transfer process**

圖 BB.8 顯示具有不同電能傳輸模式的典型正向功率傳輸（FPT）過程。

Figure BB.8 shows a typical FPT process with different energy transfer modes.




| 下列圖 BB.8 文字 |
|---|
| EV 目標電壓<br>Target voltage of the EV |
| B 側當下電壓<br>Present voltage at side B |
| EV 目標電流<br>Target current of the EV |
| B 側當下電流<br>Present current at side B |

| |
|---|
| EV 供電設備 B 側之可用最大功率<br>Applicable maximum power of the EV supply equipment at side B |
| B 側當下功率<br>Present power at side B |

| 時間戳記<br>Timestamps | t0 to t1 | t1 to t2 | t2 to t3 | t3 to t4 | t4 to t5 |
|---|---|---|---|---|---|
| 行為<br>Behaviour | B 側當下電流跟隨 EV 目標電流<br>The present current at side B follows the target current of the EV | EV 供電設備 B 側可用最大功率受電網限制，導致 B 側當下電流小於 EV 目標電流<br>The present current at side B is less than the target current of the EV because the applicable maximum power of the EV supply equipment at side B is limited by the | B 側當下電流跟隨 EV 目標電流，因 EV 目標電流小於計算出來之 EV 供電設備 B 側可用最大功率<br>The present current at side B follows the target current of the EV because the target current of the EV is less than the calculated current of the applicable maximum | B 側當下電流跟隨 EV 目標電流<br>The present current at side B follows the target current of the EV | B 側當下電流由 EV 目標電壓控制<br>The present current at side B is controlled by the target voltage of the EV |

| | | | | | |
|---|---|---|---|---|---|
| | | supply network | power of the EV supply equipment at side B | | |
| EV 請求模式 Mode requested by the EV | CCM | CCM | CCM | CCM | CCM |
| EV 供電設備模式 Mode of the EV supply equipment | CCM | CCM | CCM | CCM | CCM |

圖 BB.8 – 標準 FTP 過程

Figure BB.8 – Typical FTP process

**BB.12 待機模式 Standby mode**

EV 供電設備可能支持待機模式以最小化功耗。EV 供電設備應關閉不支援喚醒功能的 PECs 和控制單元。EV 供電設備的待機功耗應 ≤N × 50 W，其中 N 是 EV 供電設備側 B 上可以同時提供電力的車輛接頭數量。

The EV supply equipment may support a standby mode to minimize the power consumption.The EV supply equipment shall turn off the PECs, and control units, which are not used to support the wake-up function. The standby power consumption of the EV supply equipment shall be ≤ N × 50 W, where N is the number of the vehicle couplers of the EV supply equipment at side B which can provide power simultaneously.

符合性依以下試驗查核

Compliance is checked by the following test.

試驗應依以下程序執行：

The test shall be performed according to the following procedure.

(1) A 側當下電壓為 EV 供電設備 A 側之額定最高電壓。

1) The present voltage at side A is at the rated maximum voltage of the EV supply equipment at side A.

(2) EV 供電設備與 EV 斷開連接，且無使用者操作 EV 供電設備。電能傳輸處

於待機模式。

2) The EV supply equipment is un-mated from the EV and without a user operating the EV supply equipment. Energy transfer is under standby mode.

(3) 測量 EV 供電設備側 A 的功耗應 ≤ N × 50 W。

3) Measure that the side A power consumption of the EV supply equipment shall be ≤ N × 50 W.

(4) 模擬 EV 供電設備的車輛端插頭與車輛插座連接，或與 HMI 進行交互。EV 供電設備應進行喚醒。

4) Simulate that the vehicle connector of the EV supply equipment is mated into the vehicle inlet or an interaction with the HMI. The EV supply equipment shall wake up.

系統 B 之睡眠模式仍在研議中。

Sleep mode for system B is under consideration.

**BB.13 智慧充電 Smart charging**

若 EV 供電設備支持智慧充電，則 EV 供電設備應根據電網的需求響應調整側 B 當下電流。

If the EV supply equipment supports smart charging, the EV supply equipment shall adjust the present current at side B according to the demand response of the supply network.

**BB.14 保護性導體之最小截面 Minimum cross-sectional area of the protective conductor**

保護性導體之最小截面應為 16 $mm^2$

The minimum cross-sectional area of the protective conductor shall be 16 mm2

# 附錄 CC
# (規定)
# 系統 C 之 EV 供電設備

## CC.1 一般

附錄 CC 提供使用系統 C 之 EV 供電設備的特定要求。

Annex CC provides specific requirements for EV supply equipment for use with system C.

系統 C 為模式 4 之 EV 供電設備。依據系統之零組件規格，EV 供電設備 B 側之額定最高電壓限制在 1,000V DC 以下。

System C is a mode 4 EV supply equipment. The rated maximum voltage of the EV supply equipment at side B shall be limited to ≤ 1 000 V DC, dependent on the components of the system.

車輛之耦合器應符合表 CC.1 所列出的組態之一。

The vehicle couplers shall comply with one of the configurations listed in Table CC.1.

表 CC. 1 系統 C 之車輛耦合器

Table CC.1 – Vehicle couplers for system C

| 序 號<br>No. | 系統 C 之車輛耦合器<br>Vehicle couplers for system C |
|---|---|
| (a) | IEC 21196-3 或 IEC TS 62196-3-1 之組態 EE<br>Configuration EE according to IEC 62196-3 or IEC TS 62196-3-1 |
| (b) | IEC 21196-3 或 IEC TS 62196-3-1 之組態 FF<br>Configuration FF according to IEC 62196-3 or IEC TS 62196-3-1 |
| 備考：組態 CC 及組態 DD 不被 IEC 62196-3:2014(已廢止)及 IEC 62196-3:2022 所涵蓋。<br>NOTE Configuration CC and configuration DD are not covered by IEC 62196-3:2014 8 and IEC 62196-3:2022. | |

## CC.2 電路圖

CC.2.1 一般

接近導引線（PP）和控制導引線（CP）信號/接點的一般定義與功能，係依據 IEC 61851-1（包括 IEC 61851-1:2017 表 B.1 和表 B.2 中的詳細電阻定義）以及 SAE J1772。

依 IEC 61851-1:2017 附錄 A 規定，應使用 5% 的控制導引振盪工作週期（duty cycle）。

The general definitions and functions of the proximity pilot (PP) and control pilot (CP) signals/contacts are according to IEC 61851-1 (including detailed resistor definitions in IEC 61851-1:2017, Table B.1 and Table B.2) and SAE J1772. A control pilot oscillator duty cycle of 5 % shall be used according to IEC 61851-1:2017, Annex A.

EV 供電設備與 EV 間之數位通訊應符合 IEC 61851-24 規定。

Digital communications between the EV supply equipment and the EV shall comply with IEC 61851-24.

數位通訊之實體層應符合 ISO 15118-3 規定。數位通訊使用控制導引線（CP）和保護導線（PE）。不同車輛端插頭之接點分配依 IEC 62196-3:2022 之規定。

The physical layer for digital communication shall comply with ISO 15118-3. Digital communication uses the control pilot conductor and the protective conductor. Contact assignments of the different vehicle connectors are specified in IEC 62196-3:2022.

如果 EV 供電設備尚未準備好接收數位通訊，則應關閉其控制導引振盪器。參照 CC.5.2.3.2 有關控制導引振盪器的額外時序要求。

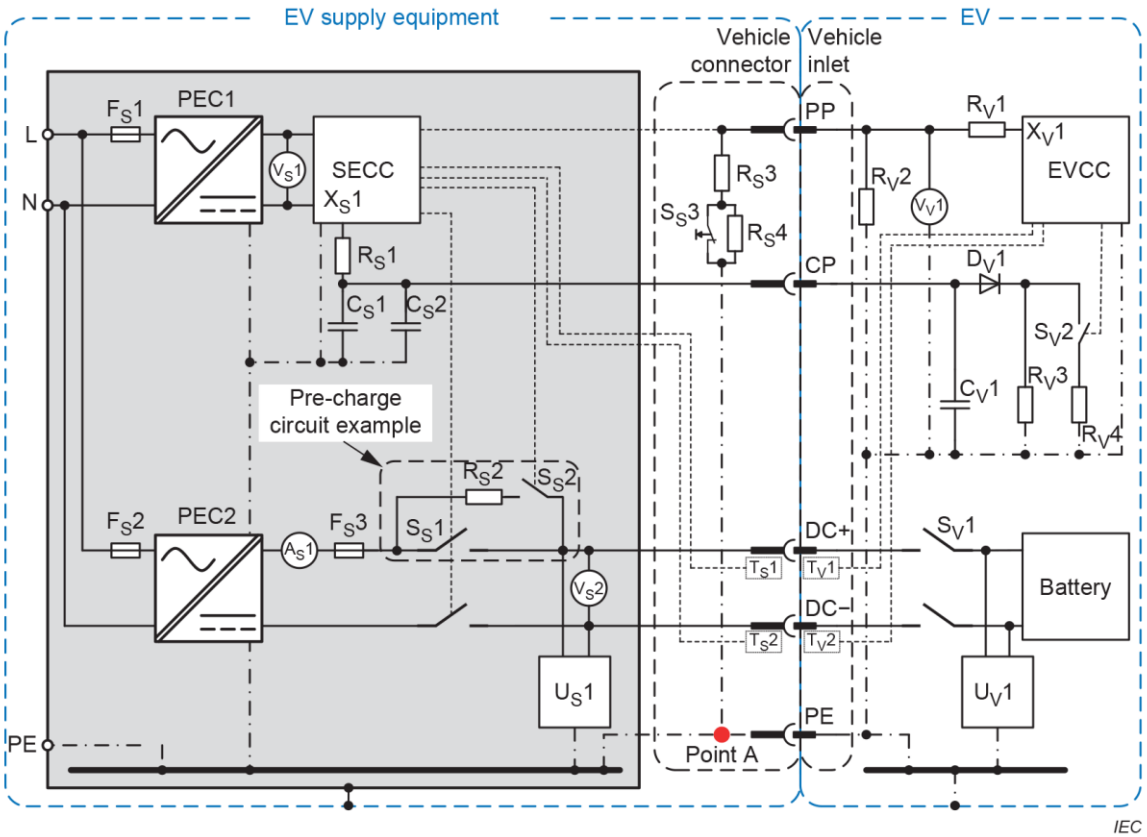
The EV supply equipment shall turn off its control pilot oscillator if the EV supply equipment is not ready to receive digital communication. See CC.5.2.3.2 for additional timing requirements for the control pilot oscillator.

CC.2.2 組態 EE 之電路圖

CC.2.2 Circuit diagram for configuration EE

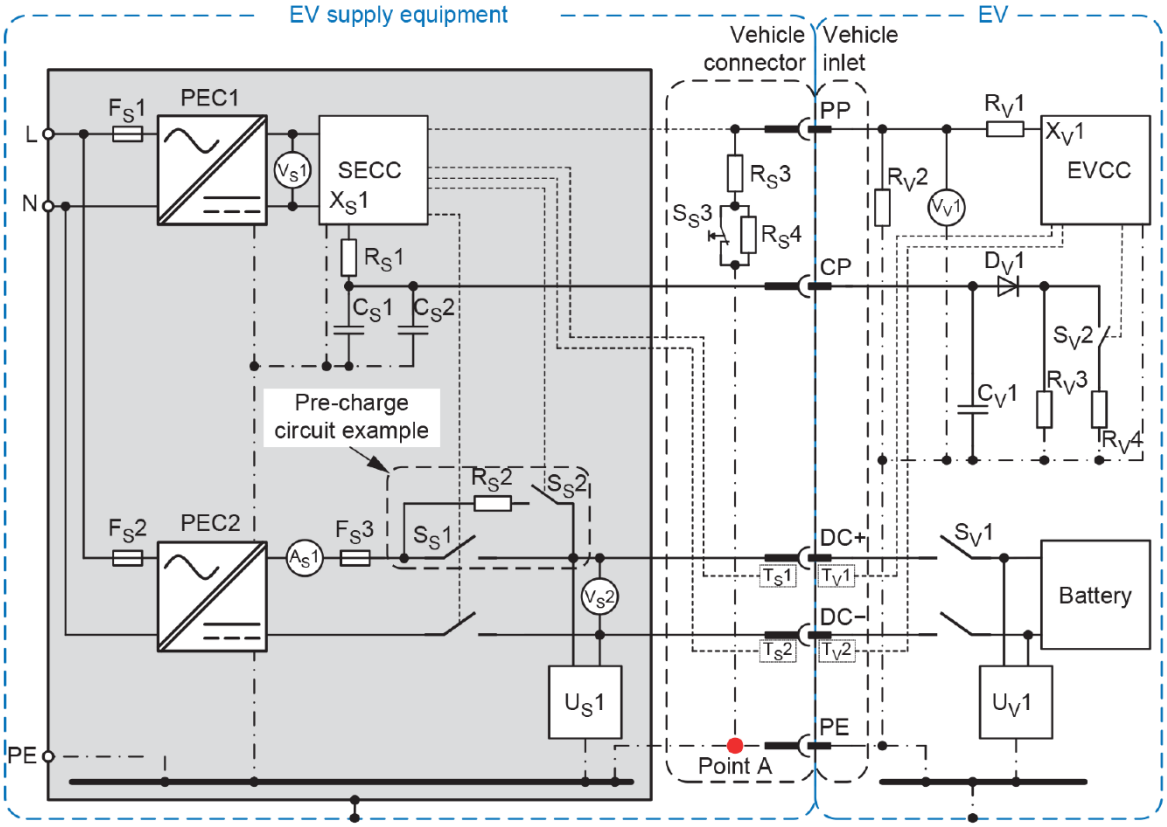
圖 CC.1 之電路圖應可使用於組態 EE。

The circuit diagram of Figure CC.1 shall be used for configuration EE.




EV 供電設備　　EV

車輛端插頭　　車輛端插座




| | | | |
|---|---|---|---|
| L1, N | AC or DC 供電 | $C_V$ | EV 之電容 |
| PE | 保護性導體接點 | $S_S$ | EV 供電設備之開關或繼電器 |
| CP | 系統 C 之控制導引導體接點 | $S_V$ | EV 之開關或繼電器 |
| PP | 接近導引線接點 | $A_S$ | EV 供電設備之電流表 |
| DC+ | B 側之正電壓端子 | $R_S$ | EV 供電設備之電阻器 |
| DC– | B 側之負電壓端子 | $R_V$ | EV 之電阻器 |
| SECC | 供電設備通訊控制器 | $U_S$ | EV 供電設備之 IMD |
| EVCC | EV 通訊控制器 | $U_V$ | EV 之 IMD |
| PEC1, PEC2 | 電力電子轉換器 | $V_S$ | EV 供電設備之電壓表 |
| $X_V1$ | EV 之電壓源 | $V_V$ | EV 之電壓表 |
| $X_S1$ | EV 供電設備之電壓源 | $F_S$ | EV 供電設備之過電流保護裝置 |
| $C_S$ | EV 供電設備之電容 | $D_V$ | EV 之二極體 |
| $T_S$ | EV 供電設備之溫度感測器 | $T_V$ | EV 之溫度感測器 |
| A 點 | 接近導引導體至保護導體之連接點 | | |

| | | | |
|---|---|---|---|
| L1, N | AC or DCsupply network | CV | capacitance in the EV |
| PE | protective conductor | SS | switch or relay in the EV |
| | contact | | supply equipment |
| CP | control pilot conductor | SV | switch or relay in the EV |

| | | | |
|---|---|---|---|
| | contact of system C | | |
| PP | proximity pilot conductor contacts | AS | ammeter in the EV supply equipment |
| DC+ | positive terminal of side B | RS | resistor in the EV supply equipment |
| DC– | negative terminal of side B | RV | resistor in the EV |
| SECC | supply equipment communication controller | US | IMD of the EV supply equipment |
| EVCC | electric vehicle communication controller | UV | IMD of the EV |
| PEC1, PEC2 | power electronic converter | VS | voltmeter in the EV supply equipment |
| XV1 | voltage source in the EV | VV | voltmeter in the EV |
| XS1 | voltage source in the EV supply equipment | FS | over-current protection device in the EV supply equipment |
| CS | capacitance in the EV supply equipment | DV | diode in the EV |
| TS | temperature sensor in the EV supply equipment | TV | temperature sensor in the EV |
| point A | point where the proximity pilot conductor is connected to the protective conductor | | |

額外之電路圖及零組件，參照 IEC 61851-1:2017 附錄 A 及附錄 B。

See IEC 61851-1:2017, Annex A and Annex B, for additional circuit diagrams and components.

圖 CC.1 系統 C 之 EV 供電設備組態 EE 之電路圖

Figure CC.1 – Circuit diagram for a system C EV supply equipment of configuration EE

表 CC.2 組態 EE 之零件值及允許差

| 零組件 [a] | 符號 | 最小值 | 標稱值 [b] | 最大值 | 單位 |
|---|---|---|---|---|---|
| 控制導引 | | | | | |
| 等效負載電阻 | $R_S1$ | 970 | 1000 | 1030 | Ω |
| 不需要排風 EV 之等效負載電阻 | $R_V4$ | 1261 | 1300 | 1339 | Ω |
| 需要排風 EV 之等效負載阻抗 | $R_V4$ | 261.9 | 270 | 278.1 | Ω |
| 等效負載電阻 | $R_V3$ | 2658 | 2740 | 2822 | Ω |
| 來自 $D_V1$ 之壓降 | $D_V1$ | 0.55 | 0.7 | 0.85 | V DC |
| EV 供電設備控制導引線電容 | $C_S1+C_S2$ | 300 | n.a. | 3100 | pF |
| 整體 EV 供電設備控制導引線等效電容 | $C_V1$ | n.a. | n.a. | 2400 | pF |
| 發電機開路正電壓 | $X_S1$ | 11.4 | 12 | 12.6 | V DC |
| 發電機開路負電壓 | | -12.6 | -12 | -11.4 | V DC |
| 頻率產生器 | | 980 | 1000 | 1020 | Hz |
| 脈寬 | | 5 % – 5 µs | 5% | 5 % + 5 µs | - |
| 上升時間(10 % to 90 %) | | n.a. | n.a. | 2 | µs |
| 下降時間(90 % to 10 %) | | n.a. | n.a. | 2 | µs |
| 設定至 95%穩態之時間 | | n.a. | n.a. | 3 | µs |
| 接近導引 | | | | | |
| 接近導引穩壓電源 | $X_V1$ | 4.75 | 5 | 5.25 | V DC |
| 等效負載電阻 | $R_V1$ | 297 | 330 | 363 | Ω |
| 等效負載電阻 | $R_V2$ | 2430 | 2700 | 2970 | Ω |
| 等效負載電阻 | $R_V3$ | 135 | 150 | 165 | Ω |
| 等效負載電阻 | $R_V4$ | 297 | 330 | 363 | Ω |

註：

(a) 必須在 EV 供電設備製造廠商規範的環境條件下，於整個使用壽命期間維持允許差。

(b) 建議在此應用中使用允許差為 1% 的電阻器。參照 IEC 61851-1:2017 附錄 A 和附錄 B。

Table CC.2 – Component values and tolerances for configuration EE

| Component a | Symbol | Minimum value | Nominal value b | Maximum value | Unit |
|---|---|---|---|---|---|
| 控制導引 | | | | | |
| Equivalent load resistance | $R_S1$ | 970 | 1000 | 1030 | Ω |
| Equivalent load resistance for EVs not requiring Ventilation | $R_V4$ | 1261 | 1300 | 1339 | Ω |
| Equivalent load resistance for EVs requiring ventilation | $R_V4$ | 261.9 | 270 | 278.1 | Ω |
| Equivalent load resistance | $R_V3$ | 2658 | 2740 | 2822 | Ω |
| Voltage drop from DV1 | $D_V1$ | 0.55 | 0.7 | 0.85 | V DC |
| EV supply equipment control pilot capacitance | $C_S1+C_S2$ | 300 | n.a. | 3100 | pF |
| Total equivalent EV control pilot capacitance | $C_V1$ | n.a. | n.a. | 2400 | pF |
| Generator open circuit positive voltage | $X_S1$ | 11.4 | 12 | 12.6 | V DC |
| Generator open circuit negative voltage | | -12.6 | -12 | -11.4 | V DC |
| Frequency generator | | 980 | 1000 | 1020 | Hz |
| Pulse width | | 5 % – 5 µs | 5% | 5 % + 5 µs | - |
| Rise time (10 % to 90 %) | | n.a. | n.a. | 2 | µs |
| Fall time (90 % to 10 %) | | n.a. | n.a. | 2 | µs |
| Settling time to 95 % steady state | | n.a. | n.a. | 3 | µs |
| 接近導引 | | | | | |
| Proximity pilot regulated voltage source | $X_V1$ | 4.75 | 5 | 5.25 | V DC |
| Equivalent load resistance | $R_V1$ | 297 | 330 | 363 | Ω |
| Equivalent load resistance | $R_V2$ | 2430 | 2700 | 2970 | Ω |
| Equivalent load resistance | $R_V3$ | 135 | 150 | 165 | Ω |
| Equivalent load resistance | $R_V4$ | 297 | 330 | 363 | Ω |

[a] Tolerances to be maintained over the full useful life and under environmental conditions as specified by the EV supply equipment manufacturer.
[b] Resistors with a tolerance of 1 % are recommended for this application. See IEC 61851-1:2017, Annex A and Annex B.

接近導引電路應符合表 CC.3 規定之電壓。

The proximity pilot circuit shall comply with the voltages specified in Table CC.3.

表 CC. 3 接近導引電壓

| 條件 [a] | 最低電壓<br>V DC | 平均電壓<br>V DC | 最高電壓<br>V DC |
|---|---|---|---|
| 車輛端插頭未接合、且 $S_S3$ 閉合/斷開 | -0.1 | 0 | 0.1 |
| 車輛端插頭接合、且 $S_S3$ 閉合 | 1.23 | 1.51 | 1.82 |
| 車輛端插頭接合、且 $S_S3$ 斷開 | 2.38 | 2.76 | 3.16 |
| [a] 當車輛端插頭接合時，EV 供電設備製造商可以將 1.82 V DC 至 2.38 V DC 之間的接近導引線電壓解譯為 $S_S3$ 斷開或 $S_S3$ 閉合。 | | | |

Table CC.3 – Proximity pilot voltages

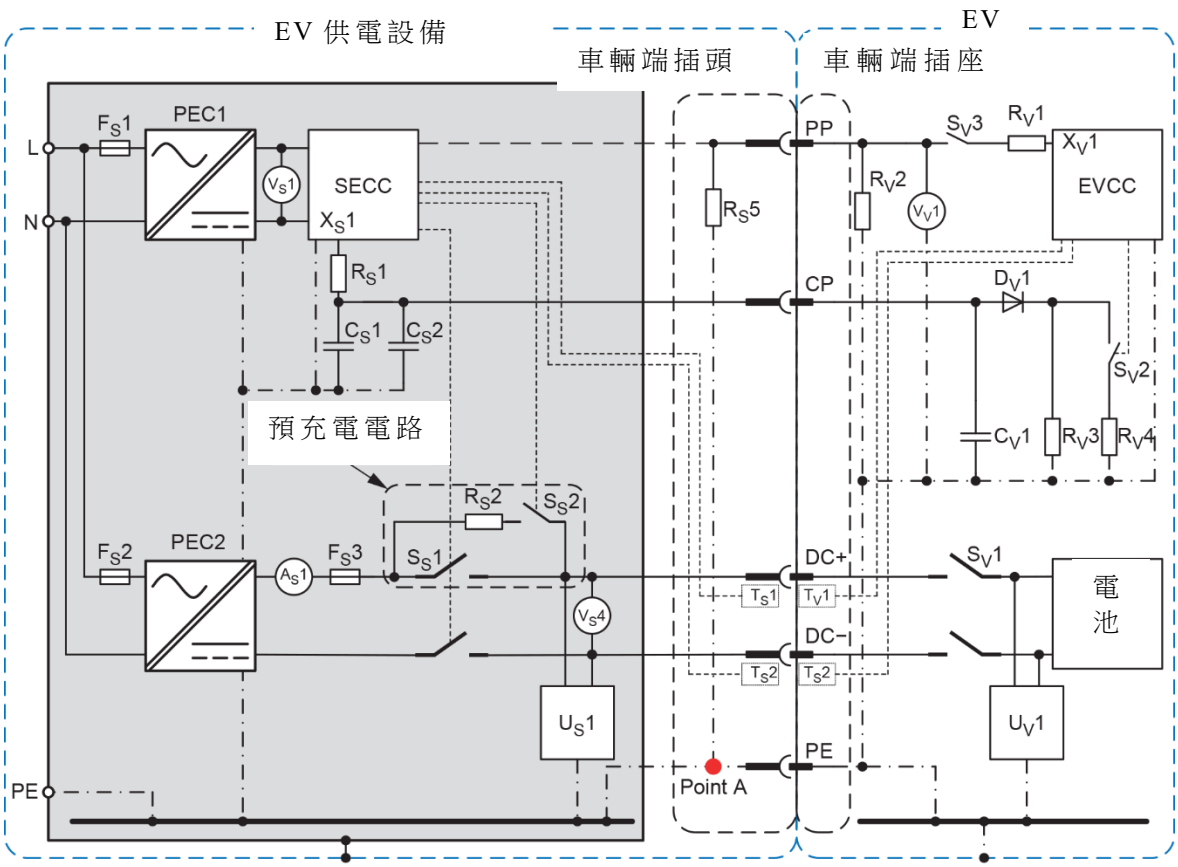
| Condition a | Minimum voltage<br>V DC | Average voltage<br>V DC | Maximum voltage<br>V DC |
|---|---|---|---|
| Vehicle connector unmated and SS3 closed/open | -0.1 | 0 | 0.1 |
| Vehicle connector mated and SS3 closed | 1.23 | 1.51 | 1.82 |
| Vehicle connector mated and SS3 open | 2.38 | 2.76 | 3.16 |
| a When the vehicle connector is mated, the EV supply equipment manufacturer may interpret a proximity pilot voltage between 1,82 V DC and 2,38 V DC as SS3 open or SS3 closed. | | | |

CC.2.3 組態 FF 之電路圖

CC.2.3 Circuit diagram for configuration FF

圖 CC.2 之電路圖應可用於組態 FF。

The circuit diagram of Figure CC.2 shall be used for configuration FF.

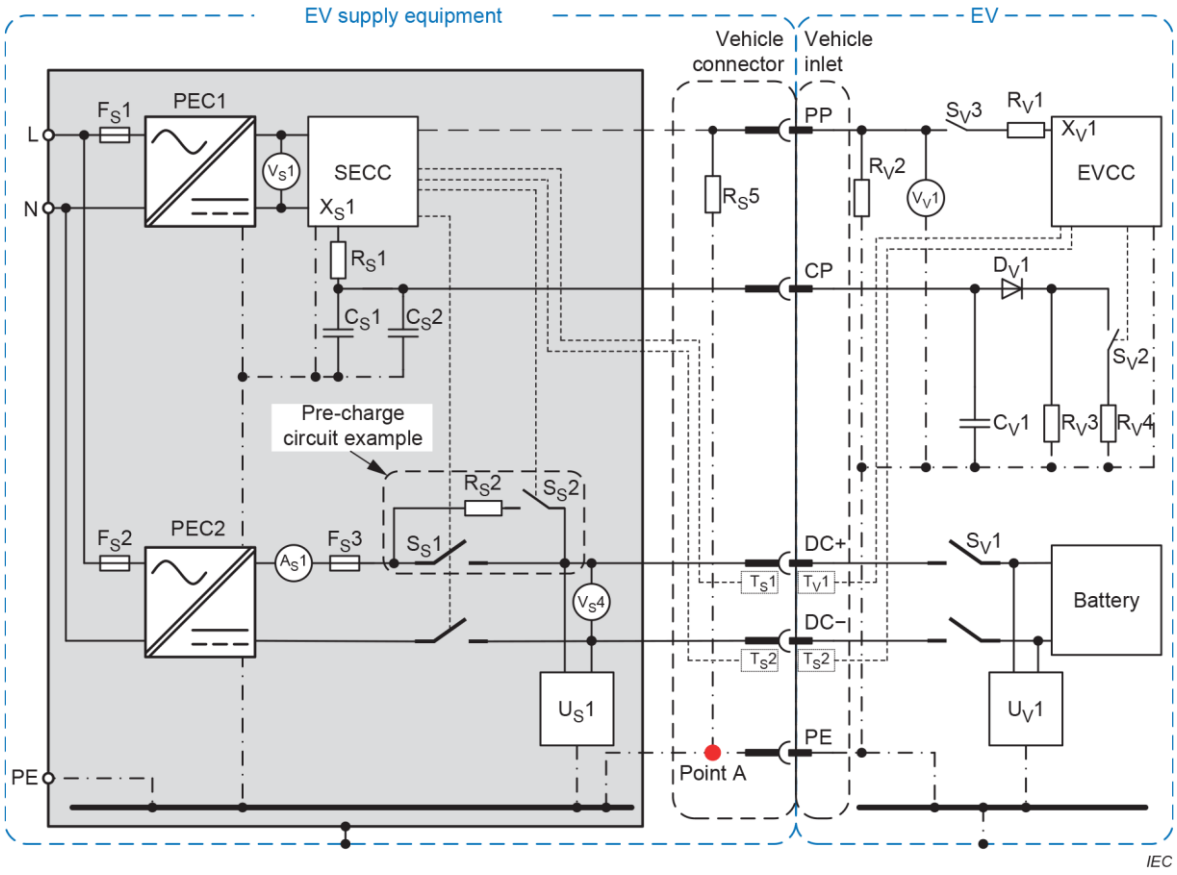



說明：

| | | | |
|---|---|---|---|
| L1, N | AC or DC 供電 | CV | EV 之電容 |
| PE | 保護性導體接點 | SS | EV 供電設備之開關或繼電器 |
| CP | 系統 C 之控制導引導體接點 | SV | EV 之開關或繼電器 |
| PP | 接近導引導體接點 | AS | EV 供電設備之電流表 |
| DC+ | B 側之正電壓端子 | RS | EV 供電設備之電阻器 |
| DC– | B 側之負電壓端子 | RV | EV 之電阻器 |
| SECC | 供電設備通訊控制器 | US | EV 供電設備之 IMD |
| EVCC | EV 通訊控制器 | UV | EV 之 IMD |
| PEC1, PEC2 | 電力電子轉換器 | VS | EV 供電設備之電壓表 |
| XV1 | EV 之電壓源 | VV | EV 之電壓表 |
| XS1 | EV 供電設備之電壓源 | FS | over-current protection device in the EV supply equipment |
| CS | EV 供電設備之電容 | DV | EV 之二極體 |
| TS | EV 供電設備之溫度感測器 | TV | EV 之溫度感測器 |
| point A | 接近導引導體至保護導體之連接點 | | |

電路圖及額外之零組件，可參照 IEC 61851-1:2017 附錄 A、附錄 B 及附錄 C。

圖 CC. 2 系統 C 之 EV 供電設備組態 FF 之電路圖




| | | | |
|---|---|---|---|
| L1, N | AC or DC supply network | CV | capacitance in the EV |
| PE | protective conductor contact | SS | switch or relay in the EV supply equipment |
| CP | control pilot conductor contact of system C | SV | switch or relay in the EV |
| PP | proximity pilot conductor contacts | AS | ammeter in the EV supply equipment |
| DC+ | positive terminal of side B | RS | resistor in the EV supply equipment |
| DC– | negative terminal of side B | RV | resistor in the EV |
| SECC | supply equipment communication controller | US | IMD of the EV supply equipment |
| EVCC | electric vehicle communication controller | UV | IMD of the EV |
| PEC1, PEC2 | power electronic converter | VS | voltmeter in the EV supply equipment |
| XV1 | voltage source in the EV | VV | voltmeter in the EV |
| XS1 | voltage source in the EV supply equipment | FS | over-current protection device in the EV supply equipment |
| CS | capacitance in the EV supply equipment | DV | diode in the EV |
| TS | temperature sensor in the EV supply equipment | TV | temperature sensor in the EV |
| point A | point where the proximity pilot conductor is connected to the protective conductor | | |

See IEC 61851-1:2017, Annex A, Annex B and Annex C, for circuit diagrams and additional components.

Figure CC.2 – Circuit diagram of a system C EV supply equipment of configuration FF

表 CC.4 組態 FF 之零組件值及容許差

| 零組件 [a] | 符號 | 最小值 | 標稱值 [b] | 最大值 | 單位 |
|---|---|---|---|---|---|
| 控制導引 | | | | | |
| 等效負載電阻 | $R_S1$ | 970 | 1000 | 1030 | Ω |
| 不需要排風 EV 之等效負載電阻 | $R_V4$ | 1261 | 1300 | 1339 | Ω |
| 需要排風 EV 之等效負載阻抗 | $R_V4$ | 261.9 | 270 | 278.1 | Ω |
| 等效負載電阻 | $R_V3$ | 2658 | 2740 | 2822 | Ω |
| 來自 $D_V1$ 之壓降 | $D_V1$ | 0.55 | 0.7 | 0.85 | V DC |
| EV 供電設備控制導引線電容 | $C_S1+C_S2$ | 300 | n.a. | 3100 | pF |
| 整體 EV 供電設備控制導引線等效電容 | $C_V1$ | n.a. | n.a. | 2400 | pF |
| 發電機開路正電壓 | $X_S1$ | 11.4 | 12 | 12.6 | V DC |
| 發電機開路負電壓 | | -12.6 | -12 | -11.4 | V DC |
| 頻率產生器 | | 980 | 1000 | 1020 | Hz |
| 脈寬 | | 5 % – 5 µs | 5% | 5 % + 5 µs | - |
| 上升時間(10 % to 90 %) | | n.a. | n.a. | 2 | µs |
| 下降時間(90 % to 10 %) | | n.a. | n.a. | 2 | µs |
| 設定至 95%穩態之時間 | | n.a. | n.a. | 3 | µs |
| 接近導引 | | | | | |
| 接近導引穩壓電源 | $X_V1$ | 4.75 | 5 | 5.25 | V DC |
| 等效負載電阻 [c] | $R_V1$ | 297 | 330 | 363 | Ω |
| 等效負載電阻 | $R_S5$ | 1455 | 1500 | 1545 | Ω |
| EV 接近導引電路之選項等效負載電阻 [c,d] | $R_V2$ | 2430 | 2700 | 2970 | Ω |

[a] 在整個使用壽命期間及 EV 供電設備製造商規定之環境條件下，容許差應予以維持。

[a] Tolerances to be maintained over the full useful life and under environmental conditions as specified by the EV supply equipment manufacturer.

[b] 在本應用中建議電阻器之容許差為 1 %。

[b] Resistors with a tolerance of 1 % are recommended for this application.

[c] 這些值為建議值。IEC 61851-1:2017 之 B.2 中並未規定該值。由於 PP 電路在 IEC 61851-1:2017 之 B.2 並未預定由 EV 供電設備來進行檢查，因此由 EV 製造廠商規定這些值。

[c] These are recommended values. IEC 61851-1:2017, Clause B.2, does not define these values. The EV manufacturer defines these values because the PP circuit in IEC 61851-1:2017, Clause B.2, was not intended to be checked by the EV supply equipment.

[d] 依照 IEC 61851-1:2017 之 B.2，EV 製造廠商對組態 EE 可能使用相同值選擇 2,700 Ω ，或另外選擇 4,700 Ω 來提升電流編碼電阻器 $R_S5$ (in IEC 61851-1:2017 之 Rc)。

[d] The EV manufacturer may choose 2,700 Ω to use the same value for configuration EE, or alternatively 4 700 Ω to improve the detection of the current coding resistor $R_S5$ (Rc in IEC 61851-1:2017), according to IEC 61851-1:2017, Clause B.2.

Table CC.4 – Component values and tolerances for configuration FF

| Component a | Symbol | Minimum value | Nominal value b | Maximum value | Unit |
|---|---|---|---|---|---|
| Control pilot | | | | | |
| Equivalent load resistance | $R_S1$ | 970 | 1000 | 1030 | Ω |
| Equivalent load resistance for EVs not requiring Ventilation | $R_V4$ | 1261 | 1300 | 1339 | Ω |
| Equivalent load resistance for EVs requiring ventilation | $R_V4$ | 261.9 | 270 | 278.1 | Ω |
| Equivalent load resistance | $R_V3$ | 2658 | 2740 | 2822 | Ω |
| Voltage drop from DV1 | $D_V1$ | 0.55 | 0.7 | 0.85 | V DC |
| EV supply equipment control pilot capacitance | $C_S1+C_S2$ | 300 | n.a. | 3100 | pF |
| Total equivalent EV control pilot capacitance | $C_V1$ | n.a. | n.a. | 2400 | pF |
| Generator open circuit positive voltage | $X_S1$ | 11.4 | 12 | 12.6 | V DC |
| Generator open circuit negative voltage | | -12.6 | -12 | -11.4 | V DC |
| Frequency generator | | 980 | 1000 | 1020 | Hz |
| Pulse width | | 5 % – 5 µs | 5% | 5 % + 5 µs | - |
| Rise time (10 % to 90 %) | | n.a. | n.a. | 2 | µs |
| Fall time (90 % to 10 %) | | n.a. | n.a. | 2 | µs |
| Settling time to 95 % steady state | | n.a. | n.a. | 3 | µs |
| Proximity pilot | | | | | |
| Proximity pilot regulated voltage source | $X_V1$ | 4.75 | 5 | 5.25 | V DC |
| Equivalent load resistance [c] | $R_V1$ | 297 | 330 | 363 | Ω |
| Equivalent load resistance | $R_S5$ | 1455 | 1500 | 1545 | Ω |
| Optional equivalent load resistance for the EV proximity pilot circuit [c,d] | $R_V2$ | 2430 | 2700 或 4700 | 5170 | Ω |

a Tolerances to be maintained over the full useful life and under environmental conditions as specified by the EV supply equipment manufacturer.
b Resistors with a tolerance of 1 % are recommended for this application.
c These are recommended values. IEC 61851-1:2017, Clause B.2, does not define these values.

| |
|---|
| The EV manufacturer defines these values because the PP circuit in IEC 61851-1:2017, Clause<br>B.2, was not intended to be checked by the EV supply equipment.<br>d The EV manufacturer may choose 2 700 Ω to use the same value for configuration EE, or<br>alternatively 4 700 Ω to improve the detection of the current coding resistor RS5 (Rc in<br>IEC 61851-1:2017), according to IEC 61851-1:2017, Clause B.2. |

開關 $S_V3$ 為選項元件，電動車可依據其策略來決定是否實施，以偵測保護導體電氣連續性的喪失(參照 CC.4.7)。

The switch SV3 is optional for the EV to implement depending on its strategy to detect the loss of electrical continuity of the protective conductor (see CC.4.7).

CC.2.4 停用 B 側

CC.2.4 Disabled side B

EV 供電設備應啟用和停用其 B 側的時間點，規定於 CC.3。

The points in time when the EV supply equipment shall enable and disable its side B are specified in Clause CC.3.

當 EV 供電設備之 B 側停用時，應具有等效於圖 CC.3 電路之電氣行為，且其零組件之限制應符合表 CC.5 之規定。

The side B of the EV supply equipment, when disabled, shall have the equivalent electrical behaviour as the circuit in Figure CC.3, with the component limits defined in Table CC.5.

於正常停機時，停用 B 側之共模和差模電壓，在 EV 啟用其斷開裝置後，應於 2 s 內放電至 < 60 V DC。參照 CC.3.3。

During normal shutdown, the common mode and differential mode voltages of the disabled side B shall be discharged to < 60 V DC in 2 s or less after the EV opens the EV disconnection device. See CC.3.3.

在錯誤停機及緊急停機時，停用 B 側之電壓，其放電要求應分別依 6.3.1.113.3 及 6.3.1.113.4 之規定。

During error shutdown and emergency shutdown, the present voltage at side B discharge requirements are defined in 6.3.1.113.3 and 6.3.1.113.4, respectively.

等效 $C_S4$ 電容應限制為 1 μF。

The equivalent $C_S4$ capacitance shall be limited to 1 μF.

備考：在熔接偵測期間，若 EV 關閉其斷開裝置停用 B 側 $C_S4$ 之限制可減少電能的儲存。

NOTE The limitation of $C_S4$ in the disabled side B reduces the energy stored if the EV closes the EV disconnection device during welding detection.

藉設計審查查核符合性。

Compliance is checked by design review.

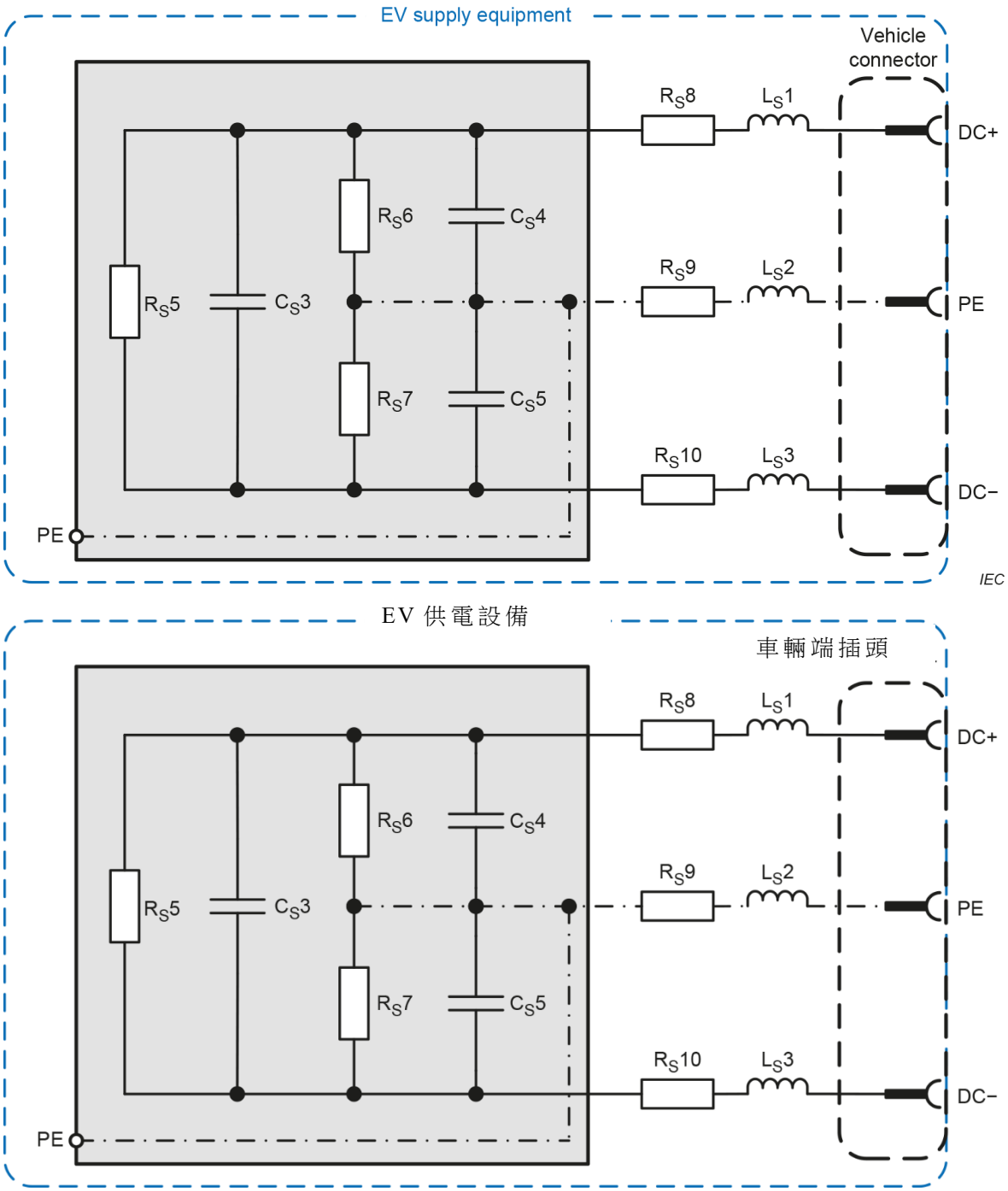



圖 CC.3 EV 供電設備停用 B 側之等效圖

Figure CC.3 – Equivalent disabled side B of the EV supply equipment

表 CC.5 EV 供電設備停用 B 側之零組件限制

Table CC.5 – Component limits for the disabled side B of the EV supply equipment

| 零組件 [a]<br>Component [a] | 最小值 [a]<br>Minimum value [a] | 最大值 [a]<br>Maximum value [a] |
|---|---|---|
| $C_S4$ | - | 500 nF |
| $C_S5$- | - | 500 nF |

| | | |
|---|---|---|
| $R_S6$ [b,c] | 70 kΩ | 300 kΩ |
| $R_S7$ [b,c] | 70 kΩ | 300 kΩ |
| $C_S3$ | - | 1 μF |
| $R_S5$ [c] | 7 kΩ | - |
| $L_S1$ | - | 參照 101.1.8 B 側最大電感之要求。<br>See 101.1.8 requirements for maximum inductance at side B |
| $L_S3$ [c] | - | |
| $L_S2$ | - | 220 μH |
| $R_S8$ | 0 mΩ | - |
| $R_S9$ | 0 mΩ | - |
| $R_S10$ | 0 mΩ | - |
| | - | - |

[a] 未規定之零組件或數值，可依 EV 供電設備製造商之規定。
[a] Unspecified components or values are to be defined by the EV supply equipment manufacturer.
[b] 此數值不包含可能之絕緣故障。
[b] This value is excluding a possible insulation fault.
[c] 此零組件可能需要長時間承受 EV 供電設備 B 側之額定最高電壓。
[c] This component may have to withstand the complete rated maximum voltage of the EV supply equipment at side B for an extended time.
備考：當選定本表零組件數值時，應符合 6.3.1.103, 6.3.1.113, 8.101.4, 13.101 及 CC.4.5 規定之要求。
NOTE When selecting the values of the components in this table, the requirements defined in 6.3.1.103, 6.3.1.113, 8.101.4, 13.101 and CC.4.5 apply.

## CC.3 電能傳輸過程

CC.3 Process of energy transfer

CC.3.1 一般

CC.3.1 General

從 EV 供電設備至 EV 之電能傳輸過程，係由數位通訊傳送的訊息來發動與控制，及應遵循以下之序列：

The process of energy transfer from the EV supply equipment to the EV is initiated and controlled by the messages sent over digital communication and shall follow the sequences shown in:

- CC.3.2: 正常啟動
- CC.3.2: normal startup,
- CC.3.3: 於電能傳輸後之正常關機或暫停
- CC.3.3: normal shutdown or pause after energy transfer,
- CC.3.4: 錯誤及緊急停機
- CC.3.4: error and emergency shutdown,
- CC.3.5: 由使用 ISO 15118-2:2014 之 EV 供電設備之暫停，及
- CC.3.5: pause by EV supply equipment using ISO 15118-2:2014, and
- CC.3.6: 由使用 ISO 15118-2:2014 之 EV 或 EV 供電設備依據發起的重新協

議

- CC.3.6: renegotiation initiated by EV or EV supply equipment using ISO 15118-2:2014.

DIN SPEC 70121:2014 及 ISO 15118-2:2014 之訊息敘述，將使用英文縮寫之訊息碼表示於序列圖中。(參照表 CC.6)

The messages described in DIN SPEC 70121:2014 and ISO 15118-2:2014 are abbreviated in the sequence diagrams with message codes (see Table CC.6).

備考 1：在 CC.3 節次，EVSE 為 EV 供電設備之英文縮寫。

NOTE 1 In Clause CC.3, the acronym EVSE is used to designate the EV supply equipment.

在電能傳輸期間，EV 之斷開裝置不應被閉合。

The EV shall not close the EV disconnection device during energy transfer stage.

如果在電能傳輸期間，EV 斷開裝置處於開啟狀態，則 EV 不得在未經以下任一條件的情況下關閉 EV 斷開裝置：

If the EV disconnection device is open during the energy transfer stage, the EV shall not close the EV disconnection device without either

- 執行正常關機，並透過 CC.5.2 規定的重新啟動序列，重新發動新的通訊會話，然後繼續進入正常啟動序列 CC.3.2 中的 t1，或
- performing a normal shutdown and re-initiating a new communication session by the restart sequence as specified in CC.5.2 and then continue to t1 in the normal startup sequence CC.3.2, or
- 依據 CC.3.6 執行重新協商。
- performing a renegotiation as defined in CC.3.6.

備考：在 B 側之任一切換事件(例如在電能傳輸期間，EV 關閉其斷開裝置或其它的電池系統)可能引起 B 側高湧浪電流，及 B 側帶電部件間(DC+ 及 DC-)或 B 側帶電部位與保護導體間之過電壓，IMD 之干擾，基本信號(CP 或 PP)之干擾，或其它不需要的行為。

NOTE 2 Any switching event at side B (for example, the EV closing the EV disconnection device or additional battery systems during energy transfer) can cause high inrush currents at side B, overvoltages between side B live parts (DC+ and DC–) or between side B live parts (DC+/DC–) and the protective conductor, interference with the IMD, interference with basic signalling (CP or PP), or other unwanted behaviours.

表 CC.6 系列圖之對應訊息碼

Table CC.6 – Message code mapping for sequence diagram

| 期間<br>Stage | 階段<br>Phase | 訊息碼<br>Message | DIN SPEC 70121:2014/ISO 15118-2:2014 |
|---|---|---|---|

| | | code | |
|---|---|---|---|
| 初始<br>Initialization | 準備<br>Preparation | 數據連結<br>Data-link | SLAC 訊息<br>SLAC messages |
| | | Xa | EV 初始化的請求訊息如 SDP、對話建立、服務、授權等，應符合 IEC 61851-24 之規定。<br>EV request messages for initialization like SDP, session setup, services, authentication, etc. as defined in IEC 61851-24. |
| | | Xb | EVSE 初始化之反應訊息如 SDP、對話建立、服務、授權等，應符合 IEC 61851-24 之規定。<br>EVSE response messages for initialization like SDP, session setup, services, authentication, etc. as defined in IEC 61851-24. |
| | | 3a | ChargeParameterDiscoveryReq |
| | | 3b | ChargeParameterDiscoveryRes |
| | 纜線檢查<br>Cable-check | 4a | CableCheckReq |
| | | 4b | CableCheckRes |
| | 預充電<br>Pre-charge | 5a | PreChargeReq |
| | | 5b | PreChargeRes |
| 電能傳輸<br>Energy transfer | 不適用<br>n.a. | 6a | PowerDeliveryReq |
| | | 6b | PowerDeliveryRes |
| | | 7a | CurrentDemandReq |
| | | 7b | CurrentDemandRes |
| | | 8a | PowerDeliveryReq |
| | | 8b | PowerDeliveryRes |
| 關機<br>Shutdown | EV 熔接偵測<br>EV welding detection | 9a | WeldingDetectionReq |
| | | 9b | WeldingDetectionRes |
| | 不適用<br>n.a. | 10a | SessionStopReq |
| | | 10b | SessionStopRes |

序列及敘述的範例參照圖 CC.4 及表 CC.7。

Examples of a sequence and description are shown in Figure CC.4 and Table CC.7.

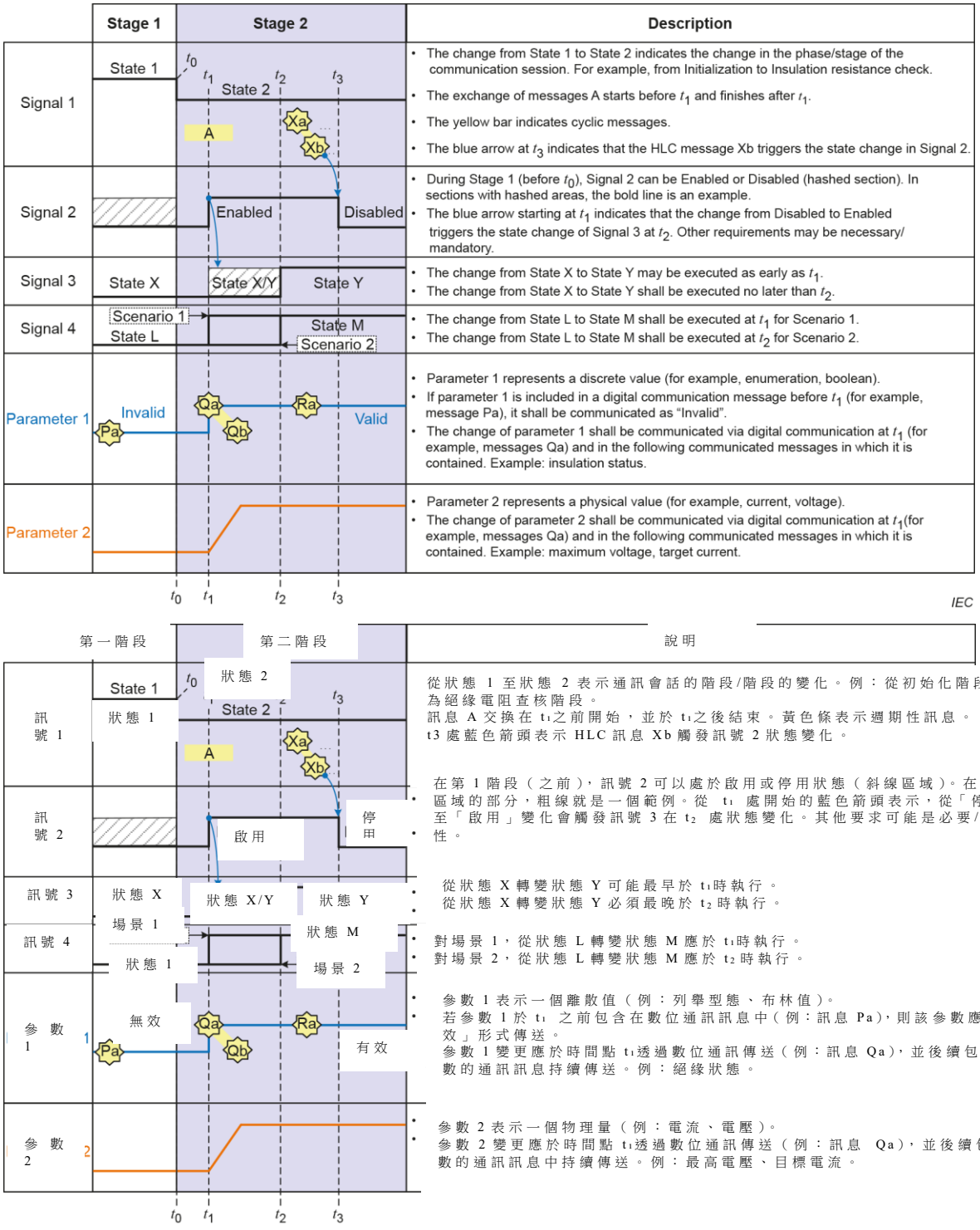



圖 CC. 4 序列圖之範例

Figure CC.4 – Example of a sequence diagram

表 CC.7 序列描述之範例

Table CC.7 – Example of a sequence description

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► ta | • 在到達 ta 前執行之事件<br>• Events executed before reaching ta. |

| | |
|---|---|
| ta | • 在 ta 執行或完成的事件<br>• Events that shall be executed or completed at ta. |
| | • 在此時間標記執行的事件，應在到達下一個時間標記前完成。<br>• The events executed at this timestamp shall be completed before reaching the next timestamp. |
| ta ► tb | • 在 ta 及 tb 之間執行的事件<br>• Events that shall be executed between ta and tb. |
| | • 事件在此時間區間(ta 和 tb 之間)應以任一順序執行，若無時間限制其應在到達下一個時間標記前完成。<br>• The events inside a timeframe (between ta and tb) shall be executed in any order and completed before reaching the next timestamp if they do not have a time constraint.<br>• 若事件在時間區間有時間限制，則其應在 tb 的時間點完成。<br>• If the event inside a timeframe has a time constraint, then tb is the moment that this event is completed. |
| tb ► | • 從 tb 開始應執行的事件，可以任何順序進行。<br>• Events that shall be executed from tb onwards, in any order. |

CC.3.2 正常啟動

CC.3.2 Normal startup

正常啟動之序列圖及敘述參照圖 CC.5 及表 CC.8。

The sequence diagram and description for normal startup are shown in Figure CC.5 and Table CC.8.

依 CC.7.5.2 檢查符合性。

Compliance is checked by CC.7.5.2.

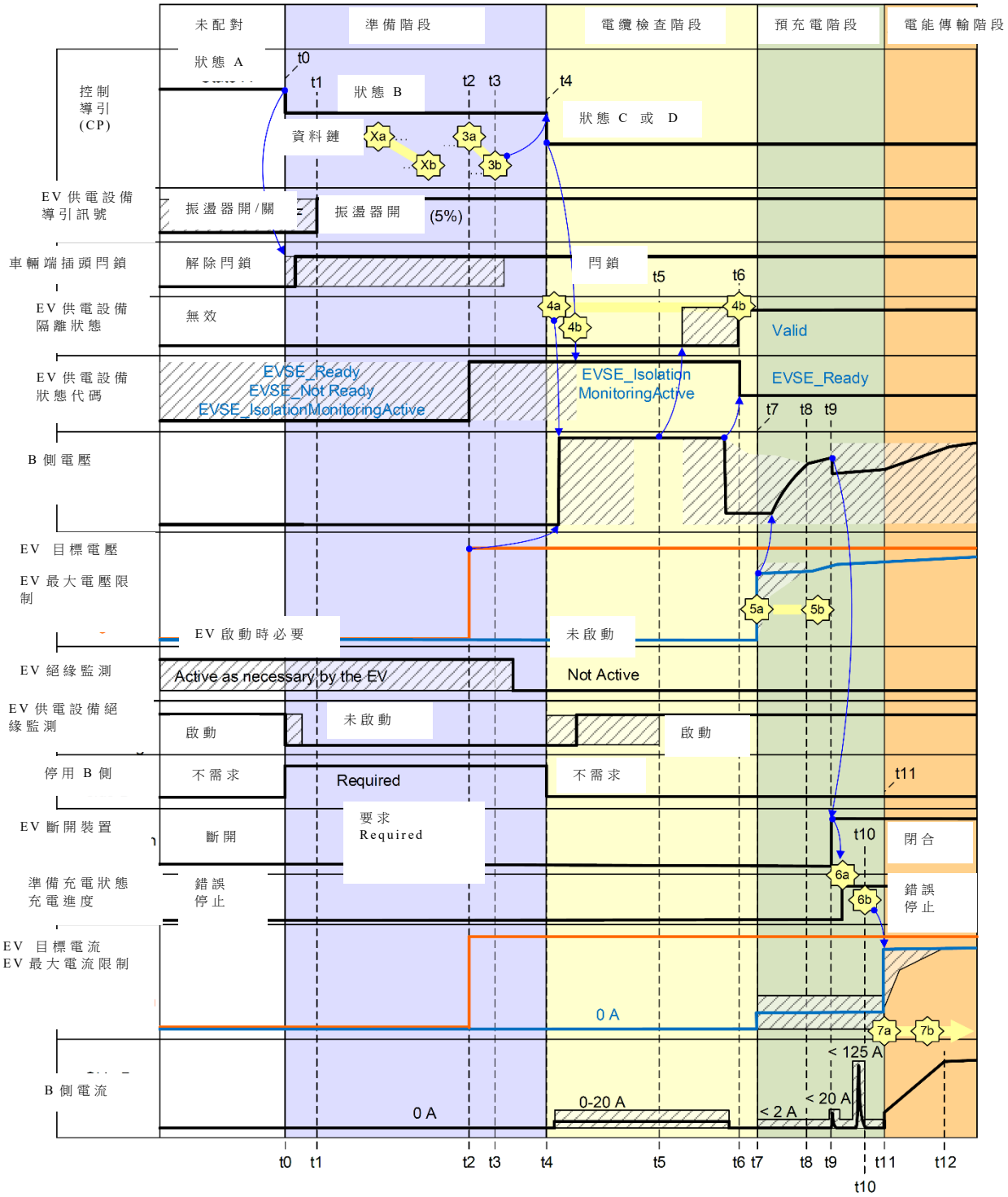



圖 CC. 5 正常啟動之序列圖

Figure CC.5 – Sequence diagram for normal startup

表 CC.8 正常啟動之序列敘述

Table CC.8 – Sequence description for normal startup

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t0 | • 依 6.3.1.113.1 在 B 側 DC+ 及 DC- 之間的電壓應 ≤ 60 V DC。<br>• The present voltage at side B between DC+ and DC– shall be ≤ 60 V DC according to 6.3.1.113.1. |
| t0 | • 車輛端插頭與車輛插座對接，將 CP 狀態從 A 變為 B。<br>• The vehicle connector is mated to the vehicle inlet, which changes the CP state from A to B.<br>• 在 CP 狀態變為 B 及偵測到 PP 後(若為組態 EE，則關閉 SS3)，EV 於車輛插座內應鎖住車輛端插頭。<br>• After the CP state changed to B and the PP is detected (SS3 closed in case of configuration EE), the EV should lock the vehicle connector in the vehicle inlet.<br>• 在 CP 狀態變為 B，EVSE 應停用 EVSE IMD，停用 B 側及斷開 EVSE 斷路連接器裝置(若有時)。<br>• After the CP state changed to B, the EVSE shall disable the EVSE IMD, disable side B and open the EVSE disconnection device, if any.<br>• 在 CP 狀態變為 B 後，EV 可試著建立 IEC 61851-24 規定之數據連結。<br>• After the CP state changed to B, the EV may try to set up a data link as defined in IEC 61851-24. |
| t0 ► t3 | • 由於 B 側目前的電壓(包含負電壓)，EVSE 不應觸發錯誤停機。<br>• The EVSE shall not trigger an error shutdown due to the present voltage at side B (including negative voltages).<br><br>當車輛端插頭與車輛插座對接，依 ISO 17409:2020, 6.5.2 非對接條件規定,電壓可由 EV 供電。EV 供電設備依 IEC 61851-23:2014 規定，於第一個 ChargeParameterDiscoveryReq <3a> 訊息中，若 B 側電壓 > 60 V 應觸發關機。<br>When the vehicle connector is mated to the vehicle inlet, these voltages can be supplied by an EV according to the requirements for unmated conditions in ISO 17409:2020, 6.5.2. EV supply equipment based on IEC 61851-23:2014 shall trigger a shutdown if the present voltage at side B is > 60 V DC in the first ChargeParameterDiscoveryReq <3a> message. |
| t0 ► t4 | • 依 IEC 61851-24 規定，若 EV 嘗試並失效鎖住車輛端插頭時，EV 應於下一個通訊訊息中包含參數"EVErrorCode" = 'FAILED_ChargerConnectorLockFault'來通知 EVSE。<br>• If the EV tried and failed to lock the vehicle connector, the EV shall notify the EVSE with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in the next communicated message that contains this parameter, according to IEC 61851-24.<br><br>• 停用 EVSE 之 B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t0 ► t10 | • EVSE 不應執行 6.3.1.106 規定之過電壓保護。<br>• The EVSE shall not perform the overvoltage protection |

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| | according to 6.3.1.106. |
| t1 | ・若 EVSE 已準備進行電能傳輸，且 CP 振盪器尚未開啟時，則 EVSE 應開啟其 CP 振盪器。<br>・The EVSE shall turn on its CP oscillator if the EVSE is ready for energy transfer and if the CP oscillator is not already on.<br>・從數據連結建立開始到通訊期間結束，EVSE 應維持 CP 5% 之工作週期(duty cycle)，除非有特定條件要求不同的 CP 工作週期。<br>・The EVSE shall maintain a CP duty cycle of 5 % from the start of the data link setup until end of communication session, unless a certain condition requires a different CP duty cycle. |
| t1 ► t2 | ・若數據連結尚未建立，在驗證 EVSE 已經開啟其 CP 振盪器後，EV 應建立 IEC 61851-24 規定之數據連結。<br>・The EV shall establish the data link as defined in the IEC 61851-24 after it has verified that the EVSE has turned on its CP oscillator, if the data link is not already established.<br>備考：由於通訊期間之暫停或重新協商，數據連結可能之前已建立完成。<br>NOTE 1 The data link could have been previously established due to a pause or renegotiation of the communication session.<br>・在 EV <Xa> 及 EVSE <Xb>之間，以適當的應用層協定之協商，開始進行數位通訊。參照表 CC.6。<br>・Digital communication starts by the negotiation of an appropriate application layer protocol between the EV <Xa> and EVSE <Xb>. See Table CC.6.<br>・EV 及 EVSE 交換相關對話建立、服務、授權、付款選項及加值服務(若協商之應用層協定有支援時)之訊息配對。依 IEC 61851-24 規定，許多訊息配對在暫停或重新協商後並不需要，例如：授權或付款選項。<br>・The EV and EVSE exchange message pairs concerning session setup, services, authentication, payment options and value-added services (if supported by the negotiated application layer protocol). According to IEC 61851-24, some message pairs are not necessary after a pause or renegotiation, for example, authentication or payment options.<br>・在初始期間，若 EVSE 要終止通訊期間(例如：使用者按壓停止鍵)，則 EVSE 應<br>・If the EVSE wants to terminate the communication session during the initialization stage (for example, user pressed the stop button), the EVSE shall<br>– 在下一個通訊訊息中，送出參數 "ResponseCode" = 'FAILED'<br>– send parameter "ResponseCode" = 'FAILED' in the next communicated message,<br>– 保持 CP 振盪器開啟(除非某些條件要求不同的 CP 工作週期)，及<br>– keep its CP oscillator on (unless a certain condition requires a different CP duty cycle), and<br>– 在錯誤停機序列中，繼續執行到 t206<br>– proceed to t206 in the error shutdown sequence.<br><br>備考：若下一個通訊訊息為 ChargeParameterDiscoveryRes <3b>訊息，則參照 t2 ► t4。 |

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| | NOTE 2 If next communicated message is a ChargeParameterDiscoveryRes <3b> message, see t2 ► t4.<br>・若 EV 接收反應訊息後，欲終止通訊期間，則 EV 應以正常關機序列執行至 t107。<br>・If, after the EV has received a response message, the EV wants to terminate the communication session, the EV shall proceed to t107 in the normal shutdown sequence.<br>・若 EV 接收反應訊息之參數為"ResponseCode" = 'FAILED'，EV 應以錯誤停機序列執行至 t206。<br>・If the EV receives a response message with parameter "ResponseCode" = 'FAILED', the EV shall proceed to t206 in the error shutdown sequence. |
| t2 | ・EV 應在第一個 ChargeParameterDiscoveryReq <3a> 訊息中，傳送參數 "EVMaximumVoltageLimit" 和 "EVMaximumCurrentLimit" (以及其它參數)。<br>・The EV shall send parameters "EVMaximumVoltageLimit" and "EVMaximumCurrentLimit" (amongst other parameters) with the first ChargeParameterDiscoveryReq <3a> message. |
| t2 ► t3 | ・EVSE 應執行相容性檢查。參照 CC.5.6。<br>・The EVSE shall perform a compatibility check. See CC.5.6.<br>・若 B 側 DC＋及 DC-之間的電壓絕對值< 60 V DC，EVSE 應檢查，且若 B 側 DC＋及 DC-之間的電壓絕對值 ≥ 60 V DC，則應送出具有參數 "EVSEProcessing" = 'Ongoing' 之訊息 ChargeParameterDiscovery <3b>。<br>・The EVSE shall check if the absolute value of the present voltage at side B between DC+ and DC– is < 60 V DC and shall send message ChargeParameterDiscovery <3b> with parameter "EVSEProcessing" = 'Ongoing' if the absolute value of the present voltage at side B is ≥ 60 V DC.<br>・EVSE 應傳送參數 "EVSEMaximumVoltageLimit"、"EVSEMinimumVoltageLimit"、"EVSEMaximumCurrentLimit" 及 "EVSEMinimumCurrentLimit" (以及其它參數)之訊息 ChargeParameterDiscoveryRes <3b> 來考量相容性檢查。如何計算這些數值可參照 CC.5.6。<br>・The EVSE shall send parameters "EVSEMaximumVoltageLimit", "EVSEMinimumVoltageLimit", "EVSEMaximumCurrentLimit" and "EVSEMinimumCurrentLimit" (amongst other parameters) in message ChargeParameterDiscoveryRes <3b> considering the compatibility check. See CC.5.6 on how to calculate these values.<br>・EVSE 應於"ChargeParameterDiscoveryRes <3b>" 訊息中，傳送參數 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive', 除非 EVSE 欲暫停通訊期間或執行關機。若 ESVE 傳送具有參數 "EVSE_StatusCode" = 'EVSE_Ready' or 'EVSE_NotReady' 之 ChargeParameterDiscoveryRes <3b> 訊息，則建議 EV 繼續通訊期間。<br>・The EVSE shall send parameter "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in the "ChargeParameterDiscoveryRes <3b>" messages, unless the EVSE wants to pause the communication session or perform a shutdown. The EV is recommended to continue the communication session if the EVSE sends |

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| | ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = ‘EVSE_Ready’ or ‘EVSE_NotReady’.<br><br>備考：EVSE 依 IEC 61851-23:2014 規定，可於 ChargeParameterDiscoveryRes <3b> 訊息，傳送參數 "EVSE_StatusCode" ="EVSE_Ready"、"EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive"。<br>NOTE 3 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" ="EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages.<br><br>・若 EVSE 回應具有參數"ResponseCode'' = 'OK' 及 "EVSEProcessing" = 'Ongoing' 之 ChargeParameterDiscoveryRes <3b> 訊息，EV 及 EVSE 可於下一個 ChargeParameterDiscoveryReq/Res 訊息中更新傳送的參數。<br>・If the EVSE replies with parameters "ResponseCode'' = 'OK' and "EVSEProcessing" = 'Ongoing' in message ChargeParameterDiscoveryRes <3b>, the EV and EVSE may update the parameters sent in the next ChargeParameterDiscoveryReq/Res messages.<br><br>備考：EVSE 因其它理由，可使用 "EVSEProcessing" = 'Ongoing'，例如：負載管理等。<br>NOTE 4 The EVSE can use "EVSEProcessing" = 'Ongoing' for other reasons. Example: load management, etc.<br><br>・若使用 DIN SPEC 70121:2014 規範：倘若在初始期間 EVSE 欲暫停通訊期間，EVSE 應於下一個 ChargeParameterDiscoveryRes <3b> 訊息中，傳送參數 "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent'、及 "EVSEProcessing" = ’Ongoing’，然後使用參數 "EVSEStatusCode" = 'EVSE_Shutdown' 繼續至 t3。<br>・If using DIN SPEC 70121:2014: if the EVSE wants to pause the communication session during the initialization stage, the EVSE shall send parameters "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' and "EVSEProcessing" = ’Ongoing’ in the next ChargeParameterDiscoveryRes <3b> message and then continue to t3 with parameter "EVSEStatusCode" = 'EVSE_Shutdown'.<br><br>備考：EVSE 傳送"EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' 及 "EVSEProcessing" = ’Ongoing’ 來指示 EV 在電能傳輸前執行正常關機的原因。<br>NOTE 5 The EVSE sends "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' and "EVSEProcessing" = ’Ongoing’ to indicate to the EV the reason for performing a normal shutdown before energy transfer.<br><br>・若 EV 於 ChargeParameterDiscoveryReq <3a> 訊息，傳送參數"EVErrorCode" = 'FAILED_ChargerConnectorLockFault'，EVSE 應回應具有參數 "EVSEProcessing" = ’Ongoing’ 及 "ResponseCode" |

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| | = 'OK' 之循環式 ChargeParameterDiscoveryRes <3b> 訊息，以給予 EV 更多的時間來解決鎖定機制之故障。EV 在循環式 ChargeParameterDiscoveryReq/Res 訊息期間，傳送"EVSEProcessing" = 'Ongoing' 之更多的情況，參照 CC.5.6<br>• If the EV sends parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in a ChargeParameterDiscoveryReq <3a> message, the EVSE should respond with cyclic ChargeParameterDiscoveryRes <3b> messages with parameters "EVSEProcessing" = 'Ongoing' and "ResponseCode" = 'OK' to give the EV additional time to solve the fault in the locking mechanism. See CC.5.6 for additional conditions for the EVSE to send "EVSEProcessing" = 'Ongoing' during cyclic ChargeParameterDiscoveryReq/Res messages.<br><br>EVSE 應通知使用者如何來改善鎖住之過程。例如：藉由指示如何正確將車輛端插頭與車輛插座對接。<br>The EVSE should inform the user how to improve the locking process. For example, by indicating how to properly mate the vehicle connector in the vehicle inlet.<br><br>• 依照 DIN SPEC 70121:2014，EV 應於每個 ChargeParameterDiscoveryReq 訊息中，重新傳送相同的參數；然而，若 EV 改變參數，建議 EVSE 不要執行關機。<br>• According to DIN SPEC 70121:2014, the EV shall resend the identical parameters in each ChargeParameterDiscoveryReq message; however, it is recommended for the EVSE not to perform a shutdown if the EV changes the parameters.<br><br>• ISO 15118-2:2014 中並未規定更新參數於後續序列 ChargeParameterDiscoveryReq/Res 訊息之可能性；然而，若 EV 改變參數，建議 EVSE 不要執行關機。<br>• ISO 15118-2:2014 does not specify the possibility to update the parameters in subsequent ChargeParameterDiscoveryReq/Res messages; however, it is recommended for the EVSE not to perform a shutdown if the EV changes the parameters.<br><br>• 為改進互通性，EVSE 於循環式 ChargeParameterDiscoveryReq/Res 訊息期間，應容許 EV 改變 CP 狀態至 C/D。若 EV 變回為 CP 狀態 B，則 EVSE 應觸發 EVSE 發動之緊急停機。參照 CC.3.4.3。<br>• To improve interoperability, the EVSE shall tolerate the EV changing CP state to C/D during cyclic ChargeParameterDiscoveryReq/Res messages. If the EV changes back to CP state B, the EVSE shall trigger an EVSE initiated emergency shutdown. See CC.3.4.3.<br><br>ISO 15118-2:2014 之規定[V2G2-912]，及 SAE J1772 過時版本之類似要求，並未規定於改變 CP 狀態從狀態 B 至狀態 C/D 前，應接收參數"EVSEProcessing" = ''Finished''之 ChargeParameterDiscoveryRe <3b>訊息，導致非期望的行為。<br>Requirement [V2G2-912] in ISO 15118-2:2014 and a similar requirement in outdated versions of SAE J1772 do not specify that the EV shall receive a ChargeParameterDiscoveryRe <3b> with parameter "EVSEProcessing" = ''Finished'' before |

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| | changing the CP state from state B to state C/D, leading to this unwanted behaviour. |
| t2 ► t4 | ・若 EVSE 於初始(發動)期間，欲終止通訊期間(例如使用者按壓停止鍵)，EVSE 應於下一個通訊訊息傳送參數 "EVSEStatusCode" = 'EVSE_Shutdown'，且繼續於正常關機序列至 t107。若使用 ISO 15118-2:2014，EVSE 應傳送參數 EVSENotification" = 'StopCharging'。<br>・If the EVSE wants to terminate the communication session during the initialization stage (for example, user pressed the stop button), the EVSE shall send parameter "EVSEStatusCode" = 'EVSE_Shutdown' in the next communicated message and proceed to t107 in the normal shutdown sequence. If using ISO 15118-2:2014, the EVSE shall also send parameter "EVSENotification" = 'StopCharging'.<br>・若在 EV 已經接收回應訊息後，EV 欲終止通訊期間或 EV 接收到參數 "EVSEStatusCode" = 'EVSE_Shutdown' (以及，若使用 ISO 15118-2:2014, 參數 "EVSENotification" = 'StopCharging')之回應訊息，EV 應繼續於正常的關機序列至 t107。<br>・If, after the EV has received a response message, the EV wants to terminate the communication session, or if the EV receives a response message with parameter "EVSEStatusCode" = 'EVSE_Shutdown' (and, if using ISO 15118-2:2014, parameter "EVSENotification" = 'StopCharging'), the EV shall proceed to t107 in the normal shutdown sequence. |
| t3 | ・若 B 側當下電壓絕對值< 60 V DC，EVSE 應於相容性檢查結果訊息 ChargeParameterDiscoveryRes <3b>，傳送 EV 使用參數"EVSEStatusCode" = 'EVSE_IsolationMonitoringActive', "EVSEProcessing" = 'Finished'，以及<br>・If the absolute value of the present voltage at side B is < 60 V DC, the EVSE shall send the EV the result of the compatibility check in message ChargeParameterDiscoveryRes <3b> using parameters "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive', "EVSEProcessing" = 'Finished', and:<br>- 若相容性檢查成功完成，參數"ResponseCode" = 'OK'，或<br>- "ResponseCode" = 'OK' if the compatibility check was successfully completed, or<br>- 若相容性檢查完成及失敗，觸發 EVSE 發動錯誤停機，參數 "ResponseCode" = 'FAILED_WrongChargeParameter'。<br>- "ResponseCode" = 'FAILED_WrongChargeParameter' if the compatibility check was completed and failed, triggering an EVSE initiated error shutdown.<br><br>備考：具 "ResponseCode" = 'FAILED_WrongChargeParameter' 及 parameter "EVSEProcessing" = 'Ongoing' 之 ChargeParameterDiscoveryRes <3b> 訊息，將觸發 EVSE 啟動錯誤停機。參照 IEC 61851-24 數位通訊標準之錯誤處理規範。<br>NOTE 6 A ChargeParameterDiscoveryRes <3b> message with "ResponseCode" = 'FAILED_WrongChargeParameter' and parameter "EVSEProcessing" = 'Ongoing' will trigger an EVSE initiated error shutdown. See error handling specifications for the digital communication |

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| | standards in IEC 61851-24.<br><br>在相容性檢查結束時(依據 IEC 61851-24 之時序要求)，若 B 側當下電壓絕對值不 < 60 V DC，則 EVSE 不可傳送參數 "EVSEProcessing" = 'Finished' 之 ChargeParameterDiscoveryRes <3b>訊息。在此情況下，EV 應觸發錯誤停機。<br>If the absolute value of the present voltage at side B is not < 60 V DC at the end of the compatibility check (based on the timing requirements of IEC 61851-24), the EVSE cannot send a ChargeParameterDiscoveryRes <3b> message with parameter "EVSEProcessing" = 'Finished'. In this case, the EV shall trigger an error shutdown.<br><br>備考：EVSE 依據 IEC 61851-23:2014 可於 ChargeParameterDiscoveryRes <3b> 訊息傳送參數 "EVSE_StatusCode" = "EVSE_Ready"、"EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive"。若 EVSE 傳送有參數"EVSE_StatusCode" = ‘EVSE_Ready’ 或 ‘EVSE_NotReady’ 之 ChargeParameterDiscoveryRes <3b> 訊息，則建議 EV 繼續通訊期間。<br>NOTE 7 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = ‘EVSE_Ready’ or ‘EVSE_NotReady’.<br><br>・由 EVSE 於 ChargeParameterDiscoveryRes <3b>傳送最後協商之最大值應大於或等於在電能傳輸期間 CurrentDemandRes <7b> 訊息之應用數值。參照 CC.5.6。<br>・The negotiated maximum values sent by the EVSE in the last ChargeParameterDiscoveryRes <3b> shall be more than or equal to the applicable values in the CurrentDemandRes <7b> messages during the energy transfer stage. See CC.5.6. |
| t3 ► t4 | ・若 EV 及 EVSE 不相容，EV 應執行 EV 啟動錯誤停機。參照 CC.3.4.2。<br>・If the EV and EVSE are not compatible, the EV shall perform an EV initiated error shutdown. See CC.3.4.2.<br><br>・在改變 CP 至狀態 C 或 D 前，若還沒鎖住，EV 應於車輛插座鎖住車輛端插頭。<br>・The EV shall lock the vehicle connector in the vehicle inlet before changing the CP to state C or D, if not already locked.<br><br>・若 EV 鎖住車輛端插頭失效，EV 應於下一個通訊訊息，以參數"EVErrorCode" = 'FAILED_ChargerConnectorLockFault' 觸發 EV 啟動錯誤停機。<br>・If the EV failed to lock the vehicle connector, the EV shall trigger an EV initiated error shutdown with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in |

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| | the next communicated message.<br><br>・EV 應停止 EV IMD (若有時)。<br>・The EV shall disable the EV IMD, if any. |
| t3 ► | ・若 B 側 DC+ 與 DC– 之間的當下電壓在 400 ms 連續時間 < -60 V DC，EVSE 應觸發錯誤停機。<br>・The EVSE shall trigger an error shutdown if the present voltage at side B between DC+ and DC– is < -60 V DC for 400 consecutive ms or more. |
| t4 | ・在 EV 停止 EV IMD 後，及檢查車輛端插頭已被鎖住後，EV 應藉由關閉 SV2 來改變 CP 狀態從 B 至 C/D。<br>・After the EV has disabled the EV IMD and after checking that the vehicle connector is locked, the EV shall change the CP state from B to C/D by closing SV2.<br><br>B 側來自 EV 共模及差模之影響(例如：焊接偵測、IMD 等)，在 EV 關閉 SV2 改變 CP 狀態 B 至 C/D 前，應予以移除，因其可能會干擾 EVSE 之 IMD。<br>The common mode and differential mode influences from the EV (for example, welding detection, IMD, etc) on side B should be removed before the EV changes the CP state from B to C/D by closing SV2 because this can interfere with the EVSE IMD.<br><br>・在 CP 狀態改變至 C/D 後，EVSE 應啟用 B 側。不要求限制停止 EVSE B 側。<br>・After the CP state changed to C/D, the EVSE shall enable side B. The limitations of the disabled side B of the EVSE are not required. |
| t4 ► t5 | ・檢查車輛端插頭被鎖住後，EV 應要在預充電階段前，以 CableCheckReq <4a>訊息要求電纜檢查階段。參照 CC.4.1.4。<br>・After checking that the vehicle connector is locked, the EV shall request cable-check phase before pre-charge phase with CableCheckReq <4a>. See CC.4.1.4.<br><br>・在傳送 firstCableCheckRes <4b>訊息前及在 B 側 DC+ 及 DC–之間當下電壓 > 60 V DC 前，若 CP 狀態改變至狀態 C 或 D，EVSE 應進行檢查。<br>・The EVSE shall check if the CP state changed to state C or D before sending the firstCableCheckRes <4b> message and before the present voltage at side B between DC+ and DC– is > 60 V DC. |
| t4 ► t6 | ・EVSE 應檢查 IMD 之功能性。參照 CC.4.1.2 及 CC.4.1.3。<br>・The EVSE shall check the functionality of the IMD. See CC.4.1.2 and CC.4.1.3.<br>・EVSE 應檢查 B 側之絕緣及應於訊息 CableCheckRes<4b> 中，以 CC.4.1.4 規定之參數 "EVSEIsolationStatus"、及 "EVSEProcessing" = 'Ongoing'、和 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive'，連續報告絕緣狀態。<br>・The EVSE shall check the insulation of side B and shall continuously report the insulation state with parameter "EVSEIsolationStatus" according to CC.4.1.4, "EVSEProcessing" = 'Ongoing', and "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in message CableCheckRes<4b>. |

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| | • 當於 CableCheckRes<4b> 訊息傳送 CC.4.1.4 規定之參數 "EVSEIsolationStatus" 及 "EVSEProcessing" = 'Ongoing' 時，EVSE 可執行其它功能(例如：熔接偵測)。<br>• The EVSE may perform other functions (for example, welding detection) while sending parameters "EVSEIsolationStatus" according to CC.4.1.4 and "EVSEProcessing" = 'Ongoing' in message CableCheckRes<4b>. |
| t4 ► t10 | • 若使用 DIN SPEC 70121:2014：在電纜檢查階段或預充電階段，EVSE 欲暫停通訊期間時，若下一個訊息如下，則 EVSE 應停止 B 側(參照 CC.2.4)。<br>• If using DIN SPEC 70121:2014: If the EVSE wants to pause the communication session during the cable-check phase or pre-charge phase, the EVSE shall disable side B (see CC.2.4) and, if the next communicated message is<br><br>– CableCheckRes <4b> 或 PreChargeRes <5b>訊息，EVSE 應首先傳送具有參數 "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent'之回應訊息，及於下一個通訊訊息傳送參數"EVSEStatusCode" = 'EVSE_Shutdown'之回應訊息，在傳送回應訊息後於正常關機序列繼續至 t107(參照 CC.3.3)，或<br>– a CableCheckRes <4b> or PreChargeRes <5b> message, the EVSE shall first send a response message with parameter "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' and a response message with parameter "EVSEStatusCode" = 'EVSE_Shutdown' in the next communicated message to proceed to t107 in the normal shutdown sequence after sending the response message (see CC.3.3), or<br><br>– PowerDeliveryRes <6b>訊息，EVSE 應傳送參數 "EVSEStatusCode" = 'EVSE_Shutdown'，使 EV 啟動正常關機(參照 CC.3.3)。<br>– a PowerDeliveryRes <6b> message, the EVSE shall send parameter "EVSEStatusCode" = 'EVSE_Shutdown', for the EV to initiate a normal shutdown (see CC.3.3).<br><br>備考 8：若下一個通訊訊息為 CurrentDemandRes <7b>，通訊期間終止將引起正常關機。參照 CC.3.3。<br>NOTE 8 If the next communicated message is a CurrentDemandRes <7b> message, a communication session termination will result in a normal shutdown. See CC.3.3.<br><br>備考 9：許多 EV 可能訊息之參數"EVSEStatusCode" = 'EVSE_UtilityInterruptEvent'，解譯為 "EVSEStatusCode" = 'EVSE_Shutdown'。<br>NOTE 9 Some EVs might interpret messages with parameter "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' as "EVSEStatusCode" = 'EVSE_Shutdown'.<br><br>• 在電纜檢查階段或預先充電階段，若 EVSE 欲終止通訊期間，EVSE 應停止 B 側(參照 CC.2.4)及於下一個通訊訊息中，傳送參數 "EVSEStatusCode" = 'EVSE_Shutdown' (及，或使用 ISO 15118-2:2014，則參數為 "EVSENotification" = 'StopCharging')。<br>• If the EVSE wants to terminate the communication session during the cable-check phase or pre-charge phase, the EVSE shall disable side B (see CC.2.4) and send parameter |

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| | "EVSEStatusCode" = 'EVSE_Shutdown' (and, if using ISO 15118-2:2014, parameter “EVSENotification” = ‘StopCharging’), in the next communicated message.<br><br>若下一個通訊訊息為：<br>If the next communicated message is<br><br>– CableCheckRes <4b> 或 PreChargeRes <5b> 訊息，EVSE 在傳送回應訊息後，應於正常關機序列繼續至 t107(參照 CC.3.3)，或<br>– a CableCheckRes <4b> or PreChargeRes <5b> message, the EVSE shall proceed to t107 in the normal shutdown sequence after sending the response message (see CC.3.3), or<br><br>– PowerDeliveryRes <6b>訊息，EV 應啟動正常關機(參照 CC.3.3)。<br>– a PowerDeliveryRes <6b> message, the EV shall initiate a normal shutdown (see CC.3.3).<br><br>備考 10：若下一個訊息為 CurrentDemandRes <7b>，通訊期間終止將引起正常關機。參照 CC.3.3。<br>NOTE 10 If the next communicated message is a CurrentDemandRes <7b> message, a communication session termination will result in a normal shutdown. See CC.3.3.<br><br>・在電纜檢查階段或預充電階段，於接收反應訊息後，若 EV 欲終止通訊期間，EV 應<br>・If the EV wants to terminate the communication session during the cable-check phase or precharge phase, after receiving a response message, the EV shall<br><br>– 若尚未閉合 EV 斷開裝置，則於正常關機序列繼續至 t107(參照 CC.3.3)，或<br>– if it has not yet closed the EV disconnection device, proceed to t107 in the normal shutdown sequence (see CC.3.3), or<br><br>– 若已經閉合 EV 斷開裝置，則啟動正常關機(參照 CC.3.3)。<br>– if it has already closed the EV disconnection device, initiate a normal shutdown (see CC.3.3).<br><br>・在電纜檢查階段或預充電階段，若 EV 接收到參數 "EVSEStatusCode"='EVSE_Shutdown' (及，<br>若使用 ISO 15118-2:2014，參數為“EVSENotification” = ‘StopCharging’)之回應碼，EV 應<br>・If the EV receives a response message with parameter "EVSEStatusCode"='EVSE_Shutdown' (and, if using ISO 15118-2:2014, parameter “EVSENotification” = ‘StopCharging’), during the cable-check phase or pre-charge phase, the EV shall<br><br>– 若尚未閉合 EV 斷開裝置，則於正常關機序列繼續至 t107(參照 CC.3.3)，或<br>– if it has not yet closed the EV disconnection device, proceed to t107 in the normal shutdown sequence (see CC.3.3), or |

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| | - 若已經閉合 EV 斷開裝置，則啟動正常關機(參照 CC.3.3)<br>- if it has already closed the EV disconnection device, initiate a normal shutdown (see CC.3.3). |
| t5 | • EVSE 測定 B 側絕緣電阻為 ≥ 100 kΩ。參照 CC.4.1.1。<br>• The EVSE determines that the insulation resistance of side B is ≥ 100 kΩ. See CC.4.1.1. |
| t6 | • 在完成電纜檢查階段後，EVSE 應傳送 CC.4.1.4 規定之參數"EVSEIsolationStatus"、及 "EVSEProcessing" = 'Finished'，以及<br>• After completing the cable-check phase, the EVSE shall send message CableCheckRes <4b> with parameters "EVSEIsolationStatus" according to CC.4.1.4, "EVSEProcessing" = 'Finished', and<br><br>- "EVSEStatusCode" = "Ready"，若絕緣狀態為"有效"及無任何錯誤，或<br>- "EVSEStatusCode" = "Ready", if the insulation status is 'Valid' and there are no errors, or<br><br>- "ResponseCode" = 'FAILED'，若 EVSE 偵測到錯誤，並觸發 EVSE 啟動錯誤停機。<br>- "ResponseCode" = 'FAILED', if the EVSE detects an error, to trigger an EVSE initiated error shutdown.<br><br>• 若 EVSE 偵測到錯誤，EVSE 將依 CC.4.1.4 於 CableCheckRes <4b>訊息中，傳送參數 "EVSEIsolationStatus"，來觸發 EVSE 啟動錯誤停機，<br>• If the EVSE detects an error, the EVSE shall trigger an EVSE initiated error shutdown by sending parameters "EVSEIsolationStatus" according to CC.4.1.4 and "ResponseCode" = 'FAILED' in message CableCheckRes <4b>. |
| t6 ► t7 | • EVSE 可保持 B 側之當下電壓。<br>• The EVSE may keep the present voltage at side B. |
| t7 | • EV 應傳送 PreChargeReq <5a>訊息，包含依電池系統當下電壓之參數 "EVTargetVoltage"，來啟動預充電階段。參照 CC.5.1。<br>• The EV shall send message PreChargeReq <5a>, with parameter "EVTargetVoltage" depending on the present voltage of the battery system, to start the pre-charge phase. See CC.5.1. |
| t7 ► t9 | • EV 及 EVSE 應依 CC.5.1 規定執行預充電階段。<br>• The EV and EVSE shall perform the pre-charge phase according to CC.5.1.<br>• EVSE 應依照 EV 於 PreChargeReq <5a> 訊息之目標電壓，控制 B 側之當下電壓，並傳送相關之 PreChargeRes <5b>訊息。<br>• The EVSE shall control the present voltage at side B according to the target voltage of the EV in the PreChargeReq <5a> messages, and send the corresponding PreChargeRes <5b> messages. |
| t8 | • B 側之當下電壓應在 101.1.2 所規定的允差範圍內達到 EV 的目標電壓。<br>• The present voltage at side B reaches the target voltage of the EV between the tolerances given in 101.1.2. |
| t8 ► t9 | • EV 可採用 EV 之目標電壓，以循環式 PreChargeReq/Res |

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| | 訊息來補償電壓差異。<br>• The EV may adapt the target voltage of the EV with cyclic PreChargeReq/Res messages to compensate for voltage deviation. |
| t9 | • EV 僅有在查證 B 側當下電壓與電池系統當下電壓之絕對差值< 20 V DC 時，應關閉 EV 斷開裝置。。參照 CC.5.1。<br>• The EV shall close the EV disconnection device only after verifying that the absolute difference between the present voltage at side B and the present voltage at the battery system is < 20 V DC. See CC.5.1.<br>EV 應有 B 側逆轉極性之防護。<br>The EV should be protected against reversed polarity of side B. |
| t9 ► t10 | • 只有在關閉 EV 斷開裝置後，依 IEC 61851-24 規定，EV 應藉由傳送 PowerDeliveryReq <6a> 訊息來請求 EVSE，停止其預充電電流之限制。<br>• The EV shall request the EVSE to disable its pre-charge current limitation by sending message PowerDeliveryReq <6a> according to IEC 61851-24, only after closing the EV disconnection device.<br>備考 11：當使用 DIN SPEC 70121:2014，使用參數為 "ReadyToChargeState" = 'TRUE'。<br>NOTE 11 When using DIN SPEC 70121:2014, use parameter "ReadyToChargeState" = 'TRUE'.<br><br>當使用 ISO 15118-2:2014，使用之參數為"ChargeProgress" = 'Start'。<br>When using ISO 15118-2:2014, use parameter "ChargeProgress" = 'Start'. |
| t10 | • 在停止預充電電流限制後(例如：預充電電路，若有時)，並啟用 B 側，EVSE 應傳送參數"EVSEStatusCode" = 'EVSE_Ready'之 PowerDeliveryRes <6b>訊息，來指示其已準備好進行電能傳輸及過電壓保護(參照 CC.6.3.1.106)。<br>• After disabling the pre-charge current limitation (for example, pre-charge circuit, if any), and enabling side B, the EVSE shall send message PowerDeliveryRes <6b> with parameter "EVSEStatusCode" = 'EVSE_Ready' to indicate that it is ready for energy transfer and overvoltage protection (see 6.3.1.106).<br><br>• EVSE 應依 6.3.1.106 啟動過電壓保護。<br>• The EVSE shall start the overvoltage protection according to 6.3.1.106. |
| t11 | • EV 應於第一個 CurrentDemandReq <7a>訊息中，設定參數 "EVTargetCurrent"，來啟動電能傳輸時段(stage)。<br>• The EV shall set parameter "EVTargetCurrent" in the first CurrentDemandReq <7a> message to start the energy transfer stage.<br>• EV 應傳送 CurrentDemandReq <7a>訊息包含參數 "EVMaximumVoltageLimit" 及 "EVMaximumCurrentLimit"，其小於或等於上一個傳送訊息 ChargeParameterDiscoveryReq <3a> 對應之協議限制。參照 CC.5.6。<br>• The EV shall send CurrentDemandReq <7a> messages with parameters "EVMaximumVoltageLimit" and "EVMaximumCurrentLimit" less than or equal to the |

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| | respective negotiated limits sent in the last ChargeParameterDiscoveryReq <3a> message. See CC.5.6. |
| t11 ► t12 | • EVSE 應調整 B 側至 EV 於 CurrentDemandReq <7a>訊息的目標值。<br>• The EVSE shall adapt the side B to the target values by the EV in message CurrentDemandReq <7a>.<br>• EVSE 應以 CurrentDemandRes<7b>訊息，回應 EV 下列資訊：<br>• The EVSE shall respond to the EV with the following information in message CurrentDemandRes<7b>:<br>– B 側當下的電流及電壓。<br>– present current and voltage at side B;<br>– EV 供電設備 B 側可應用電流、電壓及功率之最小及最大數值。<br>– applicable minimum and maximum values for current, voltage and power of the EV supply equipment at side B;<br>– 當下的狀態。<br>– its present status.<br><br>即使 B 側當下電流及電壓未達到之前的目標值，EV 仍可改變其目標電流及電壓。<br>The EV may change the target current and voltage of the EV even if the present current and voltage at side B has not reached the previous target values. |
| t11 ► | • EVSE 應持續監控 B 側之絕緣及更新參數 "EVSEIsolationStatus"，於下一個通訊訊息包含此參數。參照 CC.4.1.6。<br>• The EVSE shall continuously monitor the insulation of side B and update parameter "EVSEIsolationStatus" in the next communicated messages that contain this parameter. See CC.4.1.6. |
| t12 | • B 側電流於時間延遲(Td)或更短達到 EV 之目標電流，如 101.1.3 之規定。<br>• The present current at side B reaches the target current of the EV in the time delay (Td) or less defined in 101.1.3. |
| t12 ► | • EV 依其電能傳輸策略，藉由於循環式 CurrentDemandReq <7a>訊息設定參數 "EVTargetCurrent" 及 "EVTargetVoltage"，來調整 EV 之目標電流及電壓。<br>• The EV adapts the target current and voltage of the EV according to its energy transfer strategy by setting parameters "EVTargetCurrent" and "EVTargetVoltage" in cyclic CurrentDemandReq <7a> messages.<br><br>備考：操作範圍之處理參照 CC.5.5，CCM 及 CVM 目標數值之考量參照 CC.5.7。<br>NOTE See CC.5.5 for the handling of operating ranges and CC.5.7 for the target values considerations in CCM and CVM. |

CC.3.3 電能傳輸後之正常關機或暫停

CC.3.3 Normal shutdown or pause after energy transfer

在電能傳輸後之正常關機或暫停之序列圖及敘述，如圖 CC.6 及表 CC.9 所示。

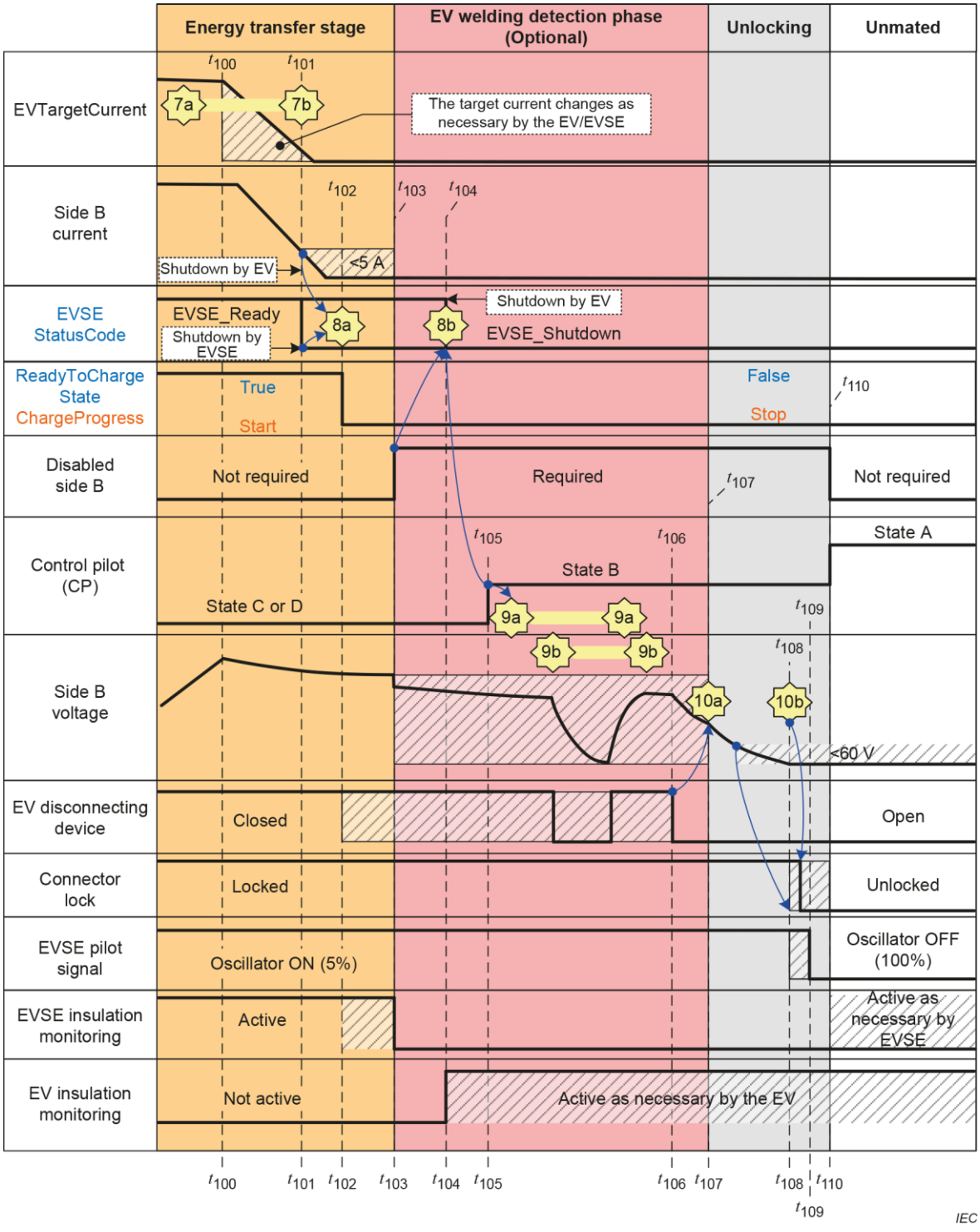
The sequence diagram and description for normal shutdown or pause after energy transfer are shown in Figure CC.6 and Table CC.9.

於電能傳輸期間正常關機或暫停完成後，EV B 側之感應電壓不應超過 6.3.1.113.2 之規定值。

After the completion of normal shutdown or pause during energy transfer, the EV shall not induce voltages at side B more than the values specified in 6.3.1.113.2.

依 CC.7.5.20 檢查符合性。

Compliance is checked by CC.7.5.20.



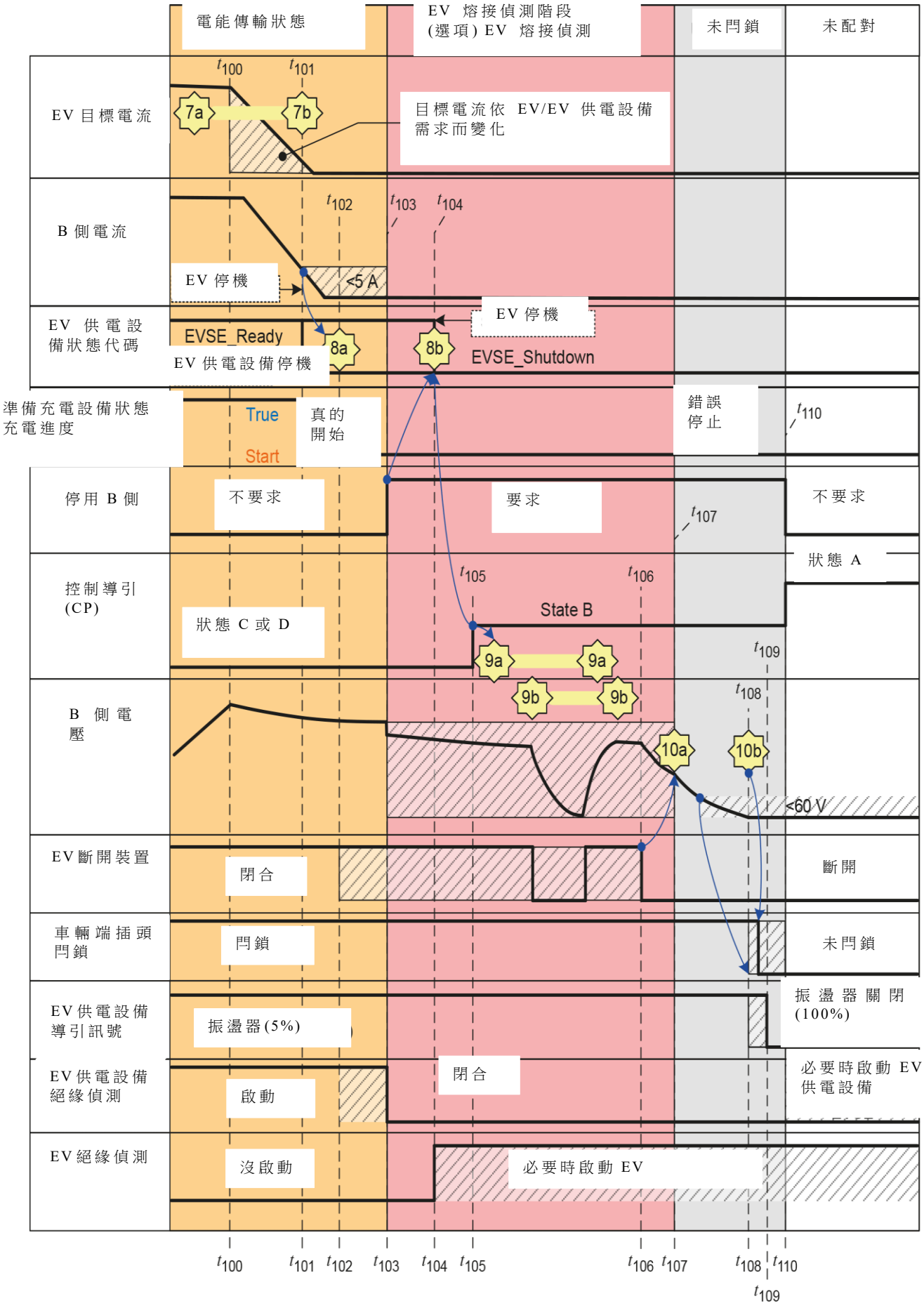

電能傳輸狀態
EV 熔接偵測階段
(選項) EV 熔接偵測
未閂鎖
未配對
EV 目標電流
$t_{100}$
$t_{101}$
7a
7b
目標電流依 EV/EV 供電設備需求而變化
B 側電流
$t_{102}$
$t_{103}$
$t_{104}$
EV 停機
<5 A
EV 供電設備狀態代碼
EVSE_Ready
EV 供電設備停機
8a
8b
EV 停機
EVSE_Shutdown
準備充電設備狀態
充電進度
True
Start
真的開始
錯誤停止
$t_{110}$
停用 B 側
不要求
要求
$t_{107}$
不要求
控制導引 (CP)
狀態 C 或 D
$t_{105}$
$t_{106}$
State B
狀態 A
9a
9a
9b
9b
$t_{109}$
$t_{108}$
B 側電壓
10a
10b
<60 V
EV 斷開裝置
閉合
斷開
車輛端插頭閂鎖
閂鎖
未閂鎖
EV 供電設備導引訊號
振盪器(5%)
振盪器關閉 (100%)
EV 供電設備絕緣偵測
啟動
閉合
必要時啟動 EV 供電設備
EV 絕緣偵測
沒啟動
必要時啟動 EV
$t_{100}$ $t_{101}$ $t_{102}$ $t_{103}$ $t_{104}$ $t_{105}$ $t_{106}$ $t_{107}$ $t_{108}$ $t_{110}$
$t_{109}$

圖 CC.6 由 EV 或 EV 供電設備能量轉移後之正常關機或暫停的序列描述圖

Figure CC.6 – Sequence diagram for normal shutdown or pause after energy transfer by EV or EV supply equipment

表 CC.9 電能傳輸後由 EV 或 EV 供電設備正常停機或暫停之序列敘述

Table CC.9 – Sequence description for normal shutdown or pause after energy transfer by EV or EV supply equipment

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t100 | • 循環式訊息 CurrentDemandReq/Res，於 EV (CurrentDemandReq <7a>)及 EVSE (CurrentDemandRes <7b>)之間<br>• Cyclic CurrentDemandReq/Res messages between the EV (CurrentDemandReq <7a>) and EVSE (CurrentDemandRes <7b>). |
| t100 | • 若 EV 因非電路之原因欲停止或暫停通訊期間，EV 應於下一個 CurrentDemandReq <7a> 訊息請求減少 B 側當下電流至 0 A DC。<br>• If the EV wants to stop or pause a communication session for a non-critical reason, the EV shall request a reduction of the present current at side B to 0 A DC in the next CurrentDemandReq <7a> messages. |
| t100 ► t101 | • 若 EVSE 因非電路之原因欲停止或暫停通訊期間(例如：使用者按壓停止鍵)，EVSE 應<br>• If the EVSE wants to stop or pause a communication session for a non-critical reason (for example, user pressed the stop button), the EVSE shall<br>– 突降 B 側當下電流至< 5 A DC，及<br>– ramp down the present current at side B to < 5 A DC, and<br>– 依照 B 側當下電流，於下一個 CurrentDemandRes <7b> 訊息，調整參數 "EVSEMaximumCurrentLimit"。<br>– adjust parameter "EVSEMaximumCurrentLimit" in the next CurrentDemandRes <7b> messages according to the present current at side B.<br>參照 101.1.3、CC.5.5.4 及 CC.5.5.6。<br>See 101.1.3, CC.5.5.4 and CC.5.5.6.<br>備考 1：依 IEC 61851-23:2014，EV 可不用減少其目標電流直接至 t102。此將被 EVSE 解譯為 EV 啟動錯誤停機 (DIN SPEC 70121:2014, 9.7.4.1.2)。參照表 CC.10。<br>NOTE 1 EVs based on IEC 61851-23:2014 might directly go to t102 without reducing the target current of the EV. This will be interpreted as an EV initiated error shutdown by the EVSE (DIN SPEC 70121:2014, 9.7.4.1.2). See Table CC.10.<br>備考 2：EVSE 可限制 B 側當下電流突降至–20 A/s，來避免 A 側突然的負載變化(例如：供電網連接)。<br>NOTE 2 The EVSE can limit the present current at side B ramp down to –20 A/s to avoid sudden load variations at side A (for example, supply network connection). |
| t101 | • B 側當下電流 < 5 A DC。<br>• The present current at side B is < 5 A DC. |
| t101 ► t102 | • 若 EVSE 欲停止或暫停通訊期間及 B 側當下電流< 5 A |

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| | DC，EVSE 應<br>• If the EVSE wants to stop or pause the communication session and the present current at side B is < 5 A DC, the EVSE shall<br>– 首先，於下一個 CurrentDemandRes <7b>訊息，設定參數"EVSEStatusCode" = 'EVSE_UtilityInterruptEvent'，來暫停通訊期間，及<br>– first, set parameter "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' in the next CurrentDemandRes <7b> message to pause the communication session, and<br>– 其次，若 EVSE 無接收到"PowerDeliveryRes" <8a> 訊息(t102)，於下一個 CurrentDemandRes <7b>訊息，設定"EVSEStatusCode" = 'EVSE_Shutdown' (及，若使用 ISO 15118-2:2014，參數為“EVSENotification” = ‘StopCharging’)，來停止通訊期間，<br>– second, if the EVSE did not receive a "PowerDeliveryRes" <8a> message (t102), set "EVSEStatusCode" = 'EVSE_Shutdown' (and, if using ISO 15118-2:2014, parameter “EVSENotification” = ‘StopCharging’), in the next CurrentDemandRes <7b> message to stop the communication session. |
| t102 | • 若使用 DIN SPEC 70121:2014：當 EV 欲停止通訊期間或 EVSE 欲停止或暫停通訊期間(亦即，EV 接收到 CurrentDemandRes <7b> 訊息，包含有參數 "EVSEStatusCode" = 'EVSE_Shutdown' 或 'EVSE_UtilityInterruptEvent')，EV 應依 IEC 61851-24 在 B 側當下電流< 5 A DC 後，於 PowerDeliveryReq <8a> 訊息，傳送參數 "ReadyToChargeState" = 'FALSE'，請求 EVSE 停用 B 側。<br>• If using DIN SPEC 70121:2014: If the EV wants to stop the communication session or if the EVSE wants to stop or pause the communication session (that is, the EV received a CurrentDemandRes <7b> message with parameter "EVSEStatusCode" = 'EVSE_Shutdown' or 'EVSE_UtilityInterruptEvent'), the EV shall request the EVSE to disable side B by sending parameter "ReadyToChargeState" = 'FALSE' in the PowerDeliveryReq <8a> message according to IEC 61851-24, after the present current at side B is < 5 A DC.<br><br>• 若使用 ISO 15118-2:2014：當 EV 欲停止通訊期間或 EVSE 欲停止或暫停通訊期間(亦即，EV 接收到 CurrentDemandRes <7b> 訊息，包含有參數 "EVSEStatusCode" = 'EVSE_Shutdown' 及 “EVSENotification” = ‘StopCharging’ 或 'EVSE_UtilityInterruptEvent')，，EV 應依 IEC 61851-24 在 B 側當下電流< 5 A DC 後，於 PowerDeliveryReq <8a> 訊息，傳送參數 "ChargeProgress" = 'Stop'，請求 EVSE 停用 B 側。<br>• If using ISO 15118-2:2014: If the EV wants to stop the communication session or if the EVSE wants to stop or pause the communication session (that is, the EV received a CurrentDemandRes <7b> message with parameter "EVSEStatusCode" = 'EVSE_Shutdown' and “EVSENotification” = ‘StopCharging’ or 'EVSE_UtilityInterruptEvent'), the EV shall request the |

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| | EVSE to disable side B by sending parameter "ChargeProgress" = 'Stop' in the PowerDeliveryReq <8a> message according to IEC 61851-24, after the present current at side B is < 5 A DC.<br><br>備考 3：從 t102 開始，EV 啟動正常關機及 EVSE 啟動正常關機之序列將相同。<br>NOTE 3 From t102 onwards, the sequences for EV initiated normal shutdown and EVSE initiated normal shutdown are identical. |
| t102 ► t103 | • 在接收到 PowerDeliveryReq <8a>訊息後，EVSE 應將 B 側當下電流於 1 s 或更短減少至< 5 A DC，若之前尚未達到。<br>• After receiving the PowerDeliveryReq <8a> message, the EVSE shall reduce the present current at side B to < 5 A DC in 1 s or less, if not already done.<br>備考：基於 IEC 61851-23:201 4 此對 EV 是必要的。<br>NOTE This is needed for EVs based on IEC 61851-23:2014.<br>• 在接收到 PowerDeliveryReq <8a>訊息後，EVSE 應依 6.3.1.106 停止過電壓保護。<br>• After receiving the PowerDeliveryReq <8a> message, the EVSE shall stop the overvoltage protection according to 6.3.1.106. |
| t102 ► t105 | •EV 在 B 側當下電流< 5 A DC 及已傳送 PowerDeliveryReq <8a>訊息後，可開啟 EV 斷開裝置。在此情況下，EV 不應再重新關閉 EV 斷開裝置。<br>• The EV may open the EV disconnection device after the present current at side B is < 5 A DC and after the message PowerDeliveryReq <8a> has been sent. In this case, the EV shall not re-close the EV disconnection device. |
| t103 | • EVSE 應停止 B 側及開啟 EVSE 斷開裝置(若有時)。<br>• The EVSE shall disable side B and open the EVSE disconnection device, if any.<br>備考 4：當 B 側當下電流> 0 A DC，若 EVSE 停用 B 側，因 EV 斷開裝置仍然為關閉，B 側當下電壓將降至電池系統電壓。<br>NOTE 4 If the EVSE disables side B while the present current at side B is > 0 A DC, the present voltage at side B drops to the battery system voltage because the EV disconnection device is still closed.<br>• EVSE 應停用 EVSE IMD。<br>• The EVSE shall disable the EVSE IMD. |
| t103 ► t110 | • 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t104 | • EVSE 應於 PowerDeliveryRes <8b> 訊息傳送參數 "EVSEStatusCode" = 'EVSE_Shutdown' 或 'EVSE_UtilityInterruptEvent'，傳達 B 側當下電流< 5 A DC 及停用 B 側。<br>• The EVSE shall communicate that the present current at side B is < 5 A DC and has disabled side B by sending parameter "EVSEStatusCode" = 'EVSE_Shutdown' or 'EVSE_UtilityInterruptEvent' in message PowerDeliveryRes <8b>.<br>• EV 可啟用 EV IMD (若有時)。 |

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| | • The EV may enable the EV IMD, if any. |
| t104 ► t107 | • 若 EVSE 在傳送 PowerDeliveryRes <8b> 訊息 20 s 後，尚未收到 SessionStopReq <10a> 訊息，EVSE 應觸發錯誤停機。<br>• If the EVSE has not received a SessionStopReq <10a> message 20 s after sending the PowerDeliveryRes <8b> message, the EVSE shall trigger an error shutdown. |
| t105 | • 在接收到 PowerDeliveryRes <8b>訊息後，EV 應改變 CP 狀態至 B。<br>• The EV shall change the CP state to B after receiving message PowerDeliveryRes <8b>.<br>備考 5：若 EV 決定不執行熔接偵測，則直接至 t106。<br>NOTE 5 If the EV decides not to perform welding detection, it proceeds to t106. |
| t105 ► t106 | • 在熔接偵測期間， EV 可多次啟動 EV 斷開裝置。<br>• The EV may actuate the EV disconnection device multiple times during welding detection.<br>• 為了在 WeldingDetectionRes <9b> 訊息中，讀取 B 側由 EVSE 量測的當下電壓，EV 可多次傳送 WeldingDetectionReq <9a> 訊息。<br>• The EV may send multiple WeldingDetectionReq <9a> messages in order to read the present voltage at side B measured by the EVSE in the WeldingDetectionRes <9b> messages.<br>• EVSE 在傳送第一個 WeldingDetectionRes <9b> 訊息前，若 CP 狀態改變至狀態 B，EVSE 應進行檢查。<br>• The EVSE shall check if the CP state changed to state B before sending the first WeldingDetectionRes <9b> message. |
| t106 | • EV 完成熔接偵測(若執行時)。<br>• The EV completes welding detection, if performed.<br>• EV 應開啟 EV 斷開裝置。<br>• The EV shall open the EV disconnection device.<br>備考 6：EV 斷開裝置之開啟，因 EVSE 尚未接收到 SessionStopReq <10a> 訊息，藉由被動放電開始減少 B 側當下電壓。<br>NOTE 6 Opening of the EV disconnection device starts the reduction of the present voltage at side B by passive discharge because the EVSE has not yet received message SessionStopReq <10a>. |
| t107 | • EV 在其已開啟 EC 斷開裝置後，應傳送 SessionStopReq <10a>訊息。<br>• The EV shall send the SessionStopReq <10a> message after it has opened the EV disconnection device.<br>• 若使用 DIN SPEC 70121:2014，EV 傳送訊息 SessionStopReq <10a> 將終止通訊期間。<br>• If using DIN SPEC 70121:2014, the EV sending the SessionStopReq <10a> message will terminate the communication session.<br>• 若使用 ISO 15118-2:2014，EV 可於 SessionStopReq <10a> 訊息，使用參數<br>• If using ISO 15118-2:2014, the EV may, in message SessionStopReq <10a>, use parameter<br>– "ChargingSession" = 'Pause' 來啟動通訊期間暫停，或<br>– "ChargingSession" = 'Pause' to initiate a communication session pause, or<br>– "ChargingSession" = 'Pause'，若 EVSE 於 |

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| | CurrentDemandRes <7b> 訊息之一或於 PowerDeliveryRes <8b> 訊息，傳送參數 "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' ，或<br>– "ChargingSession" = 'Pause' if the EVSE sent parameter "EVSEStatusCode" = 'EVSE_UtilityInterruptEvent' in one of the CurrentDemandRes <7b> messages or in the PowerDeliveryRes <8b> message, or<br>– "ChargingSession" = 'Terminate' 來終止數位通訊。參照 IEC 61851-24。<br>– "ChargingSession" = 'Terminate' to terminate digital communication.See IEC 61851-24. |
| t107 ► t108 | • EVSE 應在 1s 或更短內，降低及維持 B 側 DC+ 與 DC– 間之當下電壓 ≤ 60 V DC。<br>• The EVSE shall, in 1 s or less, reduce and maintain the present voltage at side B between DC+ and DC– ≤ 60 V DC.<br>備考 7：由於 EV 已開啟 EV 斷開裝置，EVSE 可以主動對 B 側進行放電。<br>NOTE 7 The EVSE can actively discharge the side B because the EV has opened the EV disconnection device. |
| t108 | • EVSE 應傳送 SessionStopRes <10b>訊息。<br>• The EVSE shall send the SessionStopRes <10b> message.<br>• 若使用 ISO 15118-2:2014，EVSE 應關閉其 CP 振盪器。<br>• If using ISO 15118-2:2014, the EVSE shall turn off its CP oscillator. |
| t108 ► t110 | • 在接收到 SessionStopRes <10b> 訊息後，EV 應解除車輛端插頭之鎖定。此解除鎖定的要求依 ISO 17409 規定。<br>• The EV should unlock the vehicle connector after the SessionStopRes <10b> message is received. The requirements for unlocking are defined in ISO 17409.<br>• 若由 EVSE 支援，EV 可喚醒 EVSE 及重新發動通訊期間(參照 CC.5.2)。此通訊期間應在正常啟動序列中 t1 的重新啟動過程(參照 CC.3.2)後，重新啟動。<br>• If supported by the EVSE, the EV may wake up the EVSE and re-initiate a communication session (see CC.5.2). The communication session shall restart after the restart process at t1 in the normal startup sequence (see CC.3.2).<br>• 若依 ISO 15118 使用數位通訊，EV 可請求暫停(參照 CC.3.2)。通訊期間應在正常啟動序列中 t1 的暫停過程(參照 CC.3.2)後，重新啟動。。<br>• If digital communication according to ISO 15118 is used, the EV may request a pause (see CC.3.5). The communication session shall restart after the pause process at t1 in the normal startup sequence (see CC.3.2).<br>• 任何後續重新發動的通訊會話，應使用 CC.5.2 規定之重新啟動序列，並繼續執行至 CC.3.2 正常啟動序列之 t1。<br>• Any subsequent re-initiation of a new communication session shall use the restart sequence as specified in CC.5.2 and continue to t1 in the normal startup sequence CC.3.2. |
| t109 | • 若使用 DIN SPEC 70121:2014，在傳送 SessionStopRes <10b>訊息 1.5 s 後，EVSE 應關掉其 CP 振盪器。<br>• If using DIN SPEC 70121:2014, the EVSE shall turn off its CP oscillator 1,5 s after sending the SessionStopRes <10b> message. |

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| t110 | • 拔出車輛端插頭，會改變 CP 狀態從 B 至 A。<br>• Un-mating the vehicle connector changes the CP state from B to A.<br>• 停止 B 側之限制不被要求。<br>• The limitations of the disabled side B are not required. |

CC.3.4 錯誤及緊急處理

CC.3.4 Error and emergency handling

CC.3.4.1 一般

CC.3.4.1 General

EV 供電設備及 EV 應有啟動錯誤或緊急停機的機制。

The EV supply equipment and EV shall have means to initiate error or emergency shutdowns.

備考：錯誤停機是為了防止設備受損。緊急停機是為了保護使用者免於危險情況。

NOTE An error shutdown is to prevent damage to the equipment. An emergency shutdown is to protect the user from a hazardous situation.

表 CC.10 列出本標準規定之錯誤及緊急停機案例總覽。

Table CC.10 gives an overview of the error and emergency shutdown cases defined in this document.

表 CC.10 錯誤及緊急停機案例之總覽

Table CC.10 – Overview of error and emergency shutdown cases

| 關機類型<br>Type of shutdown | 案例<br>Case |
|---|---|
| 錯誤停機<br>Error shutdown | 電纜檢查錯誤(6.3.1.105 及 CC.4.1.4)<br>Cable check errors (6.3.1.105 and CC.4.1.4) |
| | 在電能傳輸期間之絕緣監測(CC.4.1.6)<br>Insulation monitoring during energy transfer (CC.4.1.6) |
| | B 側之 DC+ 及 DC– 間的過電壓防護(參照 6.3.1.106.3)<br>Protection against overvoltage at side B between DC+ and DC– (see 6.3.1.106.3) |
| | 過溫度處理(101.2.3.2)<br>Overtemperature handling (101.2.3.2) |
| | 熱感測所提供數值的合理性檢查(101.2.3.3)<br>check of the plausibility of the values provided by the thermal sensing (101.2.3.3) |
| | 電能傳輸前之短路(6.3.1.109)<br>Short-circuit before energy transfer (6.3.1.109) |
| | B 側帶電部件之間及保護導體於單一故障情況下與保護導體的最高電壓(6.3.1.112.2)<br>Maximum voltage between side B live parts (DC+/DC–) and the protective conductor in conditions with a single fault to protective conductor (6.3.1.112.2) |
| 緊急停機<br>Emergency shutdown | 控制導引導體之電氣連接性的損失(CC.4.3)<br>Loss of electrical continuity of the control pilot conductor (CC.4.3) |
| | 接近偵測導體之電氣連接性失效(CC.4.4)<br>Loss of electrical continuity of the proximity detection |

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| | conductor (CC.4.4) |
| | 過電流保護(CC.6.4)<br>Overcurrent protection (CC.6.4) |
| | B 側之 DC+ 及 DC– 間的過電壓防護(6.3.1.106.2)<br>Protection against overvoltage at side B between DC+ and DC– (6.3.1.106.2) |
| | 控制電路供電完整性(6.3.1.108)<br>Control circuit supply integrity (6.3.1.108) |
| | 電氣連接性保護導體損失(6.3.1.2 及 CC.4.7)<br>Loss of electrical continuity the protective conductor (6.3.1.2 and CC.4.7) |
| | 短路保護(13.101)<br>Short-circuit protection (13.101) |
| | 若錯誤停機無正常工作(CC.3.4.2)<br>If error shutdown does not work properly (CC.3.4.2) |

其他導致錯誤或緊急停機的原因，已在 IEC 61851-24 所定義的相關數位通訊協定中加以規定。

Other reasons for error or emergency shutdowns are specified in the respective digital communication protocol as defined in IEC 61851-24.

CC.3.4.2 EV 供電設備及 EV 發動之錯誤停機

CC.3.4.2 EV supply equipment and EV initiated error shutdown

依據 ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EV 供電設備及 EV 發動之錯誤停機的序列圖及敘述，如圖 CC.7 及表 CC.11 所示。

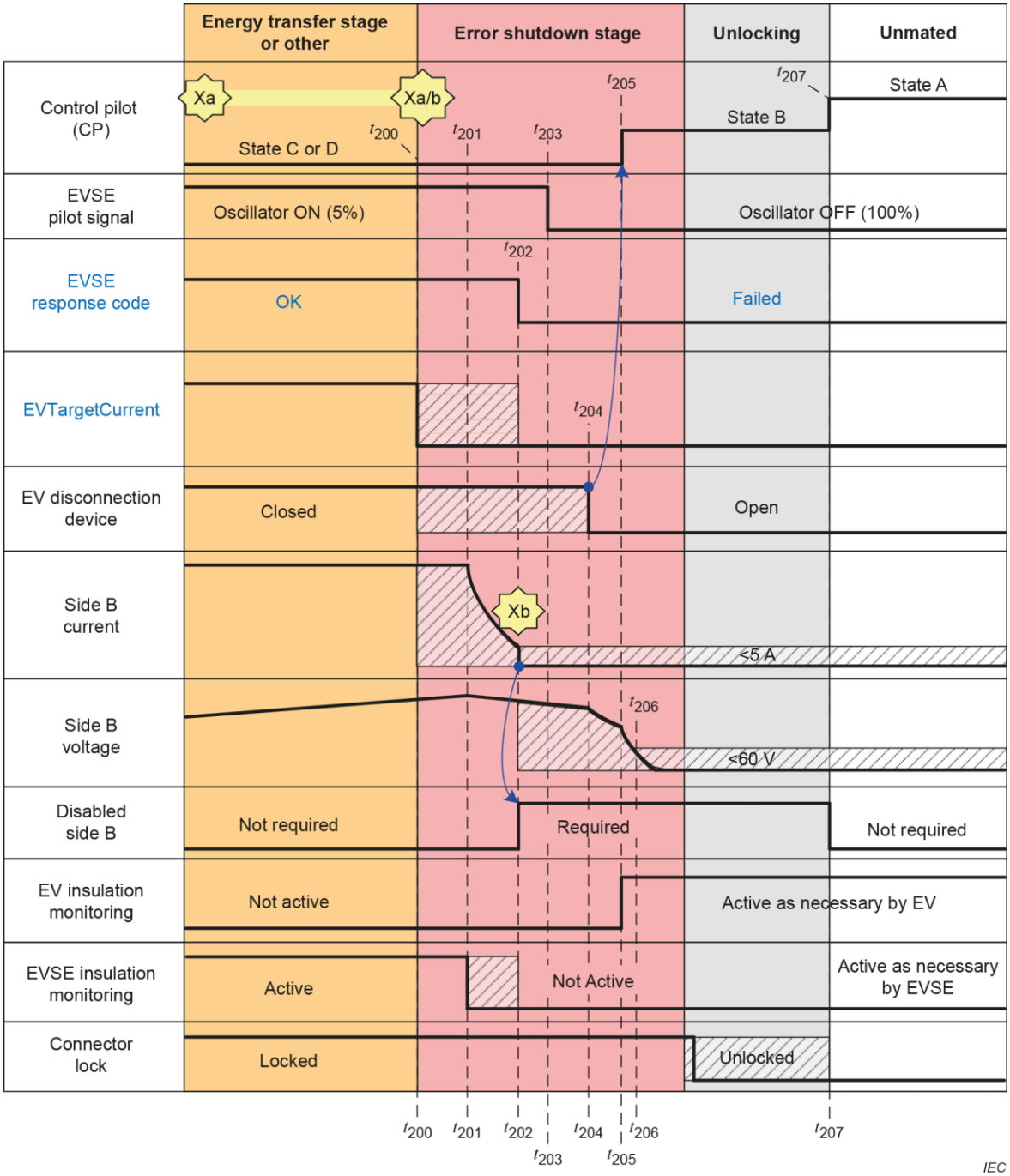
Sequence diagrams and descriptions for EV supply equipment and EV initiated error shutdown based on ISO 15118-2:2014 and DIN SPEC 70121:2014 are shown in Figure CC.7 and Table CC.11.

若數位通訊係基於 DIN SPEC 70121:2014，且錯誤發生於電能傳輸，EV 可發動錯誤停機如圖 CC.8 及表 CC.12 之序列圖及敘述。在此情況下，EV 可進入熔接偵測階段。

If the digital communication is based on DIN SPEC 70121:2014 and an error occurs during energy transfer, the EV can initiate an error shutdown as defined in the sequence diagram and description in Figure CC.8 and Table CC.12. In this case, the EV can enter the welding detection phase.

在錯誤停機完成後，EV 在 B 側不應感應電壓超過 6.3.1.113.3 之規定值。

After the completion of an error shutdown, the EV shall not induce voltages at side B more than the values specified in 6.3.1.113.3.




電能傳輸狀態或其他

未閂鎖

未配對

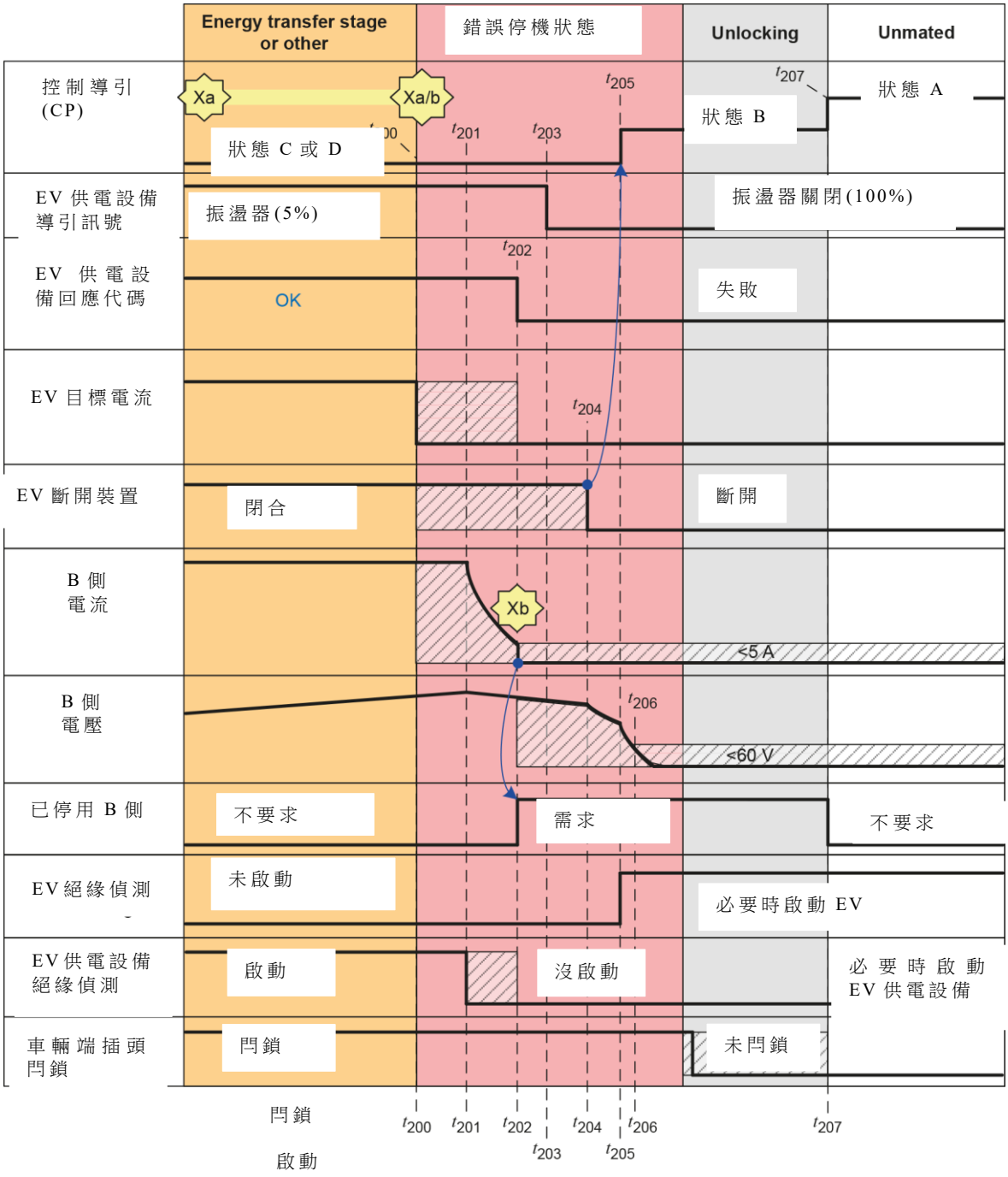



圖 CC. 7 EV 供電設備及 EV 觸發錯誤停機之序列圖

Figure CC.7 – Sequence diagram for EV supply equipment and EV initiated error shutdown

表 CC.11 EV 供電設備及 EV 觸發錯誤停機之序列描述

Table CC.11 – Sequence description for EV supply equipment and EV initiated error shutdown

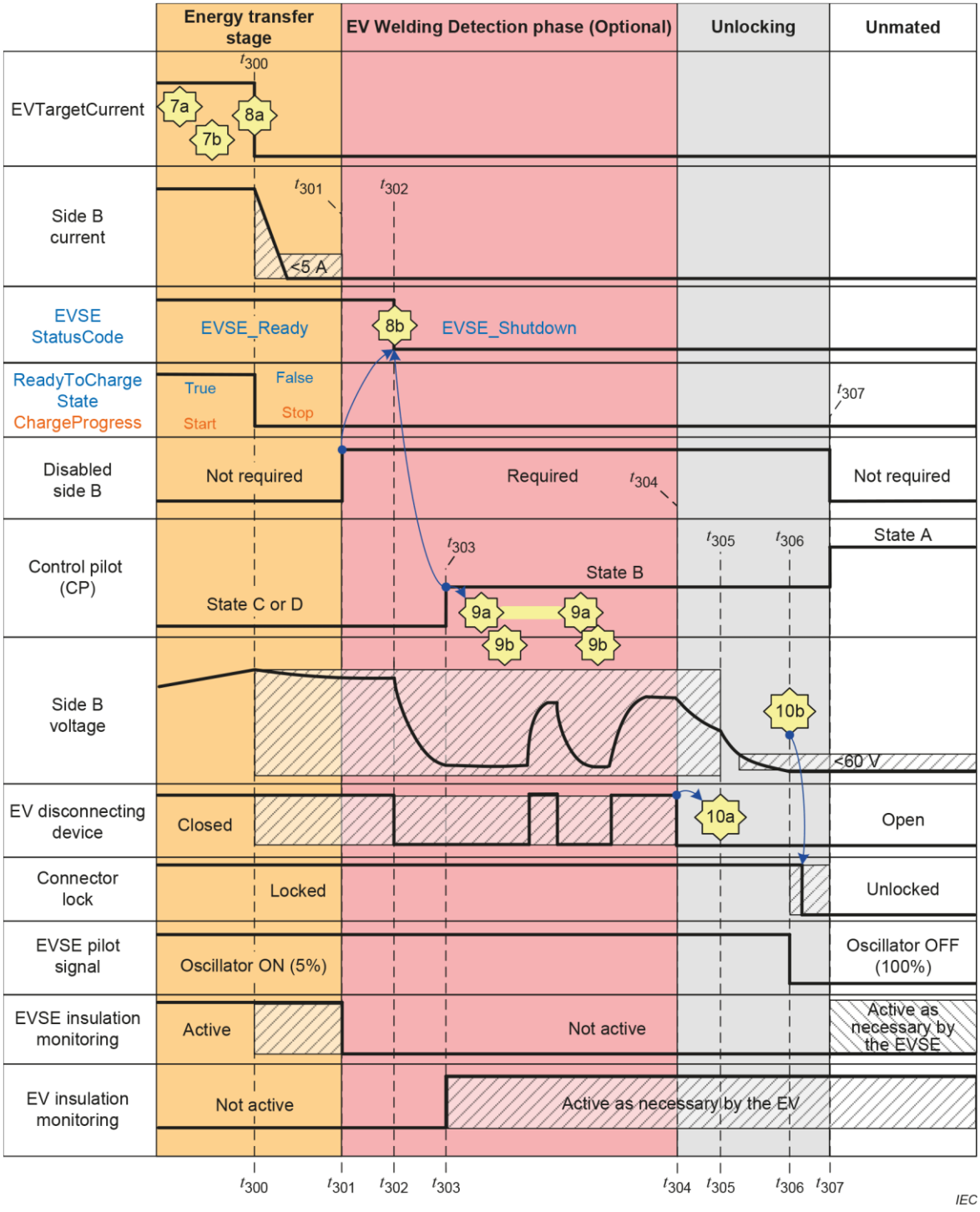
| 時間標記<br>Timestamp | 敘述<br>Description |
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| ► t200 | • 一般預調適：EV 及 EVSE 間任一通訊訊息。<br>• General pre-condition: Any digital communication |

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| | messages between the EV and EVSE.<br>• EV 發動錯誤停機之預調適：CP 狀態 B、C 或 D。<br>• Preconditions for EV initiated error shutdown: CP state B, C or D.<br>• EVSE 發動錯誤停機之預調適：CP 振盪器 ON。<br>• Preconditions for EVSE initiated error shutdown: CP oscillator ON. |
| t200 | • 錯誤停機情況之發生由 EV 或 EVSE 偵測 (例如：EV 經由數位通訊、數位通訊損失或數據連結/TCP 連結之關閉觸發一錯誤停機)。參照表 CC.10。<br>• Occurrence of error shutdown condition detected by the EV or EVSE (for example, the EV triggers an error shutdown via digital communication, digital communication loss or closing of the data link/TCP connection). See Table CC.10.<br>備考 1：當使用 DIN SPEC 70121:2014，若一錯誤情況發生在電能傳輸之前，EV 藉傳送 SessionStopReq <10a> 訊息，進行至表 CC.12 之 t305。<br>NOTE 1 When using DIN SPEC 70121:2014, if an error condition occurs before energy transfer, the EV proceeds to t305 in Table CC.12, by sending a SessionStopReq <10a> message.<br>備考 2：當使用 DIN SPEC 70121:2014，若一錯誤情況發生於電能傳輸，EV 藉傳送 SessionStopReq <8a> 訊息，進行至表 CC.12 之 t300。<br>NOTE 2 When using DIN SPEC 70121:2014, if an error condition occurs during energy transfer, the EV proceeds to t300 in Table CC.12, by sending a PowerDeliveryReq <8a> message.<br>• 觸發時間開始於此時。<br>• The trigger time starts from this moment.<br><br>備考 3：EV 發動錯誤停機之許多觸發時間，依照數位通訊之要求。參照 IEC 61851-24。<br>NOTE 3 Some trigger times for EV initiated error shutdown depends on digital communication requirements. See IEC 61851-24.<br>對 EV 發動錯誤停機：<br>For an EV initiated error shutdown:<br>• EV 可開啟 EV 斷開裝置。在此情況下，EV 不應再關閉 EV 斷開裝置。<br>• The EV may open the EV disconnection device. In this case, the EV shall not re-close the EV disconnection device. |
| t200 ► t201 | • EVSE 之觸發時間的期間。對每一個錯誤停機之特定要求，參照 CC.3.4。<br>• Duration of the trigger time of the EVSE. See CC.3.4 for the specific requirements for each error shutdown. |
| t201 | • EVSE 執行錯誤停機。<br>• The EVSE performs the error shutdown.<br>• 6.3.1.113.3 之時序要求(執行時間)從此時開啟。<br>• The timing requirements of 6.3.1.113.3 (performance time) starts from this moment.<br>• EVSE 應停用 EVSE IMD (若尚未停用時)。<br>• The EVSE shall disable the EVSE IMD, if not already done. |
| t201 ► t202 | • EVSE 應減少 B 側當下電流至< 5 A DC，且在 1s 或更短 |

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| | 內停用 B 側。(若還沒達成時)<br>• The EVSE shall reduce the present current at side B to < 5 A DC and disable side B in 1 s or less, if not already done. |
| t201 ► t206 | • EVSE 應於 2.5 s 或更短，減少 B 側當下電壓於下列兩者之間<br>• The EVSE shall, in 2,5 s or less, reduce the present voltage at side B to ≤ 60 V DC between<br>– DC+ 和 DC–,<br>– DC+ and DC–,<br>– DC+ 和 PE, 及<br>– DC+ and PE, and<br>– DC– 和 PE.<br>– DC– and PE. |
| t202 | • B 側當下電流應< 5 A DC 及維持在< 5 A DC。<br>• The present current at side B shall be < 5 A DC and remain < 5 A DC.<br>• 若尚未達到，EVSE 應停止 6.3.1.106 之過電壓保護，接著 EVSE 應停用 B 側，並斷開 EVSE 斷開裝置(若有時)。<br>• If not already done, the EVSE shall stop the overvoltage protection according to 6.3.1.106, and then, the EVSE shall disable side B, and open the EVSE disconnection device, if any.<br>在 EVSE 發動錯誤停機期間：<br>During an EVSE initiated error shutdown:<br>• 若數位通訊仍然操作時，EVSE 應於下一個反應訊息傳送參數"ResponseCode" = 'FAILED'。參照 IEC 61851-24:2023。<br>• If digital communication is still operational, the EVSE shall send parameter "ResponseCode" = 'FAILED' in the next response messages. See IEC 61851-24:2023.<br>於 EV 發動錯誤停機期間：<br>During an EV initiated error shutdown:<br>• 若數位通訊仍然進行，如在 t202 前已接收到 SessionStopReq <10a> 訊息，則 EVSE 應傳送 SessionStopRes <10b> 訊息。<br>• If digital communication is still operational, the EVSE shall send message SessionStopRes <10b> if message SessionStopReq <10a> was received before t202.<br>備考 4：參照 ISO 15118-2:2014 及 DIN SPEC 70121:2014 之例外案例( 若有時)。<br>NOTE 4 See ISO 15118-2:2014 and DIN SPEC 70121:2014 for exception cases, if any. |
| t202 ► t203 | • 在 B 側之當下電流< 5 A DC 後，EVSE 應於 300 ms 和 500 ms 之間關閉其 CP 振盪器。<br>• The EVSE shall turn off its CP oscillator between 300 ms and 500 ms after the present current at side B is < 5 A DC. |
| t202 ► t207 | • 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t203 | • EVSE 應關閉其 CP 振盪器。<br>• The EVSE shall turn off its CP oscillator.<br>若 EVSE 在傳送反應訊息包含參數 "ResponseCode" = 'FAILED' 前，關閉 CP 振盪器，EV 將偵測 EVSE 發動 |

| | |
|---|---|
| | 緊急停機(參照 6.3.1.113.3)。對 EV 傳送及接收數位通訊訊息，300 ms 之延遲應足夠。<br>If the EVSE turns off the CP oscillator before sending a response message with parameter "ResponseCode" = 'FAILED', the EV will detect an EVSE initiated emergency shutdown (see 6.3.1.113.3). The 300 ms delay should be sufficient for the EV to send and receive the digital ommunication message.<br>・若 EVSE 在偵測到錯誤(t200)後 2.5 s，未關閉其 CP 振盪器，EV 及 EVSE 應觸發緊急停機。時序要求或 EVSE B 側相關之當下電流、斷開裝置及 CP 振盪器，參照 6.3.1.113.3<br>・If the EVSE has not turned off its CP oscillator 2,5 s after the error is detected (t200), the EV and EVSE shall trigger an emergency shutdown. See 6.3.1.113.3 for the timing requirements or the EVSE regarding the present current at side B, disconnection device and CP oscillator. |
| t203 ► t204 | ・在 EVSE 已經關閉其 CP 振盪器後，EV 應於 100ms 或更短內開啟 EV 斷開裝置。<br>・The EV shall open the EV disconnection device in 100 ms or less after the EVSE has turned off its CP oscillator. |
| t204 | ・EV 應開啟 EV 斷開裝置，若其尚未開啟。<br>・The EV shall open the EV disconnection device, if not already open. |
| t205 | ・當已開啟 EV 斷開裝置，EV 應改變 CP 狀態至 B。<br>・The EV shall change the CP state to B when it has opened the EV disconnection device.<br>・EV 可啟用 EV IMD。<br>・The EV may enable the EV IMD. |
| t206 | ・B 側 DC+ 與 DC–間之當下電壓應≤ 60 V DC。<br>・The present voltage at side B between DC+ and DC– shall be ≤ 60 V DC.<br>在 EV 發動錯誤停機期間：<br>During an EV initiated error shutdown:<br>若數位通訊仍在進行，如在 t202 前已接收到 SessionStopReq <10a> 訊息，則 EVSE 應傳送 SessionStopRes <10b>訊息。<br>・If digital communication is still operational, the EVSE shall send message SessionStopRes <10b> if message SessionStopReq <10a> was received after t202.<br>備考 5：參照 ISO 15118-2:2014 及 DIN SPEC 70121:2014 之例外案件(若有時)。<br>NOTE 5 See ISO 15118-2:2014 and DIN SPEC 70121:2014 for exception cases, if any. |
| t206 ► t207 | ・若數位通訊仍在進行，在接收到 SessionStopRes <10b> 訊息後，EV 應解除車輛端插頭之鎖定。解除鎖定之要求如 ISO 17409 規定。<br>・If digital communication is still operational, the EV should unlock the vehicle connector after the SessionStopRes <10b> message is received. The requirements for unlocking are defined in ISO 17409.<br>・任何後續重新發動新的通訊會話，應使用 CC.5.2 規定之重新啟動序列，並繼續執行至 CC.3.2 正常啟動序列之 t1。<br>・Any subsequent re-initiation of a new communication session shall use the restart sequence as specified in CC.5.2 and continue to t1 in the normal startup sequence |

| | |
|---|---|
| | CC.3.2. |
| t207 | • 拔除車輛端插頭將改變 CP 狀態從 B 至 A。<br>• Un-mating the vehicle connector changes the CP state from B to A.<br>• 不要求停用 EVSE B 側之限制。<br>• The limitations of the disabled side B of the EVSE are not required. |



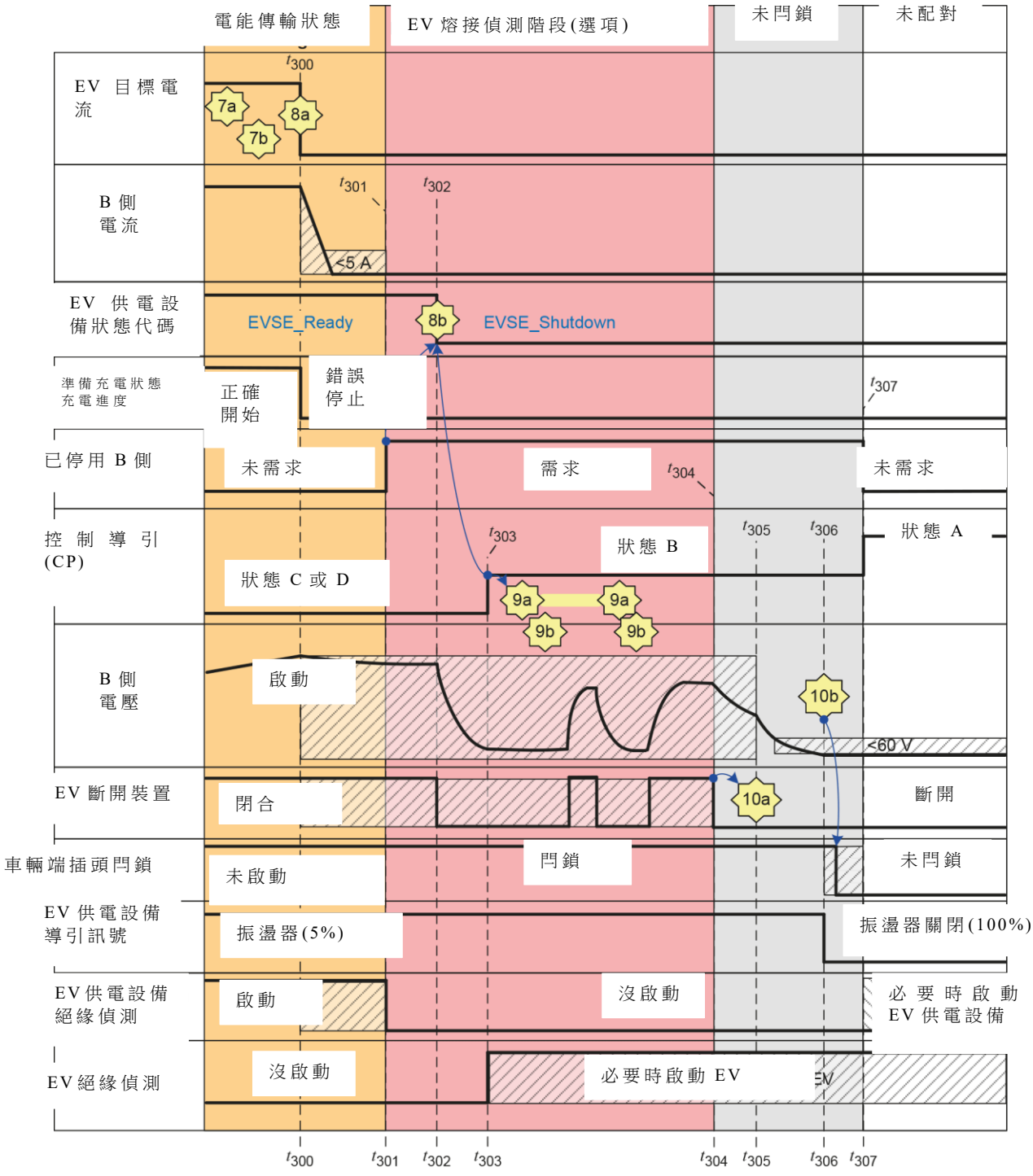



圖 CC. 8 依據 DIN SPEC 70121 之 EV 在能量轉移期間發動錯誤停機之序列圖

Figure CC.8 – Sequence diagram for EV initiated error shutdown based on DIN SPEC 70121 during energy transfer

表 CC.12 依據 DIN SPEC 70121 之 EV 在能量轉移期間發動錯誤停機之序列敘述

Table CC.12 – Sequence description for EV initiated error shutdown based on DIN SPEC 70121 during energy transfer

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t300 | • 在 EV <7a> 及 EVSE <7b> 之間，循環式 CurrentDemandReq/Res 訊息。<br>• Cyclic CurrentDemandReq/Res messages between the EV <7a> and EVSE <7b>. |
| t300 | • EV 使用 DIN SPEC 70121:2014 如其數位通訊協定，藉由傳送 PowerDeliveryReq <8a> 訊息包含參數 "ReadyToChargeState" = 'FALSE'，來請求 EVSE 停用 B 側，觸發 EV 發動錯誤停機。<br>• An EV, using DIN SPEC 70121:2014 as its digital communication protocol, triggers an EV initiated error shutdown by requesting the EVSE to disable side B by sending message PowerDeliveryReq <8a> with parameter "ReadyToChargeState" = 'FALSE'. |
| t300 ► t301 | • 若 B 側當下電流> 5 A DC，B 側當下電流應於 1s 或更短以內< 5 A DC，並維持< 5 A DC。<br>• If the present current at side B is > 5 A DC, the present current at side B shall be < 5 A DC in 1 s or less and remain < 5 A DC. |
| t300 ► t303 | • 在當下電流< 5 A DC 及 PowerDeliveryReq <8a> 訊息已被傳送後，EV 可開啟 EV 斷開裝置。在此情況下，EV 不應再關閉 EV 斷開裝置。<br>• The EV may open the EV disconnection device after the present current is < 5 A DC and after the message PowerDeliveryReq <8a> has been sent. In this case, the EV shall not re-close the EV disconnection device. |
| t301 | • 若尚未達到，EVSE 應停止 6.3.1.106 之過電壓保護，隨即 EVSE 應停用 B 側，並開啟 EVSE 斷開裝置(若有時)。<br>• If not already done, the EVSE shall stop the overvoltage protection according to 6.3.1.106, and then, the EVSE shall disable side B, and open the EVSE disconnection device, if any.<br>備考 1：當 B 側當下電流> 0 A DC，若 EVSE 停用 B 側，由於 EV 斷開裝置仍為關閉，B 側當下電壓會降至電池系統電壓。<br>NOTE 1 If the EVSE disables side B while the present current at side B is > 0 A DC, the present voltage at side B drops to the battery system voltage because the EV disconnection device is still closed.<br>• EVSE 應停用 EVSE IMD。<br>• The EVSE shall disable the EVSE IMD. |
| t301 ► t307 | • 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t302 | • EVSE 應於 PowerDeliveryRes <8b> 訊息中傳送參數 "EVSEStatusCode" = 'EVSE_Shutdown'，來傳達 B 側當下電流< 5 A DC 及停用 B 側。<br>• The EVSE shall communicate that the present current at side B is < 5 A DC and has disabled side B by sending parameter "EVSEStatusCode" = 'EVSE_Shutdown' in message PowerDeliveryRes <8b>. |
| t302 ► t305 | • 若 EVSE 在傳送 PowerDeliveryRes <8b>訊息 20 s 後，並未收到 SessionStopReq <10a>訊息，EVSE 應觸發 EVSE 發動之錯誤停機。 |

| | |
|---|---|
| | • If the EVSE has not received a SessionStopReq <10a> message 20 s after sending the PowerDeliveryRes <8b> message, the EVSE shall trigger an EVSE initiated error shutdown. |
| t303 | • 在收到 PowerDeliveryRes <8b>訊息後，EV 應改變 CP 狀態至 B。<br>• The EV shall change the CP state to B after receiving message PowerDeliveryRes <8b>.<br>• EV 可啟用 EV IMD(若有時)。<br>• The EV may enable the EV IMD, if any.<br>備考 2：若 EV 決定不執行熔接偵測，其可直接至 t304。<br>NOTE 2 If the EV decides not to perform welding detection, it proceeds to t304. |
| t303 ► t304 | • 在熔接偵測期間， EV 可多次啟動 EV 斷開裝置。<br>• The EV may actuate the EV disconnection device multiple times during welding detection.<br>• 為了在 WeldingDetectionRes <9b> 訊息中，讀取 B 側由 EVSE 量測的當下電壓，EV 可多次傳送 WeldingDetectionReq <9a> 訊息。<br>• The EV may send multiple WeldingDetectionReq <9a> messages in order to read the present voltage at side B measured by the EVSE in the WeldingDetectionRes <9b> messages.<br>• EVSE 在傳送第一個 WeldingDetectionRes <9b> 訊息前，若 CP 狀態改變至狀態 B，EVSE 應進行檢查。<br>• The EVSE shall check if the CP state changed to state B before sending the first WeldingDetectionRes <9b> message. |
| t304 | • EV 完成熔接偵測(若執行時)。<br>• The EV completes welding detection, if performed.<br>• EV 應開啟 EV 斷開裝置。<br>• The EV shall open the EV disconnection device.<br>備考 3：由於 EVSE 尚未收到 SessionStopReq <10a> 訊息，EV 斷開裝置之開啟，藉由被動放電開始降低 B 側當下電壓。<br>NOTE 3 The opening of the EV disconnection device starts the reduction of the present voltage at side B by passive discharge because the EVSE has not yet received message SessionStopReq <10a>. |
| t305 | •EV 在其開啟 EV 斷開裝置後，應傳送 SessionStopReq <10a> 訊息。<br>• The EV shall send the SessionStopReq <10a> message after it has opened the EV disconnection device.<br>•藉由傳送 SessionStopReq <10a>訊息，EV 發動終止數位通訊。<br>• The EV initiates digital communication termination by sending message SessionStopReq <10a>. |
| t305 ► t306 | • EVSE 應於 1 s 或更短，降低 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V DC。<br>• The EVSE shall, in 1 s or less, reduce the present voltage at side B between DC+ and DC– to ≤ 60 V DC.<br>備考 4：由於 EV 已開啟 EV 斷開裝置，EVSE 可進行 B 側之放電。<br>NOTE 4 The EVSE can actively discharge side B because the EV has opened the EV disconnection device. |
| t306 | • EVSE 應傳送 SessionStopRes <10b> 訊息。<br>• The EVSE shall send the message SessionStopRes <10b>.<br>• 依 IEC 61851-24 EVSE 應關閉其 CP 振盪器。 |

| | |
|---|---|
| | • The EVSE shall turn off its CP oscillator according to IEC 61851-24. |
| t306 ► t307 | • 在收到 SessionStopRes <10b> 訊息後，EV 應解除車輛端插頭之鎖定。解除鎖定之要求如 ISO 17409 之規定。<br>• The EV should unlock the vehicle connector after the SessionStopRes <10b> message is received. The requirements for unlocking are defined in ISO 17409.<br>• 任何後續重新發動新的通訊會話，應使用 CC.5.2 規定之重新啟動序列，並繼續執行至 CC.3.2 正常啟動序列之 t1。<br>• Any subsequent re-initiation of a new communication session shall use the restart sequence as specified in CC.5.2 and continue to t1 in the normal startup sequence CC.3.2. |
| t307 | • 拔開車輛端插頭，改變 CP 狀態從 B 至 A。<br>• Un-mating the vehicle connector changes the CP state from B to A.<br>• 不要求 EVSE B 側停用之限制。<br>• The limitations of the disabled side B of the EVSE are not required. |

CC.3.4.3 由 EV 或 EV 供電設備執行之緊急停機

CC.3.4.3 Emergency shutdown executed by the EV or the EV supply equipment

由 EV 執行之緊急停機的序列及敘述如圖 CC.9 及表 CC.13 所示。

The sequence and description of an emergency shutdown executed by the EV are shown in Figure CC.9 and Table CC.13.

由 EV 供電設備執行之緊急停機的序列及敘述如圖 CC.10 及表 CC.14 所示。

The sequence and description of an emergency shutdown executed by the EV supply equipment are shown in Figure CC.10 and Table CC.14.

EV 供電設備與 EV 應以基本信號之方式通訊，傳遞偵測到緊急停機的情況。在此情況下，EV 供電設備及 EV 以基本信號進行同步，各自獨立執行進行緊急停機。

Both the EV supply equipment and the EV must communicate, by means of basic signalling, that an emergency shutdown condition was detected. In this case, the EV supply equipment and the EV execute the emergency shutdown independently, synchronized with basic signalling.

圖示展現由 EV 供電設備或電動車偵測到多種緊急停機情況之情境。

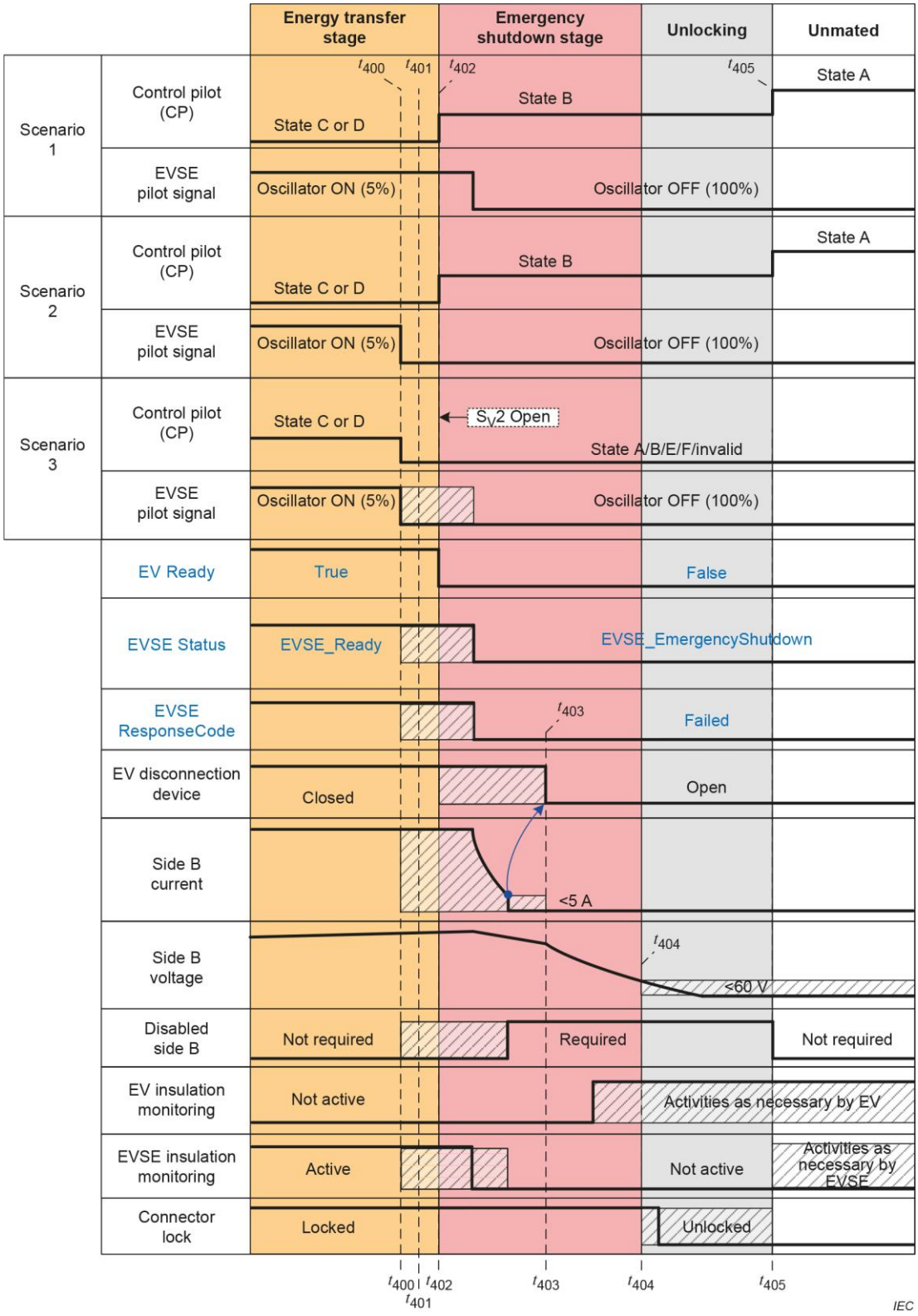
The diagrams show multiple scenarios for emergency shutdown conditions, as detected by the EV supply equipment or EV.

在完成緊急停機後，EV B 側不應有感應電壓超過 6.3.1.113.4 之規定值。

After the completion of an emergency shutdown, the EV shall not induce voltages at side B more than the values specified in 6.3.1.113.4.

備考：EV 不可進入熔接偵測階段，也不可依據 B 側電壓超過 6.3.1.113.4 之規定值進行熔接偵測。

NOTE The EV cannot enter the welding detection phase, nor can it perform a welding detection based on voltages at side B more than the values specified in 6.3.1.113.4.


Energy transfer stage
Emergency shutdown stage
Unlocking
Unmated
Scenario 1
Control pilot (CP)
State C or D
State B
State A
EVSE pilot signal
Oscillator ON (5%)
Oscillator OFF (100%)
Scenario 2
Control pilot (CP)
State C or D
State B
State A
EVSE pilot signal
Oscillator ON (5%)
Oscillator OFF (100%)
Scenario 3
Control pilot (CP)
State C or D
S2 Open
State A/B/E/F/invalid
EVSE pilot signal
Oscillator ON (5%)
Oscillator OFF (100%)
EV Ready
True
False
EVSE Status
EVSE_Ready
EVSE_EmergencyShutdown
EVSE ResponseCode
Failed
EV disconnection device
Closed
Open
Side B current
<5 A
Side B voltage
<60 V
Disabled side B
Not required
Required
Not required
EV insulation monitoring
Not active
Activities as necessary by EV
EVSE insulation monitoring
Active
Not active
Activities as necessary by EVSE
Connector lock
Locked
Unlocked
t400
t401
t402
t403
t404
t405
IEC

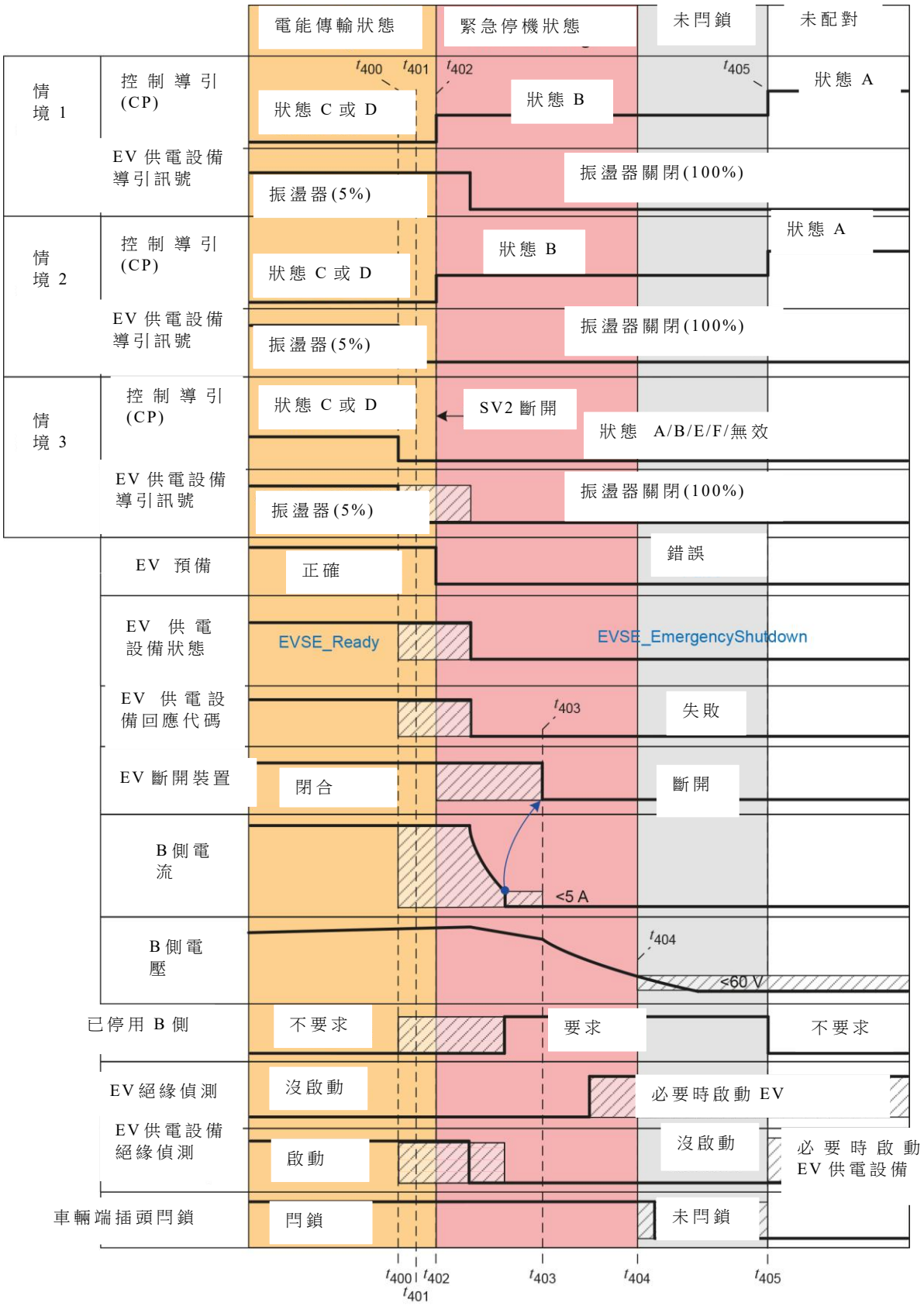



圖 CC. 9 由 EV 執行緊急停機之序列圖

Figure CC.9 – Sequence diagram for an emergency shutdown executed by the EV

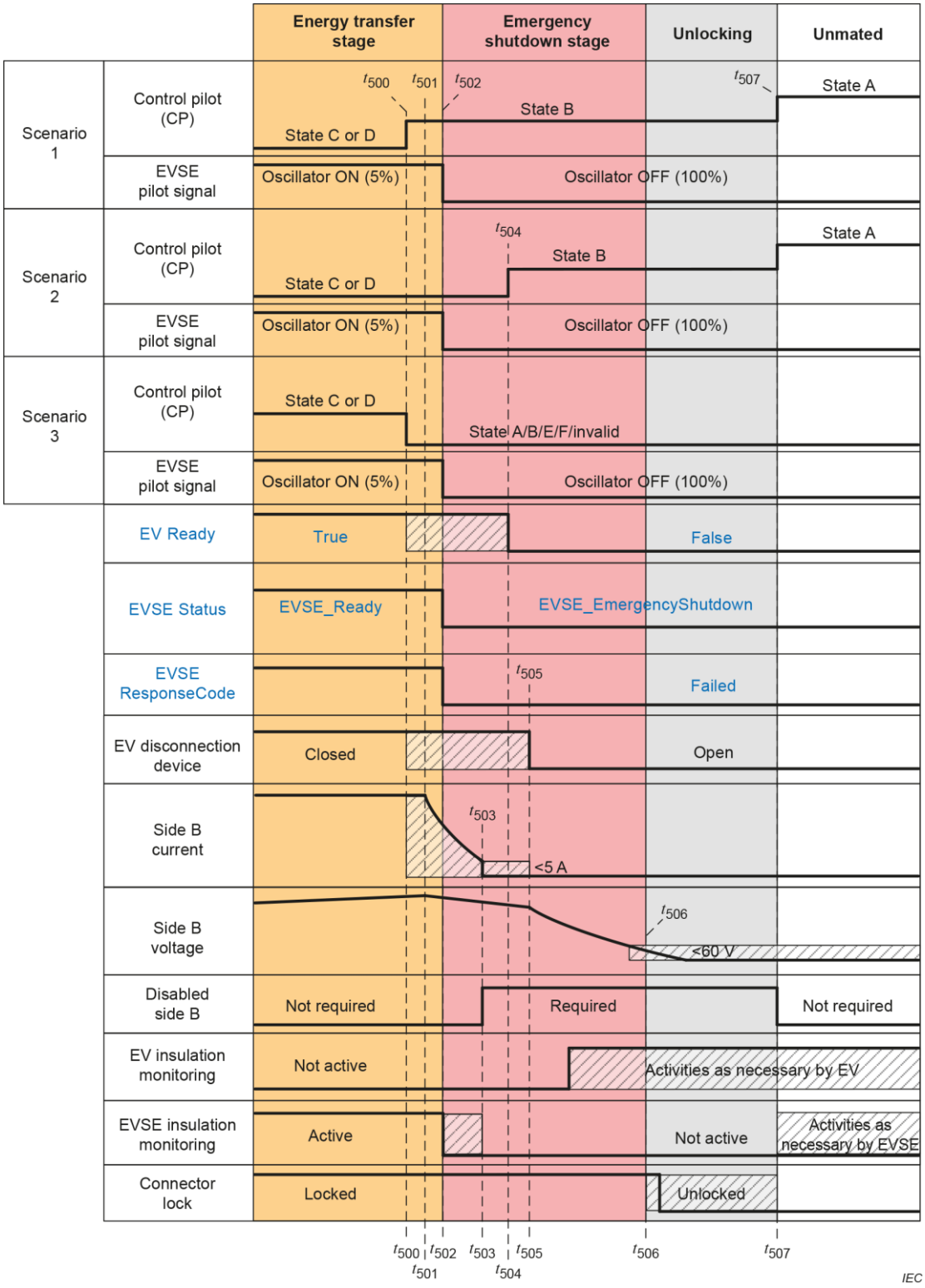
表 CC.13 由 EV 執行緊急停機之序列敘述

Table CC.13 – Sequence description of an emergency shutdown executed by the EV

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t400 | • 一般預調適(處理)：EV 與 EVSE 之間任一通訊訊息。<br>• General pre-condition: Any digital communication messages between the EV and EVSE.<br>• 由 EV 執行緊急停機之預調適：CP 狀態 C/D 及 CP 振盪器 on (5 % PWM)。<br>• Pre-conditions for emergency shutdowns executed by the EV: CP state C/D and CP oscillator on (5 % PWM) |
| t400 | • 第一次緊急停機情況之發生：<br>• Occurrence of the first emergency shutdown condition:<br>– 情境 1：可由 EV 偵測到之故障發生(例如：EV 內部故障、保護導體之電氣連接性在無離開 CP 狀態 C 或 D 受損等)。此故障不被 EVSE 偵測到。<br>– Scenario 1: Occurrence of a fault that can be detected by the EV (for example, internal fault of the EV, loss of electrical continuity of the protective conductor without leaving CP state C or D, etc). The fault has not been detected by the EVSE.<br><br>– 情境 2：EVSE 藉由關閉 CP 振盪器(100 % PWM)發動緊急停機。此故障不被 EV 偵測到。<br>– Scenario 2: The EVSE initiates an emergency shutdown by turning off the CP oscillator (100 % PWM). The fault has not been detected by the EV.<br><br>– 情境 3：故障發生由 EV 及 EVSE 皆偵測到。例如：當 SV2 關閉且從 EV 角度來看，CP 狀態改變至 A/B/E/F 或失效狀態(例如：控制導引導體之電氣連接性失效或接近偵測導體之電氣連接性失效)。<br>– Scenario 3: Occurrence of a fault detected by both the EV and EVSE. For example, when SV2 is closed and the CP state changes to states A/B/E/F or Invalid from the EV perspective (for example, loss of electrical continuity of the control pilot conductor or loss of electrical continuity of the proximity detection conductor).<br><br>當 EV 偵測到緊急停機情況，因故障情況可能干擾 EV 與 EVSE 間之數位通訊或基本信號，其不應依賴來自 EVSE 之數位通訊。<br>When the EV detects an emergency shutdown condition, it shall not rely on digital communication from the EVSE, as a fault condition may disturb digital communication or basic signalling between the EV and EVSE.<br><br>備考 1：序列的時序要求，應依據由 EV 偵測到第一次緊急停機情況之發生設定。可能有後續序列緊急停機情況。<br>NOTE 1 The timing requirements in this sequence are based on the occurrence of the first emergency shutdown condition detected by the EV. There might be subsequent emergency shutdown conditions. |
| t400 ► t401 | 情境 1： |

| | |
|---|---|
| | Scenario 1:<br>・若 EV 偵測到內部故障，EV 應依 EV 製造商規定開啟 SV2。<br>・In case the EV detects an internal fault, the EV shall open SV2 as specified by the EV manufacturer.<br>・在未離開 CP 狀態 C 或 D 下(從 A 點至 EV，參照圖 CC.1 及圖 CC.2)，保護導體失去電氣連接性，EV 應於 150 ms 或更短以內觸發緊急停機。參照 CC.4.7。<br>・In case of losing of electrical continuity of the protective conductor without leaving CP state C or D (from point A to the EV, see Figure CC.1 and Figure CC.2), the EV shall trigger an emergency shutdown in 150 ms or less. See CC.4.7.<br>情境 2：<br>Scenario 2:<br>・若 EVSE 關閉 CP 振盪器，EV 應於 50 ms 或更短以內觸發緊急停機。<br>・In case the EVSE turned off the CP oscillator, the EV shall trigger an emergency shutdown in 50 ms or less.<br>情境 3：<br>Scenario 3:<br>・若非預期的 CP 狀態發生改變， EV 應於 50 ms 或更短以內觸發緊急停機。參照 CC.4.3。<br>・In case of an unexpected CP state change, the EV shall trigger an emergency shutdown in 50 ms or less. See CC.4.3. |
| t401 | ・EV 觸發緊急停機。<br>・The EV triggers the emergency shutdown. |
| t401 ► t402 | ・EV 應於 10 ms 或更短開啟 SV2。<br>・The EV shall open SV2 in 10 ms or less. |
| t402 | ・EV 開啟 SV2。<br>・The EV opens SV2.<br>・EV 可開啟 EV 斷開裝置。在此情況下，EV 不應再關閉 EV 斷開裝置。<br>・The EV may open the EV disconnection device. In this case, the EV shall not re-close the EV disconnection device. |
| t401 ► t403 | ・EV 應進行以下其中之一<br>・The EV shall either<br>– 在 B 側當下電流< 5 A DC 後，於 100 ms 或更短以內開啟 EV 斷開裝置。<br>– open the EV disconnection device in 100 ms or less after the present current at side B is < 5 A DC, or<br>– 在觸發緊急停機後 1.1 s，開啟 EV 斷開裝置，以最短的時間來開啟 EV 斷開裝置為準。<br>– open the EV disconnection device 1,1 s after triggering an emergency shutdown, whichever results in the shortest time to open the EV disconnection device.<br><br>備考 2：在緊急停機，EVSE 應於 t401 之後 30 ms 或更短以內，降低 B 側當下電流至 < 5 A DC。B 側無當下電流，EV 有充足的時間來開啟 EV 斷開裝置。<br>NOTE 2 In an emergency shutdown, the EVSE has reduced the present current at side B to < 5 A DC in 30 ms or less after t401. The EV has sufficient time to open the EV disconnection device without a present current at side B.<br>備考 3：依據 IEC 61851-23:2014，傳統 EVSE 在 CP 狀態從 C/D 變為 B 時，可能最多需要 1 s，將 B 側的當下電流降至 < 5 A DC。 |

| | |
|---|---|
| | NOTE 3 Legacy EVSEs, according to IEC 61851-23:2014, can take up to 1 s to reduce the present current at side B to < 5 A DC in case the CP state changes from state C/D to state B. |
| t401 ► t405 | • EV 與 EVSE 兩者可試著維持數位通訊。<br>• Both the EV and EVSE may try to maintain digital communication.<br>• 若 EV 或 EVSE 傳送數位通訊訊息，由 EV 傳送之請求訊息應包含參數 "EVReady" = 'False'。<br>• If the EV or EVSE send a digital communication message, the request message sent by the EV shall contain parameter "EVReady" = 'False'. |
| t403 | • EV 開啟 EV 斷開裝置。<br>• The EV opens the EV disconnection device. |
| t403 ► | • EV 可停用 EV IMD(若有時)。<br>• The EV may enable the EV IMD, if any. |
| t404 | • 參照表 CC.14 之 t505 (由 EVSE 執行之緊急停機)。<br>• See t505 in Table CC.14 (emergency shutdown executed by the EVSE) |
| t404 ► t405 | • EV 可解除車輛端插頭之鎖定。解除車輛端插頭之鎖定的要求依 ISO 17409 之規定。<br>• The EV may unlock the vehicle connector. The requirements for unlocking are defined in ISO 17409.<br>• 任何後續重新發動的通訊會話，應使用 CC.5.2 規定之重新啟動序列，並繼續執行至 CC.3.2 正常啟動序列之 t1。<br>• Any subsequent re-initiation of a new communication session shall use the restart sequence as specified in CC.5.2 and continue to t1 in the normal startup sequence CC.3.2. |
| t405 | • 拔開車輛端插頭，改變 CP 狀態從 B 至 A。<br>• Un-mating the vehicle connector changes the CP state from B to A. |


Energy transfer stage
Emergency shutdown stage
Unlocking
Unmated
Scenario 1
Scenario 2
Scenario 3
Control pilot (CP)
EVSE pilot signal
EV Ready
EVSE Status
EVSE ResponseCode
EV disconnection device
Side B current
Side B voltage
Disabled side B
EV insulation monitoring
EVSE insulation monitoring
Connector lock
State C or D
State B
State A
State A/B/E/F/invalid
Oscillator ON (5%)
Oscillator OFF (100%)
True
False
EVSE_Ready
EVSE_EmergencyShutdown
Failed
Closed
Open
<5 A
<60 V
Not required
Required
Not active
Activities as necessary by EV
Active
Not active
Activities as necessary by EVSE
Locked
Unlocked
t500
t501
t502
t503
t504
t505
t506
t507
IEC

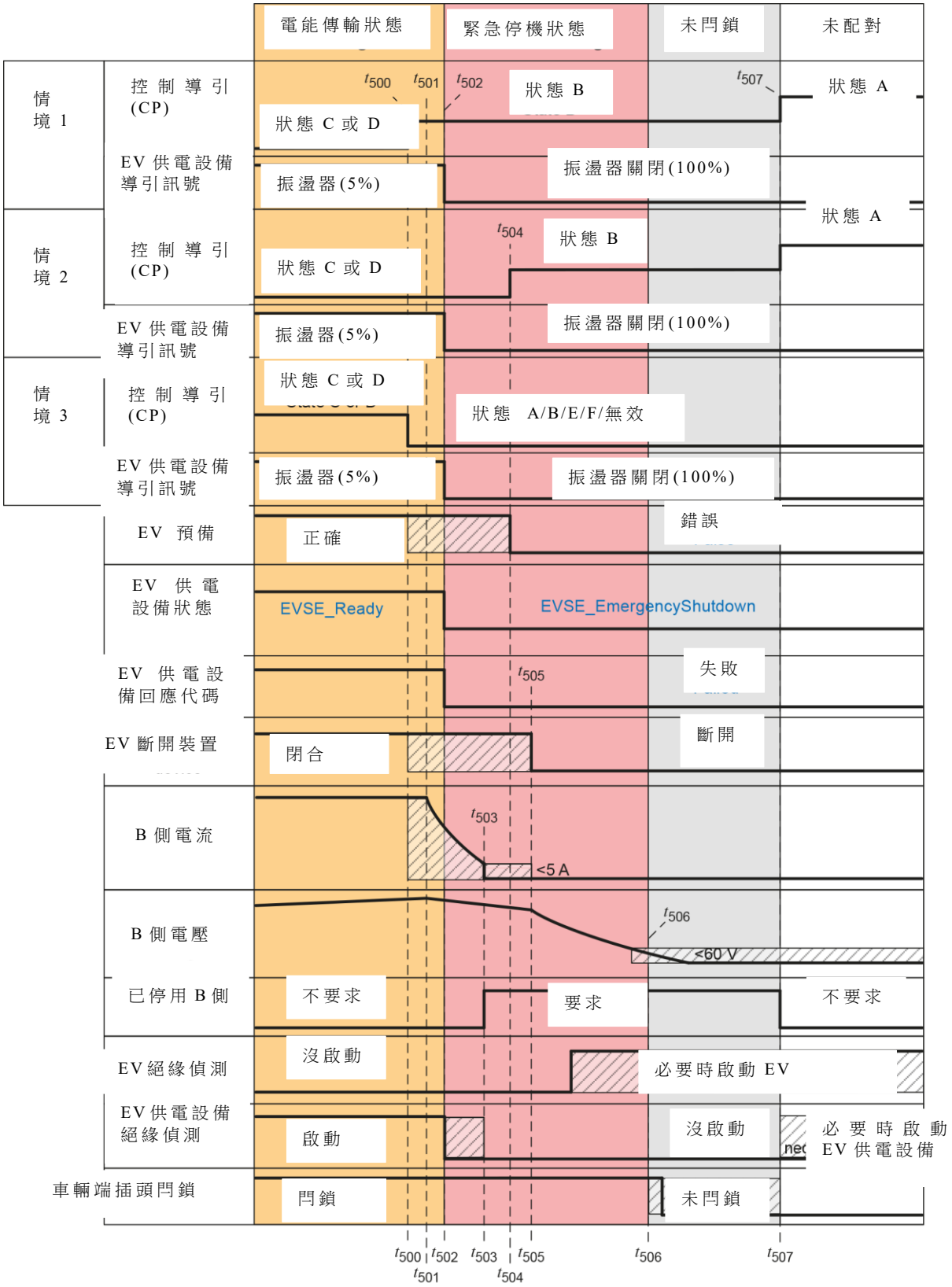



圖 CC. 10 由 EV 供電設備執行緊急停機之序列圖

Figure CC.10 – Sequence diagram for an emergency shutdown executed by the EV supply equipment

表 CC.14 由 EV 供電設備執行緊急停機之序列敘述

Table CC.14 – Sequence diagram an emergency shutdown executed by the EV supply equipment

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t500 | • 一般預調適：EV 與 EVSE 之間任一通訊訊息。<br>• General pre-condition: Any digital communication messages between the EV and EVSE.<br>• 由 EVSE 執行緊急停機之預調適：CP 振盪器 on。<br>• Pre-condition for an emergency shutdown executed by the EVSE: CP oscillator on. |
| t500 | • 第一次緊急停機情況之發生：<br>• Occurrence of the first emergency shutdown condition:<br>– 情境 1：EV 藉由開啟 SV2 發動緊急停機(例如：EV 內部故障、在未離開 CP 狀態 C 或 D 下失去保護導體電氣連接性等)。此故障不被 EVSE 偵測到。<br>– Scenario 1: The EV initiates an emergency shutdown by opening SV2 (for example, internal fault of the EV, loss of electrical continuity of the protective conductor without leaving CP state C or D, etc.). The fault has not been detected by the EVSE.<br>– 情境 2：故障的發生可被 EVSE 偵測到(例如：內部故障被 EVSE 偵測到)。此故障不被 EV 偵測到。<br>– Scenario 2: Occurrence of a fault that can be detected by the EVSE (for example, internal fault detected by EVSE). The fault has not been detected by the EV.<br>– 情境 3：故障的發生被 EV 及 EVSE 皆偵測到。例如：當 SV2 關閉且從 EV 角度來看，CP 狀態改變至 A/B/E/F 或失效狀態(例如：控制導引導體之電氣連接性失效或接近偵測導體之電氣連接性失效)<br>– Scenario 3: Occurrence of a fault detected by both the EV and EVSE. For example, the CP state changes to states A/B/E/F or Invalid from the EVSE perspective (for example, loss of electrical continuity of the protective conductor, loss of electrical continuity of the control pilot conductor or loss of electrical continuity of the proximity detection conductor).<br><br>當 EVSE 偵測到緊急停機情況，因故障情況可能干擾 EV 與 EVSE 間之數位通訊或基本信號，其不應依賴來自 EVSE 之數位通訊。<br>When the EVSE detects an emergency shutdown condition, it shall not rely on digital communication from the EV, as a fault condition can disturb digital communication or basic signalling between the EV and EVSE.<br><br>備考 1：序列的時序要求，應依據由 EV 偵測到第一次緊急停機情況之發生設定。可能有後續序列緊急停機情況。<br>NOTE 1 The timing requirements in this sequence are based on the occurrence of the first emergency shutdown condition detected by the EVSE. There might be subsequent emergency shutdown conditions.<br><br>在由 EV 執行之緊急停機(情境 1)，EV 可在偵測到故障情況後立即開啟 EV 斷開裝置。<br>In an emergency shutdown executed by the EV (scenario 1), |

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| | the EV may open the EV disconnection device as soon as it detected the fault condition. |
| t500 ► t501 | ・EVSE 應依每個故障規定之觸發時間或更短內，觸發緊急停機。參照 CC.10。<br>・ The EVSE shall trigger an emergency shutdown in the trigger times or less specified for each fault. See Table CC.10.<br>・若 EVSE 偵測到內部故障未規定於表 CC.10，則 EVSE 應依其製造商之規定觸發緊急停機。<br>・In case the EVSE detects an internal fault not specified in Table CC.10, the EVSE shall trigger an emergency shutdown as specified by the EVSE manufacturer.<br>備考 2：觸發時間為故障發生和由 EVSE 觸發緊急時的時間差。各故障之觸發時間如表 CC.10 之規定。<br>NOTE 2 The trigger time is the time between the occurrence of a fault and the moment that an emergency has to be triggered by the EVSE. These times are specified for each fault in Table CC.10. |
| t501 | ・EVSE 已觸發緊急停機。<br>・The EVSE has triggered an emergency shutdown.<br>備考 4：時間點無法於車輛端插頭進行實際量測。<br>NOTE 4 Point in time that cannot be physically measured at the vehicle connector. |
| t501 ► t502 | ・EVSE 應於 10 ms 或更短內關閉其 CP 振盪器。<br>・The EVSE shall turn off its CP oscillator in 10 ms or less. |
| t501 ► t503 | ・EVSE 應降低 B 側當下電流至< 5 A DC，且於 20 ms 或更短以內停用 B 側(若尚未進行)。參照 6.3.1.113.4。<br>・The EVSE shall reduce the present current at side B to < 5 A DC and disable side B in 20 ms or less, if not already done. See 6.3.1.113.4. |
| t501 ► t506 | ・EVSE 應於 1s 或更短內，減少 B 側於下列兩者之間的當下電壓至 ≤ 60 V DC，<br>・The EVSE shall, in 1 s or less, reduce the present voltage at side B to ≤ 60 V DC between<br>– DC+ 和 DC–，<br>– DC+ and DC–,<br>– DC+ 和 PE，及<br>– DC+ and PE, and<br>– DC– 和 PE。<br>– DC– and PE. |
| t502 | ・EVSE 關閉其 CP 振盪器來指示 EVSE 發動緊急停機。<br>・The EVSE turns off its CP oscillator to indicate an EVSE initiated emergency shutdown.<br>備考 5：6.3.1.113.4 (執行時間)之時序要求從此刻開始。<br>NOTE 5 The timing requirements of 6.3.1.113.4 (performance time) start from this moment.<br>・EVSE 應停用 EVSE IMD (若尚未達到)。<br>・The EVSE shall disable the EVSE IMD, if not already done. |
| t502 ► t504 | 情境 2：<br>Scenario 2：<br>・在 CP 振盪器已被關閉後 50 ms 或更短以內，EV 應藉由開啟 SV2 改變 CP 狀態從 C/D 至 B。<br>・The EV shall change the CP state from C/D to B by opening SV2 in 50 ms or less after the CP oscillator is turned off. |
| t502 ► t507 | ・EV 與 EVSE 可試著維持數位通訊。<br>・ Both the EV and EVSE may try to maintain digital |

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|---|---|
| | communication.<br>・若 EV 或 EVSE 傳送數位通訊訊息，由 EVSE 傳送之回應訊息應包含參數 "ResponseCode" = 'FAILED'。<br>・If the EV or EVSE send a digital communication message, the response message sent by the EVSE shall contain parameter "ResponseCode" = 'FAILED'. |
| t503 | ・EVSE 減少 B 側當下電流至< 5 A DC。<br>・The EVSE has reduced the present current at side B to < 5 A DC.<br>・若尚未達到，EVSE 應停止 6.3.1.106 規定之過電壓保護，隨即 EVSE 應停用 B 側，並開啟 EVSE 斷開裝置(若有時)。<br>・If not already done, the EVSE shall stop the overvoltage protection according to 6.3.1.106, and then, the EVSE shall disable side B, and open the EVSE disconnection device, if any. |
| t503 ► t507 | ・停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>・The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t504 | 情境 2：<br>Scenario 2:<br>・EV 開啟 SV2。參照表 CC.13 之 t402 (由 EV 執行之緊急停機)。<br>・The EV opens SV2. See t402 in Table CC.13 (emergency shutdown executed by the EV). |
| t505 | ・參照表 CC.13 之 t403 (由 EV 執行之緊急停機)。<br>・See t403 in Table CC.13 (emergency shutdown executed by the EV).<br><br>備考 6：EVSE 可假設在關閉 CP 振盪器後 160 ms 或 CP 狀態從 C/D 改變至 A/BCE/F 或失效，EV 已開啟 EV 斷開裝置。在此之後，EVSE 可開始對 B 側進行主動放電。<br>NOTE 6 The EVSE can assume the EV opened the EV disconnection device 160 ms after turning off the CP oscillator or after the CP state changed from state C/D to states A/BCE/F or Invalid. After this time, the EVSE can proceed to actively discharge side B. |
| t506 | ・B 側在 DC+ 與 DC– 間之當下電壓 ≤ 60 V DC。<br>・The present voltage at side B between DC+ and DC– is ≤ 60 V DC. |
| t506 ► t507 | ・參照表 CC.13 之 t404 ► t405 (由 EV 執行之緊急停機)。<br>・See t404 ► t405 in Table CC.13 (emergency shutdown executed by the EV)<br>・任何後續重新發動的通訊會話，應使用 CC.5.2 規定之重新啟動序列，並繼續執行至 CC.3.2 正常啟動序列之 t1。<br>・Any subsequent re-initiation of a new communication session shall use the restart sequence as specified in CC.5.2 and continue to t1 in the normal startup sequence CC.3.2. |
| t507 | ・拔開車輛端插頭，改變 CP 狀態從 B 至 A。<br>・Un-mating the vehicle connector changes the CP state from B to A.<br>・不要求 EVSE B 側停用之限制。<br>・The limitations of the disabled side B of the EVSE are not required. |

CC.3.5 由使用 ISO 15118-2:2014 之 EV 供電設備的暫停

CC.3.5 Pause by EV supply equipment using ISO 15118-2:2014

CC.3.5.1 一般

CC.3.5.1 General

CC.3.5 規定之序列僅適用於使用 ISO 15118-2:2014 之 EV 供電設備。

The sequences specified in CC.3.5 are only applicable for EV supply equipment using ISO 15118-2:2014.

CC.3.5.2 由使用 ISO 15118-2:2014 之 EV 供電設備在電纜檢查階段前的暫停

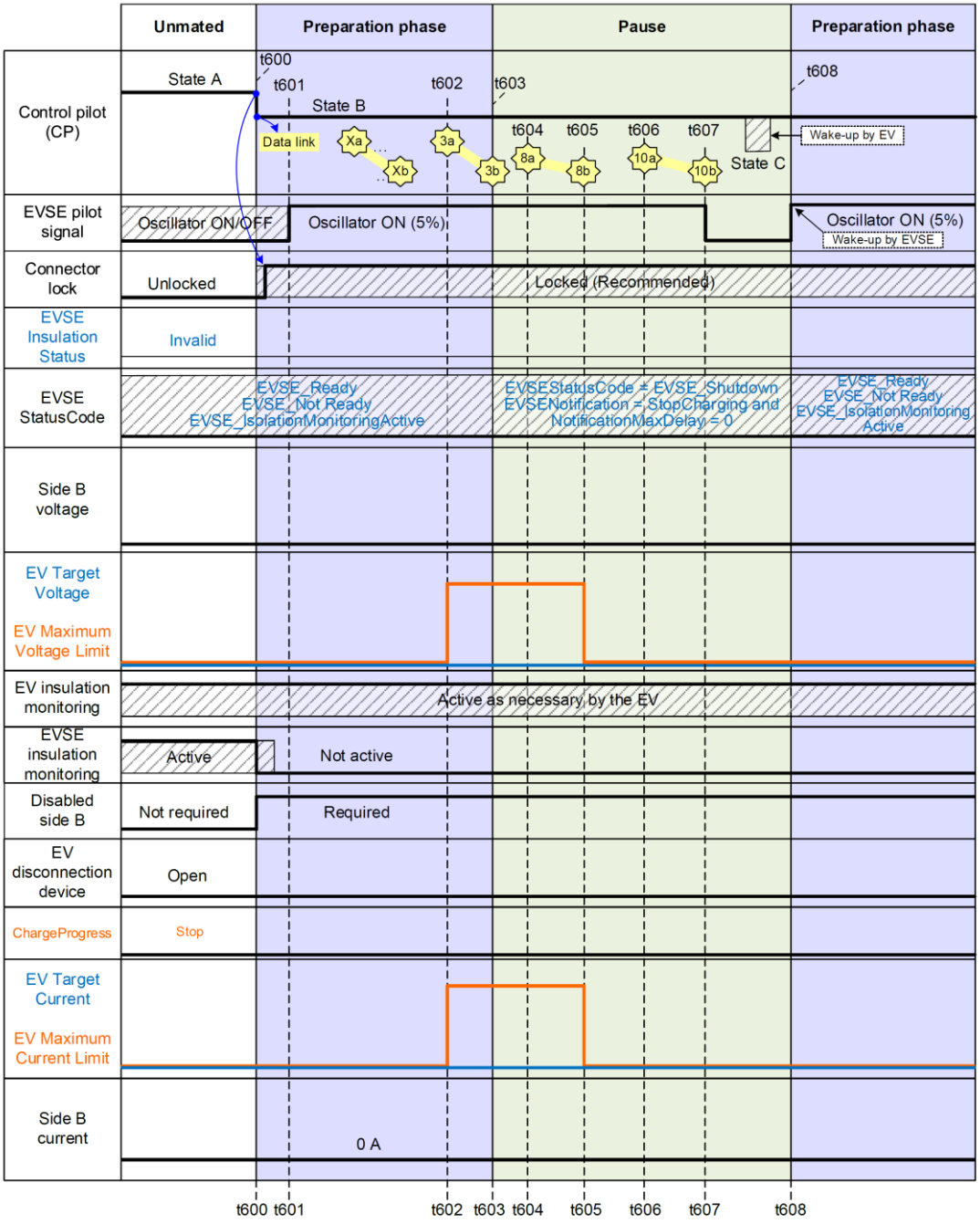
CC.3.5.2 Pause before cable-check phase executed by EV supply equipment using ISO 15118-2:2014

若 EV 供電設備在執行電纜檢查時期、預充電時期及電能傳輸時期之通訊期間開始時尚未有電力可用，EV 供電設備可在電纜檢查階段前執行暫停。EV 供電設備將於有可用電力後儘快觸發再啟動通訊期間。此序列僅適用於 ISO 15118-2:2014。

If the EV supply equipment does not have power available at the beginning of the communication session to perform the cable-check phase, pre-charge phase and energy transfer stage, the EV supply equipment can perform a pause before cable-check phase. The EV supply equipment will trigger a restart of the communication session as soon as it has power available. This sequence is only applicable for ISO 15118-2:2014.

由 EV 供電設備在電纜檢查階段前執行暫停的序列及敘述，如圖 CC.11 及表 CC.15 所示。

The sequence and description of pause before cable-check phase executed by the EV supply equipment are shown in Figure CC.11 and Table CC.15.


Unmated
Preparation phase
Pause
Preparation phase
Control pilot (CP)
State A
State B
State C
t600
t601
t602
t603
t604
t605
t606
t607
t608
Data link
Xa
Xb
3a
3b
8a
8b
10a
10b
Wake-up by EV
EVSE pilot signal
Oscillator ON/OFF
Oscillator ON (5%)
Wake-up by EVSE
Connector lock
Unlocked
Locked (Recommended)
EVSE Insulation Status
Invalid
EVSE StatusCode
EVSE_Ready
EVSE_Not Ready
EVSE_IsolationMonitoringActive
EVSEStatusCode = EVSE_Shutdown
EVSENotification = StopCharging and
NotificationMaxDelay = 0
Side B voltage
EV Target Voltage
EV Maximum Voltage Limit
EV insulation monitoring
Active as necessary by the EV
EVSE insulation monitoring
Active
Not active
Disabled side B
Not required
Required
EV disconnection device
Open
ChargeProgress
Stop
EV Target Current
EV Maximum Current Limit
Side B current
0 A

準備階段　　暫停　　準備階段

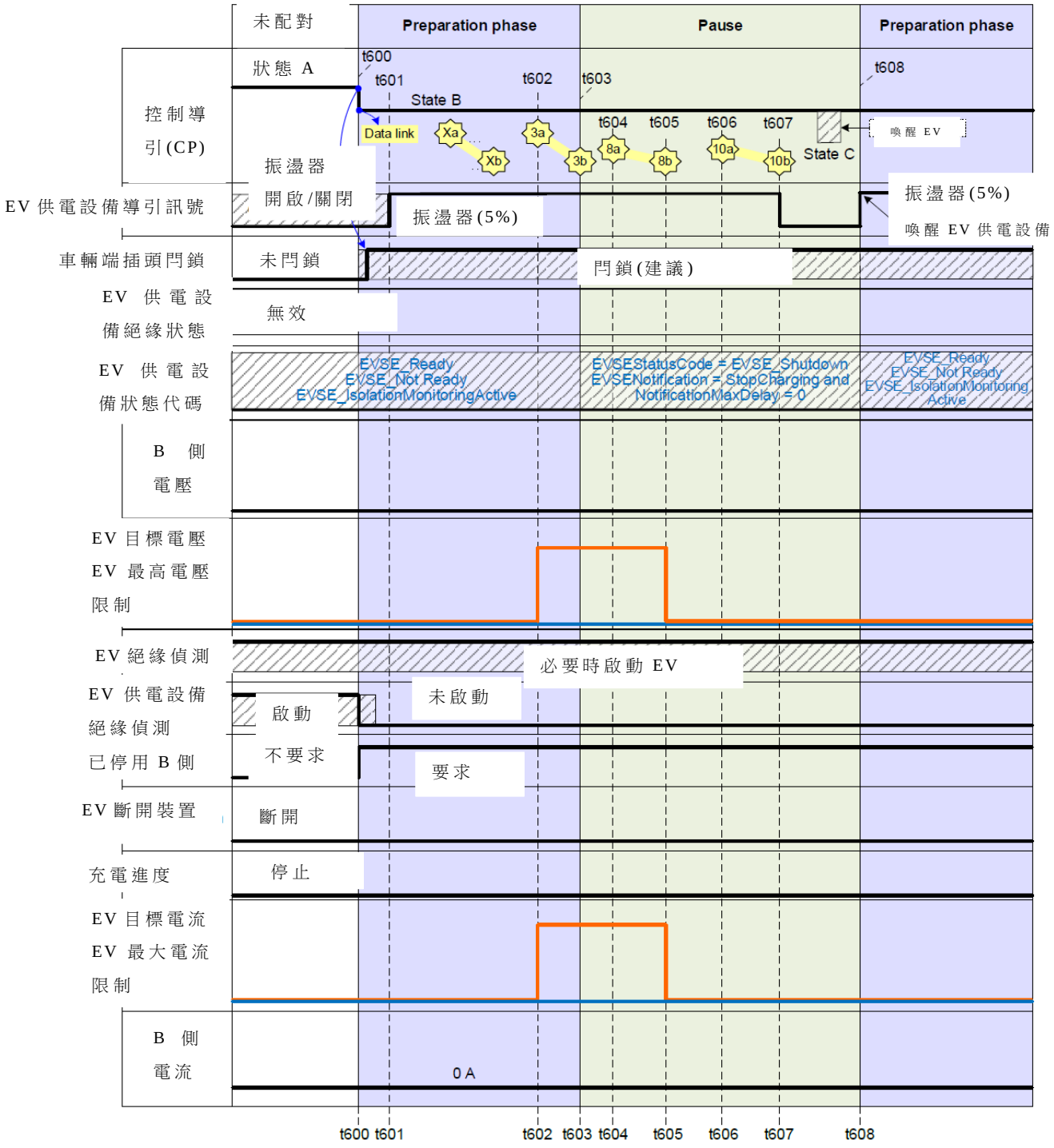



圖 CC.11 由使用 ISO 15118-2:2014 之 EV 供電設備於纜線檢查階段前暫停的序列描述圖

Figure CC.11 – Sequence diagram for pause before cable-check phase by EV supply equipment using ISO 15118-2:2014

表 CC.15 由使用 ISO 15118-2:2014 之 EV 供電設備於纜線檢查階段前暫停的序列敘述

Table CC.15 – Sequence description for pause before cable-check phase by EV supply

equipment using ISO 15118-2:2014

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t600 | • 依據 6.3.1.113.1，B 側當下電壓應 ≤ 60 V DC。<br>• The present voltage at side B shall be ≤ 60 V DC according to 6.3.1.113.1. |
| t600 | • 車輛端插頭對接至車輛端插座，改變 CP 狀態從 A 至 B。<br>• The vehicle connector is mated to the vehicle inlet, which changes the CP state from A to B.<br>• 在 CP 狀態改變至 B 及偵測到 PP 後(如為 EE 配置，關閉 SS3)，EV 應於車輛端插座鎖住車輛端插頭。<br>• After the CP state changed to B and the PP is detected (SS3 closed in case of configuration EE), the EV should lock the vehicle connector in the vehicle inlet.<br>• 在 CP 狀態改變至 B 後，EVSE 應停用 EVSE IMD、停用 B 側及開啟 EVSE 斷開裝置(若有時)。<br>• After the CP state changed to B, the EVSE shall disable the EVSE IMD, disable side B and open the EVSE disconnection device, if any.<br>• 在 CP 狀態改變至 B 後，EV 可試著建立如 IEC 61851-24 規定之數據連結。<br>• After the CP state changed to B, the EV may try to set up a data link as defined in IEC 61851-24. |
| t600 ► t603 | • 基於 B 側之當下電壓(包含負電壓)，EVSE 不應觸發錯誤停機。<br>• The EVSE shall not trigger an error shutdown due to the present voltage at side B (including negative voltages).<br><br>當車輛端連接器與車輛端插座對接時，這些電壓可能是由於電動車在未對接條件下所需符合的 ISO 17409:2020 第 6.5.2 條規定所引起。基於 IEC 61851-23:2014 之 EV 供電設備，若在第一個 ChargeParameterDiscoveryReq <3a> 訊息中 B 側的當下電壓超過 60V DC，應觸發關機。<br>When the vehicle connector is mated to the vehicle inlet, these voltages can be caused by the EV requirements for unmated conditions in ISO 17409:2020, 6.5.2. EV supply equipment based on IEC 61851-23:2014 shall trigger a shutdown if the present voltage at side B is > 60 V DC in the first ChargeParameterDiscoveryReq <3a> message. |
| t600 ►t604 | • 若 EV 嘗試及鎖住車輛端插頭失敗，依 IEC 61851-24 規定，EV 應於下一個訊息中包含參數 "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' 來通知 EVSE。<br>• If the EV tried and failed to lock the vehicle connector, the EV shall notify the EVSE with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in the next communicated message that contains this parameter, according to IEC 61851-24. |
| t600 ►t608 | • 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |

| | |
|---|---|
| | • EVSE 不應執行 6.3.1.106 之過電壓保護。<br>• The EVSE shall not perform the overvoltage protection according to 6.3.1.106. |
| t601 | • 若 EVSE 準備進行電能傳輸及其 CP 振動器尚未開啟，EVSE 應開啟其 CP 振盪器。<br>• The EVSE shall turn on its CP oscillator if the EVSE is ready for energy transfer and if its CP oscillator is not already on.<br>• EVSE 從數據連結建立開始至通訊期間結束應維持 CP 5 % 工作週期(duty cycle)，除非某些情況要求不同的 CP 工作週期。<br>• The EVSE shall maintain a CP duty cycle of 5 % from the start of the data link setup until end of communication session, unless a certain condition requires a different CP duty cycle. |
| t601 ►t602 | • 若數據連結尚未建立時，EV 在查證 EVSE 已開啟 CP 振盪器後，應建立如 IEC 61851-24 規定之數據連結。<br>• The EV shall establish the data link as defined in IEC 61851-24 after it has verified that the EVSE has turned on its CP oscillator, if the data link is not already established.<br>備考 1:數據連結可能因之前通訊期間的暫停或協議已建立完成。<br>NOTE 1 The data link could have been previously established due to a pause or renegotiation of the communication session.<br>• 數位通訊是由 EV <Xa> 與 EVSE <Xb> 之間協議適當的應用層協定所開始。參照表 CC.6。<br>• Digital communication starts by the negotiation of an appropriate application layer protocol between the EV <Xa> and EVSE <Xb>. See Table CC.6.<br>• EV 及 EVSE 進行相關對話建立、服務、授權、付費選項及加值服務(若協議的應用層協定支援)訊息對之交換。依 IEC 61851-24，許多訊息對在暫停或協議並不需要，例如：授權或付費選項。<br>• The EV and EVSE exchange message pairs concerning session setup, services, authentication, payment options and value-added services (if supported by the negotiated application layer protocol). According to IEC 61851-24, some message pairs are not necessary after a pause or renegotiation, for example, authentication or payment options. |
| t602 | • EV 應傳送參數 "EVMaximumVoltageLimit" 及 "EVMaximumCurrentLimit" (含其它參數)於第一個 ChargeParameterDiscoveryReq <3a> 訊息。<br>• The EV shall send parameters "EVMaximumVoltageLimit" and "EVMaximumCurrentLimit" (amongst other parameters) with the first ChargeParameterDiscoveryReq <3a> message. |
| t602 ►t603 | • EVSE 應執行相容性檢查。參照 CC.5.6。<br>• The EVSE shall perform a compatibility check. See CC.5.6.<br>• 若 B 側 DC+ 與 DC– 間之當下電壓絕對值 < 60 V DC，EVSE 應進行檢查；且若 B 側 DC+ 與 DC– 間之當下電壓絕對值 ≥ 60 V DC，EVSE 應傳送 ChargeParameterDiscovery <3b> 訊息其中包含參數 |

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| | "EVSEProcessing" = 'Ongoing'。<br>• The EVSE shall check if the absolute value of the present voltage at side B between DC+ and DC– is < 60 V DC and shall send message ChargeParameterDiscovery <3b> with parameter "EVSEProcessing" = 'Ongoing' if the absolute value of the present voltage at side B is ≥ 60 V DC.<br>• EVSE 應傳送參數"EVSEMaximumVoltageLimit"、"EVSEMinimumVoltageLimit"、"EVSEMaximumCurrentLimit" 及 "EVSEMinimumCurrentLimit" (含其它參數)於 ChargeParameterDiscoveryRes <3b> 訊息，以考量相容性檢查。參照 CC.5.6 如何計算這些數值。<br>• The EVSE shall send parameters "EVSEMaximumVoltageLimit", "EVSEMinimumVoltageLimit", "EVSEMaximumCurrentLimit" and "EVSEMinimumCurrentLimit" (amongst other parameters) in message ChargeParameterDiscoveryRes <3b> considering the compatibility check. See CC.5.6 on how to calculate these values.<br>• EVSE 應傳送參數"EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' 於 "ChargeParameterDiscoveryRes <3b>"訊息，除非 EVSE 欲執行停機。若 EVSE 傳送 ChargeParameterDiscoveryRes <3b> 訊息包含有參數 "EVSE_StatusCode" = ‘EVSE_Ready’ 或 ‘EVSE_NotReady’，則建議 EV 繼續通訊對話(期間)。<br>• The EVSE shall send parameter "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in the "ChargeParameterDiscoveryRes <3b>" messages, unless the EVSE wants to perform a shutdown. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = ‘EVSE_Ready’ or ‘EVSE_NotReady’.<br>備考 2：基於 IEC 61851-23:2014 之 EVSE 可於 ChargeParameterDiscoveryRes <3b> 訊息，傳送參數 "EVSE_StatusCode" = "EVSE_Ready" 、 "EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive"。<br>NOTE 2 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages.<br>• 若 EVSE 於訊息中，回應參數 "ResponseCode" = 'OK' 及 "EVSEProcessing" = 'Ongoing'，EV 及 EVSE 可於下一個傳送 ChargeParameterDiscoveryReq/Res 訊息中更新參數。<br>• If the EVSE replies with parameters "ResponseCode" = 'OK' and "EVSEProcessing" = 'Ongoing' in message, the EV and EVSE may update the parameters sent in the next ChargeParameterDiscoveryReq/Res messages.<br>備考 3：EVSE 因其它原因，可使用 "EVSEProcessing" = 'Ongoing'。例如：負載管理等。<br>NOTE 3 The EVSE can use "EVSEProcessing" = 'Ongoing' for other reasons. Example: load management, etc. |

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| | • 若 EV 於 ChargeParameterDiscoveryReq <3a> 訊息傳送參數 "EVErrorCode" = 'FAILED_ChargerConnectorLockFault'，EVSE 應反應循環式訊息 ChargeParameterDiscoveryRes <3b>，其中包含參數 "EVSEProcessing" = 'Ongoing' 及 "ResponseCode" = 'OK'，給予 EV 額外時間來解決鎖定機制的故障。關於 EV 供電設備於循環式 ChargeParameterDiscoveryReq/Res 訊息期間，傳送 "EVSEProcessing" = 'Ongoing' 之額外情況，參照 CC.5.6。<br>• If the EV sends parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in a ChargeParameterDiscoveryReq <3a> message, the EVSE should respond with cyclic ChargeParameterDiscoveryRes <3b> messages with parameters "EVSEProcessing" = 'Ongoing' and "ResponseCode" = 'OK' to give the EV additional time to solve the fault in the locking mechanism. See CC.5.6 for additional conditions for the EV supply equipment to send "EVSEProcessing" = 'Ongoing' during cyclic ChargeParameterDiscoveryReq/Res messages.<br>EVSE 應提供使用者如何改善鎖定過程之資訊。例如：藉由指示如何正確對接車輛端插頭至車輛端插座。<br>The EVSE should inform the user how to improve the locking process. For example, by indicating how to properly mate the vehicle connector in the vehicle inlet.<br>• ISO 15118-2:2014 對可能於後續 ChargeParameterDiscoveryReq/Res 訊息中進行參數更新並無規定，然而，若 EV 改變參數，建議 EVSE 不要執行停機。<br>• ISO 15118-2:2014 does not specify the possibility to update the parameters in subsequent ChargeParameterDiscoveryReq/Res messages; however, it is recommended for the EVSE not to perform a shutdown if the EV changes the parameters.<br>• 為提升換通性，EVSE 應允許 EV 於循環式 ChargeParameterDiscoveryReq/Res 訊息期間，改變 CP 狀態至 C/D。若 EV 改回 CP 狀態至 B，EVSE 應觸發由其發動之緊急停機。參照 CC.3.4.3。<br>• To improve interoperability, the EVSE shall tolerate the EV changing CP state to C/D during cyclic ChargeParameterDiscoveryReq/Res messages. If the EV changes back to CP state B, the EVSE shall trigger an EVSE initiated emergency shutdown. See CC.3.4.3.<br><br>ISO 15118-2:2014 之 [V2G2-912] 要求及 SAE J1772 舊版本之類似要求，並無規定 EV 在改變 CP 狀態從狀態 B 至狀態 C/D 前，應接收包含參數 "EVSEProcessing" = ''Finished'' 之 ChargeParameterDiscoveryRe <3b>，導致有不需要的行為。<br>Requirement [V2G2-912] in ISO 15118-2:2014 and a similar requirement in outdated versions of SAE J1772 do not specify that the EV shall receive a ChargeParameterDiscoveryRe <3b> with parameter "EVSEProcessing" = ''Finished'' before changing the CP state from state B to state C/D, leading to this unwanted behaviour. |

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| t603 | • 若 B 側當下電壓絕對值 < 60 V DC，EVSE 應傳送 EV 相容性檢查的結果，並在電纜檢查階段前於 ChargeParameterDiscoveryRes <3b> 訊息中，使用參數包含 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive'、"EVSEProcessing" = 'Finished' 及以下，來觸發通訊對話暫停。<br>• If the absolute value of the present voltage at side B is < 60 V DC, the EVSE shall send the EV the result of the compatibility check and trigger for a communication session pause before cable-check phase in message ChargeParameterDiscoveryRes <3b> using parameters "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive', "EVSEProcessing" = 'Finished', and<br><br>– "ResponseCode" = 'OK'、 "EVSENotification" = 'StopCharging'、及"NotificationMaxDelay" = '0'，若相容性檢查已經成功完成，且 EVSE 尚無可用電力，或<br>– "ResponseCode" = 'OK', "EVSENotification" = 'StopCharging', and "NotificationMaxDelay" = '0' if the compatibility check was completed successfully and the EVSE has no power available, or<br>– "ResponseCode" = 'Failed_WrongChargeParameter'，若相容性檢查已經完成及失敗，觸發 EVSE 發動錯誤停機。<br>– "ResponseCode" = 'Failed_WrongChargeParameter' if the compatibility check was completed and failed, triggering an EVSE initiated error shutdown.<br><br>備考 4：包含參數 "ResponseCode" = 'Failed_WrongChargeParameter' 及 "EVSEProcessing" = 'Ongoing'之 ChargeParameterDiscoveryRes <3b> 訊息，將觸發 EVSE 發動錯誤停機。參照 IEC 61851-24 數位通訊標準之處理規範。<br>NOTE 4 A ChargeParameterDiscoveryRes <3b> message with "ResponseCode" = 'Failed_WrongChargeParameter' and parameter "EVSEProcessing" = 'Ongoing', will trigger an EVSE initiated error shutdown. See error handling specifications for the digital communication standards in IEC 61851-24.<br><br>在相容性檢查結束時(基於 IEC 61851-24 時序之要求)，若 B 側之當下電壓不是 < 60 V DC，EVSE 不可傳送包含參數 "EVSEProcessing" = 'Finished' 之 ChargeParameterDiscoveryRes <3b> 訊息。在此情況下，EV 應觸發錯誤停機。<br>If the absolute value of the present voltage at side B is not < 60 V DC at the end of the compatibility check (based on the timing requirements of IEC 61851-24), the EVSE cannot send a ChargeParameterDiscoveryRes <3b> message with parameter "EVSEProcessing" = 'Finished'. In this case, the EV shall trigger an error shutdown.<br><br>備考 5：基於 IEC 61851-23:2014 之 EVSE 可傳送參數 "EVSE_StatusCode" = "EVSE_Ready"、 |

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| | "EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive" 於 ChargeParameterDiscoveryRes <3b> 訊息。若 EVSE 傳送包含參數 "EVSE_StatusCode" = 'EVSE_Ready' 或 'EVSE_NotReady' 於 ChargeParameterDiscoveryRes <3b> 訊息，則建議 EV 持續通訊對話。<br>NOTE 5 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = 'EVSE_Ready' or 'EVSE_NotReady'. |
| t603 ►t604 | • EV 可於車輛端插座鎖住車輛端插頭。<br>• The EV may lock the vehicle connector in the vehicle inlet.<br>• EV 不應傳送 CableCheckReq <4a> 及 PreChargeReq <5a> 訊息。<br>• The EV shall not send messages CableCheckReq <4a> and PreChargeReq <5a>.<br><br>備考 6：因 EVSE 指示無可用電力，EV 不傳送 CableCheckReq <4a> 及 PreChargeReq <5a> 訊息。<br>NOTE 6 The EV does not send messages CableCheckReq <4a> and PreChargeReq <5a> because the EVSE has indicated that it has no power available. |
| t603 ►t607 | • 在通訊對話暫停期間，EV 不應改變至 CP 狀態 C/D。<br>• The EV shall not change to CP state C/D during the communication session pause. |
| t603 ► | • 若 B 側 DC+ 與 DC– 間當下電壓於 400 ms 連續時間或更長< –60 V DC，EVSE 應觸發錯誤停機。<br>• The EVSE shall trigger an error shutdown if the present voltage at side B between DC+ and DC– is < –60 V DC for 400 consecutive ms or more. |
| t604 | • EV 不應傳送 CableCheckReq <4a> 及 PreChargeReq <5a> 訊息，但取代之，EV 應傳送包含參數 "ChargeProgress" = 'Stop' 之 PowerDeliveryReq <8a> 訊息。<br>• The EV shall not send messages CableCheckReq <4a> and PreChargeReq <5a>, but instead the EV shall send message PowerDeliveryReq <8a> with "ChargeProgress" = 'Stop'.<br><br>備考 7：當 EVSE 指示無可用電力時，EV 不可傳送 CableCheckReq <4a> 及 PreChargeReq <5a> 訊息。<br>NOTE 7 The EV does not send messages CableCheckReq <4a> and PreChargeReq <5a>, as the EVSE has indicated that it has no power available.<br>• 若 EV 嘗試及鎖住車輛端插頭時，EV 應於 PowerDeliveryReq <6a> 訊息中，包含參數 "EVErrorCode" = |

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| | 'FAILED_ChargerConnectorLockFault'，來觸發 EV 發動錯誤停機，<br>• If the EV tried and failed to lock the vehicle connector, the EV shall trigger an EV initiated error shutdown with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in message PowerDeliveryReq <6a>. |
| t605 | • EVSE 應傳送 PowerDeliveryRes <8b> 訊息，其中包含參數 "EVSEStatusCode" = 'EVSE_Shutdown'、"EVSENotification" = 'StopCharging'、及 "NotificationMaxDelay" = '0'。<br>• The EVSE shall send message PowerDeliveryRes <8b> with parameters "EVSEStatusCode" = 'EVSE_Shutdown', "EVSENotification" = 'StopCharging', and "NotificationMaxDelay" = '0'. |
| t606 | • EV 應傳送包含參數 "ChargingSession" = 'Pause' 之 SessionStopReq <10a>訊息。<br>• The EV shall send message SessionStopReq <10a> with parameter "ChargingSession" = 'Pause'. |
| t607 | • EVSE 應依 IEC 61851-24 傳送訊息 SessionStopRes <10b>。<br>• The EVSE shall send message SessionStopRes <10b> according to IEC 61851-24.<br>• EVSE 應依 IEC 61851-24 關閉 CP 振盪器。<br>• The EVSE shall turn off its CP oscillator according to IEC 61851-24. |
| t607 ►t608 | • 通訊對話暫停期間。<br>• Duration of the communication session pause.<br>• 若 EV 或 EVSE 欲停止通訊期間，EV 或 EVSE 應分別藉由執行重新啟動(參照 CC.5.2)，接著正常啟動(參照表 CC.8 之 t1 ► t2)，然後正常停機(參照 CC.3.3) 來結束暫停。<br>• If the EV or EVSE want to stop the communication session, the EV or EVSE, respectively, shall end the pause by performing a restart (see CC.5.2), followed by a normal startup (see t1 ► t2 in Table CC.8) and then a normal shutdown (see CC.3.3).<br>• 若 EV 或 EVSE 欲恢復通訊對話，EV 或 EVSE 應分別藉由執行重新啟動(參照 CC.5.2)，接著正常啟動(參照 CC.3.2) 來結束暫停。<br>• If the EV or EVSE want to resume the communication session, the EV or EVSE, respectively, shall end the pause by performing a restart (see CC.5.2) followed by a normal startup (see CC.3.2).<br>• 若車輛端插頭未被對接，EVSE 應依 IEC 61851-24 終止數據連結。<br>• If the vehicle connector is un-mated, the EVSE shall terminate the data link according to IEC 61851-24. |
| t608 | • EVSE 應依 IEC 61851-24 開啟其 CP 振盪器，來指示 EV 有可用電力。<br>• The EVSE shall turn on its CP oscillator according to IEC 61851-24, to indicate to the EV that power is now available.<br>• EVSE 應於 CC.3.2 正常啟動序列持續至 t1。<br>• The EVSE shall continue to t1 in the normal startup sequence CC.3.2. |

CC.3.5.3 由使用 ISO 15118-2:2014 之 EV 供電設備於預充電階段後與電能傳輸階段前之暫停

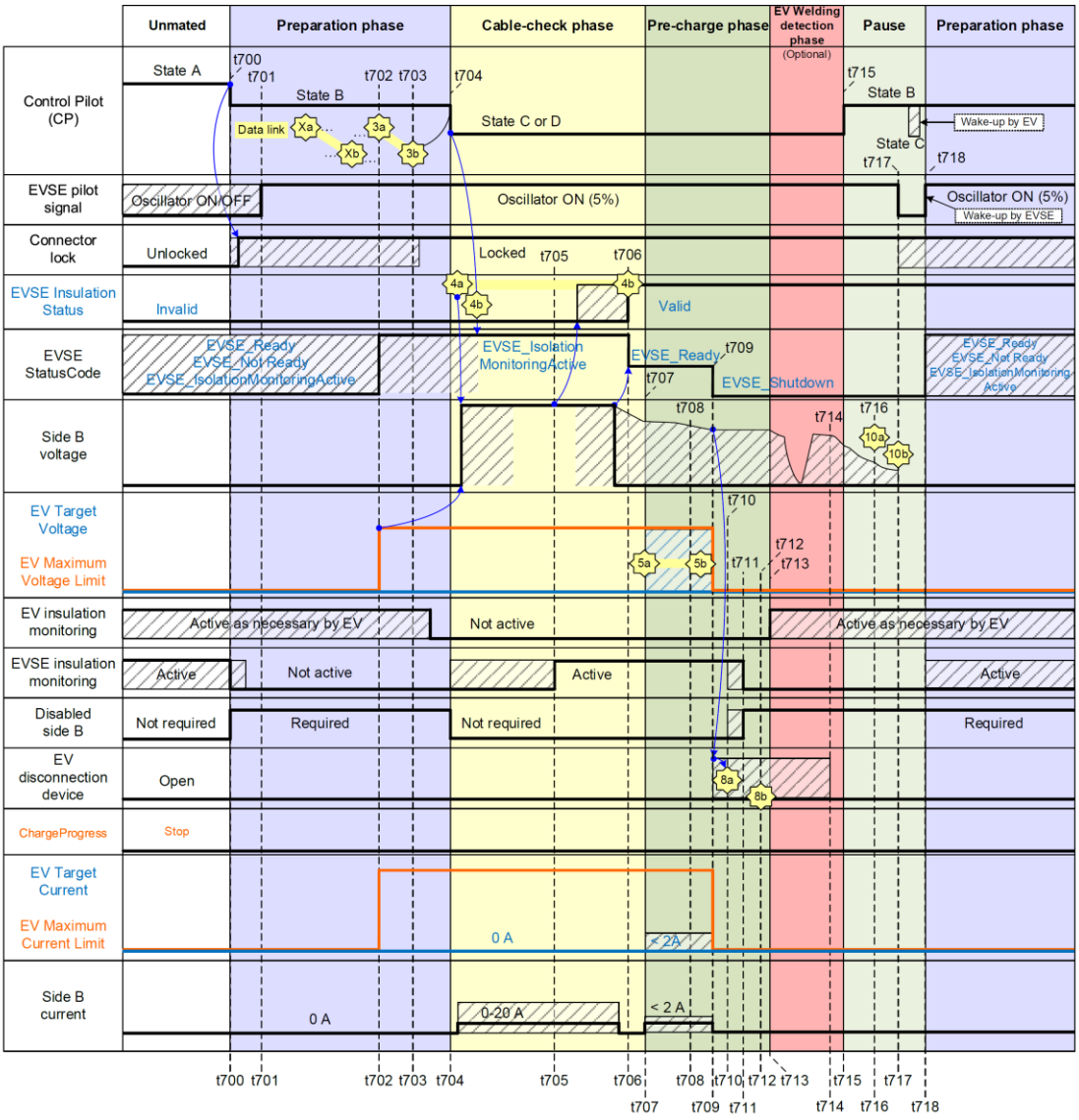
CC.3.5.3 Pause after pre-charge phase and before energy transfer stage by EV supply equipment using ISO 15118-2:2014

若 EV 供電設備在執行電纜檢查階段、預充電階段，但非為電能傳輸時期之通訊期間開始時，尚無可用電力，EV 供電設備可在預充電階段後與電能傳輸時期前執行暫停。此情況允許 EV 供電設備在暫停前，查證絕緣數值之符合性。若電纜檢查階段未符合，在暫停前使用者應被通知 EV 供電設備並不安全，並繼續其它的供電設備。此序列規定於 ISO 15118-2:2014。

In case the EV supply equipment has power available at the beginning of the communication session to perform cable-check phase and pre-charge phase but not energy transfer stage, the EV supply equipment can perform a pause after pre-charge phase and before energy transfer stage. This case allows the EV supply equipment to verify that the insulation value is valid before the pause. If the cable-check phase fails, the user is notified before the pause that the EV supply equipment is not safe and can proceed to another EV supply equipment. This sequence is specified for ISO 15118-2:2014.

使用 ISO 15118-2:2014 之 EV 供電設備，在預充電階段後與電能傳輸時期前執行暫停之序列及敘述，如圖 CC.12 和表 CC.16 所示。

The sequence and description of pause after pre-charge phase and before energy transfer stage executed by the EV supply equipment using ISO 15118-2:2014 are shown in Figure CC.12 and Table CC.16.


Unmated
Preparation phase
Cable-check phase
Pre-charge phase
EV Welding detection phase (Optional)
Pause
Preparation phase
Control Pilot (CP)
State A
State B
State C or D
State C
State B
Data link
Wake-up by EV
Wake-up by EVSE
EVSE pilot signal
Oscillator ON/OFF
Oscillator ON (5%)
Connector lock
Unlocked
Locked
EVSE Insulation Status
Invalid
Valid
EVSE StatusCode
EVSE_Ready
EVSE_Not Ready
EVSE_IsolationMonitoringActive
EVSE_Shutdown
Side B voltage
EV Target Voltage
EV Maximum Voltage Limit
EV insulation monitoring
Active as necessary by EV
Not active
EVSE insulation monitoring
Active
Disabled side B
Not required
Required
EV disconnection device
Open
ChargeProgress
Stop
EV Target Current
EV Maximum Current Limit
0 A
< 2A
Side B current
0-20 A
< 2 A
t700 t701 t702 t703 t704 t705 t706 t707 t708 t709 t710 t711 t712 t713 t714 t715 t716 t717 t718
Xa Xb 3a 3b 4a 4b 5a 5b 8a 8b 10a 10b

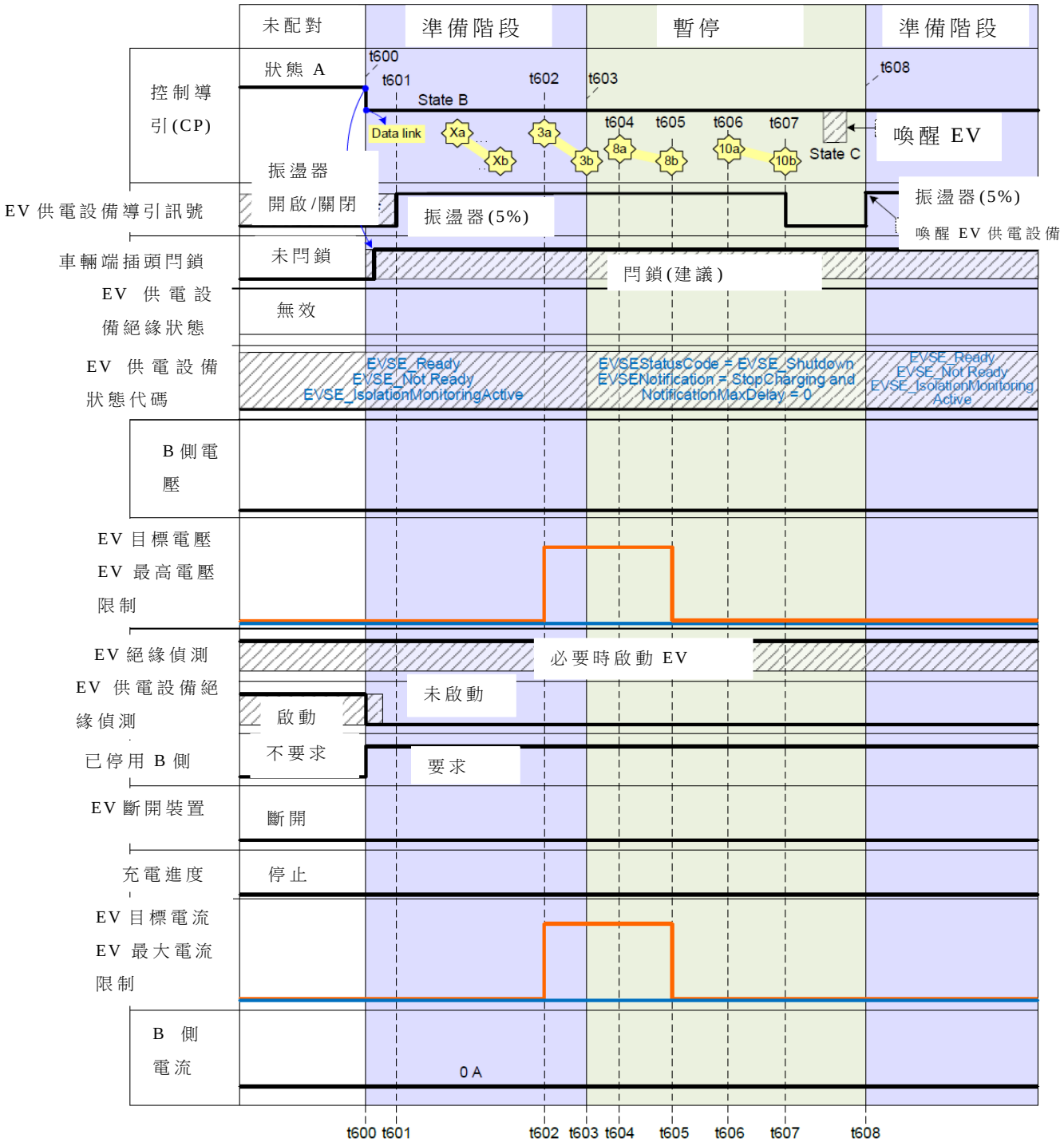



圖 CC. 12 由使用 ISO 15118-2:2014 之 EV 供電設備在預充電階段後及能量轉移階段前暫停的序列圖

Figure CC.12 – Sequence diagram for pause after pre-charge phase and before energy transfer stage by the EV supply equipment using ISO 15118-2:2014

表 CC.16 由使用 ISO 15118-2:2014 之 EV 供電設備在預充電階段後及能量轉移階段前暫停的序列敘述

Table CC.16 – Sequence description for pause after pre-charge phase and before energy transfer stage by the EV supply equipment using ISO 15118-2:2014

| 時間標記<br>Timestamp | 敘述<br>Description |
|---|---|
| ► t700 | • 依 6.3.1.113.1，B 側當下電壓應 ≤ 60 V DC。<br>• The present voltage at side B shall be ≤ 60 V DC according to 6.3.1.113.1. |
| t700 | • 車輛端插頭對接至車輛端插座，改變 CP 狀態從 A 至 B。<br>• The vehicle connector is mated to the vehicle inlet, which changes the CP state from A to B.<br>• 在 CP 狀態改變至 B 及偵測到 PP 後(如為 EE 配置，關閉 SS3)，EV 應於車輛端插座鎖住車輛端插頭。<br>• After the CP state changed to B and the PP is detected (SS3 closed in case of configuration EE), the EV should lock the vehicle connector in the vehicle inlet.<br>• 在 CP 狀態改變至 B 後，EVSE 應停用 EVSE IMD、停用 B 側及開啟 EVSE 斷開裝置(若有時)。<br>• After the CP state changed to B, the EVSE shall disable the EVSE IMD, disable side B and open the EVSE disconnection device, if any.<br>• 在 CP 狀態改變至 B 後，EV 可試著建立如 IEC 61851-24 規定之數據連結。<br>• After the CP state changed to B, the EV may try to set up a data link as defined in IEC 61851-24. |
| t700 ► t703 | • 基於 B 側之當下電壓(包含負電壓)，EVSE 不應觸發錯誤停機。<br>• The EVSE shall not trigger an error shutdown due to the present voltage at side B (including negative voltages).<br>當車輛端連接器與車輛端插座對接時，這些電壓可能是由於電動車在未對接條件下所需符合的 ISO 17409:2020 第 6.5.2 條規定所引起。基於 IEC 61851-23:2014 之 EV 供電設備，若在第一個 ChargeParameterDiscoveryReq <3a> 訊息中 B 側的當下電壓超過 60V DC，應觸發關機。<br>When the vehicle connector is mated to the vehicle inlet, these voltages can be caused by the EV requirements for unmated conditions in 6.5.2 of ISO 17409:2020. EV supply equipment based on IEC 61851-23:2014 shall trigger a shutdown if the present voltage at side B is > 60 V DC in the first ChargeParameterDiscoveryReq <3a> message. |
| t700 ► t704 | • 若 EV 嘗試及鎖住車輛端插頭失敗，依 IEC 61851-24 規定，EV 應於下一個訊息中包含參數 "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' 來通知 EVSE。<br>• If the EV tried and failed to lock the vehicle connector, the EV shall notify the EVSE with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in the next communicated message that contains this parameter, according to IEC 61851-24.<br>• 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described |

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| | in CC.2.4. |
| t700 ► t718 | • EVSE 不應執行 6.3.1.106 之過電壓保護。<br>• The EVSE shall not perform the overvoltage protection according to 6.3.1.106. |
| t701 | • 若 EVSE 準備進行電能傳輸及其 CP 振動器尚未開啟，EVSE 應開啟其 CP 振盪器。<br>• The EVSE shall turn on its CP oscillator if the EVSE is ready for energy transfer and if its CP oscillator is not already on.<br>• EVSE 從數據連結建立開始至通訊期間結束應維持 CP 5 % 工作週期(duty cycle)，除非某些情況要求不同的 CP 工作週期。<br>• The EVSE shall maintain a CP duty cycle of 5 % from the start of the data link setup until end of communication session, unless a certain condition requires a different CP duty cycle. |
| t701 ► t702 | • 若數據連結尚未建立時，EV 在查證 EVSE 已開啟 CP 振盪器後，應建立如 IEC 61851-24 規定之數據連結。<br>• The EV shall establish the data link as defined in IEC 61851-24 after it has verified that the EVSE has turned on its CP oscillator, if the data link is not already established.<br>備考 1：數據連結可能因之前通訊期間的暫停或協議已建立完成。<br>NOTE 1 The data link could have been previously established due to a pause or renegotiation of the communication session.<br>• 數位通訊是由 EV <Xa> 與 EVSE <Xb> 之間協議適當的應用層協定所開始。參照表 CC.6。<br>• Digital communication starts by the negotiation of an appropriate application layer protocol between the EV <Xa> and EVSE <Xb>. See Table CC.6.<br>• EV 及 EVSE 進行相關對話建立、服務、授權、付費選項及加值服務(若協議的應用層協定支援)訊息對之交換。依 IEC 61851-24，許多訊息對在暫停或協議並不需要，例如：授權或付費選項。<br>• The EV and EVSE exchange message pairs concerning session setup, services, authentication, payment options and value-added services (if supported by the negotiated application layer protocol). According to IEC 61851-24, some message pairs are not necessary after a pause or renegotiation, for example, authentication or payment options. |
| t702 | • EV 應於 ChargeParameterDiscoveryReq <3a>第一個訊息，傳送參數"EVMaximumVoltageLimit" and "EVMaximumCurrentLimit" (包含其它參數)。<br>• The EV shall send parameters "EVMaximumVoltageLimit" and "EVMaximumCurrentLimit" (amongst other parameters) with the first ChargeParameterDiscoveryReq <3a> message. |
| t702 ► t703 | • EVSE 應執行相容性檢查。參照 CC.5.6。<br>• The EVSE shall perform a compatibility check. See CC.5.6.<br>• 若 B 側 DC+ 與 DC– 間之當下電壓絕對值 < 60 V DC，EVSE 應進行檢查；且若 B 側 DC+ 與 DC– 間之當下電壓絕對值 ≥ 60 V DC，EVSE 應傳送 |

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| | ChargeParameterDiscovery <3b> 訊息其中包含參數 "EVSEProcessing" = 'Ongoing'。<br>• The EVSE shall check if the absolute value of the present voltage at side B between DC+ and DC– is < 60 V DC and shall send message ChargeParameterDiscovery <3b> with parameter "EVSEProcessing" = 'Ongoing' if the absolute value of the present voltage at side B is ≥ 60 V DC.<br>• EVSE 應傳送參數 "EVSEMaximumVoltageLimit"、"EVSEMinimumVoltageLimit"、"EVSEMaximumCurrentLimit" 及 "EVSEMinimumCurrentLimit" (含其它參數)於 ChargeParameterDiscoveryRes <3b> 訊息，來考量相容性檢查。參照 CC.5.6 如何計算這些數值。<br>• The EVSE shall send parameters "EVSEMaximumVoltageLimit", "EVSEMinimumVoltageLimit", "EVSEMaximumCurrentLimit" and "EVSEMinimumCurrentLimit" (amongst other parameters) in message ChargeParameterDiscoveryRes <3b> considering the compatibility check. See CC.5.6 on how to calculate these values.<br>• EVSE 應傳送參數"EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' 於 "ChargeParameterDiscoveryRes <3b>" 訊息，除非 EVSE 欲執行停機。若 EVSE 傳送 ChargeParameterDiscoveryRes <3b> 訊息，其中包含參數 "EVSE_StatusCode" = ‘EVSE_Ready’ 或 ‘EVSE_NotReady’，則建議 EV 繼續通訊對話。<br>• The EVSE shall send parameter "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in the "ChargeParameterDiscoveryRes <3b>" messages, unless the EVSE wants to perform a shutdown. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = ‘EVSE_Ready’ or ‘EVSE_NotReady’.<br>備考 2：基於 IEC 61851-23:2014 之 EVSE 可於 ChargeParameterDiscoveryRes <3b> 訊息，傳送參數 "EVSE_StatusCode" = "EVSE_Ready" 、"EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive"。<br>NOTE 2 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages..<br>• 若 EVSE 於訊息中，回應參數 "ResponseCode'' = 'OK' 及 "EVSEProcessing" = 'Ongoing'，EV 及 EVSE 可於下一個傳送 ChargeParameterDiscoveryReq/Res 訊息中更新參數。<br>• If the EVSE replies with parameters "ResponseCode'' = 'OK' and "EVSEProcessing" = 'Ongoing' in message ChargeParameterDiscoveryRes <3b>, the EV and EVSE may update the parameters sent in the next ChargeParameterDiscoveryReq/Res messages.<br>備考 3：EVSE 因其它原因，可使用 "EVSEProcessing" |

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| | = 'Ongoing'。例如：負載管理等。<br>NOTE 3 The EVSE can use "EVSEProcessing" = 'Ongoing' for other reasons. Example: load management, etc.<br>・若 EV 於 ChargeParameterDiscoveryReq <3a> 訊息傳送參數 "EVErrorCode" = 'FAILED_ChargerConnectorLockFault'，EVSE 應反應循環式訊息 ChargeParameterDiscoveryRes <3b>，其中包含參數 "EVSEProcessing" = 'Ongoing' 及 "ResponseCode" = 'OK'，給予 EV 額外的時間來解決鎖住機制的故障。關於 EV 供電設備於循環式 ChargeParameterDiscoveryReq/Res 訊息期間，傳送 "EVSEProcessing" = 'Ongoing' 之額外情況，參照 CC.5.6。<br>・If the EV sends parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in a ChargeParameterDiscoveryReq <3a> message, the EVSE should respond with cyclic ChargeParameterDiscoveryRes <3b> messages with parameters "EVSEProcessing" = 'Ongoing' and "ResponseCode" = 'OK' to give the EV additional time to solve the fault in the locking mechanism. See CC.5.6 for additional conditions for the EV supply equipment to send "EVSEProcessing" = 'Ongoing' during cyclic ChargeParameterDiscoveryReq/Res messages.<br><br>EVSE 應提供使用者如何改進鎖住過程之資訊。例如：藉由指示如何正確對接車輛端插頭至車輛端插座。<br>The EVSE should inform the user how to improve the locking process. For example, by indicating how to properly mate the vehicle connector in the vehicle inlet.<br><br>ISO 15118-2:2014 對後續可能於 ChargeParameterDiscoveryReq/Res 訊息中進行更新參數並無規定，然而，若 EV 改變參數，建議 EVSE 不要執行停機。<br>・ISO 15118-2:2014 does not specify the possibility to update the parameters in subsequent ChargeParameterDiscoveryReq/Res messages; however, it is recommended for the EVSE not to perform a shutdown if the EV changes the parameters.<br>・為提升互通性，EVSE 應允許 EV 於循環式 ChargeParameterDiscoveryReq/Res 訊息期間，改變 CP 狀態至 C/D。若 EV 改回 CP 狀態至 B，EVSE 應觸發由其發動之緊急停機。參照 CC.3.4.3。<br>・To improve interoperability, the EVSE shall tolerate the EV changing CP state to C/D during cyclic ChargeParameterDiscoveryReq/Res messages. If the EV changes back to CP state B, the EVSE shall trigger an EVSE initiated emergency shutdown. See CC.3.4.3.<br><br>ISO 15118-2:2014 之 [V2G2-912] 要求及 SAE J1772 舊版本之類似要求，並無規定 EV 在改變 CP 狀態從狀態 B 至狀態 C/D 前，應接收包含參數 "EVSEProcessing" = ''Finished'' 之 ChargeParameterDiscoveryRe <3b>，導致有不需要的行為。<br>Requirement [V2G2-912] in ISO 15118-2:2014 and a similar requirement in outdated versions of SAE J1772 do not specify that the EV shall receive a |

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| | ChargeParameterDiscoveryRe <3b> with parameter "EVSEProcessing" = ‘'Finished'’ before changing the CP state from state B to state C/D, leading to this unwanted behaviour. |
| t703 | • 若 B 側當下電壓絕對值 < 60 V DC，EVSE 應傳送 EV 相容性檢查的結果，並在預充電階段後於傳送 ChargeParameterDiscoveryRes <3b> 訊息中，使用參數包含 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive'、"EVSEProcessing" = 'Finished' 及以下，來觸發暫停通訊對話。<br>• If the absolute value of the present voltage at side B is < 60 V DC, the EVSE shall send the EV the result of the compatibility check and trigger for a communication session pause after pre-charge phase in message ChargeParameterDiscoveryRes <3b> using parameters "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive', "EVSEProcessing" = 'Finished', and<br>– "ResponseCode" = 'OK' 、"EVSENotification" = 'StopCharging、及 "NotificationMaxDelay" = 'X' (其中 where X 非為 0)，若相容性檢查成功完成，且 EVSE 無可用之電力，或<br>– "ResponseCode" = 'OK', "EVSENotification" = 'StopCharging, and "NotificationMaxDelay" = 'X' (where X is different to 0) if the compatibility check was completed successfully and the EVSE has no power available, or<br>– "ResponseCode" = 'Failed_WrongChargeParameter'，若相容性檢查完成及未符合，則觸發 EVSE 發動錯誤停機。<br>– "ResponseCode" = 'Failed_WrongChargeParameter' if the compatibility check was completed and failed, triggering an EVSE initiated error shutdown.<br><br>備考 4：ChargeParameterDiscoveryRes <3b> 訊息，包含參數 "ResponseCode" = 'Failed_WrongChargeParameter' 及 "EVSEProcessing" = 'Ongoing' ，將觸發 EVSE 發動錯誤停機。參照 IEC 61851-24 數位通訊標準之處理規定。<br>NOTE 4 A ChargeParameterDiscoveryRes <3b> message with "ResponseCode" = 'Failed_WrongChargeParameter' and parameter "EVSEProcessing" = 'Ongoing', will trigger an EVSE initiated error shutdown. See error handling specifications for the digital communication standards in IEC 61851-24.<br><br>在相容性檢查結束時(基於 IEC 61851-24 時序之要求)，若 B 側之當下電壓不為 < 60 V DC，EVSE 不可傳送包含參數 "EVSEProcessing" = 'Finished' 之 ChargeParameterDiscoveryRes <3b> 訊息。在此情況下，EV 應觸發錯誤停機。<br>If the absolute value of the present voltage at side B is not < 60 V DC at the end of the compatibility check (based on the timing requirements of IEC 61851-24), the EVSE cannot send a ChargeParameterDiscoveryRes <3b> message with parameter "EVSEProcessing" = 'Finished'. |

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| | In this case, the EV shall trigger an error shutdown.<br><br>EVSE 應考量其電纜檢查階段及預充電階段的時間，來設定 NotificationMaxDelay 的數值。NotificationMaxDelay 建議為 300 s。<br>The EVSE shall consider its timings for cable-check phase and pre-charge phase to define the value for NotificationMaxDelay. A NotificationMaxDelay of 300 s is recommended.<br><br>備考 5： 基於 IEC 61851-23:2014 之 EVSE 可傳送參數 "EVSE_StatusCode" = "EVSE_Ready"、"EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive" 於 ChargeParameterDiscoveryRes <3b> 訊息。若 EVSE 傳送包含參數 "EVSE_StatusCode" = 'EVSE_Ready' 或 'EVSE_NotReady' 於 ChargeParameterDiscoveryRes <3b> 訊息，則建議 EV 持續通訊對話。<br>NOTE 5 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = 'EVSE_Ready' or 'EVSE_NotReady'. |
| t703 ► t704 | • 若 EV 及 EVSE 不相容，EV 應執行 EV 發動之錯誤停機。參照 CC.3.4.2。<br>• If the EV and EVSE are not compatible, the EV shall perform an EV initiated error shutdown. See CC.3.4.2.<br>• EV 在改變 CP 至狀態 C 或 D 前，應於車輛端插座鎖住車輛端插頭(若尚未鎖住時)。<br>• The EV shall lock the vehicle connector in the vehicle inlet before changing the CP to state C or D, if not already locked.<br>• 當 EV 鎖住車輛端插頭失效時，EV 應於下一個通訊訊息中包含參數"EVErrorCode" = 'FAILED_ChargerConnectorLockFault'，來觸發 EV 發動之錯誤停機。<br>• If the EV failed to lock the vehicle connector, the EV shall trigger an EV initiated error shutdown with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in the next communicated message.<br>• EV 應停用 EV IMD (若有時)。<br>• The EV shall disable the EV IMD, if any. |
| t703 ► | • 若 B 側 DC+ 與 DC– 間當下電壓於 400 ms 連續時間或更長 < –60 V DC，EVSE 應觸發錯誤停機。<br>• The EVSE shall trigger an error shutdown if the present voltage at side B between DC+ and DC– is < –60 V DC for 400 consecutive ms or more. |
| t704 | • 在 EV 停用 EV IMD 後，及檢查車輛端插頭已被鎖住後，EV 應藉由關閉 $S_V2$，改變 CP 狀態從 B 至 C/D。<br>• After the EV has disabled the EV IMD and after checking |

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| | that the vehicle connector is locked, the EV shall change the CP state from B to C/D by closing $S_V2$.<br><br>B 側來自 EV 共模及差模之影響(例如：焊接偵測、IMD 等)，在 EV 關閉 SV2 改變 CP 狀態 B 至 C/D 前，應予以移除，因其可能會干擾 EVSE 之 IMD。<br>The common mode and differential mode influences from the EV at side B (for example, welding detection, IMD, etc) should be removed before the EV changes the CP state from B to C/D by closing SV2 because this can interfere with the IMD of the EVSE.<br><br>・在 CP 狀態變為 C/D 後，EVSE 應啟用 B 側。停用 EVSE B 側的限制並不被要求。<br>・After the CP state changed to C/D, the EVSE shall enable side B. The limitations of the disabled side B of the EVSE are not required. |
| t704 ► t705 | ・在檢查車輛端插頭被鎖住後，EV 在預充電前應以 CableCheckReq <4a> 訊息，請求進行電纜及絕緣電阻檢查。參照 CC.4.1.2 之電纜檢查。<br>・After checking that the vehicle connector is locked, the EV shall request cable and insulation resistance check before pre-charge with CableCheckReq <4a>. See cable-check CC.4.1.2.<br>・在傳送 firstCableCheckRes <4b> 訊息前及在 B 側 DC+ 及 DC– 間當下電壓 > 60 V DC 前，若 CP 狀態改變至狀態 C 或 D，EVSE 應進行檢查。<br>・The EVSE shall check if the CP state changed to state C or D before sending the first CableCheckRes <4b> message and before the present voltage at side B between DC+ and DC– is > 60 V DC. |
| t704 ► t706 | ・EVSE 應檢查 EVSE IMD 之功能。參照 CC.4.1.2 及 CC.4.1.3。<br>・The EVSE shall check the functionality of the EVSE IMD. See CC.4.1.2 and CC.4.1.3.<br>・EVSE 應檢查 B 側之絕緣，及依 CC.4.1.4 規定之參數 "EVSEIsolationStatus"、"EVSEProcessing" = 'Ongoing'、 及 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' 於 CableCheckRes<4b> 訊息中，持續報告絕緣狀態。<br>・The EVSE shall check the insulation of side B and continuously report the insulation state with parameter "EVSEIsolationStatus" according to CC.4.1.4, "EVSEProcessing" = 'Ongoing', and "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in message CableCheckRes<4b>.<br>・當依 CC.4.1.4 傳送參數 "EVSEIsolationStatus"，及 "EVSEProcessing" = 'Ongoing' 於 CableCheckRes<4b> 訊息時，EVSE 可執行其他功能(例如熔接偵測)。<br>・The EVSE may perform other functions (for example, welding detection) while sending parameters "EVSEIsolationStatus" according to CC.4.1.4 and "EVSEProcessing" = 'Ongoing' in message CableCheckRes<4b>. |
| t705 | ・EVSE 測定 B 側之絕緣電阻 ≥ 100 kΩ。參照 CC.4.1.1。<br>・The EVSE determines that the insulation resistance of side B is ≥ 100 kΩ. See CC.4.1.1. |

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| t706 | • 在完成電纜檢查階段後，EVSE 應傳送 CableCheckRes <4b>訊息，其中包含 CC.4.1.4 之參數 "EVSEIsolationStatus"、以及 "EVSEProcessing" = 'Finished'，及<br>• After completing the cable-check phase, the EVSE shall send message CableCheckRes <4b> with parameters "EVSEIsolationStatus" according to CC.4.1.4, "EVSEProcessing" = 'Finished', and<br>– "EVSEStatusCode" = "Ready"，若絕緣狀態為 'Valid' 及沒有錯誤，或<br>– "EVSEStatusCode" = "Ready", if the insulation status is 'Valid' and there are no errors, or<br>– "ResponseCode" = 'FAILED'，當 EVSE 偵測到錯誤時，以觸發 EVSE 發動之錯誤停機。<br>– "ResponseCode" = 'FAILED', if the EVSE detects an error, in order to trigger an EVSE initiated error shutdown.<br>• 若 EVSE 偵測到錯誤，EVSE 應於 CableCheckRes <4b>訊息中，傳送 CC.4.1.4 規定之參數 parameters "EVSEIsolationStatus"，來觸發 EVSE 發動之錯誤停機。<br>• If the EVSE detects an error, the EVSE shall trigger an EVSE initiated error shutdown by sending parameters "EVSEIsolationStatus" according to CC.4.1.4 and "ResponseCode" = 'FAILED' in message CableCheckRes <4b>. |
| t706 ► t707 | • EVSE B 側可保持當下電壓。<br>• The EVSE may keep a present voltage at side B. |
| t707 | • EV 應傳送包含參數 "EVTargetVoltage" 之 PreChargeReq <5a> 訊息，其應依照電池系統之當下電壓，來開始預充電階段。參照 CC.5.1。<br>• The EV shall send message PreChargeReq <5a>, with parameter "EVTargetVoltage" depending on the present voltage of the battery system, to start the pre-charge stage. See CC.5.1.<br>• 建議 EV 傳送 PreChargeReq <5a> 訊息，其中包含參數"EVTargetVoltage" = '0'。<br>• It is recommended that the EV sends the PreChargeReq <5a> messages with parameter "EVTargetVoltage" = '0'. |
| t707 ► t709 | • EV 及 EVSE 應執行 CC.5.1 規定之預充電階段。<br>• The EV and EVSE shall perform pre-charge according to CC.5.1.<br>• EVSE 應依 PreChargeReq <5a> 訊息之 EV 目標電壓，來控制 B 側的當下電壓，並傳送相關的 PreChargeRes <5b>訊息。<br>• The EVSE shall control the present voltage at side B according to the target voltage of the EV in the PreChargeReq <5a> messages, and send the corresponding PreChargeRes <5b> messages. |
| t708 | • B 側的當下電壓應在 101.1.2 規定的容許差範圍內，達到 EV 設定的目標電壓。<br>• The present voltage at side B reaches the target voltage of the EV between the tolerances given in 101.1.2. |
| t708 ► t709 | • EV 可透過循環的 PreChargeReq/Res 訊息調整其目標電壓，以補償電壓偏差。<br>• The EV may adapt the target voltage of the EV with cyclic PreChargeReq/Res messages to compensate for |

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| | voltage deviation. |
| t709 | • 若 EV 決定關閉其斷開裝置，EV 應僅在查證 B 側 DC+ 與 DC–間之當下電壓絕對值及電池系統當下電壓 < 20 V DC 後，關閉其斷開裝置。參照 CC.5.1。<br>• If the EV decides to close the EV disconnection device, the EV shall close the EV disconnection device only after verifying that the absolute difference between the present voltage at side B between DC+ and DC– and the present voltage of the battery system is < 20 V DC. See CC.5.1.<br>EV 應有 B 側極性相反情狀之防護。<br>The EV should be protected against the case that the polarity of side B is reversed.<br>• 當 EV 於 PreChargeReq <5a> 訊息傳送 EV 目標電壓 "EVTargetVoltage" = '0'，則 EV 不應關閉 EV 斷開裝置。<br>• If the EV sent a target voltage of the EV "EVTargetVoltage" = '0' in the PreChargeReq <5a> messages, the EV shall not close the EV disconnection device. |
| t710 | • EV 傳送 PowerDeliveryReq <8a>訊息，其中包含參數 "ChargeProgress" = 'Stop' 來發動暫停。<br>• The EV sends PowerDeliveryReq <8a> with parameter "ChargeProgress" = 'Stop' to initiate the pause.<br>備考 6：暫停可由 EV 來發動或藉由 EVSE 於 ChargeParameterDiscovery 包含 NotificationMaxDelay 數值。<br>NOTE 6 The pause can be initiated by the EV or by the EVSE with the NotificationMaxDelay value in ChargeParameterDiscovery. |
| t711 | • 在收到 PowerDeliveryReq <8a> 後，EVSE 應停用 EVSE IMD、停用 B 側及開啟 EVSE 斷開裝置(若有時)。<br>• After receiving the PowerDeliveryReq <8a> message, the EVSE shall disable the EVSE IMD, disable side B and open the EVSE disconnection device, if any. |
| t711 ► t718 | • 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t712 | • 在停用預充電電路後，若有，應停用 EVSE IMD，EVSE 應回應 PowerDeliveryRes <8b> 訊息。<br>• After disabling the pre-charge circuit, if any, and disabling the EVSE IMD, the EVSE shall respond with message PowerDeliveryRes <8b>.<br>• 在下列情狀之後，EVSE 應回應 PowerDeliveryRes 訊息：<br>• The EVSE shall respond with message PowerDeliveryRes <8b> after it has<br>– 停用其預充電電路，<br>– disabled its pre-charge circuit,<br>– 停用 B 側，並開啟 EVSE 斷開裝置(若有時)，及<br>– disabled side B and opened the EVSE disconnection device, if any, and<br>– 停用 EVSE IMD。 |

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| | – disabled the EVSE IMD. |
| t713 | • EV 可啟用 EV IMD (若有時)。<br>• The EV may enable the EV IMD, if any. |
| t713 ► t714 | • 在收到 PowerDeliveryRes <8b>訊息後，EV 應維持 CP 狀態 C。<br>• The EV shall maintain CP state C after receiving the PowerDeliveryRes <8b> message.<br>• 在無傳送 WeldingDetectionReq <9a>訊息下，EV 可執行 EV 斷開裝置之熔接偵測。<br>• The EV may perform welding detection of the EV disconnection device without sending WeldingDetectionReq <9a> messages.<br>備考 7：若 EV 決定不執行熔接偵測，則繼續執行 t711。<br>NOTE 7 If the EV decides not to perform welding detection, it proceeds with t711. |
| t714 | • EV 完成熔接偵測(若執行時)。<br>• The EV completes welding detection, if performed.<br>• EV 應開啟 EV 斷開裝置。<br>• The EV shall open the EV disconnection device.<br>備考 8：由於 EVSE 尚未收到 SessionStopReq <10a>訊息，開啟 EV 斷開裝置，B 側當下電壓將藉由被動放電開始下降。<br>NOTE 8 The opening of the EV disconnection device starts the reduction of the present voltage at side B by passive discharge because the EVSE has not yet received message SessionStopReq <10a>. |
| t715 | • EV 應改變 CP 狀態至狀態 B，來指示 EV 開斷開開裝置。<br>• The EV shall change to CP state B to indicate that the EV disconnection device is open.<br>• EV 應保持車輛端插頭被鎖住。<br>• The EV shall keep the vehicle connector locked. |
| t716 | • EV 應傳送 SessionStopReq <10a>訊息，其中包含參數 "ChargingSession" = 'Pause'。<br>• The EV shall send the SessionStopReq <10a> message with parameter "ChargingSession" = 'Pause'. |
| t716 ► t717 | • EVSE 應於 1 s 或更短內，降低 B 側於下列位置間之當下電壓至≤ 60 V DC：<br>• The EVSE shall, in 1 s or less, reduce the present voltage at side B to ≤ 60 V DC between<br>– DC+ 與 DC–，<br>– DC+ and DC–,<br>– DC+ 與 PE，及<br>– DC+ and PE, and<br>– DC– 與 PE。<br>– DC– and PE.<br>備考 9：由於 EV 已經開啟 EV 斷開裝置，EVSE 可主動進行 B 側放電。<br>NOTE 9 The EVSE can actively discharge side B because the EV has opened the EV disconnection device |
| t717 | • EVSE 應傳送 SessionStopRes <10b>訊息，並暫停數據連結。<br>• The EVSE shall send message SessionStopRes <10b> and pause the data link.<br>• EVSE 依 IEC 61851-24 應關閉其 CP 振盪器。 |

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| | • The EVSE shall turn off its CP oscillator according to IEC 61851-24. |
| t717 ► t718 | • 通訊對話暫停期間。<br>• Duration of the communication session pause.<br>• 若 EV 或 EVSE 欲停止通訊期間，EV 或 EVSE 應分別藉由執行重新啟動(參照 CC.5.2)，接著正常啟動(參照表 CC.8 之 t1 ► t2)，然後正常停機(參照 CC.3.3)來結束暫停。<br>• If the EV or EVSE want to stop the communication session, the EV or EVSE, respectively, shall perform a restart to end the pause (see CC.5.2), followed by a normal startup (see t1 ► t2 in Table CC.8) and then a normal shutdown (see CC.3.3).<br>• 若 EV 或 EVSE 欲恢復通訊對話，EV 或 EVSE 應分別藉由執行重新啟動(參照 CC.5.2)，接著正常啟動(參照 CC.3.2) 來結束暫停。<br>• If the EV or EVSE want to resume the communication session, the EV or EVSE, respectively, shall end the pause by performing a restart (see CC.5.2) followed by a normal startup (see CC.3.2).<br>• EV 可解鎖車輛端插頭。但仍建議保持鎖住車輛端插頭。<br>• The EV may unlock the vehicle connector. It is recommended to keep the vehicle connector locked.<br>• 若車輛端插頭未被對接，EVSE 應依 IEC 61851-24 終止數據連結。<br>• If the vehicle connector is un-mated, the EVSE shall terminate the data link according to IEC 61851-24. |
| t718 | • EVSE 依 IEC 61851-24 應關閉其 CP 震動器，來指示 EV 已有可用之電力。<br>• The EVSE shall turn on its CP oscillator according to IEC 61851-24, to indicate to the EV that power is now available.<br>• EVSE 應於 CC.3.2 正常啟動序列持續至 t1。<br>• The EVSE shall continue to t1 in the normal startup sequence CC.3.2. |

CC.3.6 由使用 15118-2:2014 之 EV 或 EV 供電設備發動之重新協議

CC.3.6 Renegotiation initiated by EV or EV supply equipment using ISO 15118-2:2014

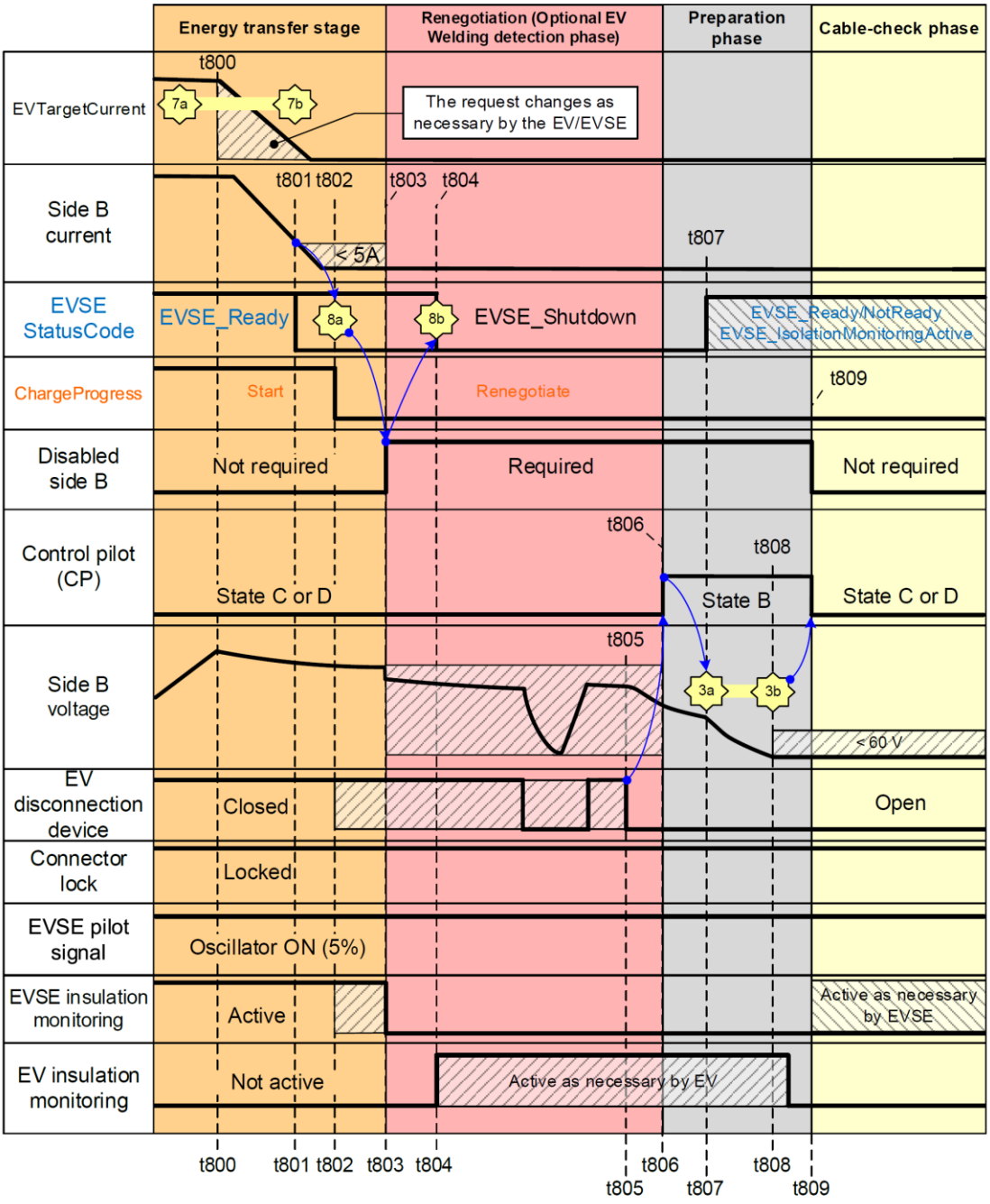
當 EV 或 EV 供電設備在電能傳輸期間，欲於初始階段以 ChargeParameterDiscoveryReq/Res 改變已協議之通訊參數(例如：EV 供電設備 B 側之額定提高電流、EV 供電設備 B 側之額定連續功率)，EV 或 EV 供電設備可觸發重新協議。此序列僅對使用 ISO 15118-2:2014 作為數位通訊標準時才能進行。

In case the EV or EV supply equipment want to change the negotiated parameters communicated in the initialization phase with ChargeParameterDiscoveryReq/Res (for example, rated boost current of the EV supply equipment at side B, rated continuous power of the EV supply equipment at side B) during energy transfer, the

EV or EV supply equipment can trigger a renegotiation. This sequence is only possible if using ISO 15118-2:2014 as a digital communication standard.

由 EV 供電設備發動重新協議之序列及敘述如 圖 CC.13 及表 CC.17 所示。

The sequence and description of renegotiation initiated by the EV supply equipment are shown in Figure CC.13 and Table CC.17.



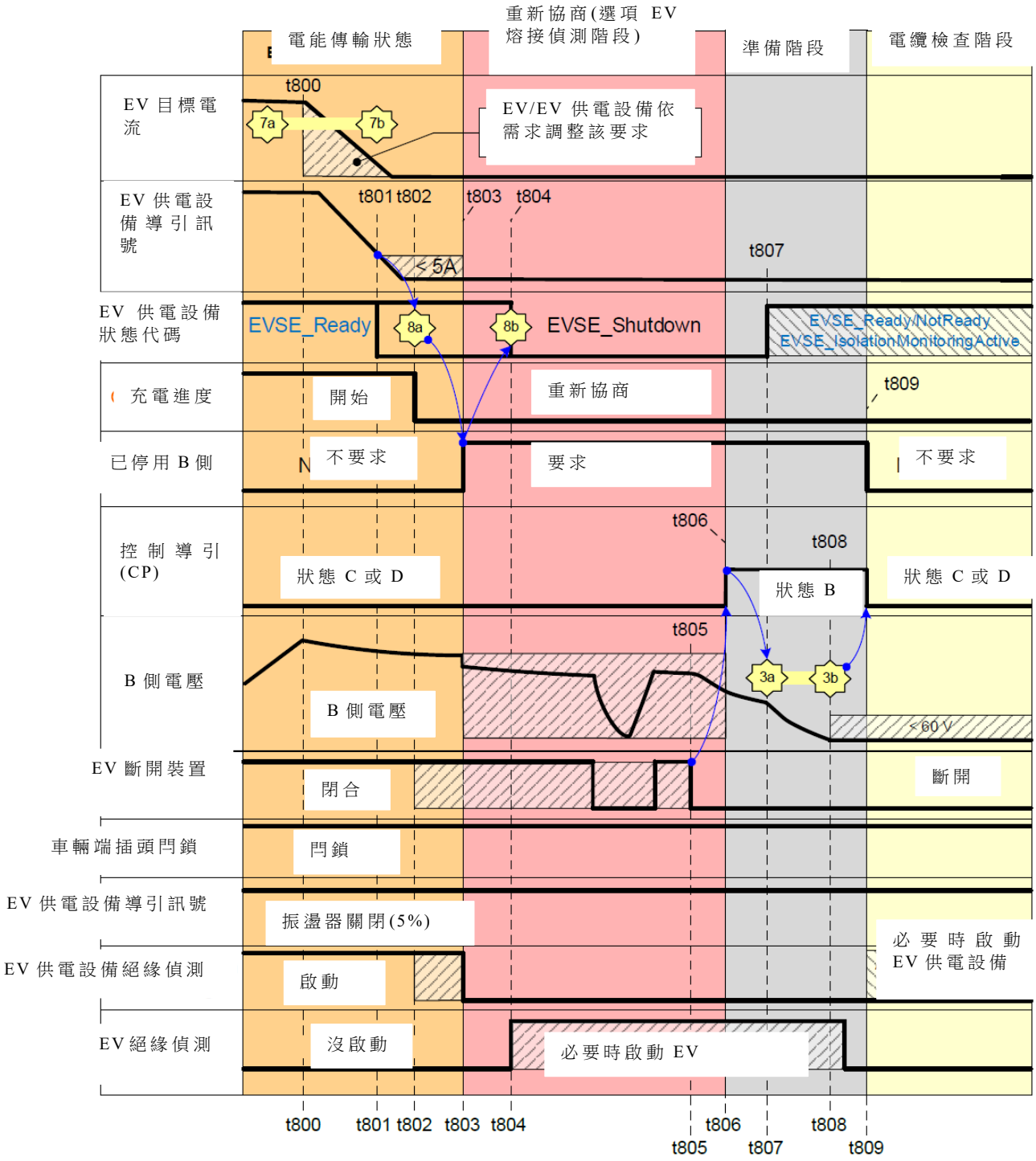



圖 CC. 13 由使用 ISO 15118-2:2014 之 EV 或 EV 供電設備發動再協商之序列圖

Figure CC.13 – Sequence diagram for renegotiation initiated by EV or EV supply equipment using ISO 15118-2:2014

表 CC.17 由使用 ISO 15118-2:2014 之 EV 或 EV 供電設備發動重新協商之序列敘述

Table CC.17 – Sequence description for renegotiation initiated by EV or EV supply equipment using ISO 15118-2:2014

| 時間標示<br>Timestamp | 敘述<br>Description |
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| ► t800 | • 於 EV (CurrentDemandReq <7a>) 與 EVSE (CurrentDemandRes <7b>) 之間的循環訊息 CurrentDemandReq/Res。<br>• Cyclic CurrentDemandReq/Res messages between the EV (CurrentDemandReq <7a>) and EVSE (CurrentDemandRes <7b>). |
| t800 | • 若 EV 欲開始通訊對話之重新協議過程，來改變協議參數，EV 應於下一個 CurrentDemandReq <7a> 訊息請求將 B 側當下電流減少至 0 A。<br>• If the EV wants to start a renegotiation process of a communication session to change the negotiated parameters, the EV shall request a reduction of the present current at side B to 0 A in the next CurrentDemandReq <7a> messages. |
| t800 ► t801 | • 若 EVSE 欲啟動通訊對話之重新協議過程，來改變電能傳輸參數，EVSE 應<br>• If the EVSE wants to start a renegotiation process of a communication session to change the energy transfer parameters, the EVSE shall<br>– 快速下降 B 側當下電流至< 5 A DC，及<br>– ramp down the present current at side B to < 5 A DC, and<br>– 依 B 側當下電流，於下一個 CurrentDemandRes <7b> 訊息，調整參數 "EVSEMaximumCurrentLimit"。<br>– adjust parameter "EVSEMaximumCurrentLimit" in the next CurrentDemandRes <7b> messages according to the present current at side B.<br>參照 101.1.3、CC.5.5.4 及 CC.5.5.6。<br>See 101.1.3, CC.5.5.4 and CC.5.5.6.<br>備考 1：基於 61851-23:2014 之 EV，可能不支援重新協議，即不降低 EV 之目標電流，直接進行至 t101。EVSE 將解譯為 EV 發動錯誤停機。參照表 CC.10。<br>NOTE 1 EVs based on IEC 61851-23:2014 might not support renegotiation and directly go to t101 without reducing the target current of the EV. The EVSE will interpret this as an EV initiated error shutdown. See Table CC.10.<br>備考 2：EVSE 可限制 B 側當下電流快速下降至–20 A/s，來避免 A 側負載突然改變(例如：連結電網)。<br>NOTE 2 The EVSE can limit the present current at side B ramp down to –20 A/s to avoid sudden load variations at side A (for example, supply network connection). |
| t801 | • 當 B 側當下電流 < 5 A DC，若 EVSE 欲觸發重新協議過程，EVSE 應下一個 CurrentDemandRes <7b> 訊息，傳送參數 "EVSEStatusCode"='EVSE_Shutdown' 及 "EVSENotification" = 'ReNegotiation'。<br>• If the EVSE wants to trigger a renegotiation process, the EVSE shall send parameter "EVSEStatusCode"='EVSE_Shutdown' and "EVSENotification" = 'ReNegotiation' in the next CurrentDemandRes <7b> message when the present current at side B is < 5 A DC. |
| t802 | • 為觸發重新協議，在電流 < 5 A DC 後，EV 藉由傳 |

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| | 送 PowerDeliveryReq <8a> 訊息，其中包含參數 "ChargeProgress" = 'Renegotiate' ，來請求 EVSE 停用 B 側。<br>• To trigger the renegotiation, the EV requests the EVSE to disable side B by sending message PowerDeliveryReq <8a> with parameter "ChargeProgress" = 'Renegotiate', after the current is < 5 A DC. |
| t802 ► t807 | • EV 可於 B 側當下電流 < 5 A 及已傳送 PowerDeliveryReq <8a> 訊息後，開啟其斷開裝置。<br>• The EV may open the EV disconnection device after the present current at side B is < 5 A and after the message PowerDeliveryReq <8a> has been sent. |
| t803 | • EVSE 應停止 6.3.1.106 之過電壓保護，及隨後，EVSE 應停用 B 側及開啟 EVSE 斷開裝置(若有時)。<br>• The EVSE shall stop the overvoltage protection according to 6.3.1.106, and then, the EVSE shall disable side B, and open the EVSE disconnection device, if any.<br>備考 3：當 B 側當下電流> 0 A DC，若 EVSE 停用 B 側，因 EV 斷開裝置仍被關閉，B 側當下電壓將降至電池系統之當下電壓。<br>NOTE 3 If the EVSE disables side B while the present current at side B is > 0 A DC, the present voltage at side B drops to the present voltage of the battery system because the EV disconnection device is still closed.<br>• EVSE 應停用 EVSE IMD。<br>• The EVSE shall disable the EVSE IMD. |
| t803 ► t809 | • 停用 EVSE B 側應有如 CC.2.4 所述電路之等效電氣特性/行為(例如：阻抗、放電率等)。<br>• The disabled side B of the EVSE shall have equivalent electrical properties/behaviour (for example, impedance, discharge rate, etc.) as the circuit described in CC.2.4. |
| t804 | • EVSE 應藉由傳送參數 "EVSEStatusCode"='EVSE_Shutdown' 於 PowerDeliveryRes <8b> 訊息，來傳達 B 側當下電流< 5 A DC，及停用 B 側。<br>• The EVSE shall communicate that the present current at side B is < 5 A DC and has disabled side B by sending parameter "EVSEStatusCode"='EVSE_Shutdown' in message PowerDeliveryRes <8b>.<br>• 在重新協議期間，EVSE 不應關閉其 CP 振盪器。<br>• The EVSE shall not turn off its CP oscillator during renegotiation.<br>• EV 可啟用 EV IMD(若有時)。<br>• The EV may enable the EV IMD, if any. |
| t804 ► t805 | • 在收到 PowerDeliveryRes <8b>訊息後，EV 應維持 CP 狀態 C。<br>• The EV shall maintain CP state C after receiving message PowerDeliveryRes <8b>.<br>• 在無傳送 WeldingDetectionReq <9a> 訊息下，EV 可執行其斷開裝置之熔接偵測。<br>• The EV may perform welding detection of the EV disconnection device without sending WeldingDetectionReq <9a> messages.<br>備考 4：若 EV 決定不執行熔接偵測，則繼續執行 t805。<br>NOTE 4 If the EV decides not to perform welding detection, it proceeds with t805. |

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| t805 | • EV 完成熔接偵測(若有時)。<br>• The EV completes welding detection, if performed.<br>• EV 應開啟 EV 斷開裝置。<br>• The EV shall open the EV disconnection device.<br>備考 5：EV 斷開裝置之開啟，因 EVSE 尚未收到 SessionStopReq <10a> 訊息，藉由被動放電開始降低 B 側當下電壓。<br>NOTE 5 The opening of the EV disconnection device starts the reduction of the present voltage at side B by passive discharge because the EVSE has not yet received message SessionStopReq <10a>. |
| t806 | • EV 應改變 CP 狀態至狀態 B，來指示 EV 斷開裝置為開啟。<br>• The EV shall change to CP state B to indicate that the EV disconnection device is open.<br>• EV 應保持鎖住車輛端插頭。<br>• The EV shall keep the vehicle connector locked. |
| t806 ► t808 | • EVSE 應於 1 s 或更短內，降低 B 側下列位置間之當下電壓至 ≤ 60 V DC：<br>• The EVSE shall, in 1 s or less, reduce the present voltage at side B to ≤ 60 V DC between<br>– DC+ 與 DC–，<br>– DC+ and DC–,<br>– DC+ 與 PE，及<br>– DC+ and PE, and<br>– DC– 與 PE。<br>– DC– and PE.<br>備考 6：因 EV 已開啟其斷開裝置，EVSE 可對 B 側進行主動放電。<br>NOTE 6 The EVSE can actively discharge side B because the EV has opened the EV disconnection device. |
| t807 | • EV 應傳送參數 "EVMaximumVoltageLimit" 及 "EVMaximumCurrentLimit" (含其它參數)於第一個 ChargeParameterDiscoveryReq <3a>訊息，來限制 B 側的當下電流及電壓。<br>• The EV shall send parameters "EVMaximumVoltageLimit" and "EVMaximumCurrentLimit" (amongst other parameters) to limit the present current and voltage at side B with the first ChargeParameterDiscoveryReq <3a> message. |
| t807 ► t808 | • 若 B 側 DC+ 與 DC– 間之當下電壓 < 60 V DC，EVSE 應進行檢查；且若 B 側 DC+ 與 DC– 間之當下電壓 > 60 V DC，EVSE 應傳送 ChargeParameterDiscovery <3b> 訊息，其中包含參數 "EVSEProcessing" = 'Ongoing'。<br>• The EVSE shall check if the present voltage at side B between DC+ and DC– is < 60 V DC and shall send message ChargeParameterDiscovery <3b> with parameter "EVSEProcessing" = 'Ongoing' if the present voltage at side B is > 60 V DC.<br>• EVSE 應執行相容性檢查。參照 CC.5.6。<br>• The EVSE shall perform a compatibility check. See CC.5.6.<br>• EVSE 應傳送參數 "EVSEMaximumVoltageLimit"、"EVSEMinimumVoltageLimit"、"EVSEMaximumCurrentLimit" 及 |

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| | "EVSEMinimumCurrentLimit" (含其它參數)於 ChargeParameterDiscoveryRes <3b> 訊息，來考量相容性檢查。參照 CC.5.6 如何計算這些數值。<br>• The EVSE shall send parameters "EVSEMaximumVoltageLimit", "EVSEMinimumVoltageLimit", "EVSEMaximumCurrentLimit" and "EVSEMinimumCurrentLimit" (amongst other parameters) in message ChargeParameterDiscoveryRes <3b> considering the compatibility check. See CC.5.6 on how to calculate these values.<br>• EVSE 應傳送參數"EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' 於 "ChargeParameterDiscoveryRes <3b>" 訊息，除非 EVSE 欲執行停機。若 EVSE 傳送 ChargeParameterDiscoveryRes <3b> 訊息，其中包含參數 "EVSE_StatusCode" = ‘EVSE_Ready’ 或 ‘EVSE_NotReady’，則建議 EV 繼續通訊對話。<br>• The EVSE shall send parameter "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in the "ChargeParameterDiscoveryRes <3b>" messages, unless the EVSE wants to perform a shutdown. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = ‘EVSE_Ready’ or ‘EVSE_NotReady’.<br>備考 7：基於 IEC 61851-23:2014 之 EVSE 可傳送參數 "EVSE_StatusCode" = "EVSE_Ready"、"EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive"，於 ChargeParameterDiscoveryRes <3b>訊息。<br>NOTE 7 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages.<br>• 若 EVSE 回應參數 "ResponseCode'' = 'OK' 及 "EVSEProcessing" = 'Ongoing' 於 ChargeParameterDiscoveryRes <3b> 訊息，EV 及 EVSE 可於下一個 ChargeParameterDiscoveryReq/Res 訊息中更新傳送的參數。<br>• If the EVSE replies with parameters "ResponseCode'' = 'OK' and "EVSEProcessing" = 'Ongoing' in message ChargeParameterDiscoveryRes <3b>, the EV and EVSE may update the parameters sent in the next ChargeParameterDiscoveryReq/Res messages.<br>備考 8：EVSE 因其它原因，可使用 "EVSEProcessing" = 'Ongoing'。例如：負載管理等。<br>NOTE 8 The EVSE can use "EVSEProcessing" = 'Ongoing' for other reasons. Example: load management, etc.<br>• ISO 15118-2:2014 並未規定更新參數於後續序列 ChargeParameterDiscoveryReq/Res 訊息之可能性；然而，若 EV 改變參數，建議 EVSE 不要執行關機。<br>• ISO 15118-2:2014 does not specify the possibility to update the parameters in subsequent ChargeParameterDiscoveryReq/Res messages; however, it is recommended for the EVSE not to perform a shutdown if the EV changes the parameters. |

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| | • 為提升互通性，EVSE 應容許 EV 於循環 ChargeParameterDiscoveryReq/Res 訊息期間，改變 CP 狀態至 C/D。若 EV 改回 CP 狀態至狀態 B，EVSE 應觸發由其發動之緊急停機。參照 CC.3.4.3。<br>• To improve interoperability, the EVSE shall tolerate the EV changing CP state to C/D during cyclic ChargeParameterDiscoveryReq/Res messages. If the EV changes back to CP state B, the EVSE shall trigger an EVSE initiated emergency shutdown. See CC.3.4.3.<br>ISO 15118-2:2014 規定之[V2G2-912]，及 SAE J1772 過時版本之類似要求，並未規定於改變 CP 狀態從狀態 B 至狀態 C/D 前，應接收參數"EVSEProcessing" = ‘'Finished'’ 之 ChargeParameterDiscoveryRe <3b>訊息，導致非期望的行為。<br><br>Requirement [V2G2-912] in ISO 15118-2:2014 and a similar requirement in outdated versions of SAE J1772 do not specify that the EV shall receive a ChargeParameterDiscoveryRe <3b> with parameter "EVSEProcessing" = ‘'Finished'’ before changing the CP state from state B to state C/D, leading to this unwanted behaviour. |
| t808 | • 若 B 側當下電壓 < 60 V DC，EVSE 應傳送 EV 相容性檢查結果於 ChargeParameterDiscoveryRes <3b>訊息，使用參數 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive'、 "EVSEProcessing" = ‘Finished’，及<br>• If the present voltage at side B is < 60 V DC, the EVSE shall send the EV the result of the compatibility check in message ChargeParameterDiscoveryRes <3b> using parameters "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive', "EVSEProcessing" = 'Finished', and<br><br>– "ResponseCode" = ‘OK’，若相容性檢查完成及通過，或<br>– "ResponseCode" = 'OK' if the compatibility check was completed successfully, or<br>– "ResponseCode" = 'FAILED_WrongChargeParameter'，若相容性檢查完成及未通過，並觸發 EVSE 發動錯誤停機。<br>– "ResponseCode" = 'FAILED_WrongChargeParameter' if the compatibility check was completed and failed, triggering an EVSE initiated error shutdown.<br><br>備考 9：包含參數 "ResponseCode" = 'FAILED_WrongChargeParameter' 及 "EVSEProcessing" = 'Ongoing' 之 ChargeParameterDiscoveryRes <3b> 訊息，將觸發 EVSE 發動錯誤停機。參照 IEC 61851-24 數位通訊標準之錯誤處理規定。<br>NOTE 9 A ChargeParameterDiscoveryRes <3b> message with "ResponseCode" = 'FAILED_WrongChargeParameter' and parameter "EVSEProcessing" = 'Ongoing', will trigger an EVSE initiated error shutdown. See error handling specifications for the digital communication standards in IEC 61851-24. |

| | |
|---|---|
| | 備考 10：基於 IEC 61851-23:2014 之 EVSE 可傳送參數 "EVSE_StatusCode" = "EVSE_Ready"、"EVSE_NotReady"、或 "EVSE_IsolationMonitoringActive" 於 ChargeParameterDiscoveryRes <3b> 訊息。若 EVSE 傳送參數"EVSE_StatusCode" = 'EVSE_Ready' or 'EVSE_NotReady' 於 ChargeParameterDiscoveryRes <3b> 訊息，則建議 EV 繼續通訊對話。<br>NOTE 10 EVSEs based on IEC 61851-23:2014 can send parameter "EVSE_StatusCode" = "EVSE_Ready", "EVSE_NotReady", or "EVSE_IsolationMonitoringActive" in ChargeParameterDiscoveryRes <3b> messages. The EV is recommended to continue the communication session if the EVSE sends ChargeParameterDiscoveryRes <3b> messages with parameter "EVSE_StatusCode" = 'EVSE_Ready' or 'EVSE_NotReady'.<br>• 在電能傳輸期間，EVSE 於上一個 ChargeParameterDiscoveryRes <3b>訊息傳送之協議最大數值，應大於或等於在 CurrentDemandRes <7b>之申請值。參照 CC.5.6。<br>• The negotiated maximum values sent by the EVSE in the last ChargeParameterDiscoveryRes <3b> shall be more than or equal to the applicable values in the CurrentDemandRes <7b> messages during energy transfer. See CC.5.6. |
| t808 ► t809 | • 若 EV 及 EVSE 不相容，EV 應執行其發動之錯誤停機。參照 CC.3.4.2。<br>• If the EV and EVSE are not compatible, the EV shall perform an EV initiated error shutdown. See CC.3.4.2.<br>• 在改變 CP 狀態至狀態 C 或 D 前，EV 應於車輛端插座鎖住車輛端插頭(若尚未鎖住)。<br>• The EV shall lock the vehicle connector in the vehicle inlet before changing the CP to state C or D, if not already locked.<br>• 若 EV 鎖住車輛端插頭失效，EV 應於下一個通訊訊息以參數 "EVErrorCode" = 'FAILED_ChargerConnectorLockFault'，來觸發其發動之錯誤停機。<br>• If the EV failed to lock the vehicle connector, the EV shall trigger an EV initiated error shutdown with parameter "EVErrorCode" = 'FAILED_ChargerConnectorLockFault' in the next communicated message.<br>• EV 應停用 EV IMD (若有時)。<br>• The EV shall disable the EV IMD, if any. |
| t809 | • 通訊對話如正常啟動序列 CC.3.2 中之 t4 繼續進行。<br>• The communication session continues as in t4 of the normal startup sequence CC.3.2.<br>• 並不要求有停用 EVSE B 側之限制。<br>• The limitations of the disabled side B of the EVSE are not required. |

CC.4 安全相關功能 CC.4 Safety related functions

CC.4.1 B 側安全措施 CC.4.1 Safety measures for side B

CC.4.1.1 一般 CC.4.1.1 General

EV 供電設備 B 側應提供如 8.105.1 規定之基本保護、故障保護及特定保護。

The side B of the EV supply equipment shall implement the provisions for basic protection, fault protection and special protection as specified in 8.105.1.

CC.4.1.2 電纜檢查階段

CC.4.1.2 Cable-check phase

車輛端插頭之過電壓防護要求，依 6.3.1.106 規定並不適用於電纜檢查階段期間。

Requirements for protection against overvoltage at the vehicle connector according to 6.3.1.106 do not apply during the cable-check phase.

在電纜檢查階段期間，EV 供電設備應執行下列檢查：

During the cable-check phase, the EV supply equipment shall perform the following checks.

- 依 CC.4.1.3 之規定，於 B 側在控制電壓下執行並完成 IMD 之功能檢查。
- Perform and finish the functional check of the IMD under a controlled voltage at side B according to CC.4.1.3.
- 依 CC.4.1.4 之規定，於 B 側在控制電壓下執行絕緣電阻檢查。
- Perform the insulation resistance check under a controlled voltage at side B according to CC.4.1.4.
- 依 6.3.1.109 之規定，於電能傳輸前執行短路檢查檢查。
- Perform the short-circuit check before energy transfer according to 6.3.1.109.
- 選項：於電纜檢查階段期間，執行 EV 供電設備斷開裝置之熔接檢查。若 EV 供電設備執行熔接偵測，EV 供電設備仍應符合 6.3.1.112 之要求。
- Optional: perform a welding check of the EV supply equipment disconnection device during the cable-check phase. If the EV supply equipment performs a welding detection, then the EV supply equipment shall still comply with the requirements of 6.3.1.112.

若於電纜檢查階段期間，所有檢查結果為 "Passed" 或 "Valid"，EV 供電設備應傳送包含參數 "EVSEIsolationStatus" = ‘Valid’ 及 "ResponseCode" = ‘OK’ 之 CableCheckRes <4b> 訊息，並於最後的 "CableCheckReq" <4b> 訊息中，傳送參數"EVSEProcessing" = ‘Finished’。

If the results of all the checks during the cable-check phase are "Passed" or "Valid", the EV supply equipment shall send message CableCheckRes <4b> with parameters "EVSEIsolationStatus" = ‘Valid’ and "ResponseCode" = ‘OK’, and "EVSEProcessing" = ‘Finished’ in the last "CableCheckReq" <4b> message.

在電纜檢查階段期間，EV 供電設備應限制 B 側當下電流最大至 20 A。

During the cable-check phase, the EV supply equipment shall limit the present current at side B to a maximum of 20 A.

為符合 IEC 61851-24 規定之數位通訊時序要求，EV 供電設備應能在 V2G_SECC_CableCheck_Performance_Time (= 38 s，依據 DIN SPEC 70121:2014 及 ISO 15118-2:2014)，完成電纜檢查階段(包含 CC.4.1.4 規定之絕緣狀態量測)。

In order to fulfil the timing requirements of the digital communication according to IEC 61851-24, the EV supply equipment shall be able complete the cable-check phase (including measuring the insulation state according to CC.4.1.4) within V2G_SECC_CableCheck_Performance_Time (= 38 s according to DIN SPEC 70121:2014 and ISO 15118-2:2014).

在電纜檢查階段，於 IMD 功能檢查與絕緣電阻檢查期間，EV 供電設備應依上一組 ChargeParameterDiscoveryReq/Res 訊息傳遞之額定最高電壓值，來申請 B 側之控制當下電壓。參照公式(CC.1)。

In the cable-check phase, during the functional check of the IMD and the insulation resistance check, the EV supply equipment shall apply a controlled present voltage at side B according to the rated maximum voltage values communicated in the last set of ChargeParameterDiscoveryReq/Res messages. See Formula (CC.1).

$V_{EVSE_CableCheck} = \min (V_{EV_MAX_CPD} + 50\ V, V_{EVSE_MAX_CPD}, 500\ V)$，

若 $V_{EV_MAX_CPD} \leq 500\ V$

(CC.1)

$V_{EVSE_CableCheck} = \min (1.1 \times V_{EV_MAX_CPD}, V_{EVSE_MAX_CPD})$，

若 $V_{EV_MAX_CPD} > 500\ V$

其中

$V_{EV_MAX_CPD}$ ：上一個 ChargeParameterDiscoveryReq 所傳遞 EV B 側之額定最高電壓，單位：V；

$V_{EV_MAX_CPD}$ is the rated maximum voltage of the EV communicated in the last ChargeParameterDiscoveryReq , expressed in volts;

$V_{EVSE_MAX_CPD}$ ：上一個 ChargeParameterDiscoveryReq 所傳遞 EV 供電設備 B 側之額定最高電壓，單位：V；

$V_{EVSE_MAX_CPD}$ is the rated maximum voltage of the EV supply equipment at side B communicated in the last ChargeParameterDiscoveryRes, expressed in volts;

$V_{EVSE_CableCheck}$ ：於 IMD 功能檢查及絕緣電阻檢查期間，B 側之當下電壓，單位：V。

$V_{EVSE_CableCheck}$ is the present voltage at side B during the functional check of the IMD and the insulation resistance check, expressed in volts.

於 IMD 功能檢查及絕緣電阻檢查期間

During the functional check of the IMD and the insulation resistance check,

- VEVSE_CableCheck 的電壓偏差，應在 VEV_MAX_CPD 之 ±5 %，或 VEVSE_MAX_CPD 之 ±2 %，取較小者，
- the voltage deviation of the VEVSE_CableCheck shall be between ±5 % of the

VEV_MAX_CPD, or ±2 % of the VEVSE_MAX_CPD, whichever deviation is less,

- DC+ 與 DC– 間之阻抗，應小於 1 kΩ，來避免 IMD 額外的量測誤差，及
- the impedance between DC+ and DC– should be less than 1 kΩ to avoid additional measurement errors of the IMD, and
- EV 於正常及極性相反，應能耐受 VEVSE_CableCheck。
- the EV shall be able to withstand VEVSE_CableCheck in both normal and reverse polarity.

EV 供電設備於 B 側當下電壓 < VEVSE_CableCheck V DC 後，應僅傳送最後訊息 "CableCheckRes" <4b>，其中包含參數 "EVSEProcessing" = ‘Finished’。

The EV supply equipment shall only send the last "CableCheckRes" <4b> message with parameter "EVSEProcessing" = ‘Finished’ after the present voltage at side B is < VEVSE_CableCheck V DC.

CC.4.1.3 絕緣監測裝置之功能檢查

CC.4.1.3 Functional check of the insulation monitoring device

若 IMD 連接至 B 側之帶電部件(DC+/DC–)與保護導體，且 IMD 可測定 DC+ 與保護導體、DC– 與保護導體間之絕緣電阻，IMD 功能檢查應進行偵測。冗餘連結的故障需透過中斷所有 IMD 連結來進行查證。

The functional check of the IMD shall detect if the IMD is connected to the side B live parts (DC+/DC–) and the protective conductor, and that the IMD is capable of determining the insulation resistances between DC+ and the protective conductor, as well as between DC– and the protective conductor. Failure of redundant connections needs to be verified by interrupting all the IMD connections.

IMD 的功能檢查不應對 IMD 及 B 側電路有不良的影響。當進行功能檢查時，B 側電路之監控不應直接接地。

The functional check of the IMD shall not negatively influence the IMD and the side B circuit. The side B circuit to be monitored shall not be directly earthed when the functional check is activated.

備考 1：於 IMD 功能檢查期間，適用 8.105.1 之規定。

NOTE 1 During the functional check of the IMD, the requirements of 8.105.1 are applicable.

功能檢查之結果應如下：

The result of the functional check can be as follows.

(a) 未知：尚未執行 IMD 功能檢查。在此結果下，EV 供電設備不應允許繼續進行 CC.4.1.4 之絕緣電阻檢查。

a) Unknown: Functional check of the IMD has not been executed yet. With this result, the EV supply equipment shall not be allowed to continue to insulation resistance

check according to CC.4.1.4.

(b) 符合：在 IMD 功能檢查符合後，EV 供電設備允許繼續進行 CC.4.1.4 之絕緣電阻檢查。

b) Passed: After the functional check of the IMD has been passed, the EV supply equipment is allowed to continue to the insulation resistance check according to CC.4.1.4.

(c) 未符合：在 IMD 功能檢查未符合後。在此結果下，EV 供電設備不應允許繼續進行 CC.4.1.4 之絕緣電阻檢查。EV 供電設備應於下一個 "CableCheckReq" <4b> 訊息，傳送參數 "EVSEIsolationStatus" = ‘Fault’ 及 "ResponseCode" = ‘FAILED’、及 "EVSEProcessing" = ‘Finished’，來觸發錯誤停機。

c) Failed: The functional check of the IMD has failed. With this result, the EV supply equipment shall not be allowed to continue to insulation resistance check according to CC.4.1.4. The EV supply equipment shall trigger an error shutdown, with parameter "EVSEIsolationStatus" = ‘Fault’ and "ResponseCode" = ‘FAILED’, and "EVSEProcessing" = ‘Finished’ in the last "CableCheckReq" <4b> message.

備考 2：IMD 功能檢查的目的，在於檢查 IMD 是否可執行 EV 供電設備 B 側之監控功能，並不檢查 B 側絕緣電阻小於某個判定值。

NOTE 2 The purpose of this functional check of the IMD is to check whether the IMD is capable of fulfilling its monitoring function on side B of the EV supply equipment and not to check if the insulation resistance of side B is less than a certain threshold.

備考 3：在啟動 IMD 功能檢查期間，只要量測反應時間的延長不發生於電能傳輸時期的期間，則 IMD 的反應時間可以延長。

NOTE 3 During the activation of the functional check of the IMD, the response time of the IMD can be extended as long the extension of a response time of measurement does not occur during the energy transfer stage.

對 IMD 量測連接至 B 側帶電部件(DC+/DC–)與保護導體之符合性，依 CC.7.5.23 進行檢查。

Compliance is checked by CC.7.5.23 for the IMD measurement connections to the side B live parts (DC+/DC–) and the protective conductor.

CC.4.1.4 絕緣電阻檢查

CC.4.1.4 Insulation resistance check

絕緣電阻檢查應僅在依 CC.4.1.3 之 IMD 功能檢查結果 "Passed" 後進行。

The insulation resistance check shall be performed only after a "Passed" result of the functional check of the IMD according to CC.4.1.3.

在絕緣電阻檢查期間，B 側當下電壓應於 1 s 或更長時間，符合 CC.4.1.2 之規定。

During the insulation resistance check, the present voltage at side B shall be as defined in CC.4.1.2 for 1 s or more.

於 "CableCheckRes" <4b> 訊息中之絕緣狀態的參數 "EVSEIsolationStatus" 可為如下：

The insulation states of parameter "EVSEIsolationStatus" in message "CableCheckRes" <4b> can be as follows.

(a) 無效：IMD 尚未完成絕緣電阻檢查。若 EV 供電設備在電纜檢查階段結束(參照 CC.4.1.2)時，於 "CableCheckRes" <4b> 訊息中，維持傳送參數 "EVSEIsolationStatus" = ‘Invalid’，EV 應觸發錯誤停機，

a) Invalid: The IMD has not finished the insulation resistance check. The EV shall trigger an error shutdown if the EV supply equipment maintains parameter "EVSEIsolationStatus" = ‘Invalid’ in message "CableCheckRes" <4b> at the end of the cable-check phase (see CC.4.1.2).

(b) 有效：B 側帶電部件 (DC+/DC–) 與保護導體間之絕緣電阻量測結果 ≥ 100 kΩ (無負容許值)。若 IMD 保持 "Valid" 狀態，EV 供電設備應繼續進行電纜檢查階段，並應依 IEC 61851-24 之數位通訊指示 EV 絕緣狀態為 "Valid"。

b) Valid: The measured insulation resistance between side B live parts (DC+/DC–) and the protective conductor is ≥ 100 kΩ (without negative tolerance). The EV supply equipment shall continue with the cable-check phase if the IMD remains in "Valid" state and shall indicate the insulation state "Valid" to the EV by digital communication according to IEC 61851-24.

(c) 故障：B 側帶電部件 (DC+/DC–) 與保護導體間之絕緣電阻量測結果 < 100 kΩ (無負容許值)。若 IMD 偵測到 "Fault" 狀態，EV 供電設備在電纜檢查階段前或結束時，應觸發錯誤停機，且應依 IEC 61851-24 之數位通訊指示 EV 絕緣狀態為 "Fault"。

c) Fault: The measured insulation resistance between side B live parts (DC+/DC–) and the protective conductor is < 100 kΩ (without negative tolerance). The EV supply equipment shall trigger an error shutdown before or at the end of the cable-check phase if the IMD detects a "Fault" state and shall indicate the insulation state "Fault" to the EV by digital communication according to IEC 61851-24.

依 CC.7.5.15 檢查符合性。

Compliance is checked by CC.7.5.15.

CC.4.1.5 首次絕緣故障之錯誤停機

CC.4.1.5 Error shutdown upon first insulation fault

EV 供電設備在發生首次絕緣故障後，應執行錯誤停機(參照 CC.3.4.2)。在電能傳輸階段期間，應使用符合 IEC 61557-8 或等同之 IMD，來執行 DC+ 與保護

導體、DC– 與保護導體間之絕緣監測。絕緣監測可執行如下：

The EV supply equipment shall perform an error shutdown (see CC.3.4.2) after the occurrence of a first insulation fault. An IMD according to IEC 61557-8 or equivalent shall be used to perform insulation monitoring between DC+ and the protective conductor, as well as between DC– and the protective conductor during the energy transfer stage. Insulation monitoring can be performed by

- 測定 B 側帶電部位(DC+ 及 DC–)與保護導體之總絕緣電阻，或
- determining the total insulation resistance of side B live parts (DC+ and DC–) and protective conductor, or
- 分別測定 B 側帶電部位(DC+ 及 DC–)與保護導體間之絕緣電阻。
- separately determining the insulation resistance between side B live parts (DC+ and DC–) and protective conductor.

B 側之當下絕緣狀態(有效、故障)應以數位通訊的方式，週期性地傳送至 EV，參照 IEC 61851-24。

The present insulation state (Valid, Fault) of side B shall periodically be sent to the EV by means of digital communication, see IEC 61851-24.

若無法測定絕緣電阻，例如：量測受到干擾或 IMD 不支援，則 EV 應觸發或執行錯誤停機。

If the insulation resistance cannot be determined, for example, due to disturbances of the measurement or if the IMD is not supplied, the EV supply equipment shall trigger and perform an error shutdown.

備考：在許多情況下，因內部故障或外部因素，可能無法測定絕緣電阻，例如：若 EV 之電容性超過 ISO 17409:2020 規定之預期值。

NOTE In some cases, the insulation resistance cannot be determined because of an internal failure or external factors, for example, if the capacitance in the EV is more than the expected value as defined in ISO 17409:2020.

EV 供電設備應依照表 CC.18，對情況 1 和情況 2 各自獨立做出反應。

The EV supply equipment shall react to both conditions 1 and 2 independently according to Table CC.18.

表 CC.18 絕緣狀態及 EV 供電設備依據絕緣電阻採取之反應。

Table CC.18 – Insulation states and EV supply equipment reaction based on the insulation resistance

| 情況 1<br>Condition 1<br>非對稱絕緣電阻 [a]<br>(asymmetric insulation resistance)[a] | 情況 2<br>Condition 2<br>對稱絕緣電阻 [a]<br>(symmetric insulation resistance)[a] | 絕緣狀態<br>Insulation state | EV 供電設備之反應<br>EV supply equipment reaction |
|---|---|---|---|
| 案例 3 及案例 4<br>Case 3 and Case 4 | 案例 1<br>Case 1 | 有效<br>Valid | 允許電能傳輸<br>Allow energy transfer |

| | | | |
|---|---|---|---|
| 案例 5 及案例 6<br>Case 5 and Case 6 | 案例 2<br>Case 2 | 故障<br>Fault | 錯誤停機<br>Error shutdown |

[a] 參照 CC.7.5.15 及 CC.7.5.16 之試驗方法的試驗電阻器應用。
[a] See application of the test resistors in the test methods in CC.7.5.15 and CC.7.5.16.
使用於試驗案例之電阻值：
Resistor values used in the test cases:
對稱絕緣電阻試驗
Symmetric insulation resistance test
案例 1：2 個電阻器 R = $300^{+2\%}_{0}$kΩ
Case 1: Two test resistors R = $300^{+2\%}_{0}$kΩ
案例 2： 2 個電阻器 R = $100^{+2\%}_{0}$ kΩ
Case 2: Two test resistors R = $100^{+2\%}_{0}$ kΩ

非對稱絕緣電阻試驗：
Asymmetric insulation resistance test:
案例 3：試驗電阻器 R = $150^{+2\%}_{0}$kΩ
Case 3: Test resistor R = $150^{+2\%}_{0}$kΩ
案例 4：試驗電阻器 R = $150^{+2\%}_{0}$kΩ
Case 4: Test resistor R = $150^{+2\%}_{0}$kΩ
案例 5：試驗電阻器 R = $100^{+2\%}_{0}$kΩ
Case 5: Test resistor R = $100^{+2\%}_{0}$kΩ
案例 6：試驗電阻器 R = $100^{+2\%}_{0}$kΩ
Case 6: Test resistor R = $100^{+2\%}_{0}$kΩ

依 CC.7.5.15 及 CC.7.5.16 檢查符合性。
Compliance is checked by CC.7.5.15 and CC.7.5.16.

CC.4.1.6 在電纜檢查階段後之絕緣監測
CC.4.1.6 Insulation monitoring after the cable-check phase
在預充電階段及電能傳輸時期期間，應持續監控 B 側之絕緣電阻。絕緣電阻狀態如表 CC.18 所示。
During the pre-charge phase and the energy transfer stage, the insulation resistance of side B shall be continuously monitored. The insulation states are shown in Table CC.18.
若有干擾防礙 IMD 正確量測絕緣電阻，EV 供電設備在上一次有效之絕緣電阻量測後，應於 30 s 或更短以內觸發錯誤停機。
In case disturbances prevent a correct insulation resistance measurement by the IMD, the EV supply equipment shall trigger an error shutdown in 30 s or less after the last valid insulation resistance measurement.
在任何情況下，EV 供電設備應在表 CC.18 之故障發生後，於 10 s 或更短內觸發錯誤停機。
In any other case, the EV supply equipment shall trigger an error shutdown in 10 s or less after the occurrence of a fault according to Table CC.18.
備考 1：EV 供電設備可發送光學及/或聲音信號給使用者。
NOTE 1 The EV supply equipment can issue an optical and/or acoustical signal to

the user.

備考 2：ISO 17409:2020 之 9.4 包含從圖 CC.5 之時間 t3 起，對 EV 絕緣電阻監測系統之要求，避免干擾 EV 供電設備之 IMD。

NOTE 2 ISO 17409:2020, 9.4, contains the requirement for the EV insulation resistance monitoring system to avoid interference with the IMD of the EV supply equipment, from time t3 in Figure CC.5.

依 CC.7.5.16 檢查符合性。

Compliance is checked by CC.7.5.16.

CC.4.2 車輛耦合器閂鎖功能

CC.4.2 Vehicle coupler latching function

對表 CC.1 之所有類型的車輛耦合器，車輛插座應提供閂鎖功能，來防止車輛端插頭於電能轉移期間，非預期的從車輛端插座脫離。

For all types of vehicle couplers according to Table CC.1, the vehicle inlet shall provide a latching function to mitigate unintentional un-mating of the vehicle connector from the vehicle inlet during energy transfer.

閂鎖功能之要求如 ISO 17409 之規定。

The requirement for the latching function is stated in ISO 17409.

CC.4.3 控制導引導體電氣連續性之喪失

CC.4.3 Loss of electrical continuity of the control pilot conductor

當非預期的轉變從 CP 狀態 C/D 改變至狀態 B/A ，任何其它或未知狀態出現，EV 供電設備應於 10 ms 或更短內觸發緊急停機。

When an unintended transition from CP state C/D to state B/A, any other or an unknown state occurs, the EV supply equipment shall trigger an emergency shutdown in 10 ms or less.

依 CC.7.5.4 及 CC.7.5.17 檢查符合性。

Compliance is checked by CC.7.5.4 and CC.7.5.17.

當非預期的轉變從 CP 狀態 C/D 改變至狀態 B/A ，任何其它或未知狀態出現，EV 應於 50 ms 或更短內觸發緊急停機。

When an unintended transition from CP state C/D to state B/A, any other or an unknown state occurs, the EV shall trigger an emergency shutdown in 50 ms or less.

CC.4.4 接近偵測導體之電氣連接性失效

CC.4.4 Loss of electrical continuity of the proximity detection conductor

針對組態 EE 車輛端插頭，當接近偵測接點測得的電壓< 0.8 V DC 或> 3.6 V DC 時，EV 供電設備應依 6.3.1.113.4，於 10ms 內或更短時間內觸發緊急停機。接近導引訊號應依圖 CC.1 實現。

For vehicle connectors of configuration EE, when the voltage measured at the

proximity detection contact is < 0,8 V DC or > 3,6 V DC, the EV supply equipment shall trigger an emergency shutdown, in accordance with 6.3.1.113.4, in 10 ms or less. The proximity pilot shall be implemented according to Figure CC.1.

依 CC.7.5.8 檢查符合性。

Compliance is checked by CC.7.5.8.

CC.4.5 初始之電壓檢查

CC.4.5 Voltage check at initialization

The voltage check at initialization shall be as specified in the sequences in Clause CC.3 and 6.3.1.106.

CC.4.6 保護導體之最小截面積

CC.4.6 Minimum cross-sectional area of the protective conductor

保護導體之最小截面積應為 6 $mm^2$ 。

The minimum cross-sectional area of the protective conductor shall be 6 $mm^2$.

以檢驗進行符合性檢查。

Compliance is checked by inspection.

CC.4.7 保護導體電氣連續性之喪失 CC.4.7 Loss of electrical continuity of the protective conductor

從 EV 供電設備內部往上至 A 點(參照圖 CC.1 及圖 CC.2)，任何位置若出現保護導體連續性喪失，EV 供電設備應於 150 ms 或更短內，觸發緊急停機。

The EV supply equipment shall trigger an emergency shutdown in 150 ms or less if a loss of electrical continuity of the protective conductor occurs anywhere from the inside of the EV supply equipment up to the point A (see Figure CC.1 and Figure CC.2).

依 CC.7.5.5 檢查符合性。

Compliance is checked by CC.7.5.5.

EV 應從 A 點(參照圖 CC.1 及圖 CC.2)監控保護導體之電氣連續性，進行如下。

The EV shall monitor the electrical continuity of the protective conductor from point A (see Figure CC.1 and Figure CC.2) to the EV by doing the following.

- EV 在每個通訊對話初始前，應檢查 PP 電路是否符合 EV 製造商規定之正確數值，此包含從 A 點至 EV 之保護導體連續性。
- The EV shall check the PP circuit before each initiation of a communication session for correct values specified by the EV manufacturer, this includes the continuity of the protective conductor from point A up to the EV.
- EV 在 CP 狀態從 B 改變至 C ，應開啟圖 CC.2 之開關 $S_V3$ 或者 EV 在電能傳輸期間應進行 PP 電路檢查，且若保護導體電氣連續性喪失，EV 應於 150 ms 或更短內觸發緊急停機。
- The EV shall either open switch $S_V3$ from Figure CC.2 when it changes the CP state from B to C or the EV shall check the PP circuit during energy transfer and, in case of loss of electrical continuity of the protective conductor, the EV shall

trigger an emergency shutdown in 150 ms or less.

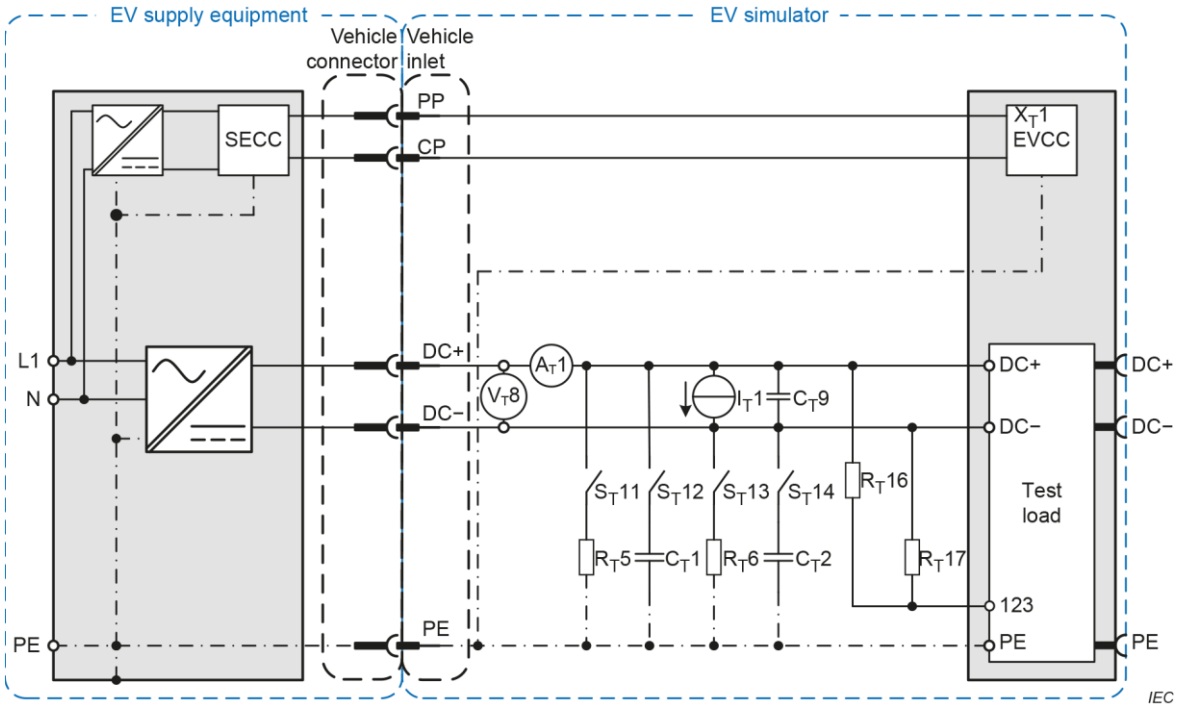
CC.5 額外功能 CC.5 Additional functions

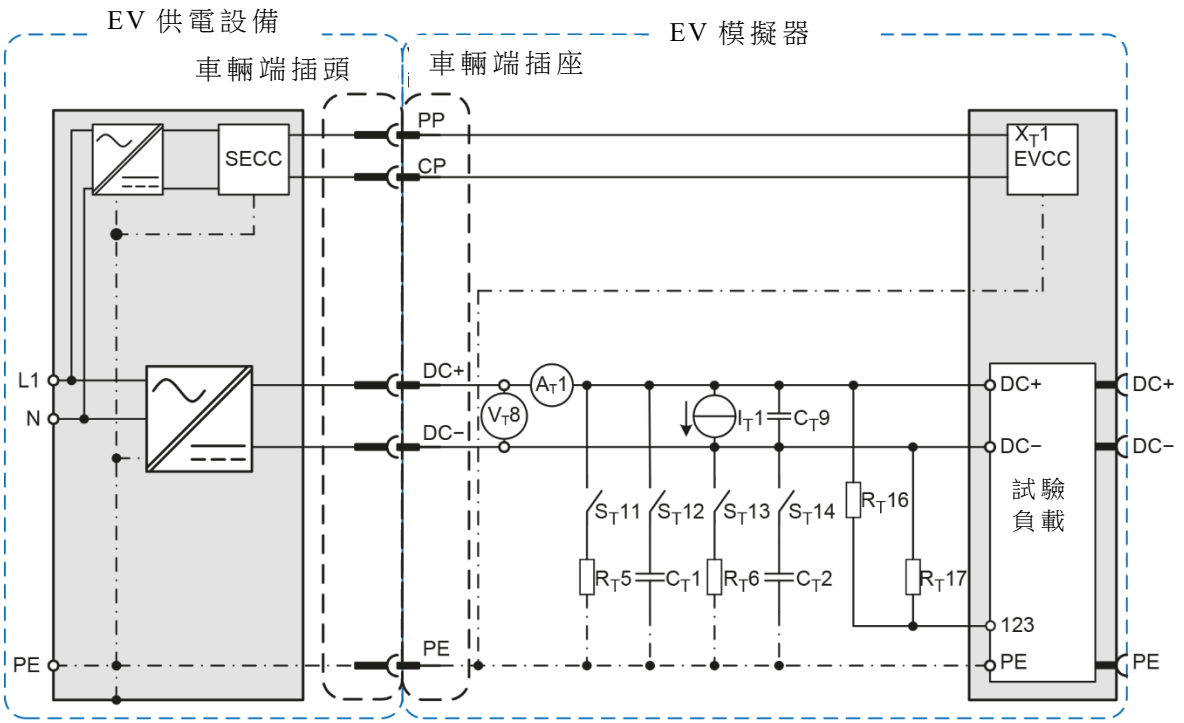
CC.5.1 預充電 CC.5.1 Pre-charge

在預充電階段，EV 供電設備應以 CVM 操作，依 101.1.2.2 及 101.1.6 來跟隨 EV 之目標電壓。EV 供電設備應

During the pre-charge phase, the EV supply equipment shall operate in CVM to follow the target voltage of the EV according to 101.1.2.2 and 101.1.6. The EV supply equipment shall

- 可依表 CC.19 之數值對圖 CC.14 之電路，在其所有操作範圍於 3 s 或更短內進行預充電，且
- be able to pre-charge the circuit defined in Figure CC.14 with the values according to Table CC.19 for its entire operating range in 3 s or less, and
- 接著於 1 s 或更短內，跟隨 ±50 V DC 最大 EV 目標電壓之變化。
- subsequently follow a change in the target voltage of the EV of a maximum of ±50 V DC in 1 s or less.






說明

Key

| | |
|---|---|
| $I_T1$ | EV 電流負載<br>EV current load |
| $C_T1$, $C_T2$ | 車輛端插座之最大 Y-電容<br>maximum Y-capacitance on the vehicle inlet |
| $C_T9$ | 車輛端插座之最大 X-電容<br>maximum X-capacitance on the vehicle inlet |
| $R_T5$, $R_T6$ | 車輛端插座之最小絕緣電阻(由於錯誤)<br>minimum insulation resistance (due to an error) on the vehicle inlet |
| $R_T16$, $R_T17$ | 車輛端插座上 EV 模擬量測電路之最小電阻<br>minimum resistance of the EV simulator measurement circuit on vehicle inlet |
| $A_T1$ | EV 模擬器之電流計<br>ammeter in the EV simulator |
| $V_T8$ | EV 模擬器之電壓計<br>voltmeter in the EV simulator |
| 試驗負載<br>Test load | 除非有其它規定，否則依 102.2.4 之試驗負載(參照圖 132)。<br>test load according to 102.2.4 unless otherwise specified (see Figure 132) |

備考：圖示依照系統 C 之試驗設置，並額外包含元件 IT1、CT9、RT16 及 RT17。參照圖 131。

NOTE Diagram based on the test setup for system C with additional components IT1, CT9, RT16 and RT17. See Figure 131.

圖 CC. 14 於充電時等效電路之最差案例

Figure CC.14 – Worst case equivalent circuit during pre-charge

表 CC.19 EV 供電設備於預充電期間基於圖 CC.14 之設計數值

Table CC.19 – Values to design the EV supply equipment during pre-charge based on Figure CC.14

| 符號<br>Symbol | 數值<br>Value |
|---|---|
| IT1 | 12 mA ± 2 mA |
| CT1, CT2 | 2 µF |
| CT9 | 10 nF |
| RT5, RT6 | 100 kΩ |
| RT16, RT17 | 500 kΩ |
| ST17 | 關閉<br>Closed |
| ST18 | 開啟<br>Open |

在預充電期間，EV 應將其在 DC+ 與 DC– 間之電流汲取限制於 10 mA 以內。

During pre-charge, the EV shall limit its current draw between DC+ and DC– to 10 mA.

依 ISO 17409 規定，在 EV 關閉其斷開裝置前，斷開裝置兩側的電壓差應 < 20 V DC。

According to ISO 17409, the voltage difference between both sides of the EV disconnection device shall be < 20 V DC before the EV closes the EV disconnection device.

若 B 側的極性相反時，EV 不應關閉其斷開裝置。

The EV shall not close the EV disconnection device if the polarity of side B is reversed.

在 EV 預充電期間，EV 應量測車輛端插頭 B 側之當下電壓，並可使用量測的電壓來調整隨後 EV 之目標電壓。建議 EV 在首次預充電請求訊息後 3 s 或更短內，不應調整其目標電壓。

The EV shall measure the present voltage at side B at the vehicle inlet and may use the measured voltage for adjusting the subsequent target voltage of the EV during pre-charge. It is recommended for the EV not to modify the target voltage of the EV in 3 s or less after the first pre-charge request message.

若 B 側當下電壓與電池系統當下電壓之相差絕對值 ≤ 20 V，EV 不應單一使用 B 側由 EV 供電設備傳遞之量測電壓來進行檢查。

The EV shall not solely use the measured voltage at side B communicated by the EV supply equipment to check if the absolute difference between the present voltage at side B and the present voltage of the battery system is ≤ 20 V.

在收到首次 PreChargeReq <5a> 訊息後，若 EV 供電設備於 20 s 或更短內沒有收到 PowerDeliveryReq <6a> 時，則 EV 供電設備可觸發錯誤停機。

The EV supply equipment may trigger an error shutdown if the PowerDeliveryReq <6a> message is not received by the EV supply equipment in 20 s or less after

receiving the first PreChargeReq <5a> message.

備考 1：此是為了限制 EV 供電設備中預充電電路溫度之上升。

NOTE 1 This is to limit the heating of the pre-charge circuit in the EV supply equipment.

在整個預充電階段期間(從 t7 至 t11)，EV 供電設備應以 CVM 操作，來跟隨 EV 的目標電壓，並應限制 B 側之當下電流至 ±2 A DC 之最大值。EV 的目標電流應可予以忽略。

During the entire pre-charge phase (from t7 to t11), the EV supply equipment shall operate in CVM to follow the target voltage of the EV and shall limit the present current at side B to a maximum of ±2 A DC. The target current of the EV shall be ignored.

從預充電階段(t7)開始至 EV 供電設備收到 PowerDeliveryReq <6a>訊息，EV 供電設備應限制 B 側當下電流 < ±20 A peak，包含突波電流及連續電流(若有時)。

From the beginning of the pre-charge phase (t7) until the EV supply equipment receives message PowerDeliveryReq <6a>, the EV supply equipment shall limit the present current at side B to < ±20 A peak, including the inrush current and a continuous current, if any.

從收到 PowerDeliveryReq <6a> 訊息到預充電階段結束 (t10)，EV 供電設備應

From the reception of message PowerDeliveryReq <6a> until the end of the pre-charge phase (t10), the EV supply equipment shall

- 限制 B 側當下電流至 < ±125 A 峰值，包含暫態店流及連續電流(若有時)，及
- limit the present current at side B to < ±125 A peak, including the transient current and a continuous current, if any, and
- 限制 B 側當下電流 > 2 A 的積分值（I > 2 A × t）≤ 3 As。
- limit the integral of the present current at side B > 2 A over time (I > 2 A × t) to ≤ 3 As.

備考 2：當 EV 關閉 EV 斷開裝置，由於電纜供電與電容器，故突波電流為暫態電流，而不是連續性電流。

NOTE 2 The inrush current is the transient current due to the energization of cables and capacitors when the EV closes the EV disconnection device. It is not a continuous current.

備考 3：在 t7 與傳送 PowerDeliveryReq <6a> 訊息間的各個步驟中，EV 可關閉許多 EV 斷開裝置。

NOTE 3 The EV might close several EV disconnection devices in individual steps between t7 and sending message PowerDeliveryReq <6a>.

依 CC.7.5.10 進行具較低電感(例如：最短 B 側電纜之組合)之 EV 供電設備組態

試驗及 CC.7.5.13，來檢查符合性。

Compliance is checked by CC.7.5.10 by testing the EV supply equipment configuration with the lowest inductance (for example, shortest side B cable assembly), and CC.7.5.13.

CC.5.2 睡眠模式及通訊對話之重啟方法

CC.5.2 Sleep mode and communication session restart methods

CC.5.2.1 一般

CC.5.2.1 General

睡眠模式為 EV 供電設備之一個運行模式或 EV 設計用來當通訊對話沒有進行時減少電能消耗。在此情況下，EVCC 或 SECC 可允許不經由數位通訊傳遞訊息。

Sleep mode is an operating mode of the EV supply equipment or EV designed for reduced energy consumption when a communication session is not occurring. In this case, the EVCC or SECC are permitted to not communicate via digital communication.

在 EV 及 EV 供電設備兩者可進入睡眠模式後，EV 可請求暫停通訊對話。此外，EV 供電設備依據電網之行為，可指示 EV 來請求通訊對話暫停。參照 CC.3.5。

The EV can request a pause of the communication session, after which both EV and EV supply equipment can enter sleep mode. Additionally, the EV supply equipment can indicate the EV to request a communication session pause due to the behaviour of the supply network. See CC.3.5.

備考：電網之行為可受到例如：智慧充電設定、供電可用性及/或 DSO 之影響。

NOTE The behaviour of the supply network can be influenced by, for example, smart charging profiles, supply availability and/or DSO.

為重新啟動數位通訊，EV 或 EV 供電設備可執行 CC.5.2.3 及 CC.5.2.4 規定之重新啟動方法。

To restart digital communication, the EV or EV supply equipment can perform a restart method as specified in CC.5.2.3 and CC.5.2.4.

重新啟動方法仍可被使用在錯誤情況後例如：數位通訊喪失，重新啟動數位通訊。

The restart methods can also be used to restart digital communication after an error condition, for example, loss of digital communication.

CC.5.2.2 EV 供電設備之睡眠模式

CC.5.2.2 Sleep mode on the EV supply equipment

EV 供電設備可依 15118-3:2015 支援睡眠模式，依據 6.3.2.101 之選項功能，使電力消耗最小化。

The EV supply equipment may support a sleep mode according to ISO 15118-3:2015 to minimize power consumption as described as an optional function in 6.3.2.101.

EV 供電設備可進入睡眠模式，若

The EV supply equipment may enter a sleep mode, if

- 超過 2 min 連續時間無數位通訊(應用層訊息)，或
- there is no digital communication (application layer messages) for more than 2 consecutive min, or
- EV 依 ISO 15118-2:2014 之 8.4.2 (參照 CC.3.3 及 CC.3.5)，請求通訊對話暫停。
- the EV requests a communication session pause according to ISO 15118-2:2014, 8.4.2 (see CC.3.3 and CC.3.5).

在睡眠模式期間，CP 振盪器或 EV 供電設備應關閉，當 CP 電壓源 $X_S1$ 被啟用。參照 CC.2。

During sleep mode, the CP oscillator of the EV supply equipment shall be off, while the CP voltage source $X_S1$ is enabled (CP state x1). See Clause CC.2.

參照 CC.5.2.4 EV 如何執行 EV 供電設備之喚起或重新啟動通訊對話。

See CC.5.2.4 on how the EV can perform a wake-up of the EV supply equipment or restart a communication session.

CC.5.2.3 由 EV 供電設備之重新啟動

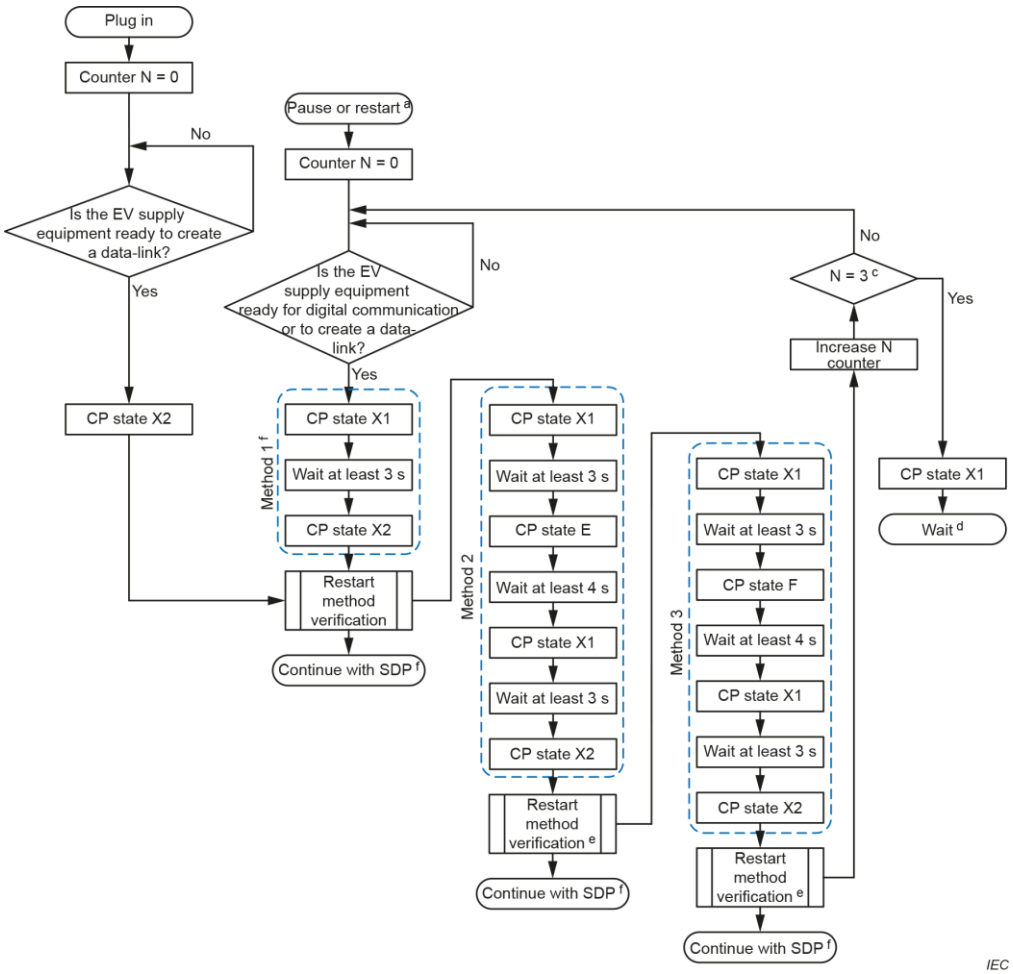
CC.5.2.3 Restart by the EV supply equipment

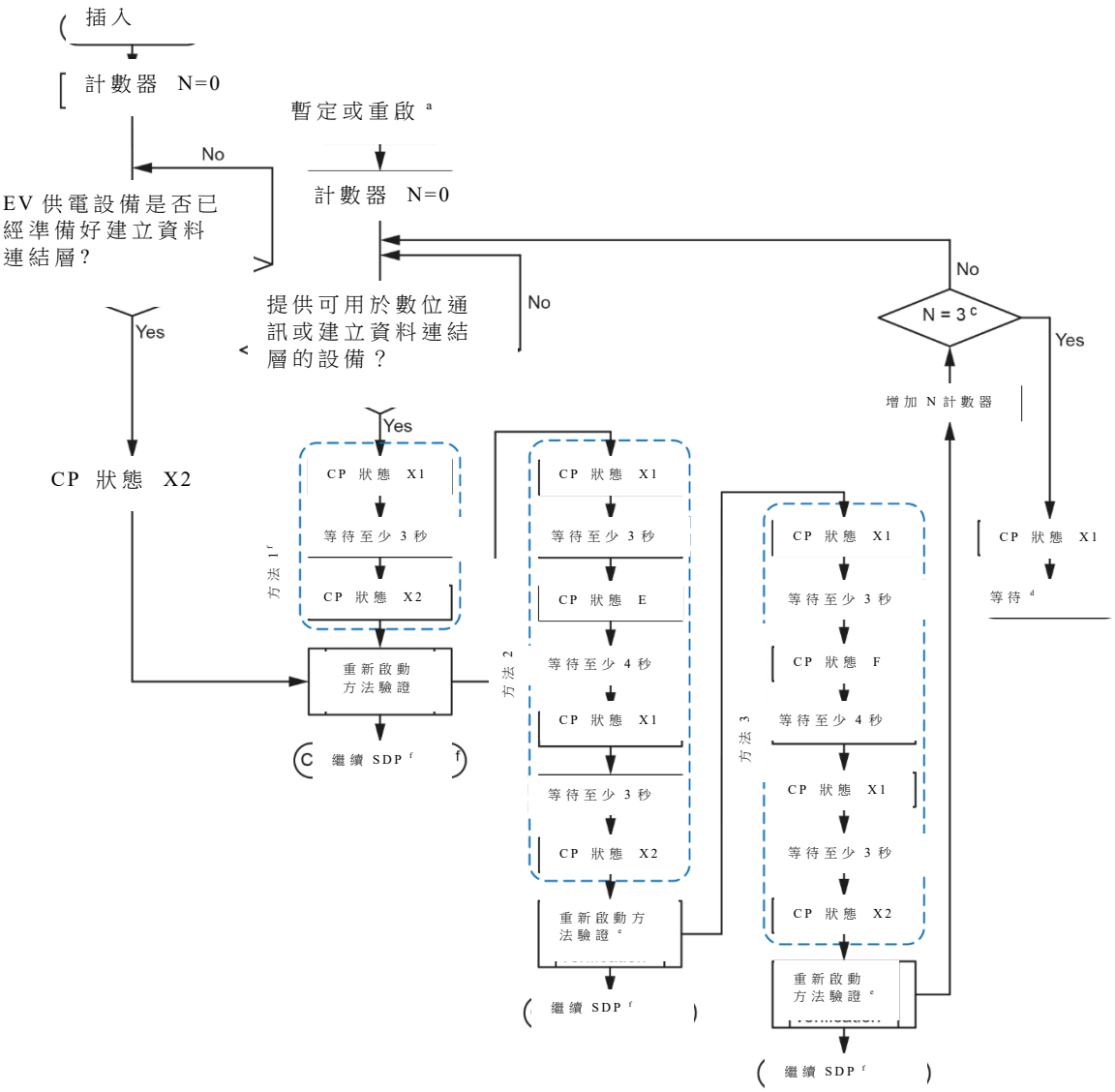
CC.5.2.3.1 一般

CC.5.2.3.1 General

EV 供電設備應執行如圖 CC15 及 CC.5.2.3.2 所述之重新啟動方法。

The EV supply equipment shall perform the restart methods as described in Figure CC.15 and CC.5.2.3.2.


Plug in
Counter N = 0
No
Is the EV supply equipment ready to create a data-link?
Yes
CP state X2
Pause or restart a
Counter N = 0
Is the EV supply equipment ready for digital communication or to create a data-link?
No
Yes
Method 1 f
CP state X1
Wait at least 3 s
CP state X2
Restart method verification
Continue with SDP f
Method 2
CP state X1
Wait at least 3 s
CP state E
Wait at least 4 s
CP state X1
Wait at least 3 s
CP state X2
Restart method verification e
Continue with SDP f
Method 3
CP state X1
Wait at least 3 s
CP state F
Wait at least 4 s
CP state X1
Wait at least 3 s
CP state X2
Restart method verification e
Continue with SDP f
No
N = 3 c
Yes
Increase N counter
CP state X1
Wait d
IEC




[a] EV 可執行 B – C – B 切換來發動重新啟動。

[a] The EV can initiate a restart by performing a B – C – B toggle.

[b] EV 可傳送 SLAC 請求(進入配對流程)來反應或 SDP 訊息，其代表數據連結已經建立。

[b] The EV can react by sending a SLAC request (entering the matching process) or an SDP message, which means that the data link is established.

[c] EV 供電設備製造廠商可規定不同數目之重新啟動循環。

[c] The EV supply equipment manufacturer can specify a different number of restart cycles.

[d] EV 供電設備製造廠商可決定執行額外的重新啟動、睡眠模式或 EV 可決定執行重新啟動。

[d] The EV supply equipment manufacturer can decide to perform additional restarts, sleep mode or the EV can decide to perform a restart.

[e] 圖 CC.16 所述之重新啟動查證方法可繼續進行 SDP 或進行下一個重新啟動方

法。

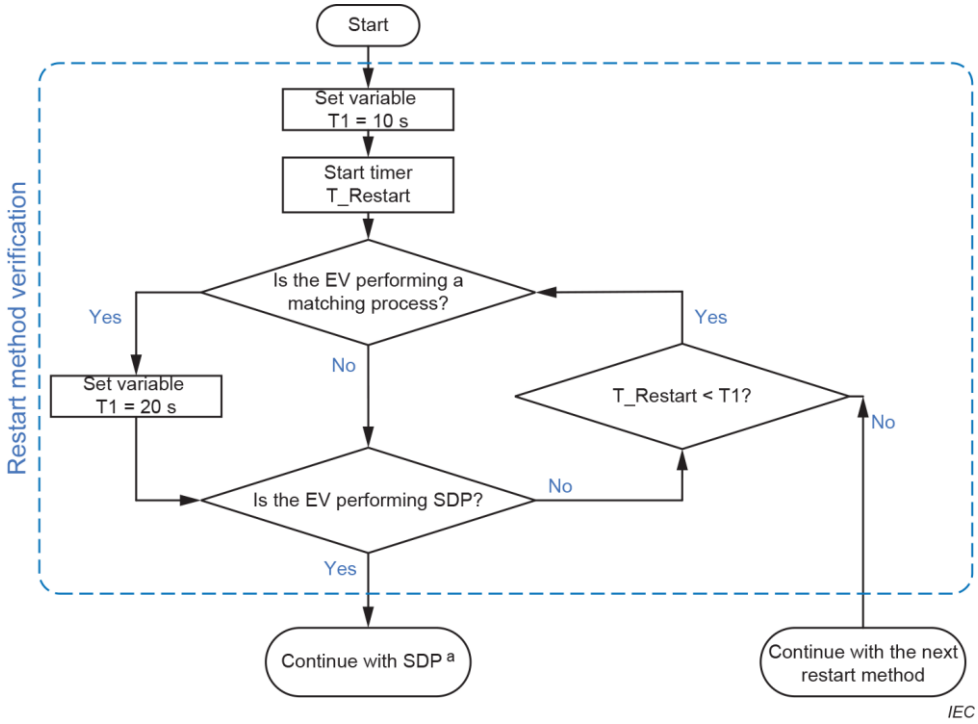
[e] The restart verification method described in Figure CC.16 can either continue with SDP or to the next restart method.

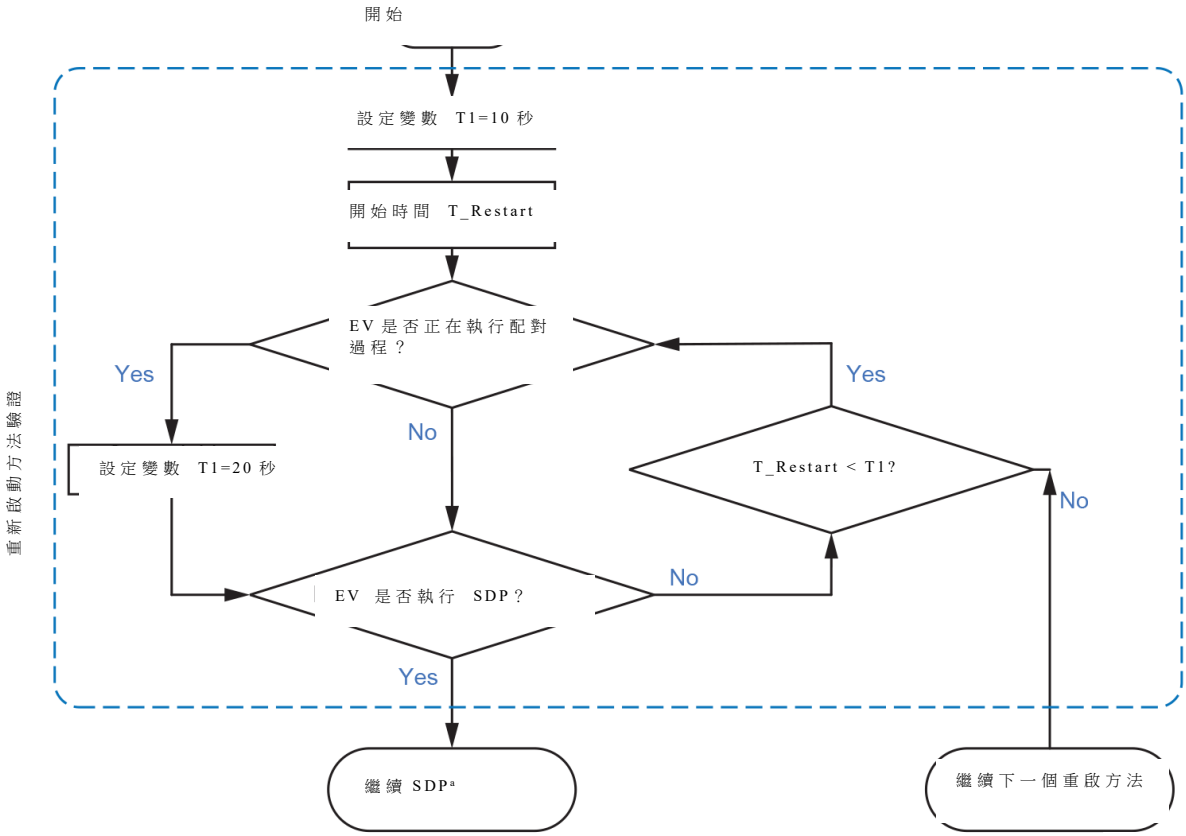
[f] SECC 探索協定。參照 IEC 61851-24。

[f] SECC discovery protocol. See IEC 61851-24.

圖 CC. 15 EV 供電設備重新啟動方法序列

Figure CC.15 – Restart methods sequence for the EV supply equipment






[a] SECC 探索協定。參照 IEC 61851-24。

[a] SECC discovery protocol. See IEC 61851-24.

圖 CC. 16 EV 供電設備重新啟動方法之查證

Figure CC.16 – Restart method verification on the EV supply equipment

若 EV 供電設備已關閉其 CP 振盪器，EV 供電設備，依 IEC 61851-1:2017 之表 A.6 的序列 9.2 ，應於 CP 狀態 x1 停留至少 3 s。

If the EV supply equipment has turned off its CP oscillator, the EV supply equipment shall stay in CP state x1 for 3 s or more according to IEC 61851-1:2017, Table A.6, sequence 9.2.

EV 供電設備於重新啟動方法之間，應至少等待 10 s。

The EV supply equipment shall wait 10 s or more between restart methods.

備考 1：依 DIN SPEC 70121 及 ISO 15118-2:2014，EV 接收配對過程請求之逾時時間為 20 s。參照 DIN SPEC 70121:2014 之表 8，及 ISO 15118-2:2014 之表 Table 111。

NOTE 1 The timeout for the EV supply equipment to receive a matching process request is 20 s for DIN SPEC 70121 and ISO 15118-2:2014. See DIN SPEC 70121:2014, Table 8, and ISO 15118-2:2014, Table 111.

應持續產生 4 s 或更長時間之 CP 狀態 E 或 F。參照 CC.5.2.3.2 之重新啟動方法 (2)及(3)。

The CP states E or F shall be generated for 4 s or more. See CC.5.2.3.2, restart method 2) and 3).

除非 IEC 61851-24 另有規定，若偵測到 CP 狀態 A，EV 供電設備應

Unless specified in IEC 61851-24, if a CP state A is detected, the EV supply equipment should

- 重新設定網路成員金鑰 (NMK)，若其已在使用，及
- reset the network membership key (NMK), if it was already used, and
- 終止已建立之數位通訊連結。
- terminate an established digital communication link.

若收到 D-LINK_TERMINATE.request，EV 供電設備應終止已建立之數位通訊連結，除非 IEC 61851-24 另有規定。

If a D-LINK_TERMINATE.request is received, the EV supply equipment should terminate the established digital communication link, unless specified in IEC 61851-24.

除非 IEC 61851-24 另有規定，若收到 D-LINK_TERMINATE.request 或 DLINK_ERROR.request 時，EV 供電設備應

Unless specified in IEC 61851-24, if a D-LINK_TERMINATE.request or a DLINK_ERROR.request is received, the EV supply equipment should

- 於下一個配對過程不改變 NMK，除非偵測到 CP 狀態 A，及
- not change the NMK in the next matching process, unless a CP state A is detected, and
- 終止已建立之數位通訊連結。
- terminate the established digital communication link.

備考 2：在 ISO 15118 中，若 SessionStopReq <10a> 訊息包含參數 ChargingSession="Terminate"，則傳送 D-LINK_TERMINATE.request。

NOTE 2 In ISO 15118, a D-LINK_TERMINATE.request is sent if message SessionStopReq <10a> contains parameter ChargingSession="Terminate".

在 DIN SPEC 70121 中，規定於 SessionStopReq <10a>訊息中，使用 D-LINK_TERMINATE.request，其意謂著 EV 或 EV 供電設備可選擇是否終止數據連結。亦即建議保持數據連結之運行。

In DIN SPEC 70121, the use of D-LINK_TERMINATE.request is not defined for message SessionStopReq <10a>, meaning the EV or EV supply equipment can choose to terminate the data link or not. It is recommended to keep the data link active.

在 ISO 15118 中，D-LINK_TERMINATE.request 被要求來重新設定 NMK，但在重新啟動或其他情狀執行時，可能導致配對過程不穩定。若 CP 狀態沒有改變至 CP 狀態 A，相同的 EV 連結至相同的 EV 供電設備，其邏輯網路不應改變。

In ISO 15118, a D-LINK_TERMINATE.request is required to reset th NMK, but for restart purposes and other cases, this can lead to unstable matching processes. The logical network should not change if the CP state does not change to CP state A, as

it is the same EV connected to the same EV supply equipment.

CC.5.2.3.2 重新啟動方法

CC.5.2.3.2 Restart methods

若 EV 供電設備欲重新啟動通訊對話，EV 供電設備應執行重新啟動方法(1)，如下：

If the EV supply equipment wants to restart a communication session, the EV supply equipment shall perform restart method 1), as follows.

(1) 依 IEC 61851-1:2017 之 表 A.6 的序列 3.1 規定之 B1 – B2 轉換。參照圖 CC.17 之範例。

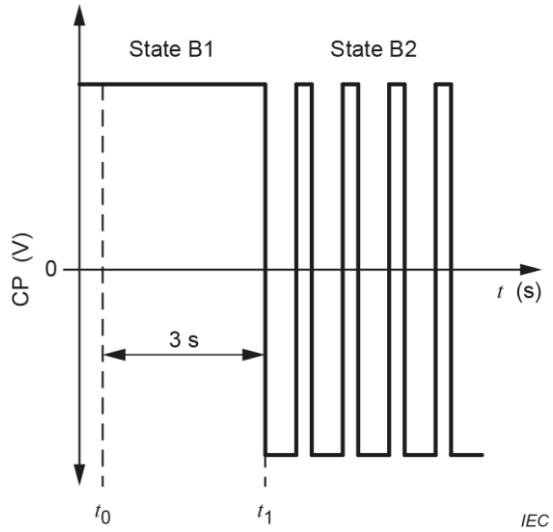
1) B1 – B2 transition according to IEC 61851-1:2017, Table A.6, sequence 3.1. See the example in Figure CC.17.

備考 1：當使用 DIN SPEC 70121 標準，通訊對話重新啟動將產出新的 SessionId。

NOTE 1 When using DIN SPEC 70121, a communication session restart will generate a new SessionId.

備考 2：當使用 ISO 15118-2:2014 標準，通訊對話在暫停後重新啟動將維持先前的 SessionId。若通訊對話被終止，則產出新的 SessionId。

NOTE 2 When using ISO 15118-2:2014, a communication session restart after a pause will maintain the previous SessionId. If a communication session is terminated, a new SessionId will be generated.



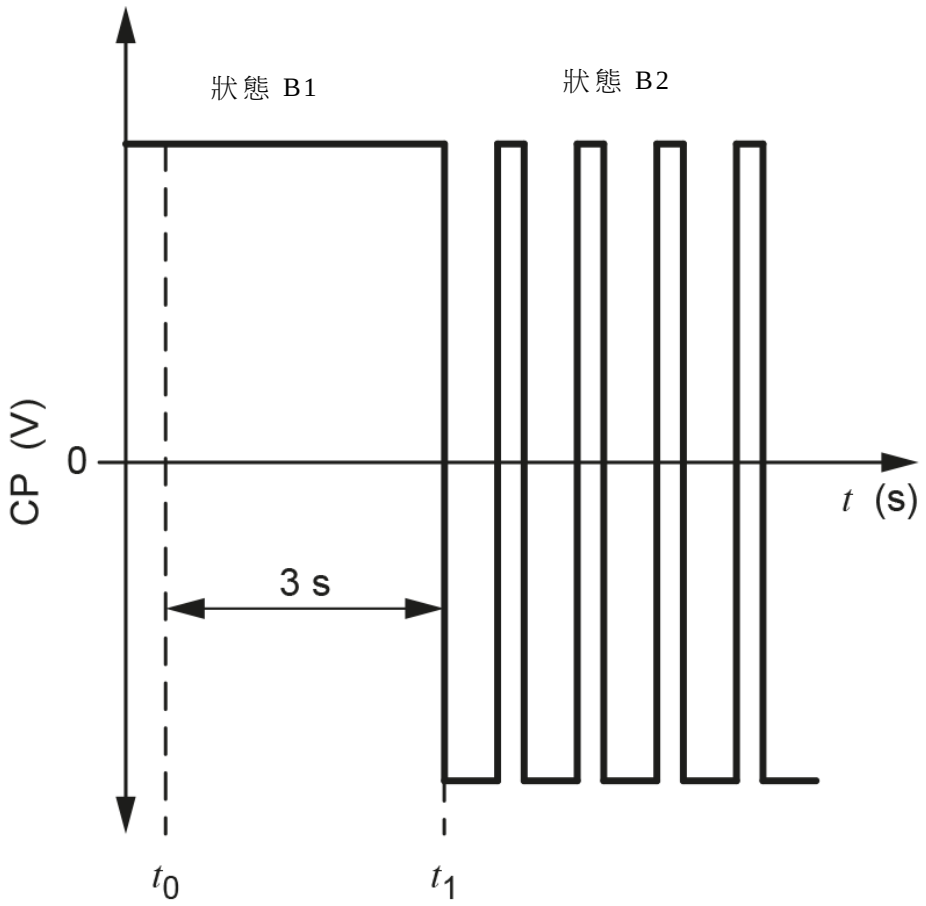



圖 CC. 17 B1 – B2 轉換之範例

Figure CC.17 – Example of a B1 – B2 transition

備考 3：ISO 15118-2 及 ISO 15118-3 要求在錯誤後跳過方法 1，例如：收到 DLINK_ERROR.request。在此並不建議，當執行重新啟動方法 2 或重新啟動方法 3，因 EV 供電設備基於 CP 監控，無法偵測 EV 是否斷開，身份驗證可能會失效。

NOTE 3 ISO 15118-2 and ISO 15118-3 require to skip restart method 1 after an error, for example, receiving a DLINK_ERROR.request. This is not recommended, as authentication can be lost when performing restart method 2 or restart method 3 because the EV supply equipment cannot detect an EV disconnection based on CP monitoring.

此外，監控 PP 電路不是個可用來測定 EV 是否已經連結的可靠方法，因 EV 可能會關閉 PP 的電源，例如：在睡眠模式期間。

Additionally, monitoring the PP circuit is not a reliable method to determine if the EV is connected, as the EV can turn off the PP voltage source, for example, during sleep mode.

當配對於重新啟動序列 1 逾時後，若 EV 不繼續進行配對過程或 SPD，EV 供電設備應執行重新啟動序列 2，如下：

If the EV does not continue with the matching process or SDP when matched after the restart sequence 1 timed out, the EV supply equipment shall perform restart sequence 2, as follows.

(2) IEC 61851-1:2017 之 A.5.3 所述之 B1 – E – B1 – B2 序列。參照圖 CC.18 之範例。

2) B1 – E – B1 – B2 sequence as described in IEC 61851-1:2017, A.5.3. See the example in Figure CC.18.

備考 4：CP 狀態 E 要求 EV 供電設備設定 $X_{S1}$ 為 0 V DC 及無 PWM 信號。

NOTE 4 A CP state E requires the EV supply equipment to set XS1 to 0 V DC and without a PWM signal.

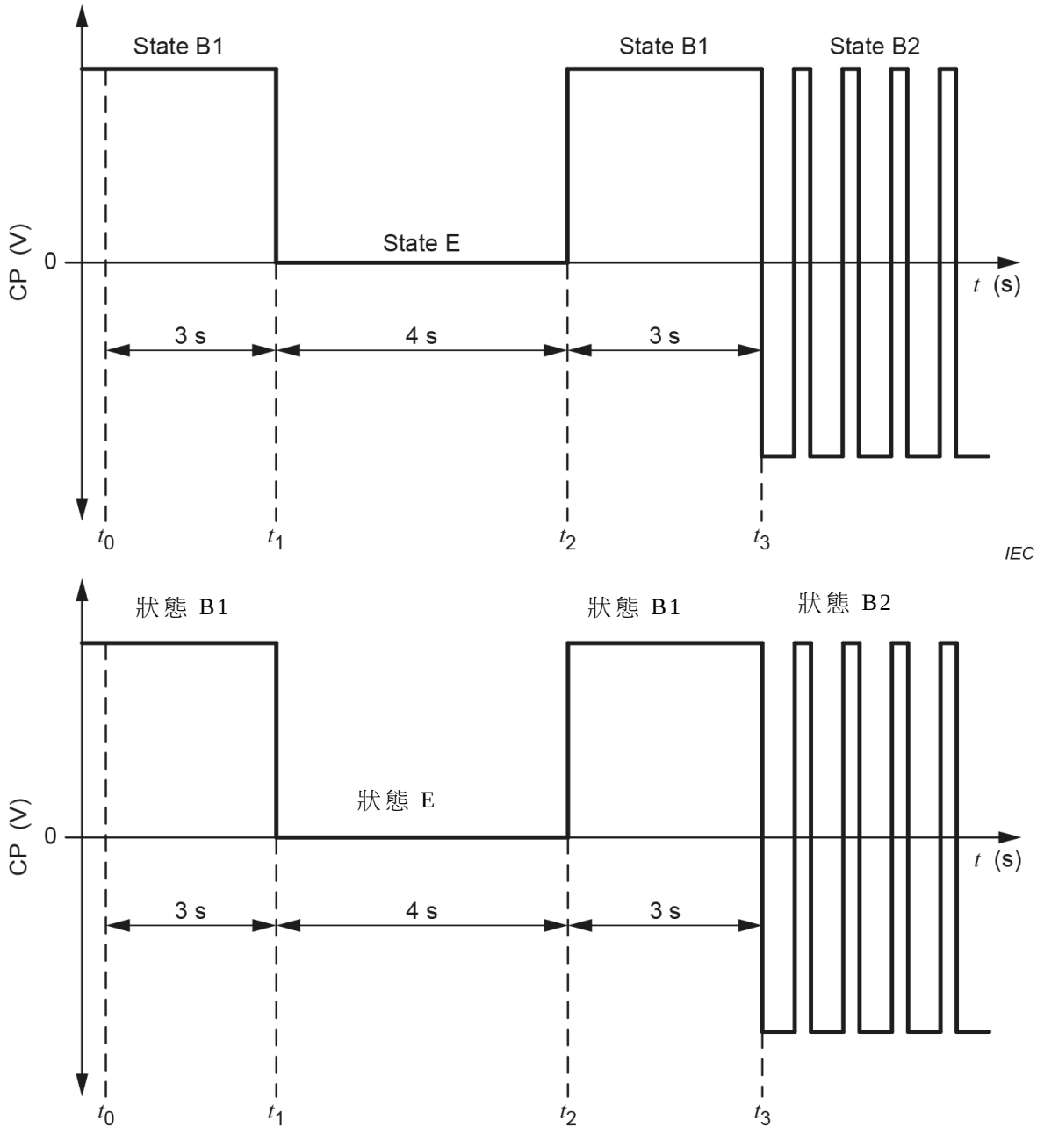


圖 CC. 18 B1 – E – B1 – B2 轉換之範例

Figure CC.18 – Example of a B1 – E – B1 – B2 transition

當配對於重新啟動序列 2 逾時後，若 EV 不繼續進行配對過程或 SPD，EV 供電設備應繼續執行重新啟動序列 3，如下：

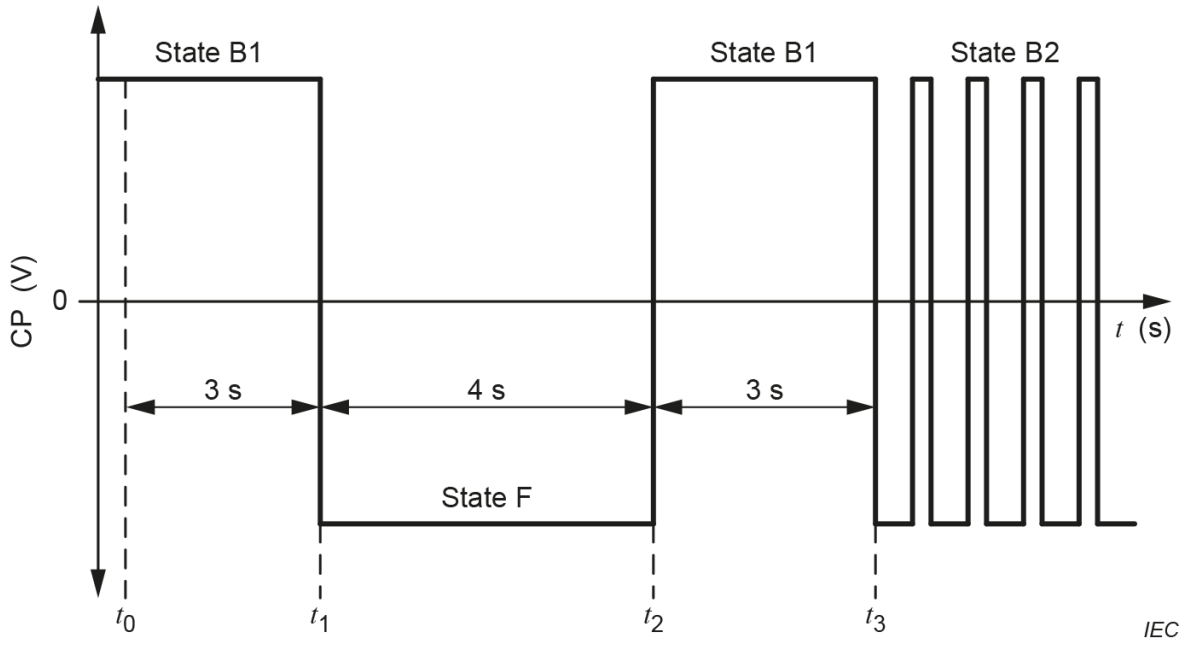
If the EV does not continue with the matching process or SDP when matched after the restart sequence 2 timed out, the EV supply equipment shall continue with restart sequence 3, as follows.

(3) IEC 61851-1:2017 之 A.5.3 所述之 B1 – F – B1 – B2 序列。參照圖 CC.19 之範例。

3) B1 – F – B1 – B2 sequence as described in IEC 61851-1:2017, A.5.3. See the example in Figure CC.19.

備考 5：CP 狀態 F 要求 EV 供電設備設定 $X_{S}1$ PWM 工作週期為 0 %，在 CP 與 PE 間產出 –12 V DC。

NOTE 5 A CP state F requires the EV supply equipment to set the $X_{S}1$ PWM duty cycle to 0 %, generating –12 V DC between CP and PE.



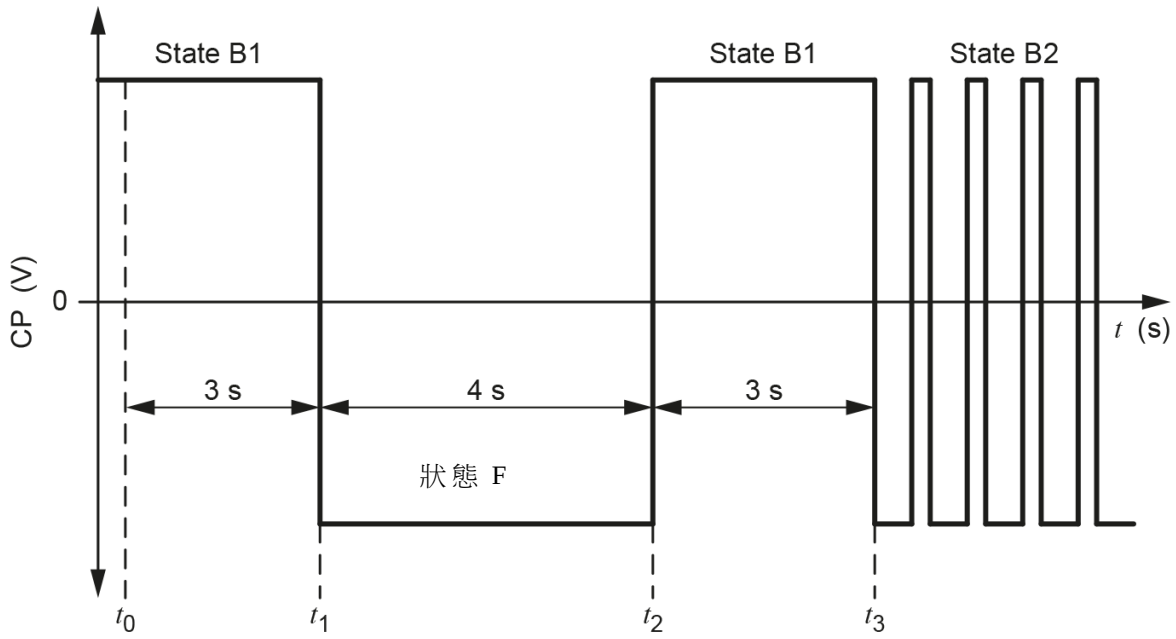



圖 CC.19 B1 – F – B1 – B2 轉換之範例

Figure CC.19 – Example of a B1 – F – B1 – B2 transition

若數據連結於一個重新啟動方法後建立，EV 及 EV 供電設備應

If the data link is established after one of the restart methods, the EV and EV supply equipment shall

- 繼續執行 SDP，或
- continue with SDP, or
- 以新 SLAC 要求重新啟動配對過程。
- restart the matching process with a new SLAC request.

若數據連結在執行所有重新啟動方法後並未啟動，EV 供電設備可執行多次重新啟動方法的序列。

If the data link is not active after performing all the restart methods, the EV supply equipment may perform multiple sequences of the restart methods.

備考 6：若使用 DIN SPEC 70121，相關對話及錯誤處理之額外要求，參照 DIN SPEC 70121:2014 之 9.6。

NOTE 6 If using DIN SPEC 70121, see DIN SPEC 70121:2014, 9.6, for additional requirements related to session and error handling.

備考 7：若使用 ISO 15118 系列標準，重新啟動相關之額外資訊，參照 ISO 15118-3:2015 之 7.5 及 IEC 61851-1:2017 之 A.5.3。睡眠模式相關之額外要求，參照 ISO 15118-3:2015 之 7.6。

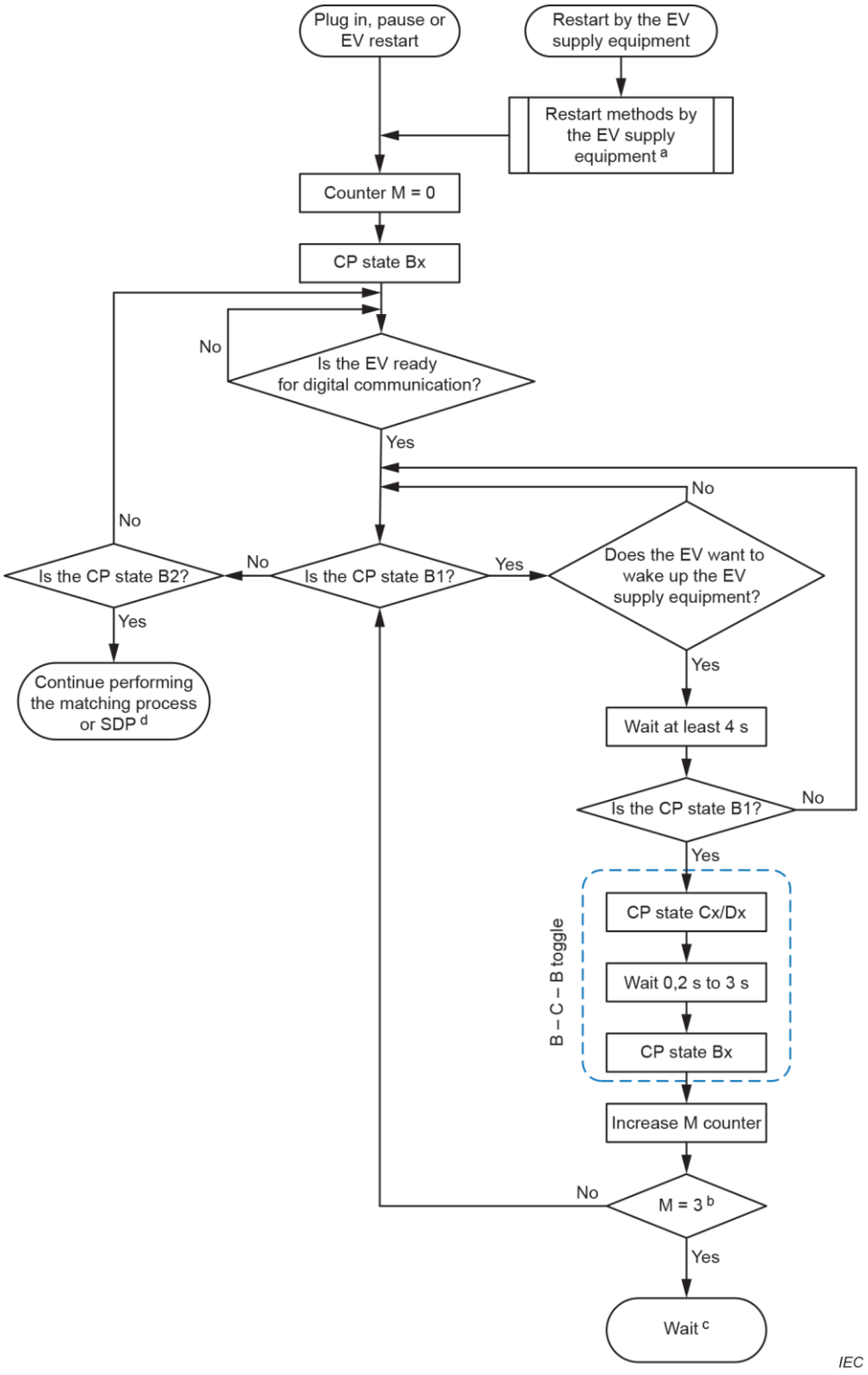
NOTE 7 If using the ISO 15118 series, see ISO 15118-3:2015, 7.5, and IEC 61851-1:2017, A.5.3, for additional information regarding the restart sequences. See ISO 15118-3:2015, 7.6, for additional requirements related to sleep mode.

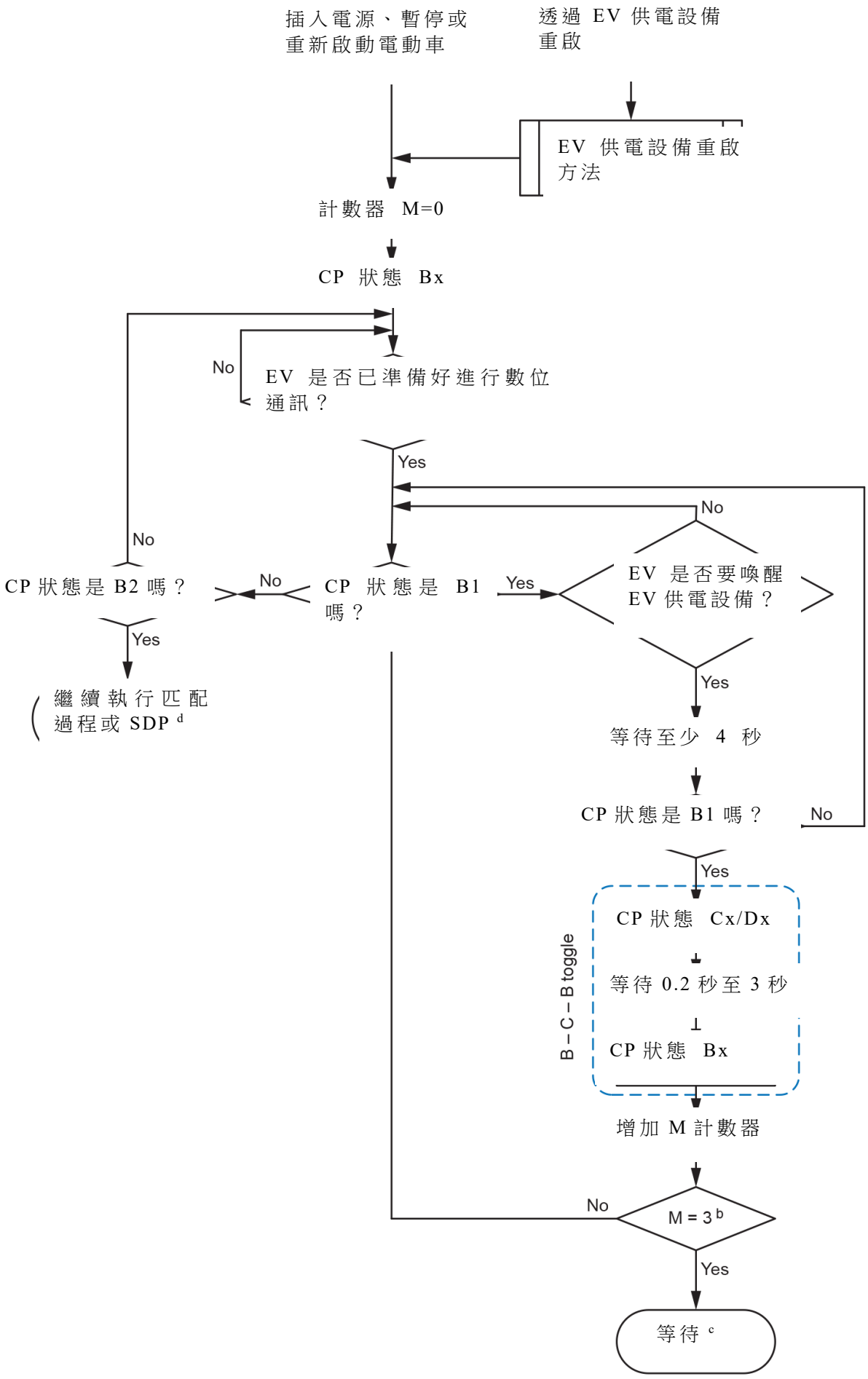
CC.5.2.4 由 EV 之重新啟動

CC.5.2.4 Restart by the EV

EV 應依循之重新啟動序列如圖 CC.20 所示。

The EV shall follow the restart sequence as shown in Figure CC.20.




插入電源、暫停或
重新啟動電動車
透過 EV 供電設備
重啟
EV 供電設備重啟
方法
計數器 M=0
CP 狀態 Bx
No
EV 是否已準備好進行數位
通訊？
Yes
No
CP 狀態是 B2 嗎？
No
CP 狀態是 B1
嗎？
Yes
EV 是否要喚醒
EV 供電設備？
Yes
繼續執行匹配
過程或 SDP d
等待至少 4 秒
CP 狀態是 B1 嗎？
No
Yes
B－C－B toggle
CP 狀態 Cx/Dx
等待 0.2 秒至 3 秒
CP 狀態 Bx
增加 M 計數器
No
M = 3 b
Yes
等待 c

[a] EV 供電設備可執行圖 CC.15 之不同重新啟動方法來喚醒 EV。

[a] The EV supply equipment may perform different restart methods to wake up the EV, according to Figure CC.15

[b] EV 製造廠商可規定不同數目的重新啟動循環。

[b] The EV manufacturer can specify a different number of restart cycles

[c] EV 製造廠商可執行額外的重新啟動，進行睡眠模式或 EV 供電設備可決定來執行重新啟動。

[c] The EV manufacturer can perform additional restarts, enter sleep mode or the EV supply equipment can decide to perform a restart

[d] SECC 探索協定。 參照 IEC 61851-24。

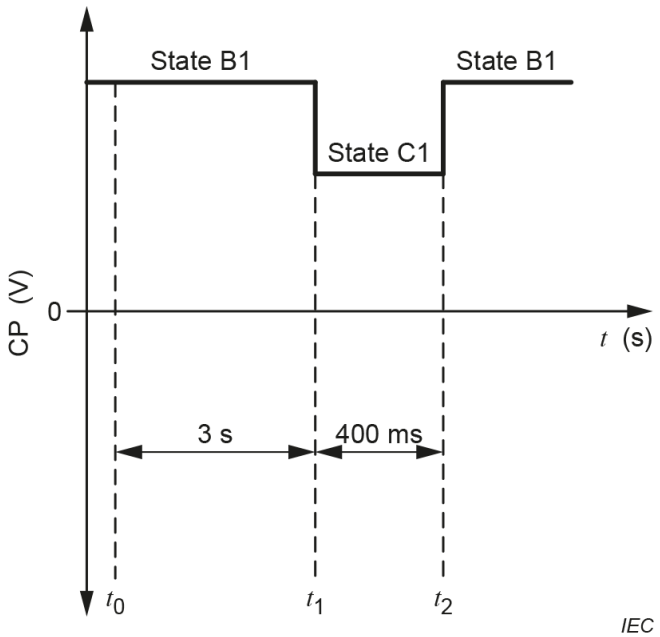
[d] SECC discovery protocol. See IEC 61851-24.

圖 CC.20 EV 重啟動方法序列

Figure CC.20 – Restart methods sequence for the EV

EV 可依 IEC 61851-1:2017 之 Table A.6 的序列 11，使用 B1 – C1 – B1 或 B1 – D1 – B1 的切換方式與 EV 供電設備重新啟動數位通訊。參照圖 CC.21 之範例。

The EV may restart the digital communication with the EV supply equipment by using a B1 – C1 – B1 or B1 – D1 – B1 toggle according to IEC 61851-1:2017, Table A.6, sequence 11. See the example in Figure CC.21.



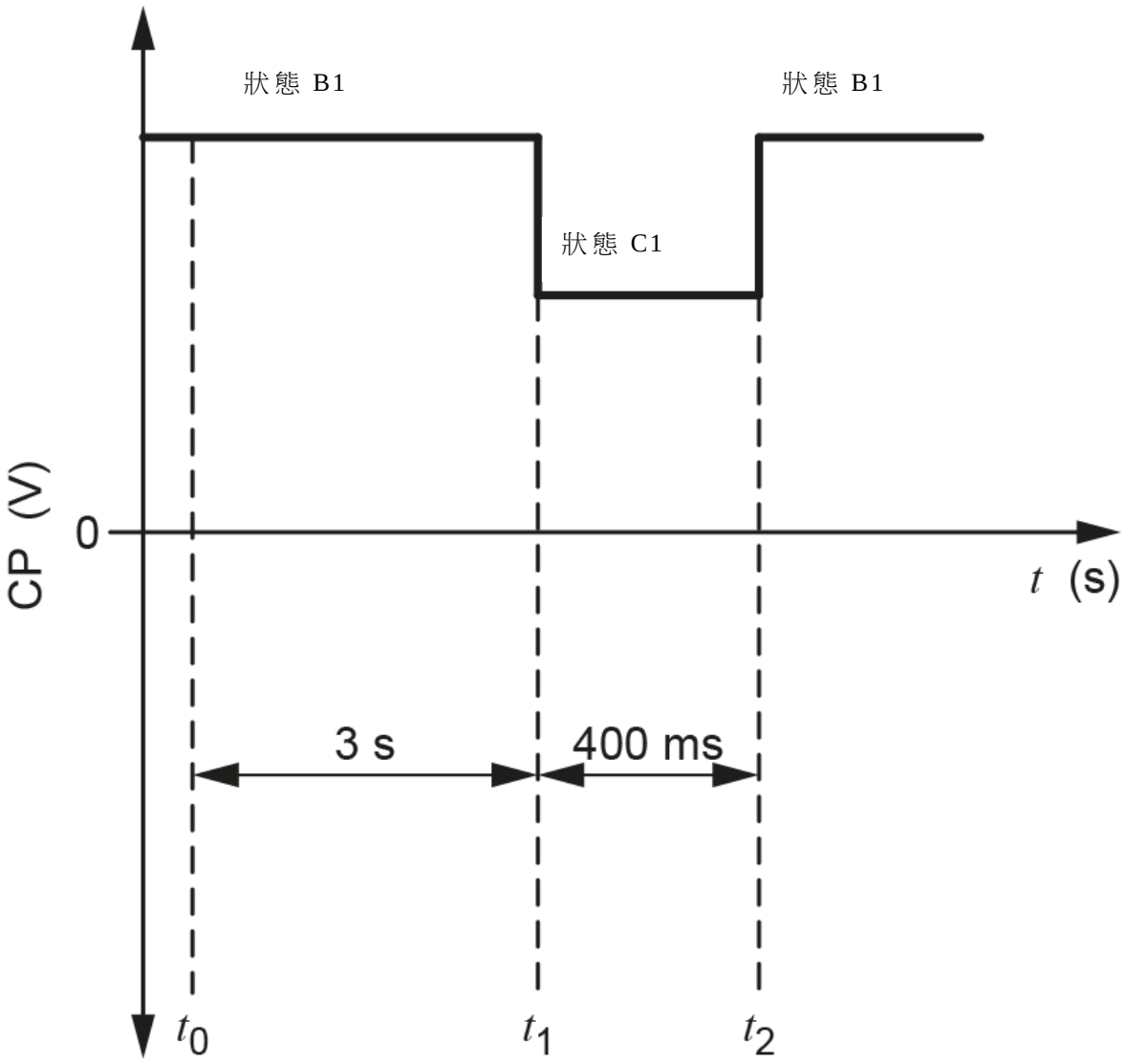



圖 CC. 21 B – C – B 切換範例

Figure CC.21 – Example of a B – C – B toggle

在成功重新啟動後，EV 供電設備應啟用 CP 振盪器，並將工作週期設定為 5% 。

After a successful restart, the EV supply equipment shall enable the CP oscillator with a duty cycle of 5 %.

若 EV 供電設備暫停了通訊對話(參照 CC.3.5)，EV 應等待直到 EV 供電設備執行重新啟動方法，才能繼續通訊對話。當 EV 供電設備處於睡眠模式，則允許 EV 終止通訊對話。

If the EV supply equipment generated a pause of the communication session (see CC.3.5), the EV shall wait until the EV supply equipment performs a restart method to continue the communication session. The EV is allowed to terminate the communication session while the EV supply equipment is in sleep mode.

備考：若 EV 偵測到 CP 狀態從狀態 E 改變至狀態 Bx，其 CP 狀態 E 持續時間超

過重新啟動方法 2 規定的 4 s ，EV 供電設備可能在重新啟動，例如：因 A 側斷電所致。

NOTE If the EV detects a CP state change from state E to state Bx, where CP state E had a duration more than the 4 s defined for restart method 2, the EV supply equipment might be restarting, for example, due to power loss on side A.

睡眠模式相關之額外要求，參照 ISO 15118-3:2015 之 7.6。

See ISO 15118-3:2015, 7.6, for additional requirements related to sleep mode.

依 CC.7.5.3 檢查符合性。

Compliance is checked by CC.7.5.3.

CC.5.3 組態 EE 車輛端插頭閂鎖位置開關($S_S3$)之啟動

CC.5.3 Configuration EE vehicle connector latch position switch ($S_S3$) activation

當車輛端插頭被車輛端插座鎖定時，組態 EE 之車輛端插頭的閂鎖位置開關(SS3)不應可被啟動。

Latch position switch ($S_S3$) of the configuration EE vehicle connector shall not be able to be actuated when the vehicle connector is locked to the vehicle inlet.

備考 1：在閂鎖鎖定容許差範圍內，車輛端插頭製造商應負責 $S_S3$ 不應被啟動。

NOTE 1 Non-actuation of $S_S3$ in the given tolerances of the latch locking is the responsibility of the vehicle connector manufacturer.

IEC 62196-3:2022 之資料表 3-IIIc 中，提供對閂鎖裝置位置之要求，使其在使用時能符合規定。

IEC 62196-3:2022, standard sheet 3-IIIc, provides location requirements of the locking device to be used to meet this requirement.

備考 2：基於車輛端插頭與車輛端插座之機械容許差，當閂鎖維持鎖定時，$S_S3$ 開關也有可能被壓下，且偵測為開啟。

NOTE 2 Due to mechanical tolerances between the vehicle connector and vehicle inlet, it is possible that, while the latch remains locked, the $S_S3$ switch is pressed and detected as open.

CC.5.4 組態 EE 車輛端插頭閂鎖位置開關($S_S3$)之查證

CC.5.4 Configuration EE vehicle connector latch position switch (SS3) verification

僅在 EV 供電設備偵測到閂鎖位置開關($S_S3$)處於閉合時，才能允許進行通訊對話。

A communication session shall only be allowed once the EV supply equipment has detected that the latch position switch ($S_S3$) is in closed position.

在通訊對話期間，若 EV 供電設備偵測 SS3 開關斷開，EV 供電設備可視此為來自使用者請求暫停的事件。

If, during a communication session, the EV supply equipment detects the SS3 switch open, the EV supply equipment may consider this event as a stop request from the

user.

備考 1：SAE J1772 中規定當 $S_S3$ 開關閉合時，車輛耦合器之 PP 電壓應在 1.23 V DC 與 1.82 V DC 之間。當 $S_S3$ 開關斷開時，車輛耦合器之 PP 電壓應在 2.38 V DC 與 3.16 V DC 之間。參照表 CC.3。

NOTE 1 SAE J1772:—9 specifies the PP voltage at the vehicle coupler when the $S_S3$ switch is closed is between 1,23 V DC and 1,82 V DC. When the $S_S3$ switch is open, the PP voltage at the vehicle coupler is between 2,38 V DC and 3,16 V DC. See Table CC.3.

備考 2：SAE J2953/1:2019 中規定當 $S_S3$ 開關閉合時，車輛耦合器之 PP 電壓應在 1.30 V DC 與 1.72 V DC 之間。當 $S_S3$ 開關斷開時，車輛耦合器之 PP 電壓應在 2.51 V DC 與 3.01 V DC 之間。

NOTE 2 SAE J2953/1:2019 specifies the PP voltage at the vehicle coupler when the SS3 switch is closed is between 1,30 V DC and 1,72 V DC. When the SS3 switch is open, the PP voltage as the vehicle coupler is between 2,51 V DC and 3,01 V DC.

備考 3：EV 供電設備可要求使用者身份驗證，來發動正常的停機序列。

NOTE 3 The EV supply equipment can require user authentication to initiate the normal shutdown sequence.

以設計審查來檢查符合性，以查證其具備偵測 $S_S3$ 狀態的功能，及若 $S_S3$ 未處於閉合位置時，防止啟動通訊對話。

Compliance is checked by design review to verify that a function is provided to detect the state of $S_S3$ and prevent the start of a communication session if $S_S3$ is not in the closed position.

CC.5.5 操作範圍之處理

CC.5.5 Handling of operating ranges

CC.5.5.1 一般

CC.5.5.1 General

EV 供電設備之目標電流、目標電壓及目標功率為 B 側預期之當下電流、電壓及功率。依據模式(參照 CC.5.7)及在操作範圍內(參照 102.2.5)之操作點，EV 供電設備 B 側之當下電流及/或電壓將為這些目標值之一個或多個數值。

The target current, target voltage and target power of the EV supply equipment are the intended present current, voltage and power at side B. Depending on the mode (see CC.5.7) and the operating point between the operating range (see 102.2.5), the present current and/or voltage at side B of the EV supply equipment will be at one or more of these targets.

在正常情況下，EV 目標電壓及 B 側當下電壓之關係如公式(CC.2)所式。

The relationship between the target voltage of the EV and the present voltage at side

B is shown in Formula (CC.2), under normal conditions.

$$V_{EVSE_Out} \leq V_{EVSE_Target} + |V_{Deviation}| + |V_{Ripple}| \qquad \text{(CC.2)}$$

其中

where

$V_{EVSE_Target}$ EV 供電設備 B 側之目標電壓(單位：V)；

$V_{EVSE_Target}$ is the target voltage of the EV supply equipment at side B, expressed in volts;

$V_{EVSE_Out}$ B 側之當下電壓(單位：V)；

$V_{EVSE_Out}$ is the present voltage at side B, expressed in volts;

$V_{Deviation}$ 依 101.1.2.2 規定之 B 側當下電壓的偏差值(單位：V)；

$V_{Deviation}$ is the deviation on the present voltage at side B as defined in 101.1.2.2, expressed in volts;

$V_{Ripple}$ 依 101.1.6 之規定 B 側當下電壓的漣波電壓(單位：V)。

$V_{Ripple}$ is the voltage ripple on the present voltage at side B as defined in 101.1.6, expressed in volts.

在正常情況及於 101.1.3 規定之控制延遲後，EV 供電設備之目標電流與 B 側當下電流之關係如公式(CC.3)所示。

The relationship between the target current of the EV supply equipment and the present current at side B is shown in Formula (CC.3), under normal conditions and after the control delay specified in 101.1.3.

$$I_{EVSE_Out} \leq I_{EVSE_Target} + |I_{Deviation}| + |I_{Ripple}| \quad \text{if } I_{EVSE_Target} > 0A \qquad \text{(CC.3)}$$

其中

where

$I_{EVSE_Target}$ EV 供電設備 B 側之目標電流(單位：A)；

$I_{EVSE_Target}$ is the target current of the EV supply equipment at side B, expressed in ampere;

$I_{EVSE_Out}$ B 側之當下電流(單位：A)；

$I_{EVSE_Out}$ is the present current at side B, expressed in ampere;

$I_{Deviation}$ 依 CC.6.3 規定之 B 側當下電流的偏差值(單位：A)；

$I_{Deviation}$ is the deviation on the present current at side B as defined in CC.6.3, expressed in ampere;

$I_{Ripple}$ 依 101.1.5 規定之 B 側當下電流的漣波電流(單位：A)。

$I_{Ripple}$ is the current ripple on the present current at side B as defined in 101.1.5, expressed in ampere.

EV 供電設備之目標功率與 B 側當下功率之關係目前進行研議中。
The relationship between the target power of the EV supply equipment and the present power at side B is under consideration.

CC.5.5.2 電能傳輸期間之 0 A 模式
CC.5.5.2 0 A mode during energy transfer

若 EV 供電設備於 B 側無法傳送任何電流，EV 供電設備應於下一個通訊訊息中，傳送 EV 供電設備 B 側可應用最大電流為 0 A 至 EV。由 EV 供電設備所發動之 0 A 模式，不應觸發 EV 之立即停機。EV 應繼續通訊對話至少 5 min。
If the EV supply equipment cannot deliver any current at side B, the EV supply equipment shall send 0 A as its applicable maximum current of the EV supply equipment at side B to the EV within the next communicated message. The 0 A mode initiated by the EV supply equipment shall not trigger an immediate shutdown by the EV. The EV should continue the communication session for 5 min or more.
若 EV 目標電流為 0 A DC 或 EV 供電設備 B 側之可應用最大電流為 0 A，EV 供電設備應降低並維持 B 側當下電流 < 0.15 A DC、下限為 – 0.15 A DC，以防止 EV 對 EV 供電設備進行再功率傳輸(RPT)。參照公式(CC.4)。參照 CC.5.5.7 有關 EV 之 0 A 目標電流及 101.1.3 之控制延遲要求。
If the target current of the EV is 0 A DC or the applicable maximum current of the EV supply equipment at side B is 0 A, then the EV supply equipment shall reduce and maintain the present current at side B < 0,15 A DC with a minimum of –0,15 A DC, to prevent RPT from the EV to the EV supply equipment. See Formula (CC.4). See CC.5.5.7 regarding the 0 A target current of the EV and 101.1.3 for the control delay requirements.

備考： 0 A 模式用於在 B 側無當下電流，暫時持續進行電能傳輸階段。例如：當電網出現電力波動或暫時無電可用時。
NOTE The 0 A mode is used to temporarily continue with the energy transfer phase without a present current at side B. For example, when there are power fluctuations in the supply network, or there is no power available.

在 0 A 模式及於 101.1.3 規定之控制延遲後，EV 供電設備 B 側之目標電流與 B 側當下電流之關係如公式(CC.4)所示。
The relationship between the target current of the EV supply equipment at side B and the present current at side B is shown in Formula (CC.4), during the 0 A mode and after the control delay specified in 101.1.3.

$$-0{,}15\ \text{A} \leq I_{\text{EVSE_Out}} \leq 0{,}15\ \text{A}$$

(CC.4)

若 $I_{EVSE_Target} = 0$ A

其中

where

$I_{EVSE_Target}$ EV 供電設備 B 側之目標電流(單位：A)；

$I_{EVSE_Target}$ is the target current of the EV supply equipment at side B, expressed in ampere;

$I_{EVSE_Out}$ EV 供電設備 B 側之當下電流(單位：A)。

$I_{EVSE_Out}$ is the present current at side B, expressed in ampere.

CC.5.5.3 變動 EV 供電設備 B 側可用最高電壓

CC.5.5.3 Changing the applicable maximum voltage of the EV supply equipment at side B

EV 供電設備應於上一個 ChargeParameterDiscoveryReq/Res 訊息中傳遞，來限制 EV 供電設備 B 側適用之最高電壓為協議最高電壓 B 側。參照公式(CC.5)。

The EV supply equipment shall limit the applicable maximum voltage of the EV supply equipment at side B to the negotiated maximum voltage at side B, as communicated in the last ChargeParameterDiscoveryReq/Res messages. See Formula (CC.5).

$$V_{EVSE_MAX} \leq V_{EVSE_MAX_CPD} \quad \text{(CC.5)}$$

其中

where

$V_{EVSE_MAX}$ EV 供電設備 B 側可用最高電壓(單位：V)；

$V_{EVSE_MAX}$ is the applicable maximum voltage of the EV supply equipment at side B, expressed in volts;

$V_{EVSE_MAX_CPD}$ 上一個 ChargeParameterDiscoveryRes 訊息所傳遞協議最高電壓 B 側(單位：V)。

$V_{EVSE_MAX_CPD}$ is the negotiated maximum voltage at side B, communicated in the last ChargeParameterDiscoveryRes, expressed in volts.

CC.5.5.4 變動 EV 供電設備 B 側可用最大電流

CC.5.5.4 Changing the applicable maximum current of the EV supply equipment at side B

若 EV 供電設備 B 側可用最大電流小於 EV 目標電流，則 B 側當下電流可小於 EV 目標電流。

The present current at side B can be less than the target current of the EV if the

applicable maximum current of the EV supply equipment at side B is less than the target current of the EV.

EV 供電設備應於下一個通訊訊息中傳遞其 B 側可用最大電流的變動。

The EV supply equipment shall communicate the change of applicable maximum current of the EV supply equipment at side B in the next communicated message.

EV 供電設備 B 側應限制其可用最大電流為協議最大電流 B 側，其應於下一個 ChargeParameterDiscoveryReq/Res 訊息中進行傳遞。參照公式(CC.6。

The EV supply equipment shall limit the applicable maximum current of the EV supply equipment at side B to the negotiated maximum current at side B which is communicated within the ChargeParameterDiscoveryReq/Res messages. See Formula (CC.6).

$$I_{EVSE_MAX} \leq I_{EVSE_MAX_CPD} \qquad (CC.6)$$

其中

where

$I_{EVSE_MAX}$ EV 供電設備 B 側可用最大電流(單位：A)

$I_{EVSE_MAX}$ is the applicable maximum current of the EV supply equipment at side B, expressed in ampere;

$I_{EVSE_MAX_CPD}$ 上一個 ChargeParameterDiscoveryRes 訊息所傳遞 EV 供電設備 B 側協議最大電流(單位：A)。

$I_{EVSE_MAX_CPD}$ is the negotiated maximum current at side B, communicated in the last ChargeParameterDiscoveryRes message, expressed in ampere.

CC.5.5.5 變動 EV 供電設備 B 側可用最大功率

CC.5.5.5 Changing the applicable maximum power of the EV supply equipment at side B

EV 供電設備 B 側應限制其可用最大功率為協議最大功率 B 側，其應於下一個 ChargeParameterDiscoveryReq/Res 訊息中進行傳遞。參照公式(CC.7)。

The EV supply equipment shall limit the applicable maximum power of the EV supply equipment at side B to the negotiated maximum power at side B, as communicated in the last ChargeParameterDiscoveryReq/Res messages. See Formula (CC.7).

$$P_{EVSE_MAX} \leq P_{EVSE_MAX_CPD} \qquad (CC.7)$$

其中

$P_{EVSE_MAX}$ EV 供電設備 B 側適用之最大功率(單位：W)；

$P_{EVSE_MAX}$ is the applicable maximum power of the EV supply equipment at side B, expressed in watts;

$P_{EVSE_MAX_CPD}$ 上一個 ChargeParameterDiscoveryRes 訊息所傳遞 EV 供電設備 B 側協議最大功率(單位：W)。

$P_{EVSE_MAX_CPD}$ is the negotiated maximum power at side B, communicated in the last ChargeParameterDiscoveryRes message, expressed in watts.

若 EV 供電設備 B 側適用之最大功率下降至小於 B 側之當下功率時，允許 EV 供電設備減少 B 側電流至小於 EV 之目標電流。參照 CC.5.5.6。

The EV supply equipment is allowed to reduce the present current at side B to less than the target current of the EV if the applicable maximum power of the EV supply equipment at side B drops to a value less than the present power at side B. See CC.5.5.6.

EV 供電設備應於下一個通訊訊息中，傳遞 EV 供電設備 B 側適用之最大功率的變動。

The EV supply equipment shall communicate the change of applicable maximum power of the EV supply equipment at side B in the next communicated message.

CC.5.5.6 B 側當下電流小於 EV 目標電流

CC.5.5.6 The present current at side B is less than the target current of the EV

若 B 側之當下電流小於 EV 之目標電流，EV 應不觸發停機。

The EV shall not trigger a shutdown if the present current at side B is less than the target current of the EV.

備考：B 側當下電流的減少，可能是由於電網電壓下降、CVM 或 EV 供電設備 B 側適用最大電流之變動所引起。參照 CC.5.5.4。

NOTE This decrease in present current at side B can be caused by supply network dips, CVM or a change in applicable maximum current of the EV supply equipment at side B. See CC.5.5.4.

CC.5.5.7 EV 目標電流小於 EV 供電設備 B 側可用最小電流

CC.5.5.7 The target current of the EV is less than the applicable minimum current of the EV supply equipment at side B

當 EV 目標電流小於 EV 供電設備 B 側可用最小電流，EV 供電設備應啟用 0 A 模式(參照 CC.5.5.2)，就如同 EV 之目標電流為 0 A。參照公式(CC.8)。

The EV supply equipment shall enable 0 A mode (see CC.5.5.2), as if the target current of the EV were 0 A, when the target current of the EV is less than the applicable minimum current of the EV supply equipment at side B. See Formula (CC.8).

$$I_{EVSE_Target} = 0\ A$$

(CC.8)

若 $I_{EV_Req} < I_{EVSE_MIN}$

其中

where

$I_{EVSE_Target}$ EV 供電設備 B 側之目標電流(單位：A)；

$I_{EVSE_Target}$ is the target current of the EV supply equipment at side B, expressed in ampere;

$I_{EVSE_MIN}$ EV 供電設備 B 側可用最小電流(單位：A)；

$I_{EVSE_MIN}$ is the applicable minimum current of the EV supply equipment at side B, expressed in ampere;

$I_{EV_Req}$ EV 之目標電流(單位：A)；

$I_{EV_Req}$ is the target current of the EV, expressed in ampere

CC.5.5.8 EV 之目標電流大於 EV 供電設備 B 側可用最大電流

CC.5.5.8 The target current of the EV is more than the applicable maximum current of the EV supply equipment at side B

若 EV 之目標電流大於 EV 供電設備 B 側可用最大電流或 EV 可用最大電流，EV 供電設備應繼續通訊對話，傳遞 EV 供電設備 B 側可用最大電流或 EV 可用最大電流，取其較小者。參照公式(CC.9)。

The EV supply equipment shall continue the communication session with the applicable maximum current of the EV supply equipment at side B or the applicable maximum current of the EV, whichever is less, if the target current of the EV is more than the applicable maximum current of the EV supply equipment at side B or the applicable maximum current of the EV. See Formula (CC.9).

$$I_{EVSE_Target} = min(I_{EV_MAX}, I_{EVSE_MAX})$$

(CC.9)

若 $I_{EV_Req} > min(I_{EV_MAX}, I_{EVSE_MAX})$

其中

where

$I_{EVSE_Target}$ EV 供電設備 B 側之目標電流(單位：A)；

$I_{EVSE_Target}$ is the target current of the EV supply equipment at side B, expressed in ampere;

$I_{EVSE_MAX}$ EV 供電設備 B 側可用最大電流(單位：A)；

$I_{EVSE_MAX}$ is the applicable maximum current of the EV supply equipment at side B, expressed in ampere;

$I_{EV_MAX}$ EV 可用最大電流(單位：A)；

$I_{EV_MAX}$ is the applicable maximum current of the EV, expressed in

ampere;

$I_{EV_Req}$ EV 目標電流(單位：A)。

$I_{EV_Req}$ is the target current of the EV, expressed in ampere.

備考：EV 可請求 EV 之目標電流高於 EV 供電設備 B 側可用最大電流，來指示 EV 供電設備 EV 可以耐受 B 側較高的當下電流。

NOTE The EV can request a target current of the EV higher than the applicable maximum current of the EV supply equipment at side B, to indicate the EV supply equipment that the EV can withstand a higher present current at side B.

CC.5.5.9 EV 目標電壓小於 B 側當下電壓

CC.5.5.9 The target voltage of the EV is less than the present voltage at side B

當 EV 目標電壓小於 B 側之當下電壓，EV 供電設備應啟用 0A 模式(參照 see CC.5.5.2)，如同 EV 目標電流為 0 A，以防止 RPT(參照 101.1)。參照公式(CC.10)。

The EV supply equipment shall enable 0 A mode (see CC.5.5.2), as if the target current of the EV were 0 A, when the target voltage of the EV is less than the present voltage at side B, to prevent RPT (see 101.1). See Formula (CC.10).

$$I_{EVSE_Target} = 0\ A \qquad (CC.10)$$

若 $V_{EV_Req} < V_{EVSE_Out}$

其中

$I_{EVSE_Target}$ EV 供電設備 B 側之目標電流(單位：A)；

$I_{EVSE_Target}$ is the target current of the EV supply equipment at side B, expressed in ampere;

$V_{EVSE_Out}$ B 側之當下電壓 (單位：V)；

$V_{EVSE_Out}$ is the present voltage at side B, expressed in volts;

$V_{EV_Req}$ B 側之目標電壓 (單位：V)。

$V_{EV_Req}$ is the target voltage of the EV, expressed in volts.

CC.5.5.10 EV 目標電壓大於最高電壓限制

CC.5.5.10 The target voltage of the EV is more than the maximum voltage limits

若 EV 之目標電壓大於 EV 供電設備 B 側之可用最高電壓或 EV 可用最高電壓，EV 供電設備應繼續通訊對話，傳遞 EV 供電設備 B 側可用最高電壓或 EV 可用最高電壓，取其較小者。參照公式(CC.11)。

The EV supply equipment shall continue the communication session with the applicable maximum voltage of the EV supply equipment at side B or the target voltage of the EV, whichever is less, if the target voltage of the EV is more than the of the EV supply equipment at side B or the applicable maximum voltage of the EV. See Formula (CC.11).

$$V_{EVSE_Target} = \min(V_{EV_Req}, V_{EVSE_MAX})$$

(CC.11)

若 $V_{EV_Req} > \min(V_{EV_MAX}, V_{EVSE_MAX})$

其中

$V_{EVSE_Target}$ EV 供電設備 B 側之目標電壓(單位：V)

$V_{EVSE_Target}$ is the target voltage of the EV supply equipment at side B, expressed in volts;

$V_{EVSE_MAX}$ EV 供電設備 B 側可用最高電壓(單位：V)

$V_{EVSE_MAX}$ is the applicable maximum voltage of the EV supply equipment at side B, expressed in volts;

$V_{EV_Req}$ EV 之目標電壓(單位：V)

$V_{EV_Req}$ is the target voltage of the EV, expressed in volts;

$V_{EV_MAX}$ EV 可用最高電壓(單位：V)

$V_{EV_MAX}$ is the applicable maximum voltage of the EV, expressed in volts.

備考：EV 供電設備可保留於 CCM，直到達到 EV 適用之最高電壓。參照 6.3.1.106 之過電壓保護，其可防止電池系統過度充電。

NOTE The EV supply equipment can remain in CCM until the applicable maximum voltage of the EV is reached. See overvoltage protection in 6.3.1.106, which prevents overcharging the battery system.

CC.5.5.11 B 側當下電壓小於 EV 供電設備 B 側可用最低電壓

CC.5.5.11 The present voltage at side B is less than the applicable minimum voltage of the EV supply equipment at side B

若 B 側當下電壓或 EV 目標電壓小於 EV 供電設備 B 側之可用最低電壓超過 3 s，EV 供電設備應於 50 ms 或更短內觸發錯誤停機。參照公式(CC.12)。

The EV supply equipment shall trigger an error shutdown in 50 ms or less if the present voltage at side B or the target voltage of the EV is less than the applicable minimum voltage of the EV supply equipment at side B for more than 3 s. See Formula (CC.12).

進行錯誤停機，若

Error shutdown if

$$\min(V_{EVSE_Measured}, V_{EV_Req}) < V_{EVSE_MIN} \quad \text{(CC.12)}$$

超過 3 s

for more than 3 s

其中

$V_{EVSE_Measured}$ B 側當下電壓(單位：V)

$V_{EVSE_Measured}$ is the present voltage at side B, expressed in volts;

$V_{EVSE_MIN}$ EV 供電設備 B 側可用最低電壓(單位：V)

$V_{EVSE_MIN}$ is the applicable minimum voltage of the EV supply equipment at side B,expressed in volts;

$V_{EV_Req}$ EV 之目標電壓(單位：V)

$V_{EV_Req}$ is the target voltage of the EV, expressed in volts.

備考:在預充電階段期間,若 EV 供電設備 B 側無法提供預充電正確的當下電壓,此情況應可被偵測到。

NOTE This case could be detected during the pre-charge phase, as the EV supply equipment cannot supply the correct present voltage at side B for pre-charge.

CC.5.5.12 B 側當下電壓大於 EV 供電設備 B 側適用之最高電壓

CC.5.5.12 The present voltage at side B is more than the applicable maximum voltage of the EV supply equipment at side B

若 B 側當下電壓大於或等於 EV 供電設備 B 側適用之最高電壓超過 400 ms，EV 供電設備應依 6.3.1.106.3 於 50 ms 或更短內觸發錯誤停機。參照公式(CC.13)。

The EV supply equipment shall trigger an error shutdown in 50 ms or less if the present voltage at side B is more than or equal to the applicable maximum voltage of the EV supply equipment at side B for more than 400 ms, according to 6.3.1.106.3. See Formula (CC.13).

錯誤停機

Error shutdown

$$\text{if } V_{EVSE_Measured} \geq V_{EVSE_MAX} \qquad \text{(CC.13)}$$

超過 400 ms

for more than 400 ms

其中

$V_{EVSE_Measured}$ B 側之當下電壓(單位：V)

$V_{EVSE_Measured}$ is the present voltage at side B, expressed in volts;

$V_{EVSE_MAX}$ EV 供電設備 B 側適用之最大功率(單位：V)

$V_{EVSE_MAX}$ is the applicable maximum voltage of the EV supply equipment at side B, expressed in volts.

CC.5.5.13 基於 EV 供電設備 B 側適用之最小功率的限制

CC.5.5.13 Limitations due to the applicable minimum power of the EV supply equipment at side B

EV 供電設備應啟用 0 A 模式(參照 CC.5.5.2)，即如同 EV 之目標電流為 0A，若

The EV supply equipment shall enable 0 A mode (see CC.5.5.2), as if the target current of the EV were 0 A, if

- EV 之目標功率小於 EV 供電設備 B 側適用之最小功率，或
- the target power of the EV is less than the applicable minimum power of the EV supply equipment at side B, or
- B 側之當下電壓乘以 EV 之目標電流小於 EV 供電設備 B 側適用之最小功率超過 3 s。參照公式(CC.14)。
- for more than 3 s, the present voltage at side B multiplied by the target current of the EV is less than the applicable minimum power of the EV supply equipment at side B. See Formula (CC.14).

$$I_{EVSE_Target} = 0\ A \text{ 若 } P_{EV_Req} < P_{EVSE_MIN}, \text{ 或}$$

$$I_{EVSE_Target} = 0\ A \text{ if } V_{EVSE_Measured} \times I_{EV_Req} < P_{EVSE_MIN} \text{ 超過 } 3\ s \quad \text{(CC.14)}$$

其中

| | |
|---|---|
| $I_{EVSE_Target}$ | EV 供電設備 B 側之目標電流(單位：A) |
| $I_{EVSE_Target}$ | is the target current of the EV supply equipment at side B, expressed in ampere; |
| $I_{EV_Req}$ | EV 之目標電流(單位：A) |
| $I_{EV_Req}$ | is the target current of the EV, expressed in ampere; |
| $V_{EVSE_Measured}$ | B 側之當下電壓(單位：V) |
| $V_{EVSE_Measured}$ | is the present voltage at side B, expressed in volts; |
| $P_{EV_Req}$ | EV 請求之目標功率(單位：W) |
| $P_{EV_Req}$ | is the target power requested of the EV, expressed in watts; |
| $P_{EVSE_MIN}$ | EV 供電設備 B 側適用之最小功率(單位：W) |
| $P_{EVSE_MIN}$ | is the applicable minimum power of the EV supply equipment at side B,expressed in volts. |

備考：$P_{EVSE_MIN}$ 為 EV 供電設備可傳送的內部最小功率，該值並非透過數位通訊處理，但其限制了 B 側的當下功率。EV 供電設備無法得知電池系統的最低電壓及當下電壓，因這些數據並不經由數位通訊來傳遞。

NOTE $P_{EVSE_MIN}$ is the internal minimum power that the EV supply equipment can deliver, as this value is not handled by the digital communication, but is restricting the present power at side B. The EV supply equipment cannot know the minimum voltage and the present voltage of the battery system, as these are not communicated through digital communication.

CC.5.5.14 基於 EV 供電設備 B 側適用之最大功率的限制

CC.5.5.14 Limitations due to the applicable maximum power of the EV supply

equipment at side B

若 EV 之目標功率、或 EV 的目標電流乘以 B 側之當下電壓，或 EV 的目標電流乘以 EV 的目標電壓，超過 EV 適用的最大功率或 EV 供電設備 B 側適用之最大功率，則 EV 供電設備應繼續通訊對話，並限制 EV 供電設備 B 側之目標功率為下列的最小數值：

If the target power of the EV, or target current of the EV multiplied by the present voltage at side B, or target current of the EV multiplied by the target voltage of the EV, that is more than the applicable maximum power of the EV or the applicable maximum power of the EV supply equipment at side B, then the EV supply equipment shall continue the communication session and limit the target power of the EV supply equipment at side B to the minimum of the following values:

- EV 之適用的最大功率；
- applicable maximum power of the EV;
- EV 供電設備 B 側之適用的最大功率。
- applicable maximum power of the EV supply equipment at side B.

參照公式(CC.15)。

See Formula (CC.15).

$$P_{EVSE_Target} = \min(P_{EV_MAX}, P_{EVSE_MAX}) \text{ 若 } \min(V_{EVSE_Measured} \times I_{EV_Req}, V_{EV_Req} \times I_{EV_Req}, P_{EV_Req}) > \min(P_{EV_MAX}, P_{EVSE_MAX}) \quad \text{(CC.15)}$$

$$\text{且 } P_{EV_MAX} = \max(P_{EV_MAX_CPD}, V_{EV_MAX_CPD} \times I_{EV_MAX_CPD})$$

其中

where

| | |
|---|---|
| $V_{EVSE_Measured}$ | B 側之當下電壓(單位：V)； |
| $V_{EVSE_Measured}$ | is the present voltage at side B, expressed in volts; |
| $V_{EV_Req}$ | EV 之目標電壓(單位：V)； |
| $V_{EV_Req}$ | is the target voltage of the EV, expressed in volts; |
| $I_{EV_Req}$ | EV 之目標電流(單位：A)； |
| $I_{EV_Req}$ | is the target current of the EV, expressed in amperes; |
| $P_{EVSE_Target}$ | EV 供電設備 B 側之目標功率(單位：W)； |
| $P_{EVSE_Target}$ | is the target power of the EV supply equipment at side B, expressed in watts; |
| $P_{EVSE_MAX}$ | EV 供電設備 B 側之適用的最大功率(單位：W)； |
| $P_{EVSE_MAX}$ | is the applicable maximum power of the EV supply equipment at side B,expressed in watts; |
| $P_{EV_Req}$ | EV 之目標功率(單位：W)； |
| $P_{EV_Req}$ | is the target power of the EV, expressed in watts; |
| $P_{EV_MAX}$ | EV 之適用的最大功率 (單位：W)； |

| | |
|---|---|
| $P_{EV_MAX}$ | is the applicable maximum power of the EV, expressed in watts; |
| $V_{EV_MAX_CPD}$ | EV 於 ChargeParameterDiscoveryReq 訊息中之額定最高電壓(單位：V)； |
| $V_{EV_MAX_CPD}$ | is the rated maximum voltage of the EV in ChargeParameterDiscoveryReq, expressed in volts; |
| $I_{EV_MAX_CPD}$ | EV 於 ChargeParameterDiscoveryReq 訊息中之額定最大電流(單位：A)； |
| $I_{EV_MAX_CPD}$ | is the rated maximum current of the EV in ChargeParameterDiscoveryReq, expressed in ampere; |
| $P_{EV_MAX_CPD}$ | EV 於 ChargeParameterDiscoveryReq 訊息中之額定最大功率(單位：W)； |
| $P_{EV_MAX_CPD}$ | is the rated maximum power of the EV in ChargeParameterDiscoveryReq, expressed in watts. |

備考 1：若 EV 沒有傳遞 $P_{EV_MAX_CPD}$ ，則 $P_{EV_MAX_CPD} = 0$。

NOTE 1 $P_{EV_MAX_CPD} = 0$ if $P_{EV_MAX_CPD}$ is not communicated by the EV.

備考 2：依 ISO 15118-2，$P_{EV_Req}$ 為 CurrentDemandReq 訊息中之 "EVMaximumPowerLimit"，及 $P_{EV_MAX}$ 是由 "EVMaximumPowerLimit" 來傳遞。

NOTE 2 According to ISO 15118-2, $P_{EV_Req}$ is the "EVMaximumPowerLimit" within the CurrentDemandReq messages and $P_{EV_MAX}$ is the "EVMaximumPowerLimit" communicated.

備考 3：由於系統 C 並未規定 CPM，降低 B 側之當下功率可依據 B 側當下電壓及供電設備 B 側之目標功率，透過限制 EV 供電設備 B 側之目標電流來達成。另參照 CC.5.5.4 及 CC.5.5.6。

NOTE 3 Lowering the present power at side B can be achieved by limiting the target current of the EV supply equipment at side B based on the present voltage at side B and the target power of the EV supply equipment at side B, as the CPM is not defined for system C. See also CC.5.5.4 and CC.5.5.6.

CC.5.6 相容性檢查

CC.5.6 Compatibility check

在相容性檢查期間，EV 及 EV 供電設備會交換 ChargeParameterDiscoveryReq/Res 訊息。EV 及 EV 供電設備兩者都會對收到訊息進行驗證。EV 與 EVSE 可能需要傳送多次訊息來更新參數。

During the compatibility check, the EV and EV supply equipment exchange ChargeParameterDiscoveryReq/Res messages. Both the EV and EV supply equipment validate the received messages. The EV and EV supply equipment may need to send

multiple messages to update the parameters.

參數 "EVSEProcessing" 之值，由 EV 供電設備於 ChargeParameterDiscoveryRes <3b> 訊息中進行傳送，依據下列進行。

The value in parameter "EVSEProcessing", sent by the EV supply equipment in message ChargeParameterDiscoveryRes <3b>, depends on the following.

(a) Ongoing: 若 EV 供電設備需要更多的時間來完成相容性檢查。

a) Ongoing: If the EV supply equipment needs more time to complete the compatibility check.

(b) Finished：EV 供電設備完成相容性檢查。

b) Finished: The EV supply equipment has finished the compatibility check.

參數 " ResponseCode " 之值，由 EV 供電設備於 ChargeParameterDiscoveryRes <3b> 訊息中進行傳送，依據下列進行。

The value in parameter "ResponseCode", sent by the EV supply equipment in message ChargeParameterDiscoveryRes <3b>, depends on the following.

(c) OK: 無錯誤。

c) OK: No error.

(d) FAILED_WrongChargeParameter：錯誤訊息來指出 EV 及 EV 供電設備不相容。

d) FAILED_WrongChargeParameter: Error message to indicate that the EV and EV supply equipment are not compatible.

(e) FAILED_X：由其他原因引起的錯誤訊息。

e) FAILED_X: Error message by another cause.

EV 應依 EV 供電設備於訊息 ChargeParameterDiscoveryRes <3b>中傳遞的參數，執行自身的相容性檢查。若有下列其中之一未符合，EV 可維持或更新傳送到 EV 供電設備之參數，來達到相容性。

The EV should perform its own compatibility check based on the parameters communicated by the EV supply equipment in message ChargeParameterDiscoveryRes <3b>. If one of the following conditions is not met, the EV can either maintain or update the values sent to the EV supply equipment to reach compatibility:

(f) $V_{EV_MAX_CPD} \geq V_{EVSE_MIN_CPD}$；

f) $V_{EV_MAX_CPD} \geq V_{EVSE_MIN_CPD}$;

(g) $I_{EV_MAX_CPD} \geq I_{EVSE_MIN_CPD}$；

g) $I_{EV_MAX_CPD} \geq I_{EVSE_MIN_CPD}$;

(h) $P_{EV_MAX_CPD} \geq P_{EVSE_MIN_CPD}$。

h) $P_{EV_MAX_CPD} \geq P_{EVSE_MIN_CPD}$.

相容性檢查的訊息序列，依據 ISO 15118-2:2014 及 DIN SPEC 70121:2014，如以

下步驟所述。

The message sequence for the compatibility check, based on ISO 15118-2:2014 and DIN SPEC 70121:2014, is described in the following steps.

(1) EV 傳送 ChargeParameterDiscoveryReq <3a>訊息，使用 EV 之額定最高電壓、電流及功率：

1) The EV shall send a ChargeParameterDiscoveryReq <3a> message using the rated maximum voltage, current and power of the EV:

(a) $V_{EV_MAX_CPD} = V_{EV_MAX_RATED}$;

(b) $I_{EV_MAX_CPD} = I_{EV_MAX_RATED}$;

(c) $P_{EV_MAX_CPD} = I_{EV_MAX_RATED}$.

(2) 當 EV 供電設備收到 ChargeParameterDiscoveryReq <3a> 訊息，EV 供電設備基於上一個 ChargeParameterDiscoveryReq <3a> 訊息，應傳送 ChargeParameterDiscoveryRes <3b> 訊息，其中包含參數如下：

2) When a ChargeParameterDiscoveryReq <3a> message is received by the EV supply equipment, the EV supply equipment shall send a ChargeParameterDiscoveryRes <3b>message, based on the values received in the previous ChargeParameterDiscoveryReq <3a> message, with the following parameters.

(a) 若 $V_{EV_MAX_CPD} \leq 500$ V:

$V_{EVSE_MAX_CPD} \leq \min (V_{EV_MAX_CPD} + 50\ V, V_{EVSE_MAX_RATED}, 500\ V)$.

若 $V_{EV_MAX_CPD} > 500$ V:

$V_{EVSE_MAX_CPD} \leq \min (1.1 \times V_{EV_MAX_CPD}, V_{EVSE_MAX_RATED})$.

(b) $I_{EVSE_MAX_CPD} \leq \min (I_{EV_MAX_CPD}, I_{EVSE_MAX_RATED})$.

(c) $P_{EVSE_MAX_CPD} \leq \min (P_{EV_MAX}, P_{EVSE_MAX_RATED})$ 其中:

- 若 EV 沒有傳遞 $P_{EV_MAX}$ 或 $P_{EV_MAX}$ 為 0，則
- if $P_{EV_MAX}$ is not communicated by the EV or $P_{EV_MAX}$ is 0, then

$P_{EV_MAX} = \max(V_{EV_MAX_CPD} \times I_{EV_MAX_CPD}, 200\ kW)$，或

$P_{EV_MAX} = \max(V_{EV_MAX_CPD} \times I_{EV_MAX_CPD}, 200\ kW)$, or

- 若 EV 沒有傳遞 $P_{EV_MAX}$ 及 $P_{EV_MAX}$ 不為 0，則
- if $P_{EV_MAX}$ is communicated by the EV and $P_{EV_MAX}$ is not 0, then

$P_{EV_MAX} = P_{EV_MAX_CPD}$。

$P_{EV_MAX} = P_{EV_MAX_CPD}$.

備考 1：設定 EV 之額定最大功率為 200 kW，提升 IEC 61851-23:2014 之 EV 的互通性。

NOTE 1 Setting the rated maximum power of the EV to 200 kW improves interoperability with EVs based on IEC 61851-23:2014.

(d) $V_{EVSE_MIN_CPD} = V_{EVSE_MIN_RATED}$

(e) $I_{EVSE_MIN_CPD} = I_{EVSE_MIN_RATED}$

(f) $P_{EVSE_MIN_CPD} = P_{EVSE_MIN_RATED}$

備考 2：$P_{EVSE_MIN_CPD}$ 不被許多數位通訊標準所涵蓋。

NOTE 2 $P_{EVSE_MIN_CPD}$ is not covered by some digital communication standards.

(g) 參數 EVSEProcessing、 EVSEStatusCode 及 ResponseCode 係基於下列情況。

g) Parameters EVSEProcessing, EVSEStatusCode and ResponseCode are based on the following conditions.

- $V_{EVSE_MIN_RATED} < V_{EV_MAX_CPD}$.
- $I_{EVSE_MIN_RATED} < I_{EV_MAX_CPD}$.
- 若 EV 無傳遞 $P_{EV_MAX_CPD}$ 或 $P_{EV_MAX_CPD}$ 為 0，則 $P_{EVSE_MIN_RATED} < \max(V_{EV_MAX_CPD} \times I_{EV_MAX_CPD}, 200\ kW)$，或
- If $P_{EV_MAX_CPD}$ is not communicated by the EV or $P_{EV_MAX_CPD}$ is 0, then $P_{EVSE_MIN_RATED} < \max(V_{EV_MAX_CPD} \times I_{EV_MAX_CPD}, 200\ kW)$, or
- 若 EV 無傳送 $P_{EV_MAX_CPD}$ 及 $P_{EV_MAX_CPD}$ 不為 0，則 $P_{EVSE_MIN_RATED} < P_{EV_MAX_CPD}$.
- If $P_{EV_MAX_CPD}$ is communicated by the EV and $P_{EV_MAX_CPD}$ is not 0, then $P_{EVSE_MIN_RATED} < P_{EV_MAX_CPD}$.

(i) 若有任一以上情況未符合，EV 供電設備應

i) If any of the above conditions are not met, the EV supply equipment shall

- 設定 "EVSEProcessing" = ‘Finished’,
- set "EVSEProcessing" = ‘Finished’,
- 設定 "EVSEStatusCode" = ‘EVSE_Shutdown’,
- set "EVSEStatusCode" = ‘EVSE_Shutdown’,
- 設定 "ResponseCode" = ‘FAILED_WrongChargeParameter’, and
- set "ResponseCode" = ‘FAILED_WrongChargeParameter’, and
- 依 CC.3.4 and IEC 61851-24 觸發錯誤停機。
- trigger an error shutdown according to CC.3.4 and IEC 61851-24.

備考 3：以 "ResponseCode" = ’FAILED_’ 訊息來結束相容性檢查，並觸發錯誤停機。

NOTE 3 A message with "ResponseCode" = ’FAILED_’ ends the compatibility check and triggers an error shutdown.

(ii) 若以上所有情況皆符合，且 EV 供電設備偵測到錯誤，EV 供電設備應

ii) If all the conditions above are met and the EV supply equipment has detected an

error, the EV supply equipment shall

- 設定 "EVSEProcessing" = ‘Finished’
- set "EVSEProcessing" = ‘Finished’
- 設定 "EVSEStatusCode" = ‘EVSE_Shutdown’
- set "EVSEStatusCode" = ‘EVSE_Shutdown’

- 設定 "ResponseCode" = ‘FAILED’ (除非有特定的錯誤要求其它值)，及
- set "ResponseCode" = ‘FAILED’ (unless a specific error requires another value), and
- 依 CC.3.4 及 IEC 61851-24 觸發錯誤停機。
- trigger an error shutdown according to CC.3.4 and IEC 61851-24.

(iii) 若上述所有條件皆符合，且 EV 供電設備沒有更新其電能傳輸參數，沒有必要維持於 ChargeParameterDiscovery 循環，且沒有偵測到錯誤，EV 供電設備應

iii) If all the conditions above are met and the EV supply equipment does not have to update its energy transfer parameters, does not have to remain in the ChargeParameterDiscovery cycle, and has not detected an error, the EV supply equipment shall

- 設定 "EVSEProcessing" = ‘Finished’
- set "EVSEProcessing" = ‘Finished’
- 設定 "EVSEStatusCode" = ‘EVSE_IsolationMonitoringActive’，或 ‘EVSE_Shutdown’ (如有錯誤時)，
- set "EVSEStatusCode" = ‘EVSE_IsolationMonitoringActive’, or ‘EVSE_Shutdown’ (in case of an error),
- 設定 "ResponseCode" = ‘OK’，及
- set "ResponseCode" = ‘OK’, and
- 繼續序列之步驟(5)。
- continue with step 5) in this sequence.

(iv) 若所有以上條件皆符合，但 EV 供電設備需要在後續需要更新其電能傳輸參數，EV 供電設備應

iv) If all the conditions above are met, but the EV supply equipment needs to update its energy transfer parameters at a later time, the EV supply equipment shall

- 設定 "EVSEProcessing" = ‘Ongoing’，
- set "EVSEProcessing" = ‘Ongoing’,
- 設定 "EVSEStatusCode" = ‘EVSE_IsolationMonitoringActive’，或 ‘EVSE_Shutdown’ (如有錯誤時),

- set "EVSEStatusCode" = ‘EVSE_IsolationMonitoringActive’, or ‘EVSE_Shutdown’ (in case of an error),
- 設定 "ResponseCode" = ‘OK’，及
- set "ResponseCode" = ‘OK’, and
- 繼續序列之步驟(3)。
- continue with step 3) in this sequence.

包含參數 "EVSEProcessing" = ’Ongoing’ and "ResponseCode" = ’ OK’ 之訊息，允許於循環 ChargeParameterDiscoveryReq/Res 訊息持續進行交換。

Messages with parameters "EVSEProcessing" = ’Ongoing’ and "ResponseCode" = ’ OK’ allow to continue with cyclic ChargeParameterDiscoveryReq/Res messages.

若 EV 供電設備相容性檢查結果為 "failed compatibility check"，EV 供電設備在拒絕通訊對話前，應至少傳送一個含有參數"EVSEProcessing" = ’Ongoing’ 及 "ResponseCode" = ’OK’ 之 ChargeParameterDiscoveryRes <3b> 訊息，並附帶提議之協議值。

If the EV supply equipment compatibility check results in a "failed compatibility check", the EV supply equipment shall send at least one ChargeParameterDiscoveryRes <3b> message with parameters "EVSEProcessing" = ’Ongoing’ and "ResponseCode" = ’OK’ with the proposed negotiated values before the EV supply equipment rejects the communication session.

此使得 EV 及 EV 供電設備在必要時能更新其電能傳輸參數。當 EV 供電設備在等待更新其額定限制或其它原因時，EV 供電設備可要求循環進行 ChargeParameterDiscoveryReq/Res 訊息交換。例如：等待負載管理控制、車輛端插頭鎖定問題等。

This enables the EV and the EV supply equipment to update their energy transfer parameters, if necessary. The EV supply equipment may require cyclic ChargeParameterDiscoveryReq/Res messages while it waits to update its rated limits or other reasons. For example, waiting for load management controls, vehicle connector locking issues, etc.

(h) 若 EV 供電設備在電纜檢查階段前欲觸發暫停，因其無法及時於當下執行電纜檢查階段，EV 供電設備應於參數 "EVSEStatus"，進行

h) If the EV supply equipment wants to trigger a pause before cable-check phase, as it cannot perform the cable-check phase at this moment in time, the EV supply equipment shall, in parameter "EVSEStatus",

- 設定 "EVSENotification" = ‘StopCharging’ ，及
- set "EVSENotification" = ‘StopCharging’, and
- 設定 "NotificationMaxDelay" = 0。

– set "NotificationMaxDelay" = 0.

另可參照 CC.3.5.2。

See also CC.3.5.2.

(i) 若 EV 供電設備在電能傳輸執行前欲觸發暫停，且可執行電纜檢查階段，則 EV 供電設備應於參數"EVSEStatus"，進行

i) If the EV supply equipment wants to trigger a pause before energy transfer and can perform the cable-check phase, the EV supply equipment shall, in parameter "EVSEStatus",

– 設定 "EVSENotification" = ‘StopCharging’，及

– set "EVSENotification" = ‘StopCharging’, and

– 設定 "NotificationMaxDelay" > 0。

– set "NotificationMaxDelay" > 0

對 "NotificationMaxDelay" 建議使用 300 s。

It is recommended to use 300 s for the "NotificationMaxDelay".

另可參照 CC.3.5.3。

See also CC.3.5.3.

(j) 若 EV 供電設備欲執行正常通訊對話，則 EV 供電設備應於參數"EVSEStatus"，進行

j) If the EV supply equipment wants to perform a normal communication session, the EV supply equipment shall, in parameter "EVSEStatus",

– 設定 "EVSENotification" = ‘None’，及

– set "EVSENotification" = ‘None’, and

– 設定 "NotificationMaxDelay" = 0。

– set "NotificationMaxDelay" = 0.

另可參照 CC.3.2。

See also CC.3.2.

(3) 當 EV 收到 ChargeParameterDiscoveryRes <3b> 訊息，其包含參數 "EVSE_Processing" = ’Ongoing’，則 EV 應傳送 ChargeParameterDiscoveryReq <3a> 訊息 (若需要，EV 可依據上一個 ChargeParameterDiscoveryRes <3b> 訊息所接收的值，來更新 ChargeParameterDiscoveryReq <3a> 訊息中之參數)，並符合下列條件。

3) When the EV receives a ChargeParameterDiscoveryRes <3b> message with parameter "EVSE_Processing" = ’Ongoing’, the EV shall send a ChargeParameterDiscoveryReq <3a> message (if necessary, the EV may update the parameters in this ChargeParameterDiscoveryReq <3a> message, based on

the values received in the previous ChargeParameterDiscoveryRes <3b> message), with the following conditions.

a) $V_{EVSE_MIN_CPD} < V_{EV_MAX_CPD} \leq V_{EV_MAX_RATED}$.

b) $I_{EVSE_MIN_CPD} < I_{EV_MAX_CPD} \leq I_{EV_MAX_RATED}$.

c) $P_{EVSE_MIN_CPD} < P_{EV_MAX_CPD} \leq P_{EV_MAX_RATED}$.

備考 4:$P_{EVSE_MIN_CPD}$ 不被許多數位通訊標準所涵蓋,在此情況下則視其為 0 kW。

NOTE 4 $P_{EVSE_MIN_CPD}$ is not covered by some digital communication standards and is considered as 0 kW in this case.

備考 5：當 EV 可支援 B 側當下電壓 < 500 V DC 及 > 500 V DC 的情況下，EV 可要求更新其電能傳輸參數。例如：許多 EV 可與在 B 側提供 500 V DC 或 1,000 V DC 之 EV 供電設備進行電能傳輸，意味著 EV 可使用內部 DC/DC PEC 或切換陣列，改變電池系統在 B 側的當下電壓，來成功完成相容性檢查。

NOTE 5 The EV can require updating its energy transfer parameters in case it can support present voltages at side B < 500 V DC and > 500 V DC. For example, some EVs support energy transfer with an EV supply equipment capable of 500 V DC or 1 000 V DC at side B, meaning the EV could successfully complete the compatibility check by using an internal DC/DC PEC or a switching matrix to change the present voltage of the battery system voltage at side B.

依據 DIN SPEC 70121:2014,EV 應重新傳送相同的 ChargeParameterDiscoveryReq 訊息。然而，若 EV 變動參數，則建議 EV 供電設備不要執行停機。

According to DIN SPEC 70121:2014, the EV shall resend the identical ChargeParameterDiscoveryReq messages. However, it is recommended for the EV supply equipment not to perform a shutdown if the EV changes the parameters.

EV 於第一個 ChargeParameterDiscoveryReq <3a> 訊息中，傳送能達到最高 FPT 功率的參數。若 EV 供電設備回應了不相容值的參數 (例如：EV 供電設備 B 側的額定最高電壓小於電池系統的當下電壓)，EV 應於下一個 ChargeParameterDiscoveryReq <3a> 訊息中,使用能力內可相容的值來更新參數。

The EV sends the parameters that result in the highest FPT power in the first ChargeParameterDiscoveryReq <3a> message. If the EV supply equipment responds with incompatible values (for example, a rated maximum voltage of the EV supply equipment at side B less than the present voltage of the battery system), the EV should update the parameters with compatible values within its capabilities in the next ChargeParameterDiscoveryReq <3a> message.

若更新參數為不可能或需要時,EV 應傳送與上一個 ChargeParameterDiscoveryReq

<3a> 訊息中相同的參數值。

If updating the parameters is not possible or necessary, the EV shall send the same parameter values as in the previous ChargeParameterDiscoveryReq <3a> message.

(4) EV 及 EV 供電設備應繼續循環傳送 ChargeParameterDiscoveryReq/Res 訊息，來更新參數(如有需要)，以符合選定之數位通訊標準的時序要求(例如：數位通訊逾期)。

4) The EV and EV supply equipment shall continue to send cyclic ChargeParameterDiscoveryReq/Res messages to update the parameters (if necessary), complying with the timing requirements (for example, digital communication timeouts) of the selected digital communication standard.

從此序列之步驟(2) 繼續。

Resume at step 2) in this sequence.

(5) 在 EV 供電設備於 ChargeParameterDiscoveryRes <3b> 訊息中，以參數 "EVSEProcessing" = 'Finished' 來傳送其最終參數值後，EV 在傳送 CableCheckReq <4a> 前，應查證回應訊息中的參數值符合以下條件：

5) After the EV supply equipment has sent its definitive values for the parameters in message ChargeParameterDiscoveryRes <3b> with "EVSEProcessing" = 'Finished', the EV shall verify that, before sending the CableCheckReq <4a>, the values in the response message comply with the following conditions.

(a) $V_{EVSE_MIN_CPD} \leq V_{Battery} < V_{EVSE_MAX_CPD}$.

備考 6：若 EV 支援在 B 側以較低的當下電壓來進行電能傳輸，則 $V_{Battery}$ 可小於電池系統之當下電壓。例如：透過使用 DC/DC PEC。

NOTE 6 $V_{Battery}$ could be less than the present voltage of the battery system if the EV supports energy transfer with a lower present voltage at side B. For example, by using a DC/DC PEC.

(b) $I_{EVSE_MIN_CPD} \leq I_{EV_MIN_RATED} \leq I_{EVSE_MAX_CPD}$.

(c) $P_{EVSE_MIN_CPD} \leq P_{EV_MIN_RATED} \leq P_{EVSE_MAX_CPD}$.

(d) "ResponseCode" = 'OK'.

若條件沒有符合，則 EV 應依 CC.3.4 及 IEC 61851-24 來觸發錯誤停機。

If the conditions are not met, then the EV shall trigger an error shutdown according to CC.3.4 and IEC 61851-24.

在電能傳輸期間於 CurrentDemandRes <7b> 訊息所傳送適用的最大值，應小於或等於 EV 供電設備在上一個 ChargeParameterDiscoveryRes <3b> 訊息中，所傳送之協議的最大值。

The applicable maximum values sent in CurrentDemandRes <7b> messages during energy transfer shall be less than or equal to the negotiated maximum values sent by the EV supply equipment in the last ChargeParameterDiscoveryRes <3b> message.
若 EV 供電設備傳送 ChargeParameterDiscoveryRes <3b>，包含參數為：
If the EV supply equipment sent ChargeParameterDiscoveryRes <3b> with parameters:

- "EVSENotification" = 'StopCharging'，
- "NotificationMaxDelay" = '0'，
- "EVSEProcessing" = 'Finished' 及
- "ResponseCode" = 'OK'

並符合條件 (5) (a)、(b)、(c)、(d)，則 EV 不應傳送 CableCheckReq <4a> 及 PreChargeReq <5a> 訊息，但 EV 應以下列來替代
and meets all conditions 5) a), b), c), d), then the EV shall not send messages CableCheckReq <4a> and PreChargeReq <5a>, but instead the EV shall

- 若使用 ISO 15118-2:2014: 作為下一個訊息傳送 PowerDeliveryReq <6a>，其中包含 "ChargeProgress" = 'Stop' 參數，以跳過電纜檢查及預充電階段(另可參照 CC.3.5.2)，或
- if using ISO 15118-2:2014: send message PowerDeliveryReq <6a> with "ChargeProgress" = 'Stop' as the next message to skip the cable-check and pre-charge phases (see also CC.3.5.2), or
- 若使用 DIN SPEC 70121:2014：作為下一個訊息傳送 SessionStopReq <10a>，以跳過電纜檢查及預充電階段(另可參照 CC.3.5.2)。
- if using DIN SPEC 70121:2014: send message SessionStopReq <10a> as the next message to skip the cable-check and pre-charge phases (see also CC.3.5.2).

使用於 (1) 到 (5) 之 EV 供電設備參數：
EV supply equipment parameters used in 1) to 5):

$V_{EVSE_MAX_RATED}$ EV 供電設備 B 側之額定最高電壓
$V_{EVSE_MAX_RATED}$: rated maximum voltage of the EV supply equipment at side B
$I_{EVSE_MAX_RATED}$: EV 供電設備 B 側之額定提高電流
$I_{EVSE_MAX_RATED}$: rated boost current of the EV supply equipment at side B
$P_{EVSE_MAX_RATED}$: EV 供電設備 B 側之額定最大功率
$P_{EVSE_MAX_RATED}$: rated maximum power of the EV supply equipment at side B
$V_{EVSE_MIN_RATED}$: EV 供電設備 B 側之額定最低電壓
$V_{EVSE_MIN_RATED}$: rated minimum voltage of the EV supply equipment at side B
$I_{EVSE_MIN_RATED}$: EV 供電設備 B 側之額定最小電流
$I_{EVSE_MIN_RATED}$: rated minimum current of the EV supply equipment at side B

$P_{EVSE_MIN_RATED}$: EV 供電設備 B 側之額定最小功率

$P_{EVSE_MIN_RATED}$: rated minimum power of the EV supply equipment at side B

$V_{EVSE_MAX_CPD}$ 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 供電設備 B 側的最高電壓(例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVSEMaximumVoltageLimit)

$V_{EVSE_MAX_CPD}$: maximum voltage of the EV supply equipment at side B communicated in ChargeParameterDiscoveryRes (for example, EVSEMaximumVoltageLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$I_{EVSE_MAX_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 供電設備 B 側的最大電流(例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVSEMaximumCurrentLimit)

$I_{EVSE_MAX_CPD}$: maximum current of the EV supply equipment at side B communicated in ChargeParameterDiscoveryRes (for example, EVSEMaximumCurrentLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$P_{EVSE_MAX_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 供電設備 B 側的最大功率(例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVSEMaximumPowerLimit)

$P_{EVSE_MAX_CPD}$: maximum power of the EV supply equipment at side B communicated in ChargeParameterDiscoveryRes (for example, EVSEMaximumPowerLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$V_{EVSE_MIN_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 供電設備 B 側的最低電壓(例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVSEMinimumVoltageLimit)

$V_{EVSE_MIN_CPD}$: minimum voltage of the EV supply equipment at side B communicated in ChargeParameterDiscoveryRes (for example, EVSEMinimumVoltageLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$I_{EVSE_MIN_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 供電設備 B 側的最小電流(例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVSEMinimumCurrentLimit)

$I_{EVSE_MIN_CPD}$: minimum current of the EV supply equipment at side B communicated in ChargeParameterDiscoveryRes (for example, EVSEMinimumCurrentLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$P_{EVSE_MIN_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 供電設備 B

側的最小功率

$P_{EVSE_MIN_CPD}$: minimum power of the EV supply equipment at side B communicated in ChargeParameterDiscoveryRes

備考 7：$P_{EVSE_MIN_CPD}$ 不被許多數位通訊標準涵蓋。

NOTE 7 $P_{EVSE_MIN_CPD}$ is not covered by some digital communication standards.

使用於 (1) 到 (5) 之 EV 參數：

EV parameters used in 1) to 5):

$V_{EV_MAX_RATED}$ EV 之額定最高電壓

$V_{EV_MAX_RATED}$: rated maximum voltage of the EV

$V_{Battery}$ 電池系統之當下電壓

$V_{Battery}$: present voltage of the battery system

$I_{EV_MAX_RATED}$ EV 之額定最大電流

$I_{EV_MAX_RATED}$: rated maximum current of the EV

$I_{EV_MIN_RATED}$: EV 之額定最小電流

$I_{EV_MIN_RATED}$: rated minimum current of the EV

$P_{EV_MAX}$: EV 之最大功率

$P_{EV_MAX}$: maximum power of the EV

$P_{EV_MAX_RATED}$: EV 之額定最大功率

$P_{EV_MAX_RATED}$: rated maximum power of the EV

$P_{EV_MIN_RATED}$: EV 之額定最小功率

$P_{EV_MIN_RATED}$: rated minimum power of the EV

$V_{EV_MAX_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 的最高電壓 (例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVMaximumVoltageLimit)

$V_{EV_MAX_CPD}$: maximum voltage of the EV in ChargeParameterDiscoveryReq (for example, EVMaximumVoltageLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$I_{EV_MAX_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 的最大電流 (例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVMaximumCurrentLimit)

$I_{EV_MAX_CPD}$: maximum current of the EV in ChargeParameterDiscoveryReq (for example, EVMaximumCurrentLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

$P_{EV_MAX_CPD}$: 於 ChargeParameterDiscoveryRes 訊息傳遞之 EV 的最大功率 (例如：ISO 15118-2:2014 及 DIN SPEC 70121:2014 之 EVMaximumPowerLimit)

$P_{EV_MAX_CPD}$: maximum power of the EV in ChargeParameterDiscoveryReq (for

example, EVMaximumPowerLimit in ISO 15118-2:2014 and DIN SPEC 70121:2014)

CC.5.7 CCM、CVM 及 CPM 之考量(參考)

CC.5.7 Considerations for CCM, CVM and CPM (informative)

EV 供電設備在不同的通訊對話時期/階段，要求使用 CCM、CVM 或 CPM 電能傳輸控制模式。EV 供電設備將基於適用之最高電壓、電流及功率值與 EV 之目標電壓、電流及功率來選用電能傳輸控制模式。依數位通訊訊息及通訊對話時期/階段之電能傳輸控制模式，如表 CC.20 之規定。

The EV supply equipment requires to use CCM, CVM or CPM energy transfer control modes at different stages/phases of the communication session. The EV supply equipment will select the energy transfer control mode based on the applicable maximum voltage, current and power values and target voltage, current and power of the EV. The energy transfer control modes, based on the digital communication messages and communication session stage/phase, are defined in Table CC.20.

表 CC.20 在不同通訊對話時期/階段之電能傳輸控制模式

Table CC.20 – Energy transfer control modes at different communication session stage/phase

| | CCM | CPM | CVM |
|---|---|---|---|
| 纜線檢查階段 Cable-check phase | | | X |
| 預充電階段 Pre-charge phase | | | X |
| 電能傳輸階段 Energy transfer stage | X | X | X |

EV 供電設備在同一時間僅能以一種電能傳輸模式運作。此代表著不受控制的目標值將隨著 B 側的實際特性而變化。例如：若 EV 供電設備是處於 CCM 模式，B 側當下電壓將為電池系統的當下電壓加上 B 側纜線組件、車輛端插頭及導體阻抗至電池系統間之壓降。若是 CVM 模式，B 側當下電流將取決於 EV 供電設備於車輛端插頭所見之阻抗。若 EV 斷開裝置為關閉，車輛端插頭之阻抗將隨著內部電池系統電阻、X-電容、Y-電容、B 側纜線組件阻抗、EV 內部 DC 導體阻抗、在電能傳輸期間額外連接至 B 側的其它配件等參數，而有所變化。

The EV supply equipment can only work in one energy transfer control mode at the time. This means that the uncontrolled target value will vary according to the physical characteristics of the side B. For example, if the EV supply equipment is in CCM, the present voltage at side B will be the present voltage of the battery system

plus the voltage drop between the side B cable assembly, vehicle inlet and conductor impedances to the battery system. In CVM, the present current at side B will depend on the impedance seen by the EV supply equipment at the vehicle connector. If the EV disconnection device is closed, the impedance at the vehicle connector will vary with the internal battery system resistance, X-capacitance, Y-capacitance, side B cable assembly impedance, impedance of the internal DC conductors of the EV, additional accessories connected to the side B during energy transfer, among other parameters.

在纜線檢查階段與預充電階段，B 側當下電流之限制值將分別依 CC.4.1.2 及 CC.5.1 之規定。基於 B 側之負載或錯誤，若 B 側需要高一點的電流，則 EV 供電設備會切換至 CCM，來符合 B 側當下電流之限制要求。。

During cable-check phase and pre-charge phase, the limits of the present current at side B are defined in CC.4.1.2 and CC.5.1, respectively. If a higher present current at side B is needed due to the load or errors on side B, then the EV supply equipment switches to CCM to fulfil the limitation requirements for the present current at side B.

在 CCM、CVM 及 CPM 之間切換時，由於控制回路之切換，可能會引起非預期的高電流尖峰及 B 側當下電流之漣波。限制這些由模式切換所引起尖峰之特定要求，尚在研議中。

Changing between CCM, CVM, and CPM may cause unwanted high current spikes and ripples at the present current at side B due to the switching of the control loops. Specific requirements to limit these spikes, due to mode switching, are under consideration.

針對電池系統之 FPT，良好的作法是 EV 將 EV 供電設備處於 CCM。接著，EV 可基於其內部 CVM 來控制 EV 的目標電流，因為 EV 完全控制 B 側當下電流直到通訊對話結束。

For FPT to a battery system, it is good practice that the EV puts the EV supply equipment in CCM. Then, the EV controls the target current of the EV based on its internal CVM, as the EV has full control of the present current at side B until the end of the communication session.

若 EV 目標電壓在 CCM 與 CVM 之間切換邊界區(即無法明確判定 EV 供電設備處於 CCM 或 CVM)，則依據 B 側當下電壓的偏差，電池系統電壓可能達不到 EV 的目標電壓，或電池電壓可能超過 EV 的目標電壓，只要 B 側當下電壓小於 EV 之額定的最高電壓即可。參照 101.1.2.2 對 B 側電壓偏差及 CC.6.4 對量測正確性之要求。

If the target voltage of the EV is within the switch over border between CCM and CVM (meaning it is unclear if the EV supply equipment is in CCM or CVM), then, depending on the deviation of the present voltage at side B, it is possible that the battery system voltage does not reach the target voltage of the EV, or the battery system voltage can be more than the target voltage of the EV, as long as the present voltage at side B is less than the rated maximum voltage of the EV. See 101.1.2.2 for the requirements of the voltage deviation at side B and CC.6.4 for the measurement accuracy.

當 EV 供電設備與 EV 同時處於相同的控制模式(CVM 或 CCM)，兩者的控制迴路將試著分別以 B 側當下電流/電壓與 EV 的目標電流/電壓，來調節 EV 供電設備 B 側之目標電流/電壓。此可導致控制回路不穩定，進而造成 B 側當下電流出現大的偏差及漣波。

When the EV supply equipment and the EV are in the same control mode (CVM or CCM) at the same time, the two control loops will try to regulate the target current/voltage of the EV supply equipment at side B with the present current/voltage at side B and the target current/voltage of the EV, respectively. This may cause unstable control loops and result in large deviation and ripple in the present current at side B.

如 101.1.2.2 所述，為確認 EV 供電設備處於 CCM，EV 的目標電壓應遠離 CVM 的邊界，否則 EV 供電設備可切換至 CVM。當 EV 的目標電壓/電流在不同模式的切換邊界，依據漣波、B 側偏差及其他效應，EV 供電設備可保持在 CCM 與 CVM 之間切換。

As described in 101.1.2.2, to ensure that the EV supply equipment stays in CCM, the target voltage of the EV should be far from the border of the CVM, otherwise the EV supply equipment may switch to CVM. Depending on the ripple, side B deviations and other effects, the EV supply equipment can keep switching between CCM and CVM when the target voltage/current of the EV are at the switching borders of the different modes.

EV 供電設備可處於 CCM 的範圍，如 101.1.2.2 之公式的規定。

The range where the EV supply equipment can stay in the CCM is defined by the formula in 101.1.2.2.

CC.6 特定要求 CC.6 Specific requirements

CC.6.1 負載突降要求 CC.6.1 Requirements for load dump

在發生負載突降情況下，在最初 3 ms 之後，B 側 DC+ 與 DC– 間之電壓過衝應小於或等於

In case of a load dump, after the first 3 ms, the voltage overshoot at side B between

DC+ and DC– shall be less than or equal to

- 對 EV 額定最高電壓，如初始階段所傳遞(於 t3 前之最後請求訊息) > 500 V：110 % EV 額定之最高電壓，或
- for a rated maximum voltage of the EV, as communicated (in the last request message before t3) during the initialization phase, > 500 V: 110 % of the rated maximum voltage of the EV, or
- 對 EV 額定最高電壓，如初始階段所傳遞(於 t3 前之最後的請求訊息) ≤ 500 V： 110 % EV 之額定最高電壓 + 50V。
- for a rated maximum voltage of the EV, as communicated (in the last request message before t3) during the initialization phase, ≤ 500 V: rated maximum voltage of the EV plus 50 V.

參照公式(CC.16)。

See Formula (CC.16).

$$V_{EVSE_Out} \leq \max(110\ \% \times V_{EV_MAX_CPD}, V_{EV_MAX_CPD} + 50\ V) \qquad (CC.16)$$

其中

where

| | |
|---|---|
| $V_{EVSE_Out}$ | 為 B 側當下電壓(單位:V)； |
| $V_{EVSE_Out}$ | is the present voltage at side B, expressed in volts; |
| $V_{EV_MAX_CPD}$ | 於最後 ChargeParameterDiscoveryReq 訊息所傳遞之 EV 的最高電壓(單位：V)。 |
| $V_{EV_MAX_CPD}$ | is the maximum voltage of the EV, communicated in the last ChargeParameterDiscoveryReq message, expressed in volts. |

依 CC.7.5.9 檢查符合性。

Compliance is checked by CC.7.5.9.

CC.6.2 B 側電流調節

CC.6.2 Side B current regulation

當處於 CCM 模式，EV 供電設備應控制 B 側之當下電流。B 側當下電流與 EV 之目標電流的最大容許偏差如下：

When in CCM, the EV supply equipment shall control the present current at side B. The maximum allowable deviation between the present current at side B and the target current of the EV is:

- ± 150 mA DC，當 EV 之目標電流 < 5 A DC；
- ± 150 mA DC when the target current of the EV is < 5 A DC;
- ± 1,5 A DC，當 EV 之目標電流 ≥ 5 A DC、但 ≤ 50 A DC；

- ± 1,5 A DC when the target current of the EV is ≥ 5 A DC but ≤ 50 A DC;
- ± 3 % EV 之目標電流，當 EV 之目標電流 > 50 A DC。
- ± 3 % of the target current of the EV when the target current of the EV is > 50 A DC.

若最低電流之準確度無法符合要求時，則 EV 供電設備 B 側之可用最小電流可設定為 EV 供電設備可以符合規定的數值。若 EV 目標電流小於 EV 供電設備 B 側之可用最小電流，則參照 CC.5.5.7。

If the accuracy requirements cannot be met for the lowest currents, the applicable minimum current of the EV supply equipment at side B may be set to values where the EV supply equipment can meet the requirements. If the target current of the EV is less than the applicable minimum current of the EV supply equipment at side B, see CC.5.5.7.

依 CC.7.5.11 檢查符合性。

Compliance is checked by CC.7.5.11.

CC.6.3 B 側電流及電壓之量測

CC.6.3 Measuring current and voltage at side B

系統 C 量測 B 側電壓及電流之準確度應在以下數值範圍內：

The accuracy of side B voltage and current measurements of system C shall be between the following values:

- B 側量測電壓：± 10 V DC；
- measured voltage at side B: between ±10 V DC;
- B 側量測電流：± 1.5 % B 側量測電流或 ± 0.5 A，取較大者
- measured current at side B: between ±1,5 % of the measured current at side B or between ± 0,5 A, whichever is more.

藉設計審查查核符合性。

Compliance is checked by design review.

量測 B 側電壓及電流至傳遞其數值到 EV 之時間應小於或等於 200 ms。EV 不應僅依據 EV 供電設備 B 側量測之電壓及電流來控制通訊對話。

The time between measuring voltage and current at side B and communicating them to the EV should be less than or equal to 200 ms. The EV should not solely rely on the voltage and current measurements from the EV supply equipment at side B to control the communication session.

CC.6.4 B 側之過電流保護

CC.6.4 Overcurrent protection of side B

EV 供電設備應提供 B 側過電流保護。

The EV supply equipment shall provide an overcurrent protection to protect the side B.

若下列條件之一或兩者於 0.5 s 期間持續符合，EV 供電設備應於 0.5 s 或更短內觸發緊急停機：

If one or both of the following conditions are continuously fulfilled for a duration of 0,5 s, the EV supply equipment shall trigger an emergency shutdown in 0,5 s or less:

- B 側之當下電流超過 120 % EV 供電設備 B 側之適用最大電流；
- the present current at side B is more than 120 % of the applicable maximum current of the EV supply equipment at side B;
- 在電能傳輸期間，B 側之當下電壓小於 80 % EV 供電設備 B 側之可用最低電壓。
- during energy transfer, the present voltage at side B is less than 80 % of the applicable minimum voltage of the EV supply equipment at side B.

備考：參照 ISO 17409:2020 之 6.2 的 EV 保護措施。藉設計審查查核符合性。

NOTE For the protective measures in the EV, see ISO 17409:2020, 6.2. Compliance is checked by design review.

CC.7 一般試驗條件 CC.7 General test conditions

CC.7.1 操作點-定義 CC.7.1 Operating points – Definitions

變數的定義如下：

Definitions of variables are as follows:

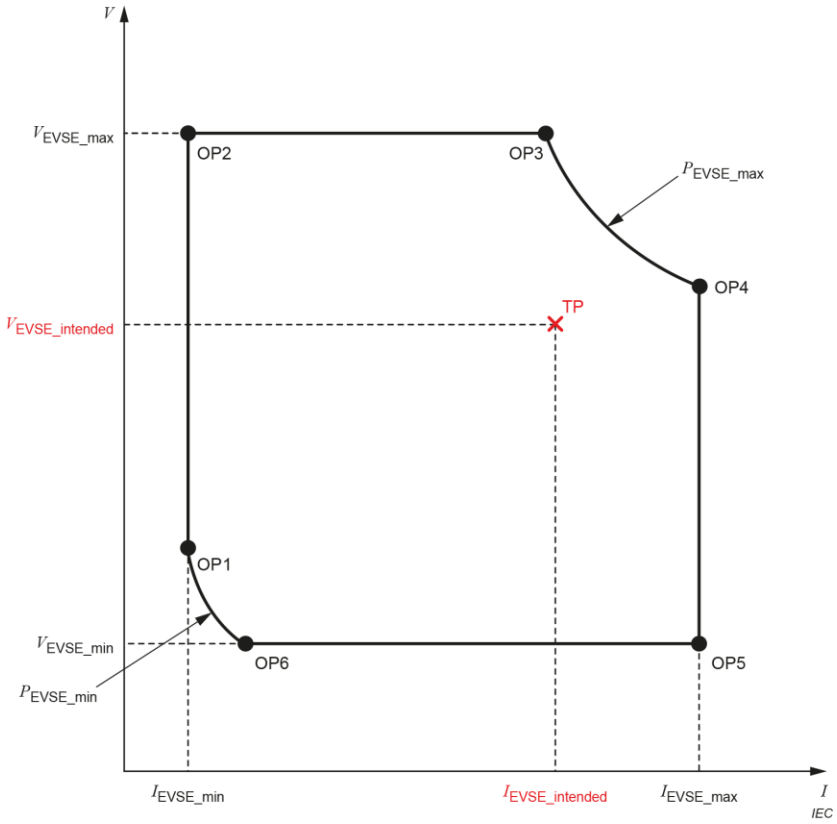
- $V_{EV_target}$：EV 模擬器之目標電壓，透過數位通訊傳送至 EV 供電設備。
- $V_{EV_target}$: target voltage of the EV simulator, sent to the EV supply equipment via digital communication;
- $I_{EV_target}$：EV 模擬器之目標電流，透過數位通訊傳送至 EV 供電設備。
- $I_{EV_target}$: target current of the EV simulator, sent to the EV supply equipment via digital communication;
- $V_{EVSE_SideB}$：EV 模擬器量測之 B 側電壓。
- $V_{EVSE_SideB}$: voltage at side B measured by the EV simulator;
- $I_{EVSE_SideB}$：EV 模擬器量測之 B 側電流。
- $I_{EVSE_SideB}$: current at side B measured by the EV simulator;
- $V_{EV_max}$：EV 模擬器之額定最高電壓。
- $V_{EV_max}$: rated maximum voltage of EV simulator;
- $I_{EV_max}$：EV 模擬器之額定最大電流。
- $I_{EV_max}$: rated maximum current of EV simulator.

$V_{EV_max}$ 及 $I_{EV_max}$ 數值應設定為 EV 供電設備透過數位通訊(例如：ChargeParameterDiscoveryRes)傳遞之最大相關值，除非另有規定。

The values for $V_{EV_max}$ and $I_{EV_max}$ shall be set to the maximum corresponding values of the EV supply equipment transferred via digital communication (for example, ChargeParameterDiscoveryRes) unless otherwise specified.

所有數位通訊應依 IEC 61851-24 規定，其中包含適用之 DIN SPEC 70121:2014 及 ISO 15118-2:2014 標準。

All digital communication shall be according to IEC 61851-24, which includes the applicable standards DIN SPEC 70121:2014 and ISO 15118-2:2014.




說明
Key

| | | | |
|---|---|---|---|
| $I_{EVSE_max}$ | EV 供電設備 B 側之額定增強/連續電流<br>rated boost/ continuous current of the EV supply equipment at side B | OP1 | $I_{EVSE_min}$ 及 $P_{EVSE_min}$ |
| $I_{EVSE_min}$ | EV 供電設備 B 側之額定最小電流<br>rated minimum current of the EV | OP2 | $V_{EVSE_max}$ 及 $I_{EVSE_min}$ |

| | | | |
|---|---|---|---|
| | supply equipment at side B | | |
| $I_{EVSE_intended}$ | 對試驗點 TP，EV 供電設備 B 側之目標電流<br>target current of the EV supply equipment at side B for the test point TP | OP3 | $V_{EVSE_max}$ 及 $P_{EVSE_max}$ |
| $V_{EVSE_max}$ | EV 供電設備 B 側之額定最高電壓<br>rated maximum voltage of EV supply equipment at side B | OP4 | $I_{EVSE_max}$ 及 $P_{EVSE_max}$ |
| $V_{EVSE_min}$ | EV 供電設備 B 側之額定最低電壓<br>rated minimum voltage of EV supply equipment at side B | OP5 | $V_{EVSE_min}$ a 及 $I_{EVSE_max}$ |
| $V_{EVSE_intended}$ | 對試驗點 TP，EV 供電設備 B 側之目標電壓<br>target voltage of the EV supply equipment at side B for the test point TP | OP6 | $V_{EVSE_min}$ 及 $P_{EVSE_min}$ |
| $P_{EVSE_max}$ | EV 供電設備 B 側之額定最大功率<br>rated maximum power of the EV supply equipment at side B | TP | $V_{EVSE_intended}$ 及 $I_{EVSE_intended}$ |
| $P_{EVSE_min}$ | EV 供電設備 B 側之額定最小功率<br>rated minimum power of the EV supply equipment at side B | | |

圖 CC. 22 操作點

Figure CC.22 – Operating points

所定義之操作範圍(OP1 to OP6)界定了 EV 目標電壓及電流值的可能範圍。然而，在容許誤差範圍內，EV 供電設備仍可能輸出超出此操作範圍的電壓或電流值。

The defined operating range (OP1 to OP6) specifies the possible range of values of target voltage and current of the EV. Between the tolerances, the EV supply equipment however may deliver values for current or voltage that are outside of this operating range.

操作範圍的實際形狀可能與圖 CC.22 繪製之理想形狀有所不同(例如：因多個 PEC 彈性配置所致)。此外，EV 供電設備之操作範圍在電能傳輸階段也可能會動態改變，例如：由於熱能劣化。

The actual shape of the operating range may differ from the idealized shape as

depicted in Figure CC.22 (for example, caused by flexible configuration of multiple PECs). Furthermore, the operating range of the EV supply equipment may dynamically change during the energy transfer stage, for example, due to thermal degradation.

對於依據 DIN SPEC 70121 及 ISO 15118-2 之數位通訊而言，兩個操作點 OP1 及 OP6 如上圖所示是表示為同一個操作點(OP1 = OP6)，且 $P_{EVSE_min} = V_{EVSE_min} \times I_{EVSE_min}$。

For digital communication according to DIN SPEC 70121 and ISO 15118-2, both operating points OP1 and OP6 as shown above denote the same operating point (OP1 = OP6) and $P_{EVSE_min} = V_{EVSE_min} \times I_{EVSE_min}$

試驗點 TP 定義了為執行特定試驗所需預定的操作電壓及操作電流。

A test point TP defines the intended operating voltage and operating current which is needed to run a specific test.

CC.7.2 標準試驗設置

CC.7.2 Standard test setup

圖 131 展示系統 C 標準的試驗設置

Figure 131 shows the standard test setup for system C.

CC.7.3 B 側量測值之定義

CC.7.3 Definition of measured values at side B

B 側之量測值定義如下：

The measured values at side B are defined as follows:

- $V_{EVSE_SideB_DC}$：B 側之量測電壓($V_{EVSE_SideB}$)，於 1 s 或更長量測期間之平均(RMS 或平均值)；
- $V_{EVSE_SideB_DC}$: measured voltage at side B $V_{EVSE_SideB}$ averaged (RMS or mean) over a measurement duration of 1 s or more;
- $V_{EVSE_rip}$：B 側之量測電壓($V_{EVSE_SideB}$) 於頻率範圍 < 150 kHz 之所有電壓漣波成分，電壓峰對峰值($V_{peak\text{-}to\text{-}peak}$)的絕對最大限制；
- $V_{EVSE_rip}$ : absolute maximum limit in $V_{peak\text{-}to\text{-}peak}$ of all voltage ripple components of the measured voltage at side B $V_{EVSE_SideB}$ in the frequency range < 150 kHz;
- $I_{EVSE_SideB_DC}$：B 側之當下電流($I_{EVSE_SideB}$)，於 1 s 或更長量測期間之平均(RMS 或平均值)；
- $I_{EVSE_SideB_DC}$: present current at side B $I_{EVSE_SideB}$ averaged (RMS or mean) over a measurement duration of 1 s or more;
- $I_{rip_low}$：B 側之量測電流($I_{EVSE_SideB}$)於頻率範圍 < 10 Hz 之所有電流漣波成分，電流峰對峰值($I_{peak\text{-}to\text{-}peak}$)的絕對最大限制；
- $I_{rip_low}$: absolute maximum limit in $A_{peak\text{-}to\text{-}peak}$ of all current ripple components of the measured current at side B $I_{EVSE_SideB}$ in the frequency range < 10 Hz;

- $I_{rip_mid}$：B 側之量測電流($I_{EVSE_SideB}$)於頻率範圍 < 5 kHz 之所有電流漣波成分，電流峰對峰值($I_{peak\text{-}to\text{-}peak}$)的絕對最大限制；
- $I_{rip_mid}$: absolute maximum limit in $A_{peak\text{-}to\text{-}peak}$ of all current ripple components of the measured current at side B $I_{EVSE_SideB}$ in the frequency range < 5 kHz;
- $I_{rip_high}$：B 側之量測電流($I_{EVSE_SideB}$)於頻率範圍 < 150 kHz 之所有電流漣波成分，電流峰對峰值($I_{peak\text{-}to\text{-}peak}$)的絕對最大限制
- $I_{rip_high}$: absolute maximum limit in $A_{peak\text{-}to\text{-}peak}$ of all current ripple components of the measured current at side B $I_{EVSE_SideB}$ in the frequency range < 150 kHz.

對於漣波成分，所有濾波應使用一階濾波器來完成，且數值應於 10 s 或更長期間進行量測。

For ripple components, all filtering shall be done with a first order filter, and the values shall be measured over a duration of 10 s or more.

CC.7.4 在 CCM 中設置測試點的示範方法

CC.7.4 Exemplary approach to set a test point in CCM

為了在 CCM 下接近特定試驗點 TP，應按照下列步驟。步驟編號參照圖 CC.23 及圖 CC.24。

In order to approach a specific test point TP in CCM, the following steps shall be taken. The step numbers refer to Figure CC.23 and Figure CC.24:

步驟 1：

Step 1:

(a) 設定 $U_T4$ = VPre-charge 及 閉合 $S_T19$。

a) Set $U_T4$ = VPre-charge and close ST19.

建議依下列方式選定 $V_{Pre\text{-}charge}$

It is recommended to choose $V_{Pre\text{-}charge}$ in such a way that

- $V_{EVSE_min} \leq V_{Pre\text{-}charge} \leq V_{EVSE_max}$，
- $V_{EVSE_SideB}$ 不會離開 EV 供電設備於步驟 2 期間之操作範圍，且
- $V_{EVSE_SideB}$ does not leave the operating range of the EV supply equipment during step 2, and
- 在步驟 2 後 $V_{EVSE_SideB}$ 與 $V_{EVSE_intended}$ 之差異小。因此，在步驟 3 需要進行 $U_T4$ 調整的需求也相對小。
- the difference between $V_{EVSE_SideB}$ and $V_{EVSE_intended}$ after step 2 is small. With that, the need to adjust $U_T4$ in step 3 will also be small.

(b) 依據 EV 供電設備之數據表，EV 模擬器應透過 "ChargeParameterDiscoveryReq" <3a> 訊息傳送下列屬性：

b) Based on the data sheet of the EV supply equipment, the EV simulator shall communicate the following properties with the message "ChargeParameterDiscoveryReq" <3a>:

- $V_{EV_max} = 1.2 \times V_{EVSE_max}$;
- $V_{EV_min} = 0.8 \times V_{EVSE_min}$;
- $I_{EV_max} = 1.2 \times I_{EVSE_max}$;
- $I_{EV_min} = 0.8 \times I_{EVSE_min}$;
- $P_{EV_max} = 1.2 \times P_{EVSE_max}$.

EV 供電設備應透過 "ChargeParameterDiscoveryRes" <3b> 訊息，成功傳送下列屬性至 EV 模擬器，：

The EV supply equipment shall have successfully communicated the following properties to the EV simulator with the message "ChargeParameterDiscoveryRes" <3b>:

- $V_{EVSE_min}$;
- $V_{EVSE_max}$;
- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

(c) 繼續正常啟動序列直到 t=t9。隨後閉合 $S_T17$ 及 $S_T18$。繼續正常啟動序列直至 EV 供電設備傳遞 "PowerDeliveryRes" <6b>，表示準備好進行電能傳輸(亦即，CC.3.2 之 t = t9 與 t = t11 之間)。

c) Continue the normal startup sequence up to t = t9. Then close $S_T17$ and $S_T18$. Continue the normal startup sequence until the EV supply equipment has communicated that it is ready for energy transfer with the message "PowerDeliveryRes" <6b> (that is, between t = t9 and t = t11 according to CC.3.2).

使用下列參數於"PreChargeReq" <5a> 訊息：

Use the following parameter in the message "PreChargeReq" <5a>:

EVTargetVoltage = $V_{EV_target} = V_{Pre\text{-}charge}$

步驟 2：

Step 2:

(a) 於訊息中透過下列參數請求目標值

a) Request target values with the following parameters in the message "CurrentDemandReq" <7a> 依據 DIN SPEC 70121:2014 或 ISO 15118-2:2014：

"CurrentDemandReq" <7a> according to DIN SPEC 70121:2014 or ISO 15118-2:2014:

- EVTargetCurrent = $I_{EV_target} = I_{EVSE_intended}$;
- EVTargetVoltage = $V_{EV_target} = 1.2 \times V_{EVSE_max}$ (對 CCM 允許);

- EVTargetVoltage = $V_{EV_target}$ = 1.2 × $V_{EVSE_max}$ (to allow for CCM);
- EVMaximumVoltageLimit = $V_{EV_max}$.

EV 模擬器在每一個 "CurrentDemandRes" <7b> 訊息後，應透過 "CurrentDemandReq" <7a>訊息定期發送目標電流及目標電壓的請求。

The EV simulator shall periodically issue target current and target voltage requests in the message "CurrentDemandReq" <7a> after each "CurrentDemandRes" <7b>.

(b) 等待直到轉移至 $I_{EVSE_intended}$ 完成。

b) Wait until transition to $I_{EVSE_intended}$ is finished.

步驟 3：

Step 3:

量測 $V_T8$ = $V_{EVSE_SideB_DC}$ 及以調整速率 ≤ 1 V/s 進行 $U_T4$ 調整，直到 $V_{EVSE_SideB_DC}$ = $V_{EVSE_intended_1}$ ± 10 V DC

Measure $V_T8$ = $V_{EVSE_SideB_DC}$ and adjust $U_T4$ with a slew rate of ≤ 1 V/s until $V_{EVSE_SideB_DC}$ = $V_{EVSE_intended_1}$ ± 10 V DC

當 while:

$V_{EVSE_SideB_DC} \geq V_{EVSE_min}$

及 and

$V_{EVSE_SideB_DC} \leq V_{EVSE_max}$

依照於 "CurrentDemandRes" <7b> 訊息所傳遞 EV 供電設備之最新操作範圍。

according to the latest operating range of the EV supply equipment as communicated in "CurrentDemandRes" <7b>.

步驟 4：

Step 4:

量測 $V_T8$ = $V_{EVSE_SideB_DC}$ 及以調整速率 ≤ 1 V/s 進行 $U_T8$ 調整，直到 $V_{EVSE_SideB_DC}$ = $V_{EVSE_intended_2}$ ± 10 V DC

Measure $V_T8$ = $V_{EVSE_SideB_DC}$ and adjust $U_T4$ with a slew rate of ≤ 1 V/s until $V_{EVSE_SideB_DC}$ = $V_{EVSE_intended_2}$ ± 10 V DC

當 while:

$V_{EVSE_SideB_DC} \geq V_{EVSE_min}$

及 and

$V_{EVSE_SideB_DC} \leq V_{EVSE_max}$

依照於 "CurrentDemandRes" <7b> 訊息所傳遞 EV 供電設備之最新操作範圍。

according to the latest operating range of the EV supply equipment as communicated in "CurrentDemandRes" <7b>.

備考：步驟 3 和步驟 4 中提到的 ±10 V DC 值是任意選定的，且與 CC.6.3 中規定 EV 供電設備 B 側之電壓量測允許準確度無關。

NOTE The ±10 V DC value mentioned in step 3 and step 4 has been chosen arbitrarily and is not related to the permissible accuracy of the side B voltage measurement of the EV supply equipment as specified in CC.6.3.

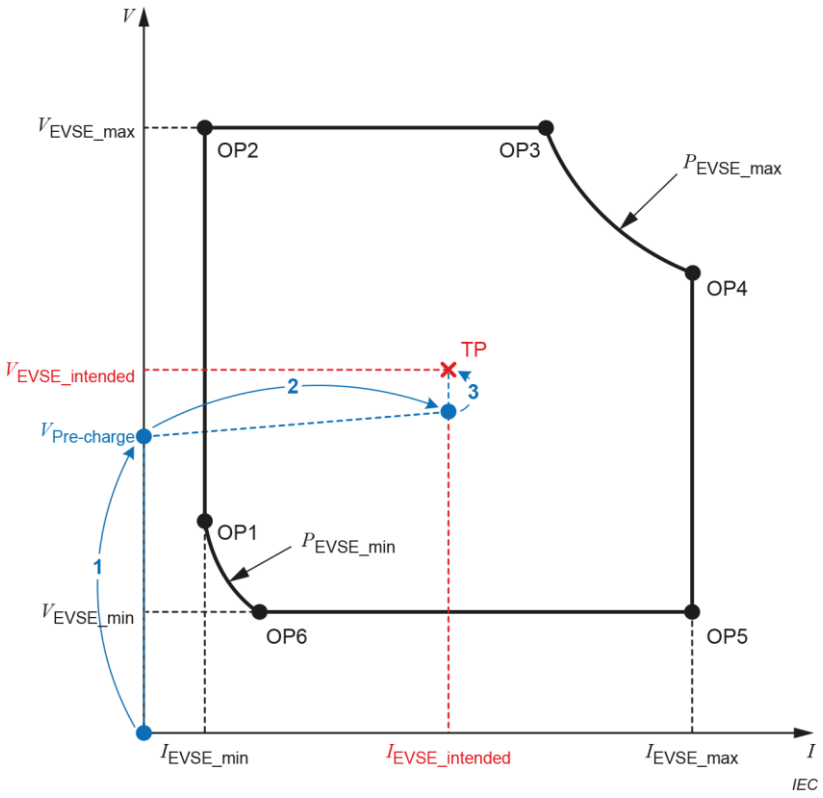



圖 CC. 23 於 CCM 接近單一試驗點 TP (範例 1)

Figure CC.23 – Approaching a single test point TP in CCM (example 1)

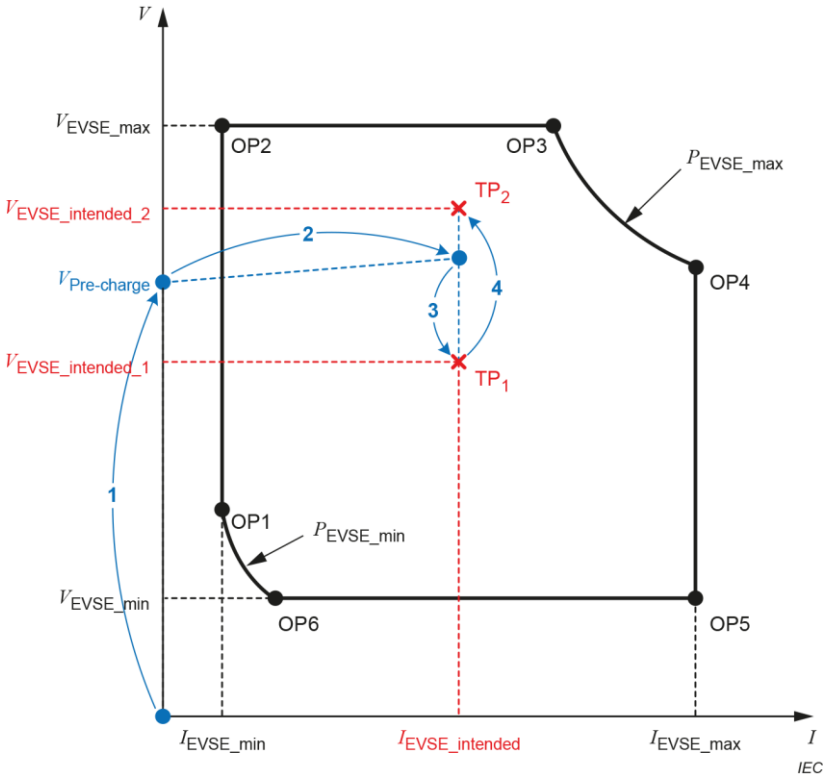



圖 CC.24 CCM 接近多試驗點 TPn (範例 2)

Figure CC.24 – Approaching multiple test points TPn CCM (example 2)

CC.7.5 試驗案例

CC.7.5 Test cases

CC.7.5.1 相容性檢查

CC.7.5.1 Compatibility check

CC.7.5.1.1 參考要求

CC.7.5.1.1 Reference requirements

此試驗案例考量以下要求：

This test case considers the following requirements:

- 6.3.1.104 相容性檢查；
- 6.3.1.104 Compatibility check;
- CC.3.2 正常啟動
- CC.3.2 Normal startup;
- CC.3.3 正常停機
- CC.3.3 Normal shutdown;
- CC.5.6 相容性檢查
- CC.5.6 Compatibility check.

CC.7.5.1.2 敘述

CC.7.5.1.2 Description

試驗若 EV 供電設備在下列情況下，將不繼續進行通訊對話：

Test if the EV supply equipment will not proceed with the communication session in case of:

$V_{EVSE_min} > V_{EV_max}$

CC.7.5.1.3 試驗設置

CC.7.5.1.3 Test setup

標準試驗設置

Standard test setup.

CC.7.5.1.4 預處理

CC.7.5.1.4 Preconditions

- 對 DIN SPEC 70121:2014："ContractAuthenticationRes" 訊息被 EV 模擬器成功的接收。
- For DIN SPEC 70121:2014: Message "ContractAuthenticationRes" was successfully received by the EV simulator.
- 對 ISO 15118-2:2014："AuthorizationRes" 訊息被 EV 模擬器成功的接收。
- For ISO 15118-2:2014: Message "AuthorizationRes" was successfully received by the EV simulator.

CC.7.5.1.5 定義及計算

CC.7.5.1.5 Definitions and calculations

無

None.

CC.7.5.1.6 動作

CC.7.5.1.6 Actions

對 DIN SPEC 70121:2014 及 ISO 15118-2:2014：

For DIN SPEC 70121:2014 and ISO 15118-2:2014:

(1) 傳送 "ChargeParameterDiscoveryReq" <3a> 訊息，包含參數：EVMaximumVoltageLimit = max ($V_{EVSE_min}$ − 10 V DC, 0 V DC)

1) send message "ChargeParameterDiscoveryReq" <3a> containing the following parameter: EVMaximumVoltageLimit = max ($V_{EVSE_min}$ − 10 V DC, 0 V DC);

(2) 繼續進行依照各標準之數位通訊。

2) proceed with the digital communication according to each standard.

CC.7.5.1.7 預期結果

CC.7.5.1.7 Expected results

以下視為試驗符合，

To consider the test as passed,

- EV 供電設備不應依據各項標準，透過數位通訊傳送下一個訊息，
- the EV supply equipment shall not proceed with the next message via digital communication according to each standard,

- EV 供電設備應回應 "ChargeParameterDiscoveryRes" <3b> 訊息，其中包含參數 "ResponseCode" = ‘FAILED_WrongChargeParameter’，且
- the EV supply equipment shall respond with message "ChargeParameterDiscoveryRes" <3b> with parameter "ResponseCode" = ‘FAILED_WrongChargeParameter’, and
- $V_T8 < 60$ V DC.

CC.7.5.2 正常啟動

CC.7.5.2 Normal startup

CC.7.5.2.1 參考要求

CC.7.5.2.1 Reference requirements

此試驗案例考量下列要求：

This test case considers the following requirements:

- CC.3.2 正常啟動
- CC.3.2 Normal startup.

CC.7.5.2.2 敘述

CC.7.5.2.2 Description

檢查 EV 供電設備是否依表 CC.8 執行正常啟動。

Check if the EV supply equipment performs a normal startup according to Table CC.8.

CC.7.5.2.3 試驗設置

CC.7.5.2.3 Test setup

標準試驗設置

Standard test setup.

CC.7.5.2.4 預處理

CC.7.5.2.4 Preconditions

無。

None.

CC.7.5.2.5 定義及計算

CC.7.5.2.5 Definitions and calculations

無。

None.

預定試驗點(TP)之定義：

Definition of intended test point (TP):

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 且:

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) with:

- $I_{EVSE_intended} = I_{EVSE_min} + 0.5 \times (I_{EVSE_max} - I_{EVSE_min})$;
- $V_{EVSE_intended} = V_{EVSE_min} + 0.5 \times (V_{EVSE_max} - V_{EVSE_min})$.

CC.7.5.2.6 動作

CC.7.5.2.6 Actions

此試驗應依 EV 供電設備所支援之各個數位通訊協定來執行。

This test shall be performed with every digital communication protocol which the EV supply equipment supports.

(1) 設定 $U_T4$ = 0 V DC 及閉合 $S_T19$.

1) Set $U_T4$ = 0 V DC and close $S_T19$.

(2) 對接車輛端插頭

2) Mate the vehicle connector.

(a) 連接 PP (至可量測接近電路的電阻)

a) Connect PP (to be able to measure the resistances in the proximity circuit)

分別量測 $R_S3$ (組態 EE，參照圖 CC.1) 及 $R_S5$ (組態 ff，參照圖 CC.2)。

Measure $R_S3$ (configuration EE, see Figure CC.1) and $R_S5$ (configuration FF, see Figure CC.2), respectively.

檢查是否達成預期結果 (1)。

Check if expected results 1) are achieved.

(b) 連接 CP (CP 從狀態 Ax 改變至 狀態 Bx)

b) Connect CP (CP change from state Ax to state Bx)

(3) 建立 IEC 61851-24 規定之數據連結。

3) Establish the data-link as defined in IEC 61851-24.

檢查是否達成預期結果(2)。

Check if expected results 2) are achieved.

(4) 建立 IEC 61851-24 規定之數位通訊。

4) Establish digital communication as defined in IEC 61851-24.

(5) 傳送"ChargeParameterDiscoveryReq" <3a> 訊息包含下列參數(包含其它參數)：

5) Send the message "ChargeParameterDiscoveryReq" <3a> with the following parameters (amongst others):

- EVMaximumCurrentLimit = $I_{EVSE_max}$;
- EVMaximumVoltageLimit = $V_{EVSE_max}$.

檢查是否達到預期結果(3)。

Check if expected results 3) are achieved.

(6) 無關閉 $S_V2$ 鎖住車輛端插頭(CP 維持狀態 B)

6) Lock the vehicle connector without closing $S_V2$ (CP remains in state B).

檢查是否達到預期結果(4)。

Check if expected results 4) are achieved.

(7) 關閉 $S_V2$ (CP 從狀態 B 改變至狀態 C/D)

7) Close $S_V2$ (CP change from state B to state C/D).

(8) 傳送一個或更多 "CableCheckReq" <4a> 訊息。

8) Send one or more "CableCheckReq" <4a> messages.

檢查是否達到預期結果(5)。

Check if expected results 5) are achieved.

(9) 傳送一個或更多 "PreChargeReq" <5a> 訊息，其中包含下列參數：

9) Send one or more "PreChargeReq" <5a> messages with following parameters:

- EVTargetCurrent = $I_{EV_target}$ = 2 A；
- EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_mid}$.

設定 UT4 = $V_{EVSE_mid}$。

Set UT4 = $V_{EVSE_mid}$.

檢查是否達到預期結果(6)。

Check if expected results 6) are achieved.

若試驗負載 $V_T11$ 與 $V_T8$ 間之電壓差絕對值 < 20 V DC，應閉合 $S_T17$ 及 ST18 (參照 t9)。

If the absolute voltage difference between $V_T11$ of the test load and $V_T8$ is < 20 V DC, $S_T17$ and ST18 shall be closed (see t9).

EV 模擬器可採用循環 "PreChargeReq/Res" <5a>/<5b> 訊息之 EV 目標電壓，來補償電壓偏差。

The EV simulator may adapt the target voltage of the EV with cyclic "PreChargeReq/Res" <5a>/<5b> messages to compensate for voltage deviation.

(10) 傳送"PowerDeliveryReq" <6a>訊息，其中含有參數"ReadyToCharge" = ‘True’。

10) Send a message "PowerDeliveryReq" <6a> with parameter "ReadyToCharge" = ‘True’.

檢查是否達到預期結果(7)。

Check if expected results 7) are achieved.

(11) 依 CC.7.4 應用步驟 2 和步驟 3 接近試驗點 TP。

11) Approach the test point TP according to CC.7.4 applying step 2 and step 3.

檢查是否達到預期結果(8)。

Check if expected results 8) are achieved.

CC.7.5.2.7 預期結果

CC.7.5.2.7 Expected results

(1) PP 電阻器 $R_S3$ = 150 Ω (± 10 %) (組態 EE，參照表 CC.2).

1) PP resistor $R_S3$ = 150 Ω (± 10 %) (configuration EE, see Table CC.2).

PP 電阻器 $R_S5$ = 1 500 Ω (± 3 %) (組態 FF，參照表 CC.4).

PP resistor $R_S5$ = 1 500 Ω (± 3 %) (configuration FF, see Table CC.4).

(2) 若 EV 供電設備準備好進行電能傳輸及 CP 振盪器尚未開啟，則 EV 供電設備應開啟其 CP 振盪器。

2) The EV supply equipment shall turn on its CP oscillator if the EV supply equipment is ready for energy transfer and if the CP oscillator is not already turned on.

EV 供電設備應維持 CP 工作週期(duty cycle)為 5%，除非某些情況要求不同的 CP 工作週期(參照 t1)。

The EV supply equipment shall maintain a CP duty cycle of 5% unless a certain condition requires a different CP duty cycle (see t1).

(3) 由 EV 供電設備執行相容性檢查。

3) The compatibility check is performed by the EV supply equipment.

EV 供電設備應傳送"ChargeParameterDiscoveryRes" <3b>訊息，其中包含下列參數：

The EV supply equipment shall send message "ChargeParameterDiscoveryRes" <3b> with the following parameters:

- EVSEMaximumVoltageLimit;
- EVSEMinimumVoltageLimit;
- EVSEMaximumCurrentLimit;
- EVSEMinimumCurrentLimit;

來考量相容性檢查(參照 t2 ► t3)。

considering the compatibility check (see t2 ► t3).

此外，EV 供電設備應傳送 EV 相容性檢查結果，於 "ChargeParameterDiscoveryRes" <3b> 訊息，包含下列參數：

Furthermore, the EV supply equipment shall send the EV the result of the compatibility check in message "ChargeParameterDiscoveryRes" <3b> with following parameters:

- ResponseCode = "OK";
- EVSEProcessing = "Finished" (參照 t3).

(4) 若 CP 狀態不為 C2 或 D2，EV 供電設備不應傳送第一個 "CableCheckRes" <4b> 訊息，且不應施加 B 側當下電壓 > 60 V DC (參照 t4 ► t5)。

4) The EV supply equipment shall not send the first "CableCheckRes" <4b> message and shall not apply a present voltage at side B > 60 V DC if the CP state is not C2 or D2 (see t4 ► t5).

(5) 在傳送第一個"CableCheckRes" <4b>訊息前，且 B 側當下電壓 > 60 V 前，若 CP 狀態變為狀態 C/D ，EV 供電設備應進行檢查(參照 t4 ► t5)。

5) The EV supply equipment shall check if the CP state changed to state C/D before sending the first "CableCheckRes" <4b> message and before the present voltage at side B is > 60 V (see t4 ► t5).

EV 供電設備應檢查 IMD 之功能性及 B 側之絕緣。EV 供電設備應持續於 "CableCheckRes" <4b> 訊息，以 CC.4.1.4 之參數 "EVSEIsolationStatus" 、"EVSEProcessing" = 'Ongoing' 、及 "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' 報告絕緣狀態(參照 t4 ► t6)。

The EV supply equipment shall check the functionality of the IMD and the insulation of side B. The EV supply equipment shall continuously report the insulation state with parameter "EVSEIsolationStatus" according to CC.4.1.4, "EVSEProcessing" = 'Ongoing', and "EVSEStatusCode" = 'EVSE_IsolationMonitoringActive' in message "CableCheckRes" <4b> (see t4 ► t6).

B 側當下電壓 $V_{EVSE_SideB_DC}$ 應依 CC.4.1.2 最後訊息 ChargeParameterDiscoveryReq/Res messages 所傳遞之協議最高電壓值：

The present voltage at side B $V_{EVSE_SideB_DC}$ shall be according to the negotiated maximum voltage values communicated in the last set of ChargeParameterDiscoveryReq/Res messages according CC.4.1.2:

$V_{EVSE_Cable_Check}$ = min($V_{EV_max_CPD}$ + 50 V DC, $V_{EVSE_max_CPD}$, 500 V DC)，若 $V_{EV_max_CPD} \leq$ 500 V DC，或

$V_{EVSE_Cable_Check}$ = min($V_{EV_max_CPD}$ + 50 V DC, $V_{EVSE_max_CPD}$, 500 V DC), if $V_{EV_max_CPD} \leq$ 500 V DC, or

$V_{EVSE_Cable_Check}$ = min(1.1 × $V_{EV_max_CPD}$, $V_{EVSE_max_CPD}$)，若 $V_{EV_max_CPD}$ > 500 V DC

$V_{EVSE_Cable_Check}$ = min(1,1 × $V_{EV_max_CPD}$, $V_{EVSE_max_CPD}$), if $V_{EV_max_CPD}$ > 500 V DC

其中

where

$V_{EV_max_CPD}$: 由 EV 於最後 "ChargeParameterDiscoveryReq" <3a> 訊息所傳送 B 側提議之協議最高電壓；

$V_{EV_max_CPD}$: proposed negotiated maximum voltage at side B communicated by the EV in the last message "ChargeParameterDiscoveryReq" <3a>;

$V_{EVSE_max_CPD}$: 於最後 "ChargeParameterDiscoveryReq" <3b> 訊息所傳送 EV 供電設備 B 側提議之協議最高電壓；

$V_{EVSE_max_CPD}$: proposed negotiated maximum voltage at side B of the EV supply

equipment communicated in the last ChargeParameterDiscoveryRes <3b>;

$V_{EVSE_Cable_Check}$: 在纜線檢查階段期間 B 側之當下電壓。

$V_{EVSE_Cable_Check}$: present voltage at side B during the cable-check phase.

在纜線檢查期間，$V_{EVSE_Cable_Check}$ 的偏差應小於 $V_{EV_max_CPD}$ 之 ±5 % 或小於 $V_{EVSE_max_CPD}$ 之 ±2 %，取其較小者。

During the cable-check phase, the deviation of the $V_{EVSE_Cable_Check}$ shall be less then ±5 % of the $V_{EV_max_CPD}$ or less than ±2 % of the $V_{EVSE_max_CPD}$, whichever deviation is smaller.

在完成纜線檢查階段，EV 供電設備應傳送"CableCheckRes " <4b> 訊息，其中包含以下參數：

After completing the cable-check phase, the EV supply equipment shall send message "CableCheckRes" <4b> with following parameters:

- CC.4.1.4 之 EVSEIsolationStatus ；
- EVSEProcessing = "Finished";
- EVSEStatusCode" = "Ready"，若絕緣狀態為'Valid' ，且沒有錯誤(參照 t6).
- EVSEStatusCode" = "Ready", if the insulation status is 'Valid' and there are no errors (see t6).

(6) EV 供電設備採用 B 側當下電壓作為 "PreChargeReq" <5a> 訊息的目標電壓，並傳送相關的 "PreChargeRes" <5b> 訊息。在預充電階段期間，EV 供電設備可依 CC.5.1 提供 B 側當下電流，限制 B 側當下電流至 2 A DC，且忽略 EV 的目標電流(參照 t7 ► t8)。

6) The EV supply equipment adapts the present voltage at side B to the target voltage of the EV in the "PreChargeReq" <5a> message and sends the corresponding "PreChargeRes" <5b> message. During the pre-charge phase the EV supply equipment is able to supply a present current at side B as defined in CC.5.1, limit the present current at side B to 2 A DC and ignore the target current of the EV (see t7 ► t8).

The present voltage at side B of the EV supply equipment reaches the target voltage of the EV between the tolerances given in section 101.1.2.

(7) 在停用預充電電流限制(例如：若有預充電電路時)及開啟其 PEC，EV 供電設備應傳送 PowerDeliveryRes <6b> 訊息，其中包含參數 "EVSEStatusCode"= 'EVSE_Ready'，來指示其已準備好進行電能傳輸及過電壓保護(參照 t9 ► t11)。

7) After disabling the pre-charge current limitation (for example, pre-charge circuit,

if any), and switching on its PECs, the EV supply equipment shall send message PowerDeliveryRes <6b> with parameter "EVSEStatusCode"= 'EVSE_Ready' to indicate that it is ready for energy transfer and overvoltage protection (see t9 ► t11).

(8) EV 供電設備應繼續監控 B 側之絕緣，並於下一個通訊訊息中包含參數 "EVSEIsolationStatus" 來進行更新(參照 t11 ►)。

8) The EV supply equipment shall continuously monitor the insulation of side B and update parameter "EVSEIsolationStatus" in the next communicated messages that contain this parameter (see t11 ►).

EV 供電設備應採用 B 側當下電流作為 "CurrentDemandReq" <7a> 訊息中 EV 之目標電流。

The EV supply equipment shall adapt the present current at side B to the target current of the EV in message "CurrentDemandReq" <7a>.

EV 供電設備應於 CurrentDemandRes <7b> 訊息中，包含下列資訊來回應 EV：

The EV supply equipment shall respond with the following information to the EV in message CurrentDemandRes<7b>:

- EV 供電設備 B 側之當下電流及電壓；
- its present current and voltage at side B;
- EV 供電設備 B 側之適用最大電流及電壓；
- its applicable maximum/minimum current and voltage at side B;
- EV 供電設備當下之狀態(參照 t11 ► t12)。
- its present status (see t11 ► t12).

CC.7.5.3 由 EV 喚醒 EV 供電設備

CC.7.5.3 Wake up of EV supply equipment by EV

CC.7.5.3.1 參考要求

CC.7.5.3.1 Reference requirements

此試驗案例考量下列要求：

This test case considers the following requirements:

- CC.5.2 睡眠模式與通訊對話重新啟動方法。
- CC.5.2 Sleep mode and communication session restart methods.

CC.7.5.3.2 敘述

CC.7.5.3.2 Description

在 EV 供電設備進入睡眠模式後，由 EV 執行喚醒動作之反應。

Reaction on wake up action performed by EV after the EV supply equipment entered sleep mode.

CC.7.5.3.3 試驗設置

CC.7.5.3.3 Test setup

標準試驗設備。

Standard test setup.

CC.7.5.3.4 預處理

CC.7.5.3.4 Preconditions

無。

None.

CC.7.5.3.5 定義及計算

CC.7.5.3.5 Definitions and calculations

預定試驗點之定義：

Definition of intended test point:

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 及：

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) with:

- $I_{EVSE_intended} = I_{EVSE_min}$
- $V_{EVSE_intended} = P_{EVSE_min} / I_{EVSE_min}$

TP 等同於 OP1。

TP equals to OP1.

CC.7.5.3.6 動作

CC.7.5.3.6 Actions

(1) 依 CC.7.4 接近試驗點 TP。

1) Approach test point TP according to CC.7.4.

(2) 依 IEC 61851-24 傳送 "PowerDeliveryReq" 訊息，其中包含參數 "ChargeProgress" = ‘Stop’。

2) Send message "PowerDeliveryReq" according to IEC 61851-24 with the parameter "ChargeProgress" = ‘Stop’.

(3) 等待 "PowerDeliveryRes" 訊息。

3) Wait for the "PowerDeliveryRes" message.

(4) 依 IEC 61851-24 傳送 "SessionStopReq" 訊息，其中包含參數 "ChargingSession" = ‘Pause’ 。

4) Send message "SessionStopReq" according to IEC 61851-24 with the parameter "ChargingSession" = ‘Pause’.

(5) 等待 "SessionStopRes" 訊息。

5) Wait for "SessionStopRes".

(6) 暫停數據連結(D-LINK_PAUSE.request())。

6) Pause the data-link (D-LINK_PAUSE.request()).

(7) 等待 EV 供電設備進行睡眠模式，其可由停止 CP 振盪器來指示，亦即，改變 CP 狀態從 B2 到 B1。

7) Wait until the EV supply equipment enters sleep mode, which is indicated by a disabled CP oscillator, that is, change from CP state B2 to B1.

(8) 依 IEC 61851-1:2017 之表 A.6 的序列 11，執行一次 B1-C1-B1 轉換操作。

8) Perform one B1-C1-B1 toggle according to IEC 61851-1:2017, Table A.6, Sequence 11.

CC.7.5.3.7 預期結果

CC.7.5.3.7 Expected results

EV 供電設備以工作週期 5 % 啟用 CP 振盪器，亦即，改變 CP 狀態從 B1 to B2，來發出喚醒信號。

The EV supply equipment signals a wake up by enabling the CP oscillator with a duty cycle of 5 %, that is, change from CP state B1 to B2.

CC.7.5.4 控制導引導體電氣連續性之喪失

CC.7.5.4 Loss of electrical continuity of the control pilot conductor

CC.7.5.4.1 參考要求

CC.7.5.4.1 Reference requirements

此試驗案例考量下列要求：

This test case considers the following requirements:

- 6.3.1.105 停止供電至 EV；
- 6.3.1.105 De-energization of the power supply to the EV;
- 6.3.1.113.4 緊急停機；
- 6.3.1.113.4 Emergency shutdown;
- CC.4.3 控制導引導體電氣連續性之喪失。
- CC.4.3 Loss of electrical continuity of the control pilot conductor.

CC.7.5.4.2 敘述

CC.7.5.4.2 Description

EV 供電設備在喪失控制導引導體情況下之緊急停機(CP 狀態從狀態 C 改變至狀態 A 或 B)

EV supply equipment emergency shutdown in case of losing the electrical continuity of the control pilot conductor (CP change from state C to states A or B).

CC.7.5.4.3 試驗設備

CC.7.5.4.3 Test setup

標準試驗設備。

Standard test setup.

CC.7.5.4.4 預處理

CC.7.5.4.4 Preconditions

依據 EV 供電設備之數據表，EV 模擬器應於"ChargeParameterDiscoveryReq" <3a> 訊息傳送下列屬性：

Based on the data sheet of the EV supply equipment, the EV simulator shall communicate the following properties with the message "ChargeParameterDiscoveryReq" <3a>:

- $V_{EV_max} = 1.2 \times V_{EVSE_max}$;
- $V_{EV_min} = 0.8 \times V_{EVSE_min}$;

- $I_{EV_max} = 1.2 \times I_{EVSE_max}$;
- $I_{EV_min} = 0.8 \times I_{EVSE_min}$;
- $P_{EV_max} = 1.2 \times P_{EVSE_max}$.

EV 供電設備應於 "ChargeParameterDiscoveryRes" <3b> 訊息，成功傳遞以下屬性至 EV 模擬器：

The EV supply equipment shall have successfully communicated the following properties to the EV simulator with the message "ChargeParameterDiscoveryRes" <3b>:

- $V_{EVSE_min}$;
- $V_{EVSE_max}$;
- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

CC.7.5.4.5 定義及計算

CC.7.5.4.5 Definitions and calculations

預定試驗點之定義：

Definition of intended test points:

TP1 = ($I_{EVSE_intended_1}$ / $V_{EVSE_intended_1}$) 及 with:

- $I_{EVSE_intended_1} = I_{EVSE_max}$
- $V_{EVSE_intended_1} = P_{EVSE_max} / I_{EVSE_max}$
- TP1 等同於 OP4.
- TP1 equals to OP4.

TP2 = ($I_{EVSE_intended_2}$ / $V_{EVSE_intended_2}$) 及 with:

- $I_{EVSE_intended_2} = P_{EVSE_max} / V_{EVSE_max}$
- $V_{EVSE_intended_2} = V_{EVSE_max}$
- TP2 等同於 OP3.
- TP2 equals to OP3.

TP3 = ($I_{EVSE_intended_3}$ / $V_{EVSE_intended_3}$) 及 with:

- $I_{EVSE_intended_3}$ = 0 A DC
- $V_{EVSE_intended_3} = V_{EVSE_min} + 1/2 \times (V_{EVSE_max} - V_{EVSE_min})$

更多的定義：

Further definitions:

- $V_{EVSE_mid} = V_{EVSE_min} + 1/2 \times (V_{EVSE_max} - V_{EVSE_min})$

CC.7.5.4.6 動作

CC.7.5.4.6 Actions

下列每一個案例應進行試驗。

Each of the following cases shall be tested.

(1) 在纜線檢查階段 CP 從狀態 C 改變為狀態 A

1) CP change from state C to state A during the cable-check phase

- 依 圖 CC.5 正常啟動序列應成功進作直到 t = t4。
- The normal startup sequence shall be successfully done until t = t4 according to Figure CC.5.
- 斷開 $S_T3$，並檢查預期結果。
- Open $S_T3$ and check expected results.

(2) 在預充電階段，CP 從狀態 C 改變為 A

2) CP change from state C to state A during the pre-charge phase

- 依 CC.7.4 接近試驗點 TP3。
- Approach test point TP3 according to CC.7.4.
- 斷開 $S_T3$，並檢查預期結果。
- Open $S_T3$ and check expected results.

(3) 在 TP1 的電能傳輸時期，CP 從狀態 C 改變為狀態 A。

3) CP change from state C to state A during the energy transfer stage at TP1

- 依 CC.7.4 接近試驗點 TP1。
- Approach test point TP1 according to CC.7.4.
- 斷開 $S_T3$，並檢查預期結果。
- Open $S_T3$ and check expected results.

(4) 在 TP2 的電能傳輸時期，CP 從狀態 C 改變為狀態 A。

4) CP change from state C to state A during the energy transfer stage at TP2

- 依 CC.7.4 接近試驗點 TP2。
- Approach test point TP2 according to CC.7.4.
- 斷開 $S_T3$，並檢查預期結果。
- Open $S_T3$ and check expected results.

(5) 在 TP1 的電能傳輸時期，CP 從狀態 C 改變為狀態 B，參照(3)。

5) CP change from state C to state B during the energy transfer stage at TP1: see 3)

- 斷開 EV 模擬器之 $S_V2$，並檢查預期結果。
- Open $S_V2$ in the EV simulator and check expected results.

(6) 在 TP2 的電能傳輸時期，CP 從狀態 C 改變為狀態 B，參照(4)。

6) CP change from state C to state B during the energy transfer stage at TP2: see 4)

- 斷開 EV 模擬器之 $S_V2$，並檢查預期結果。
- Open $S_V2$ in the EV simulator and check expected results.

備考 1：試驗案例 (1)、(2)、(3)、(4)、(5)及(6) 可以任一順序進行，且試驗之間的故障狀態需進行清除。

NOTE 1 The test cases 1), 2), 3), 4), 5) and 6) can be done in arbitrary order, and fault states need to be cleared between tests.

備考 2：若 TP1 = TP2 則只需進行一個聯合試驗即可。

NOTE 2 If TP1 = TP2 one joint test run is sufficient.

CC.7.5.4.7 預期結果

CC.7.5.4.7 Expected results

EV 供電設備應執行緊急停機。亦即 EV 供電設備應：

The EV supply equipment shall perform an emergency shutdown. That means that the EV supply equipment shall:

- 在斷開 $S_T3$ 或 $S_V2$ 後，於 20 ms 或更短時間內關閉其 CP 振盪器來指示緊急停機。
- turn off its CP oscillator to indicate an emergency shutdown in 20 ms or less after opening $S_T3$ or $S_V2$,
- 在斷開 $S_T3$ 或 $S_V2$ 後，於 30 ms 或更短時間內減少 AT1 至 ≤5 A DC，及停用 B 側。
- reduce AT1 to ≤ 5 A DC and disable side B in 30 ms or less after opening ST3 or SV2,
- 在斷開 $S_T3$ 或 $S_V2$ 後，於 1,010 ms 或更短時間內減少 $V_T8$ 至 ≤ 60 V DC，及
- reduce $V_T8$ to ≤ 60 V DC in 1 010 ms or less after opening $S_T3$ or $S_V2$, and
- 在斷開 $S_T3$ 或 $S_V2$ 後，於 1,010 ms 或更短時間內減少 $V_T7$ 至 ≤ 60 V DC。
- reduce $V_T6$ and $V_T7$ to ≤ 60 V DC in 1 010 ms or less after opening $S_T3$ or $S_V2$.

此外，對 CC.7.5.4.6 之 (5) 及 (6)：

In addition, for CC.7.5.4.6 5) and 6):

- CP 振動器應於 20 ms 或更短時間內予以關閉(CP 從狀態 B2 改變為狀態 X1)
- The CP oscillator shall be switched off (CP change from state B2 to state X1) in 20 ms or less.

CC.7.5.5 保護導體連續性檢查

CC.7.5.5 Protective conductor continuity checking

CC.7.5.5.1 參考要求

CC.7.5.5.1 Reference requirements

此試驗案例考量下列要求：

This test case considers the following requirements:

- 6.3.1.2 保護導體連續性檢查;
- 6.3.1.2 Continuous continuity checking of the protective conductor;
- 6.3.1.113.4 緊急停機;
- 6.3.1.113.4 Emergency Shutdown;
- CC.4.7 保護導體電氣連續性之喪失。
- CC.4.7 Loss of electrical continuity of the protective conductor.

CC.7.5.5.2 敘述

CC.7.5.5.2 Description

喪失保護導體電氣連續性情況下之緊急停機。此試驗案例適用於 EV 供電設備 B 側額定最高電壓 ≥ 60 V DC 之 EV 供電設備。

Emergency shutdown in case of loss of protective conductor continuity. This test case applies to EV supply equipment with a rated maximum voltage of the EV supply equipment at side B ≥ 60 V DC.

CC.7.5.5.3 試驗設置

CC.7.5.5.3 Test setup

標準試驗設置使用開關 $S_T28$ 來破壞 EV 供電設備側之保護導體連續性。

Standard test setup with switch $S_T28$ to break the protective conductor continuity in the EV supply equipment side.

此試驗要求 EV 供電設備如試驗設置所示進行調整。

This test requires the EV supply equipment to be modified as shown in the test setup.

CC.7.5.5.4 預處理

CC.7.5.5.4 Preconditions

無。

None.

CC.7.5.5.5 定義及計算

CC.7.5.5.5 Definitions and calculations

預定試驗點之定義：

Definition of intended test points:

TP1 = ($I_{EVSE_intended_1}$ / $V_{EVSE_intended_1}$) 及 with:

- $I_{EVSE_intended_1} = P_{EVSE_max} / V_{EVSE_max}$
- $V_{EVSE_intended_1} = V_{EVSE_max}$
- 依據圖 CC.22，TP1 對應至 OP3。
- TP1 corresponds to OP3 according to Figure CC.22.

TP2 = ($I_{EVSE_intended_2}$ / $V_{EVSE_intended_2}$) 及 with:

- $I_{EVSE_intended_2} = I_{EVSE_max}$
- $V_{EVSE_intended_2} = P_{EVSE_max} / I_{EVSE_max}$
- 依據圖 CC.22，TP2 對應至 OP4。
- TP2 corresponds to OP4 according to Figure CC.22.

CC.7.5.5.6 動作

CC.7.5.5.6 Actions

對每一個定義的試驗點重複以下步驟。

Repeat the following steps for each of the defined test points.

(1) 依 CC.7.4 接近試驗點 TP。

1) Approach the test point TP according to CC.7.4.

(2) 斷開 $S_T28$。

2) Open $S_T28$.

(3) $t_{CP_open}$ 為當 $S_T28$ 改變狀態從閉合至斷開的時間點(需依據 $V_T1$ 的狀態轉換來推導)。

3) $t_{CP_open}$ is the point in time when $S_T28$ changes its state from closed to opened (to be derived from the transition in $V_T1$)

(4) 檢查是否達到預期結果。

4) Check if the expected results are achieved.

CC.7.5.5.7 預期結果

CC.7.5.5.7 Expected results

EV 供電設備應執行緊急停機。亦即 EV 供電設備應

The EV supply equipment shall perform an emergency shutdown. That means that the EV supply equipment shall

- 在 $t_{CP_open}$ 後 160 ms 或更短時間內，關閉 CP 振盪器來指示緊急停機，
- turn off its CP oscillator to indicate an emergency shutdown in 160 ms or less after $t_{CP_open}$,
- 在 $t_{CP_open}$ 後 160 ms 或更短時間內，減少 B 側當下電流至 ≤ 5 A DC 並停用 B 側，
- reduce its present current at side B to ≤ 5 A DC and disable its side B in 170 ms or less after $t_{CP_open}$,
- 在 $t_{CP_open}$ 後 150 ms 或更短時間內，減少 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V DC，
- reduce the present voltage at side B between DC+ and DC– to ≤ 60 V DC in 1 150 ms or less after $t_{CP_open}$, and
- 在 $t_{CP_open}$ 後 1,150 ms 或更短時間內，減少 B 側 DC+ 與保護導體間、及 DC– 與保護導體間之當下電壓至 ≤ 60 V DC。
- reduce the present voltage at side B between DC+ and protective conductor, and between DC– and protective conductor to ≤ 60 V DC in 1,150 ms or less after $t_{CP_open}$.

CC.7.5.6 EV 供電設備 B 側之額定值

CC.7.5.6 Rated EV supply equipment values at side B

CC.7.5.6.1 一般

CC.7.5.6.1 General

試驗之試驗點 TPn 如圖 CC.25 所示。

The test points TPn for the test is shown in Figure CC.25.

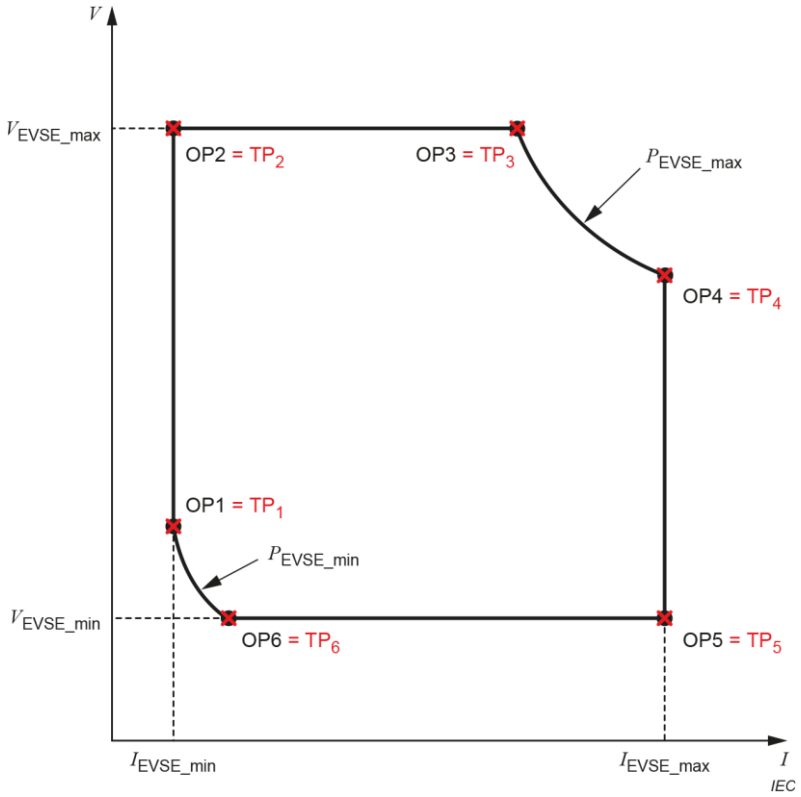



圖 CC. 25 $TP_n$ 試驗點

Figure CC.25 – Test points $TP_n$

CC.7.5.6.2 參考要求

CC.7.5.6.2 Reference requirements

此試驗設置考量以下要求：

This test setup considers the following requirements:

- 101.1.1 B 側電壓、電流及功率操作範圍；
- 101.1.1 Operating ranges for voltage, current, and power at side B;
- 101.1.2.1 CCM 模式下 B 側之電流調節；
- 101.1.2.1 Side B current regulation in CCM;
- 101.1.5 週期性及隨機偏差(CCM 模式下之電流漣波) ；
- 101.1.5 Periodic and random deviation (current ripple in CCM);
- CC.5.5.7 EV 目標電流小於 EV 供電設備 B 側之可用最小電流
- CC.5.5.7 The target current of the EV is less than the applicable minimum current of the EV supply equipment at side B;
- CC.5.5.8 EV 之目標電流大於 EV 供電設備 B 側之適用最大電流
- CC.5.5.8 The target current of the EV is more than the applicable maximum current of the EV supply equipment at side B;
- CC.5.5.9 EV 之目標電壓小於 B 側之當下電壓
- CC.5.5.9 The target voltage of the EV is less than the present voltage at side B;

- CC.5.5.10 EV 之目標電壓大於最高電壓限制
- CC.5.5.10 The target voltage of the EV is more than the maximum voltage limits;
- CC.5.5.13 由於 EV 供電設備 B 側適用之最小功率的限制
- CC.5.5.13 Limitations due to the applicable minimum power of the EV supply equipment at side B;
- CC.5.5.14 由於 EV 供電設備 B 側適用之最大功率的限制
- CC.5.5.14 Limitations due to the applicable maximum power of the EV supply equipment at side B;
- CC.6.2 B 側電流調節。
- CC.6.2 Side B current regulation.

CC.7.5.6.3 敘述

CC.7.5.6.3 Description

A 部分：

Part A:

試驗 EV 供電設備於溫度 –5 °C 至 +40 °C、及水平面 ≥2,000 m 之環境條件下，是否可傳送 B 側於電壓範圍 [$V_{EVSE_min}$, $V_{EVSE_max}$] 之當下電壓，且 EV 之目標電流在 CCM 模式、於電流範圍 [$I_{EVSE_min}$, $I_{EVSE_max}$] 小於或等於 EV 供電設備 B 側額定最大功率 [$P_{EVSE_max}$] 之限制，，

Test if the EV supply equipment is able to deliver present voltage at side B in the voltage range [$V_{EVSE_min}$, $V_{EVSE_max}$] and the target current of the EV in the current range [$I_{EVSE_min}$, $I_{EVSE_max}$] in CCM less than or equal to the limit of the rated maximum power of the EV supply equipment at side B [$P_{EVSE_max}$] at the ambient temperature –5 °C to +40 °C and ≥ 2 000 m above sea level.

B 部分：

Part B:

試驗若 EV 之目標電流或電壓值在 EV 供電設備之操作範圍外，EV 供電設備於 B 側是否傳送預定之電流及電壓。

Test if the EV supply equipment delivers the expected current and voltage at side B if the target current or voltage of the EV values are outside the operating range of the EV supply equipment.

CC.7.5.6.4 試驗設備

CC.7.5.6.4 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.6.5 預處理

CC.7.5.6.5 Preconditions

無。

None.

CC.7.5.6.6 定義及計算

CC.7.5.6.6 Definitions and calculations

在此試驗案例，許多 EV 供電設備屬性在特定試驗點 TPn 於 EV 供電設備之操作邊緣，以 EV 之目標電流及電壓的特定組合來進行試驗。

In this test case, certain properties of the EV supply equipment are tested at specific test points TPn at the edges of the operating range of the EV supply equipment, with specific combinations of target current and voltage of the EV.

在此試驗案例，許多 EV 供電設備屬性在特定之試驗點 TP 於 EV 供電設備之操作邊緣進行試驗。

In this test case, certain properties of the EV supply equipment are tested at specific test points TP at the edges of the operating range of the EV supply equipment.

試驗點 TP 之定義：

Definition of test points TP:

TP1 = ($I_{EVSE_intended_1}$ / $V_{EVSE_intended_1}$) 及 with:

- $I_{EVSE_intended_1} = I_{EVSE_min}$
- $V_{EVSE_intended_1} = P_{EVSE_min} / I_{EVSE_min}$
- TP1 對應至 OP1。
- TP1 corresponds to OP1.

TP2 = ($I_{EVSE_intended_2}$ / $V_{EVSE_intended_2}$) 及 with:

- $I_{EVSE_intended_2} = I_{EVSE_min}$
- $V_{EVSE_intended_2} = V_{EVSE_max}$
- TP2 對應至 OP2。
- TP2 corresponds to OP2.

TP3 = ($I_{EVSE_intended_3}$ / $V_{EVSE_intended_3}$) 及 with:

- $I_{EVSE_intended_3} = P_{EVSE_max} / V_{EVSE_max}$
- $V_{EVSE_intended_2} = V_{EVSE_max}$
- TP3 對應至 OP3.
- TP3 corresponds to OP3.

TP4 = ($I_{EVSE_intended_4}$ / $I_{EVSE_intended_4}$) 及 with:

- $I_{EVSE_intended_4} = I_{EVSE_max}$
- $V_{EVSE_intended_4} = P_{EVSE_max} / I_{EVSE_max}$
- TP4 對應至 OP4.
- TP4 corresponds to OP4.

TP5 = ($I_{EVSE_intended_5}$ / $V_{EVSE_intended_5}$) 及 with:

- $I_{EVSE_intended_5} = I_{EVSE_max}$

- $V_{EVSE_intended_5} = V_{EVSE_min}$
- TP5 對應至 OP5.
- TP5 corresponds to OP5.

TP6 = ($I_{EVSE_intended_6}$ / $V_{EVSE_intended_6}$) 及 with:

- $I_{EVSE_intended_6} = P_{EVSE_min} / V_{EVSE_min}$
- $V_{EVSE_intended_6} = V_{EVSE_min}$
- TP6 對應至 OP6.
- TP6 corresponds to OP6.

在每一個 TPn 量測期間，持續進行計算：

Calculations done continuously during the measurement duration of each TPn:

- 測定 B 側當下電流偏差之絕對值：
- Determine the absolute present current at side B deviation:

  $I_{dev_abs} = |I_{EVSE_SideB_DC} - I_{EV_target}|$ 對 $I_{EV_target} \leq 50$ A DC
- 測定 B 側當下電流之相對偏差：
- Determine the relative present current at side B deviation:

  $I_{dev_rel} = |I_{EVSE_SideB_DC} - I_{EV_target}| / I_{EV_target}$ 對 $V_{EV_target} > 50$ A DC
- 測定 B 側當下功率：
- Determine the present power at side B:

  $P_{EVSE_SideB_DC} = V_{EVSE_SideB_DC} \times I_{EVSE_SideB_DC}$

CC.7.5.6.7 動作

CC.7.5.6.7 Actions

EV 模擬器應以 1 s 或更短的週期時間，來循環傳送 "CurrentDemandReq" <7a> 訊息，使 EV 供電設備於 "CurrentDemandRes" <7b> 訊息中傳遞其(可能已更新)適用之最大或最小值。

The EV simulator shall cyclically send "CurrentDemandReq" <7a> messages with a cycle time of 1 s or less in order to enable the EV supply equipment to communicate its (potentially updated) applicable maximum and minimum values in "CurrentDemandRes" <7b>.

試驗案例之一般敘述與及參數之規格：

General description of test case and specification of parameter values:

試驗點之順序可依據試驗負載進行最佳化。可利用通訊對話間之延遲時間，例如：提供試驗負載冷卻。

The sequence of the test points can be optimized for the test load. Delay times between the communication sessions can be used for example, for cooling down the test load.

每個試驗點之試驗包含兩個主要部分(a)與(b)如下：

The test of each test point consists of two main parts a) and b) as follows:

(a) 於 CCM 模式下，EV 供電設備 B 側測試點位於操作範圍邊界上之試驗。

a) test of the side B of the EV supply equipment in CCM at test points located at the boundary of the operating range;

(b) 在 CCM 模式下，EV 供電設備對目標值在操作範圍外反應之試驗。

b) test of the reaction of the EV supply equipment on a target values outside the operating range in CCM .

A 部分之動作

Actions for Part A)

(1) 依 CC.7.4 接近試驗點

1) Approach a test point according to CC.7.4.

(2) 量測 $I_{EVSE_SideB_DC}$、$I_{rip_low}$、$I_{rip_mid}$ 及 $I_{rip_high}$。

2) Measure $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$.

(3) 接收 $I_{EVSE_measure}$ 及 $V_{EVSE_measure}$。

3) Receive $I_{EVSE_measure}$ and $V_{EVSE_measure}$.

(4) 執行及完成每一個試驗點 TPn 之計算。

4) Perform calculations to be done for each test point TPn.

(5) 檢查是否達到 A 部分之預期結果。

5) Check if expected results for part a) are achieved.

B 部分之動作

Actions for Part B)

(5) 當依照部分(a)所述成功達到某個試驗點後，EV 模擬器在每次收到 "CurrentDemandRes" <7b> 訊息後，應傳送 "CurrentDemandReq" <7a> 訊息，其中包含如表 CC.21 所示超過 EV 供電設備操作範圍之參數值。

6) After a test point has been successfully approached as described in part a), the EV simulator shall send "CurrentDemandReq" <7a> messages after each "CurrentDemandRes" <7b> message, with the parameter values shown in Table CC.21 that are outside the operating range of the EV supply equipment.

表 CC.21 EV 模擬設定之電流及電壓

Table CC.21 – EV simulator target current and voltage

| 試驗點<br>Test point | EVTargetCurrent = $I_{EV_target}$ | EVTargetVoltage = $V_{EV_target}$<br>(CCM 所允許)<br>(to allow for CCM) |
|---|---|---|
| TP1 | $0.8 \times I_{EVSE\ intended}$ | $1.2 \times V_{EVSE\ max}$ |
| TP2 | $0.8 \times I_{EVSE\ intended}$ | $1.2 \times V_{EVSE\ max}$ |
| TP3 | $1.2 \times I_{EVSE\ intended}$ | $1.2 \times V_{EVSE\ max}$ |
| TP4 | $1.2 \times I_{EVSE\ intended}$ | $1.2 \times V_{EVSE\ max}$ |
| TP5 | $1.2 \times I_{EVSE\ intended}$ | $1.2 \times V_{EVSE\ max}$ |
| TP6 | $0.8 \times I_{EVSE\ intended}$ | $1.2 \times V_{EVSE\ max}$ |

(7) 傳送 "CurrentDemandReq" <7a> 訊息，其中包含表 CC.21 規定之新參數值，

來請求 EV 之目標電流超過 EV 供電設備之操作範圍。

7) Request a target current of the EV outside the operating range of the EV supply equipment by sending "CurrentDemandReq" <7a> messages with the new parameter values specified in Table CC.21.

(8) 檢查是否達到 B 部分之預期結果。

8) Check if expected results for part b) are achieved.

CC.7.5.6.8 預期結果

CC.7.5.6.8 Expected results

A 部分：

Part A:

對 $I_{EVSE_target_n} \leq 5$ A DC:

- $I_{dev_abs_n} \leq 150$ mA DC.

對 5 A < $I_{EVSE_target_n} \leq 50$ A DC:

- $I_{dev_abs_n} \leq 1{,}5$ A DC.

對 $I_{EVSE_target_n} > 50$ A DC:

- $I_{dev_rel_n} \leq 3$ %.

電流漣波應符合表 CC.22 規定之限制。

The current ripple shall meet the limits in Table CC.22.

表 CC.22 電流漣波限制

Table CC.22 – Current ripple limits

| | 電流漣波，峰對峰(Apeak-to-peak)<br>Current ripple, Apeak-to-peak | | |
|---|---|---|---|
| | $I_{EVSE_SideB_DC} \leq 200$ A DC | 200 A DC < $I_{EVSE_SideB_DC} \leq 400$ A DC | $I_{EVSE_SideB_DC} > 400$ A DC |
| $I_{rip_low}$ | ≤ 1.5 | ≤ ($I_{EVSE_SideB_DC}$ × 0.75 %) | ≤ ($I_{EVSE_SideB_DC}$ × 0.75 %) |
| $I_{rip_mid}$ | ≤ 6.0 | ≤ 6.0 | ≤ ($I_{EVSE_SideB_DC}$ × 1.5 %) |
| $I_{rip_high}$ | ≤ 9.0 | ≤ ($I_{EVSE_SideB_DC}$ × 4.5 %) | ≤ ($I_{EVSE_SideB_DC}$ × 4.5 %) |

B 部分：

Part B:

對 TP1、TP2 及 TP6：

For TP1, TP2 and TP6:

- $I_{EVSE_SideB_DC} = 0$ A DC ± 0.150 A DC.
- 預期結果適用 A 部分對電流漣波之規定。
- The expected results for the current ripple as specified in part a) shall apply.

對 TP3, TP4 and TP5：

For TP3, TP4 and TP5:

- 依照表 CC.21 於 "CurrentDemandReq" <3a> 訊息，傳送請求參數 EVTargetCurrent 及 EVTargetVoltage 後，B 側之當下電流及電壓不應發生變化。
- The present current and voltage at side B shall not change after requesting parameters EVTargetCurrent and EVTargetVoltage according to Table CC.21 in the "CurrentDemandReq" <3a> messages.
- 預期結果適用 A 部分之規定。
- The expected results as specified in part a) shall apply.

CC.7.5.7 車輛端插頭過電壓防護

CC.7.5.7 Protection against overvoltage at the vehicle connector

CC.7.5.7.1 過電壓引起之緊急停機(試驗 1)

CC.7.5.7.1 Emergency shutdown caused by an overvoltage (test 1)

CC.7.5.7.1.1 參考要求

CC.7.5.7.1.1 Reference requirements

本試驗案例考量下列要求：

This test case considers the following requirements:

- 6.3.1.106.2 以緊急停機對車輛端插頭 DC+ 與 DC– 間之過電壓防護。
- 6.3.1.106.2 Protection against overvoltage between DC+ and DC– at the vehicle connector by emergency shutdown;
- 6.3.1.113.4 緊急停機。
- 6.3.1.113.4 Emergency shutdown.

CC.7.5.7.1.2 敘述

CC.7.5.7.1.2 Description

在 B 側當下電壓超過表 103 之臨界值情況下，應進行緊急停機。EV 模擬器切換電壓源，使 B 側當下電壓超過緊急停機之電壓臨界值。

Emergency shutdown in case the present voltage at side B is more than the thresholds in Table 103. The EV simulator switches a voltage source, and the present voltage at side B becomes more than the voltage threshold for emergency shutdown.

CC.7.5.7.1.3 試驗設置

CC.7.5.7.1.3 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.7.1.4 預處理

CC.7.5.7.1.4 Preconditions

無。

None.

CC.7.5.7.1.5 定義及計算

CC.7.5.7.1.5 Definitions and calculations

時間的定義：

Definition of times:

$t_{overvoltage}$ 為過電壓情況開始之時間點

$t_{overvoltage}$ is the point in time when the overvoltage condition starts

預定試驗點之定義：

Definition of intended test points:

TP1 = ($I_{EVSE_intended_1}$ / $V_{EVSE_intended_1}$) 及 with:

- $I_{EVSE_intended_1} = I_{EVSE_min} + 0.5 \times (I_{EVSE_max} - I_{EVSE_min})$
- $V_{EVSE_intended_1} = \min(V_{EVSE_max}; 500\ V) - 50\ V$
- TP1 永遠適用。
- TP1 is always applicable.

TP2 = ($I_{EVSE_intended_2}$ / $V_{EVSE_intended_2}$) 及 with:

- $I_{EVSE_intended_2} = I_{EVSE_intended_1}$
- $V_{EVSE_intended_2} = \min(V_{EVSE_max}; 750\ V) - 50\ V$
- TP2 僅適用於當 $V_{EVSE_max} > 500$ V.
- TP2 is only applicable if $V_{EVSE_max} > 500$ V.

TP3 = ($I_{EVSE_intended_3}$ / $V_{EVSE_intended_3}$) 及 with:

- $I_{EVSE_intended_3} = I_{EVSE_intended_1}$
- $V_{EVSE_intended_3} = \min(V_{EVSE_max}; 850\ V) - 50\ V$
- TP3 僅適用於當 $V_{EVSE_max} > 750$ V.
- TP3 is only applicable if $V_{EVSE_max} > 750$ V.

TP4 = ($I_{EVSE_intended_4}$ / $V_{EVSE_intended_4}$) 及 with:

- $I_{EVSE_intended_4} = I_{EVSE_intended_1}$
- $V_{EVSE_intended_4} = \min(V_{EVSE_max}; 1{,}000\ V) - 50\ V$
- TP4 僅適用於當 $V_{EVSE_max} > 850$ V.
- TP4 is only applicable if $V_{EVSE_max} > 850$ V.

目標電壓要求接近試驗點 TP:

Target values requested to approach test point TP:

- $I_{EV_target_m} = I_{EVSE_intended_m}$

CC.7.5.7.1.6 動作

CC.7.5.7.1.6 Actions

(1) 依 CC.7.4 從範例方法之步驟 2 開始，以 $V_{EV_target\ 1} = \min(V_{EVSE_max}; 500\ V)$接

近試驗點 TP1。

1) Approach the test point TP1 according to CC.7.4 with $V_{EV_target\ 1} = \min(V_{EVSE_max}; 500\ V)$ starting from Step 2 of the exemplary approach.

(2) 增加 $U_T4$，故 $V_T8$ 於 20 ms 或更短時間內增加至 $V_T8 = 550\ V + 15\ V$ 。

2) Increase $U_T4$ so that $V_T8$ increases in 20 ms or less to $V_T8 = 550\ V + 15\ V$.

(3) $t_{overvoltage}$ 為當 $V_T8 \geq 550\ V$ 之時間點。

3) $t_{overvoltage}$ is the point in time once $V_T8 \geq 550\ V$.

(4) 檢查是否達到預期結果。

4) Check if expected results are achieved.

(5) 依據適用之 TP2、TP3 及 TP4，重複試驗步驟使用以下：

5) Depending on the applicability of TP2, TP3 and TP4, repeat the test steps using:

TP2:

- $V_{EV_target_2} = V_{EV_max_2} = \min(V_{EVSE_max}; 750\ V)$
- $V_T8 = 825\ V + 15\ V$
- $t_{overvoltage}$ 為當 $V_T8 \geq 825\ V$ 之時間點。
- $t_{overvoltage}$ is the point in time once $V_T8 \geq 825\ V$

TP3:

- $V_{EV_target_3} = V_{EV_max_3} = \min(V_{EVSE_max}; 850\ V)$
- $V_T8 = 935\ V + 15\ V$
- $t_{overvoltage}$ 為當 $V_T8 \geq 935\ V$ 之時間點。
- $t_{overvoltage}$ is the point in time once VT8 ≥ 935 V

TP4:

- $V_{EV_target\ 4} = V_{EV_max\ 4} = \min(V_{EVSE_max}; 1\ 000\ V)$
- $V_T8 = 1\ 100\ V + 15\ V$
- $t_{overvoltage}$ 為當 $V_T8 \geq 1{,}100\ V$ 之時間點。
- $t_{overvoltage}$ is the point in time once $V_T8 \geq 1\ 100\ V$

CC.7.5.7.1.7 預期結果

CC.7.5.7.1.7 Expected results

EV 供電設備應執行緊急停機。亦即 EV 供電設備應進行

The EV supply equipment shall perform an emergency shutdown. That means that the EV supply equipment shall

- 在 $t_{overvoltage}$ 後 20 ms 或更短時間，關閉其 CP 振盪器來指示進行緊急停機，
- turn off its CP oscillator to indicate an emergency shutdown in 20 ms or less after $t_{overvoltage}$,

- 在 $t_{overvoltage}$ 後 30 ms 或更短時間，減少其 B 側當下電流至 ≤ 5 A DC，並停用 B 側。
- reduce its present current at side B to ≤ 5 A DC and disable its side B in 30 ms or less after $t_{overvoltage}$,
- 在 $t_{overvoltage}$ 後 1,010 ms 或更短時間，減少其 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V DC，及
- reduce the present voltage at side B to ≤ 60 V DC between DC+ and DC– in 1 010 ms or less after $t_{overvoltage}$, and
- 在 $t_{overvoltage}$ 後 1,010 ms 或更短時間，減少其 B 側 DC+ 與保護導體間、DC– 與保護導體間之當下電壓至 ≤ 60 V DC
- reduce the present voltage at side B to ≤ 60 V DC between DC+ and the protective conductor, and between DC– and the protective conductor in 1 010 ms or less after $t_{overvoltage}$.

CC.7.5.7.2 過電壓引起之錯誤關機(試驗 2)

CC.7.5.7.2 Error shutdown caused by an overvoltage (test 2)

CC.7.5.7.2.1 參考要求

CC.7.5.7.2.1 Reference requirements

試驗案例考量下列要求：

This test case considers the following requirements:

- 6.3.1.106.3 以錯誤停機進行車輛插頭 DC+ 與 DC– 間之過電壓防護；
- 6.3.1.106.3 Protection against overvoltage between DC+ and DC– at the vehicle connector by error shutdown;
- 6.3.1.113.3 錯誤停機。
- 6.3.1.113.3 Error shutdown.

CC.7.5.7.2.2 敘述

CC.7.5.7.2.2 Description

在車輛端插頭過電壓情況下，非由 EV 供電設備引起之錯誤停機。

Error shutdown in case of an overvoltage at the vehicle connector not caused by the EV supply equipment.

EV 模擬器切換電源，使 B 側當下電壓超過協議最高電壓。

The EV simulator switches a voltage source and the present voltage at side B becomes more than the negotiated maximum voltage.

CC.7.5.7.2.3 試驗設置

CC.7.5.7.2.3 Test setup

標準試驗設置。

CC.7.5.7.2.4 Standard test setup.

CC.7.5.7.2.4 預處理

CC.7.5.7.2.4 Preconditions

無。

None.

CC.7.5.7.2.5 定義及計算

CC.7.5.7.2.5 Definitions and calculations

時間的定義：

Definition of times:

- $t_{overvoltage}$ 為當過電壓情況開始之時間點
- $t_{overvoltage}$ is the point in time when the overvoltage condition starts

預定試驗點之定義：

Definition of intended test point:

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 及:

- $I_{EVSE_intended} = I_{EVSE_min} + 0.5 \times (I_{EVSE_max} - I_{EVSE_min})$
- $I_{EVSE_intended} = I_{EVSE_min} + 0,5 \times (I_{EVSE_max} - I_{EVSE_min})$
- $V_{EVSE_intended} = V_{EVSE_max} - 50$ V

請求接近試驗點 TP 之目標值：

Target values requested to approach test point TP:

- $I_{EV_target} = I_{EVSE_intended}$
- $V_{EV_target} = V_{EVSE_max}$
- $V_{EV_max} = V_{EVSE_max} - 25$ V

CC.7.5.7.2.6 動作

CC.7.5.7.2.6 Actions

(1) 依 CC.7.4 接近試驗點 TP。

1) Approach the test point TP according to CC.7.4.

(2) 增加 $U_T4$，故 $V_T8$ 於 20 ms 或更短增加至 $V_T8 = V_{EV_max} + 15$ V。

2) Increase $U_T4$ so that $V_T8$ increases in 20 ms or less to $V_T8 = V_{EV_max} + 15$ V.

(3) $t_{overvoltage}$ 為 VT8 ≥ $V_{EV_max}$ 之時間點。

3) $t_{overvoltage}$ is the point in time once VT8 ≥ $V_{EV_max}$.

(4) 檢查是否達到預期結果。

4) Check if expected results are achieved.

CC.7.5.7.2.7 預期結果

CC.7.5.7.2.7 Expected results

EV 供電設備應執行錯誤停機。亦即 EV 供電設備應

The EV supply equipment shall perform an error shutdown. That means that the EV supply equipment shall

- 在 $t_{overvoltage}$ 後 1,450 ms 或更短時間，減少其 B 側當下電流至 ≤ 5 A DC，並停用其 B 側。

- reduce its present current at side B to ≤ 5 A and disable its side B in 1 450 ms or less after tovervoltage,
- 在 $t_{overvoltage}$ 後 2,950 ms 或更短時間，減少其 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V DC，及
- reduce the present voltage at side B to ≤ 60 V between DC+ and DC– in 2 950 ms or less after tovervoltage, and
- 在 $t_{overvoltage}$ 後 2,950 ms 或更短時間，減少其 B 側 DC+ 與保護導體間、DC– 與保護導體間之當下電壓至 ≤ 60 V DC。
- reduce the present voltage at side B to ≤ 60 V between DC+ and the protective conductor, and between DC– and the protective conductor in 2 950 ms or less after tovervoltage.

CC.7.5.7.3 暫時性過電壓(試驗 3)

CC.7.5.7.3 Temporary overvoltage (test 3)

CC.7.5.7.3.1 參考要求

CC.7.5.7.3.1 Reference requirements

此試驗案例考量下列要求：

This test case considers the following requirements:

- 6.3.1.106.3 以錯誤停機進行車輛插頭 DC+ 與 DC– 間之過電壓防護。
- 6.3.1.106.3 Protection against overvoltage between DC+ and DC– at the vehicle connector by error shutdown.
- 6.3.1.113.3 錯誤停機。
- 6.3.1.113.3 Error shutdown.

CC.7.5.7.3.2 敘述

CC.7.5.7.3.2 Description

在暫時性過電壓(非由 EV 供電設備所引起)的情況下，進行穩健性驗證。

Robustness demonstration in case of a temporary overvoltage which is not caused by the EV supply equipment.

CC.7.5.7.3.3 試驗設置

CC.7.5.7.3.3Test setup

標準試驗設置。

Standard test setup.

CC.7.5.7.3.4 預處理

CC.7.5.7.3.4 Preconditions

無。

None.

CC.7.5.7.3.5 定義及計算

CC.7.5.7.3.5 Definitions and calculations

時間之定義：

Definition of times:

- $t_{overvoltage}$ 為當過電壓情況開始之時間點
- tovervoltage is the point in time when the overvoltage condition starts.

預定試驗點之定義

Definition of intended test point:

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 及

- $I_{EVSE_intended} = I_{EVSE_min} + 0.5 \times (I_{EVSE_max} - I_{EVSE_min})$
- $I_{EVSE_intended} = I_{EVSE_min} + 0,5 \times (I_{EVSE_max} - I_{EVSE_min})$
- $V_{EVSE_intended} = V_{EVSE_max} - 50$ V

請求接近試驗點 TP 之目標值：

Target values requested to approach test point TP:

- $I_{EV_target} = I_{EVSE_intended}$
- $V_{EV_target} = V_{EVSE_max}$
- $V_{EV_max} = V_{EVSE_max} - 25$ V

CC.7.5.7.3.6 動作

CC.7.5.7.3.6 Actions

(1) 依 CC.7.4 接近試驗點 TP。

1) Approach the test point TP according to CC.7.4.

(2) 調變 $U_T4$，使 $V_T8$ 依時間順序符合以下準則：

2) Modulate $U_T4$ so that $V_T8$ fulfils the following criteria in chronological order:

(a) $V_T8$ 於 20 ms 或更短時間，從 ($V_{EVSE_max}$ – 50 V) 增加至 ($V_{EV_max}$ + 15 V)；

a) $V_T8$ increases from ($V_{EVSE_max}$ – 50 V) to ($V_{EV_max}$ + 15 V) in 20 ms or less;

(b) $V_T8$ 在增加後之位準即 ($V_T8 \geq V_{EV_max}$) 停留 190 ms ± 10 ms；

b) VT8 stays on the increased level so that ($VT8 \geq V_{EV_max}$) for 190 ms ± 10 ms;

(c) $V_T8$ 於 20 ms 或更短時間，減少至 ($V_T8$ – 50 V)。

c) $V_T8$ decreases back to ($V_T8$ – 50 V) in 20 ms or less.

參照圖 CC.26 以瞭解需達成的電壓曲線。

See Figure CC.26 for the voltage profile to be achieved.

(3) $t_{overvoltage}$ 為 $V_T8 \geq V_{EV_max}$ 發生之時間點。

3) $t_{overvoltage}$ is the point in time once $V_T8 \geq V_{EV_max}$.

(4) 檢查是否達到預期結果。

4) Check if expected results are achieved.

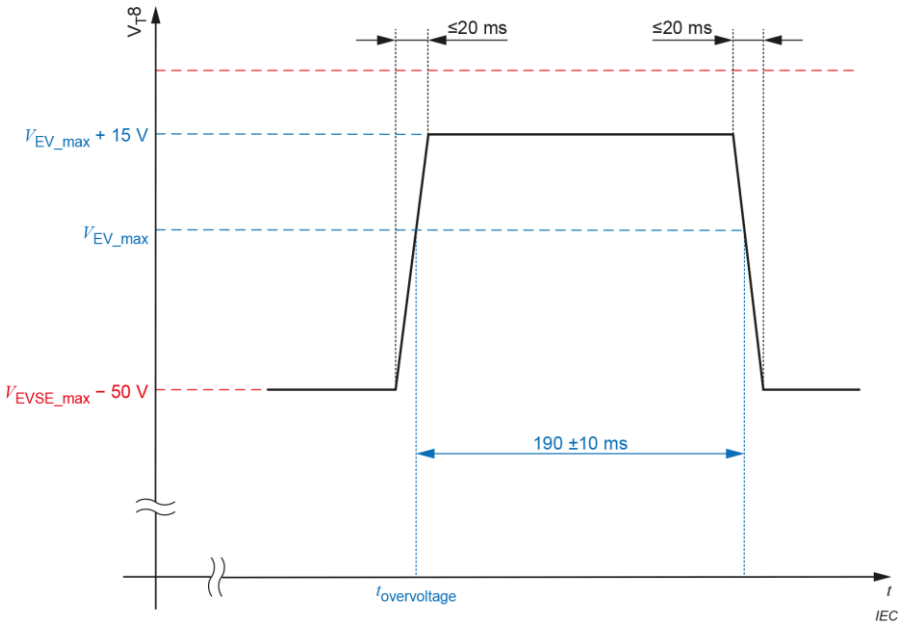



圖 CC.26 車輛端插頭之電壓

Figure CC.26 – Voltage at the vehicle connector

CC.7.5.7.3.7 預期結果

CC.7.5.7.3.7 Expected results

在短暫的過電壓情況期間，EV 供電設備應維持在電能傳輸時期，且不執行錯誤停機。

The EV supply equipment shall remain in the energy transfer stage and not perform an error shutdown during the temporary overvoltage condition.

CC.7.5.7.4 因過電壓引起之錯誤關機(試驗 4)

CC.7.5.7.4 Error shutdown caused by an overvoltage (test 4)

CC.7.5.7.4.1 參考要求

CC.7.5.7.4.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 6.3.1.106.3 以錯誤停機進行車輛端插頭 DC+ 與 DC– 間之過電壓防護。
- 6.3.1.106.3 Protection against overvoltage between DC+ and DC– at the vehicle connector by error shutdown.
- 6.3.1.113.3 錯誤停機
- 6.3.1.113.3 Error shutdown.

CC.7.5.7.4.2 敘述

CC.7.5.7.4.2 Description

在過電壓情況下進行錯誤關機。

Error shutdown in case of an overvoltage which is not caused by the EV supply

equipment.

EV 模擬器調整。

The EV simulator modifies its maximum voltage limit sent to the EV supply equipment to a value less than the present voltage at side B.

CC.7.5.7.4.3 試驗設置

CC.7.5.7.4.3 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.7.4.4 預處理

CC.7.5.7.4.4 Preconditions

無。

None.

CC.7.5.7.4.5 定義及計算

CC.7.5.7.4.5 Definitions and calculations

時間之定義：

Definition of times:

- $t_{overvoltage}$ 為過電壓情況開啟之時間點。
- $t_{overvoltage}$ is the point in time when the overvoltage condition starts.

預定試驗點之定義：

Definition of intended test point:

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 及

- $I_{EVSE_intended} = I_{EVSE_min} + 0.5 \times (I_{EVSE_max} - I_{EVSE_min})$;
- $V_{EVSE_intended} = V_{EVSE_max} - 50$ V

要求目標值接近試驗點 TP：

Target values requested to approach test point TP:

- $I_{EV_target} = I_{EVSE_intended}$;
- $V_{EV_target} = V_{EVSE_max} - 25$ V;
- $V_{EV_max} = V_{EV_target}$.

CC.7.5.7.4.6 動作

CC.7.5.7.4.6 Actions

(1) 依 CC.7.4 接近試驗點 TP。

1) Approach the test point TP according to CC.7.4.

(2) 傳送 "CurrentDemandReq" 訊息，包含 $V_{EV_max} = V_{EVSE_intended} - 15$ V。

2) Send "CurrentDemandReq" message with $V_{EV_max} = V_{EVSE_intended} - 15$ V.

(3) $t_{overvoltage}$ 為傳送 "CurrentDemandReq" 訊息之時間點。

3) tovervoltage is the point in time when the message "CurrentDemandReq" is sent.

(4) 檢查是否達到預期結果。

4) Check if expected results are achieved.

CC.7.5.7.4.7 預期結果

CC.7.5.7.4.7 Expected results

EV 供電設備應執行錯誤關機。亦即 EV 供電設備應

The EV supply equipment shall perform an error shutdown. That means that the EV supply equipment shall

- 在 $t_{overvoltage}$ 後 1,450 ms 或更短時間，減少 B 側當下電流至 ≤5 A，並停用其 B 側，
- reduce its present current at side B to ≤ 5 A and disable its side B in 1 450 ms or less after $t_{overvoltage}$,
- 在 $t_{overvoltage}$ 後 2,950 ms 或更短時間，減少 B 側 DC+ 與 DC– 間之當下電壓至 ≤60 V DC，及
- reduce the present voltage at side B to ≤ 60 V between DC+ and DC– in 2 950 ms or less after tovervoltage, and
- 在 $t_{overvoltage}$ 後 2,950 ms 或更短時間，減少 B 側 DC+ 與保護導體間、DC–與保護導體間之當下電壓至 ≤60 V DC。
- reduce the present voltage at side B to ≤ 60 V between DC+ and the protective conductor, and between DC– and the protective conductor in 2 950 ms or less after $t_{overvoltage}$.

CC.7.5.8 接近導引斷開情況下之緊急停機

CC.7.5.8 Emergency shutdown in case of proximity pilot disconnection

CC.7.5.8.1 參考要求

CC.7.5.8.1 Reference requirements

參考要求

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- CC.4.4 接近偵測導體之電氣連接性失效
- CC.4.4 Loss of electrical continuity of the proximity detection conductor.
- 6.3.1.113.4 緊急停機
- 6.3.1.113.4 Emergency shutdown.

CC.7.5.8.2 敘述

CC.7.5.8.2 Description

在接近導引斷開的情況下進行緊急停機。此試驗適用於具有組態 EE 車輛端插頭之系統 C EV 供電設備。參照圖 CC.1。

Emergency shutdown in case of proximity pilot disconnection. The test applies to EV supply equipment of system C with a vehicle connector of configuration EE only.

See Figure CC.1.

CC.7.5.8.3 試驗設置

CC.7.5.8.3 Test setup

標準試驗設置，其 RT1 = RV1 及 XT1 = XV1。參照表 CC.2。

Standard test setup, with RT1 = RV1 and XT1 = XV1. See Table CC.2.

CC.7.5.8.4 預處理

CC.7.5.8.4 Preconditions

無。

None.

CC.7.5.8.5 定義及計算

CC.7.5.8.5 Definitions and calculations

試驗點 1 之定義(TP1)：

Definition of Test Point 1 (TP1):

- TP1 對應至 OP3;
- TP1 corresponds to OP3;
- $I_{EVSE_intended_1} = P_{EVSE_max} / V_{EVSE_max}$;
- $V_{EVSE_intended_1} = V_{EVSE_max}$.

試驗點 2 之定義(TP2)：

Definition of Test Point 2 (TP2):

- TP2 對應至 OP4;
- TP2 corresponds to OP4;
- $I_{EVSE_intended_2} = P_{EVSE_max} / V_{EVSE_max}$;
- $V_{EVSE_intended_2} = V_{EVSE_max}$.

CC.7.5.8.6 動作

CC.7.5.8.6 Actions

應對每一個試驗點 TPn 進行下列步驟。

The following steps shall be done for each of the defined test points TPn.

下列每個試驗點，接近故障應使用兩種方法進行模擬。亦即，對每一個試驗點進行兩個試驗(斷開 $S_T1$ 及閉合 $S_T2$)。

In each test point, the proximity fault shall be simulated by using both methods. That is, two tests (one opening $S_T1$ and one closing $S_T2$) shall be done for each test point.

(1) 依 CC.7.4 接近試驗點 TPn。等待直到 EV 供電設備達到穩定操作。

1) Approach a test point TPn as defined in CC.7.4. Wait until the EV supply equipment has reached a stable operation.

(2) 模擬接近故障依

2) Simulate a proximity fault by

(a) 斷開 $S_T1$，及

a) Opening $S_T1$, and

(b) 閉合 $S_T2$。

b) Closing $S_T2$.

(3) 檢查是否達到預期結果。

3) Check if the expected results are achieved.

CC.7.5.8.7 預期結果

CC.7.5.8.7 Expected results

EV 供電設備應執行緊急停機。亦即 EV 供電設備應

The EV supply equipment shall perform an emergency shutdown. That means that the EV supply equipment shall

- 在斷開 $S_T1$ 或閉合 $S_T2$ 後 20 ms 或更短時間內，關閉其 CP 振動器來指示緊急停機。
- turn off its CP oscillator to indicate an emergency shutdown in 20 ms or less (trigger time) after opening $S_T1$ or closing $S_T2$,
- 在斷開 $S_T1$ 或閉合 $S_T2$ 後 30 ms 或更短時間內(10 ms 觸發時間及 20 ms 反應時間)，減少其 B 側當下電流至 ≤ 5 A，並停用其 B 側。
- reduce its present current at side B to ≤ 5 A and disable its side B in 30 ms or less (10 ms trigger time and 20 ms reaction time) after opening $S_T1$ or closing $S_T2$,
- 在斷開 $S_T1$ 或閉合 $S_T2$ 後 1,010 ms 或更短時間內，(10 ms 觸發時間及 1,000 ms 反應時間)，減少其 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V，並停用其 B 側。
- reduce the present voltage at side B to ≤ 60 V between DC+ and DC– in 1 010 ms or less (10 ms trigger time and 1000 ms reaction time) after opening $S_T1$ or closing $S_T2$, and
- 在斷開 $S_T1$ 或閉合 $S_T2$ 後 1,010 ms 或更短時間內，(10 ms 觸發時間及 1,000 ms 反應時間)，減少其 B 側 DC+ 與保護導體間、DC– 與保護導體間之當下電壓至 ≤ 60 V，並停用其 B 側。
- reduce the present voltage at side B to < 60 V between DC+ and the protective conductor, and between DC– and the protective conductor in 1 010 ms or less (10 ms trigger time and 1 000 ms reaction time) after opening $S_T1$ or closing $S_T2$.

CC.7.5.9 負載突降

CC.7.5.9 Load dump

CC.7.5.9.1 一般

CC.7.5.9.1 General

試驗之試驗點 TPn 如圖 CC.27 所示。

The test points TPn for the test are shown in Figure CC.27.

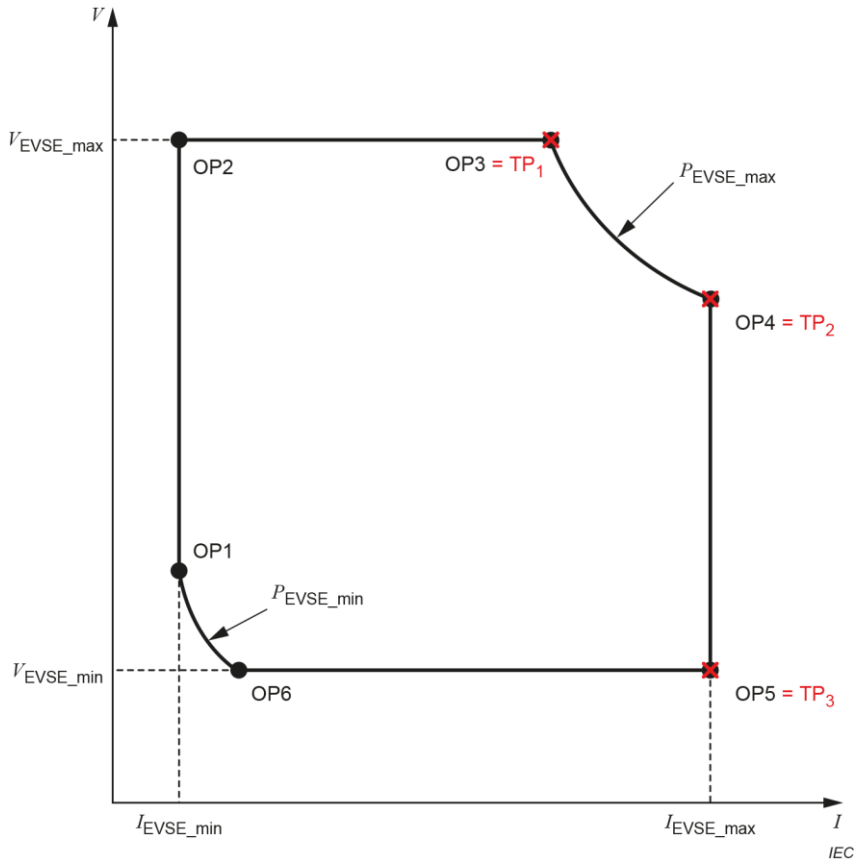



圖 CC. 27 負載突降試驗之試驗點 TPn

Figure CC.27 – Test points TPn for the load dump test

CC.7.5.9.2 參考要求

CC.7.5.9.2 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 101.1.7 負載突降；
- 101.1.7 Load dump;
- CC.6.1 負載突降之要求。
- CC.6.1 Requirements for load dump.

CC.7.5.9.3 敘述

CC.7.5.9.3 Description

檢查在負載突降時，EV 供電設備是否能限制過衝的電壓至特定的規定值。

Check if the EV supply equipment limits the voltage overshoot to the specified values in case of a load dump.

CC.7.5.9.4 試驗設置

CC.7.5.9.4 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.9.5 預處理

CC.7.5.9.5 Preconditions

無。

None.

CC.7.5.9.6 定義及計算

CC.7.5.9.6 Definitions and calculations

預定試驗點之定義：

Definition of intended test points:

TP1 = ($I_{EVSE_intended_1}$ / $V_{EVSE_intended_1}$) 及：

- $I_{EVSE_intended_1} = P_{EVSE_max} / V_{EVSE_max}$
- $V_{EVSE_intended_1} = V_{EVSE_max}$
- TP1 corresponds to OP3.

TP2 = ($I_{EVSE_intended_2}$ / $V_{EVSE_intended_2}$) 及：

- $I_{EVSE_intended_2} = I_{EVSE_max}$
- $V_{EVSE_intended_2} = P_{EVSE_max} / I_{EVSE_max}$
- TP2 corresponds to OP4.

TP3 = ($I_{EVSE_intended_3}$ / $V_{EVSE_intended_3}$) 及：

- $I_{EVSE_intended_3} = I_{EVSE_max}$
- $V_{EVSE_intended_3} = V_{EVSE_min}$
- TP3 corresponds to OP5.
- TP3 對應至 OP5。

CC.7.5.9.7 動作

CC.7.5.9.7 Actions

對每一個規定之試驗點 TPn 重複以下步驟。

Repeat the following steps for each of the defined test points TPn.

(1) 依 CC.7.4 使用以下規定之目標電壓接近試驗點 TPn：

1) Approach the test point TPn according to CC.7.4 using the target voltages as defined below:

- TP1: EVTargetVoltage = $V_{EV\ max\ 1} = V_{EVSE_max}$ + 30 V;
- TP2: EVTargetVoltage = $V_{EV\ max\ 2} = (P_{EVSE_max} / I_{EVSE_max})$ + 30 V;
- TP3: EVTargetVoltage = $V_{EV\ max\ 3} = V_{EVSE\ min}$ + 30 V.

(2) 斷開試驗負載開關 $S_T19$。

2) Open switch ST19 of the test load.

(3) 以截止頻率 2 MHz 或更高、最小取樣率 10 MS/s 之試驗條件，於 3 s 期間量測 $V_T8$。

3) Measure $V_T8$ for a duration of 3 s with a cut-off frequency of 2 MHz or more and a minimum sampling rate of 10 MS/s.

(4) 檢查是否達到預期結果。

4) Check if expected results are achieved.

CC.7.5.9.8 預期結果

CC.7.5.9.8 Expected results

查證，在斷開 $S_T19$ 後 3 ms 開始持續 3 s，$V_T8 \leq \max (110\ \% \times V_{EV_max}, V_{EV_max} + 50\ V)$。

Verify that, for a duration of 3 s starting at 3 ms after opening of $S_T19$, $VT8 \leq \max(110\ \% \times V_{EV_max}, V_{EV_max} + 50\ V)$.

CC.7.5.10 EV 供電設備之限制突波電流

CC.7.5.10 Limiting the inrush current by EV supply equipment

CC.7.5.10.1 參考要求

CC.7.5.10.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- CC.5.1 預充電
- CC.5.1 Pre-charge.

CC.7.5.10.2 敘述

CC.7.5.10.2 Description

檢查 EV 供電設備是否依 CC.5.1 限制突波電流至規定之限制值。

Check if the EV supply equipment limits the inrush current according to the limits defined in CC.5.1.

CC.7.5.10.3 試驗設置

CC.7.5.10.3 Test setup

標準試驗設備，且使用表 CC.23 之規定值。

Standard test setup, with the values specified Table CC.23.

表 CC.23 突波電流限制試驗之零組件值

Table CC.23 – Component valued for the inrush current limit test

| 零組件<br>Component | 數值<br>Value |
|---|---|
| $L_T3$, $L_T4$ | ≤ 2 µH |
| $R_T5$, $R_T6$ | 2 MΩ |
| $R_T10$ | 可變<br>Variable |
| $C_T6$ | 470 µF |
| $C_T7$, $C_T8$ | 2 µF |
| $R_T13$, $R_T14$ | 500 kΩ |

CC.7.5.10.4 預處理

CC.7.5.10.4 Preconditions

依據 EV 供電設備之數據表，EV 模擬器應以 "ChargeParameterDiscoveryReq" <3a> 訊息，傳遞以下屬性：

Based on the data sheet of the EV supply equipment, the EV simulator shall communicate the following properties with the message "ChargeParameterDiscoveryReq" <3a>:

- $V_{EV_max} \geq V_{EVSE_max}$;
- $V_{EV_min} \leq V_{EVSE_min}$;
- $I_{EV_max} \geq I_{EVSE_max}$;
- $I_{EV_min} \leq I_{EVSE_min}$;
- $P_{EV_max} \geq P_{EVSE_max}$.

EV 供電設備成功傳送以下屬性至 EV 模擬器：

The EV supply equipment has successfully communicated its following properties to the EV simulator:

- $V_{EVSE_min}$;
- $V_{EVSE_max}$;
- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

正常啟動序列執行至 t6，並傳送 "CableCheckRes" <4b> 訊息，其中包含參數 "EVSEProcessing" = 'Finished'。

The normal startup sequence is performed until t6 with message "CableCheckRes" <4b> including the parameter "EVSEProcessing" = 'Finished'.

CC.7.5.10.5 定義及計算

CC.7.5.10.5 Definitions and calculations

以截止頻率 2 MHz 以上及最小取樣率 10 MS/s ，從 t7 至 t11 時間於 DC+ 導體及 DC– 導體分別量測電流 $I_{EVSE_SideB_DC+}$ 及 $I_{EVSE_SideB_DC-}$。

Measure the currents $I_{EVSE_SideB_DC+}$ on DC+ conductor and $I_{EVSE_SideB_DC-}$ on DC– conductor from time t7 to t11 with a cut-off frequency of 2 MHz or more, and a minimum sampling rate of 10 MS/s.

定義：

Definitions:

- 從 t7 至 t11， $I_{EVSE_SideB_DC+}$ 之平均值(亦即，DC 成分)；
- the average (that is, the DC component) of $I_{EVSE_SideB_DC+}$ from t7 to t11;
- 從 t7 至 t11， $I_{EVSE_SideB_DC-}$ 之平均值(亦即，DC 成分)；
- the average (that is, the DC component) of $I_{EVSE_SideB_DC-}$ from t7 to t11;
- 從 CC.7.5.10.6 步驟 (6) 至 EV 供電設備收到 "PowerDeliveryReq" <6a> 訊

息，$I_{EVSE_SideB_DC+}$ 之最大峰值；

- the maximum peak of $I_{EVSE_SideB_DC+}$ from CC.7.5.10.6 step 6) until the EV supply equipment receives message "PowerDeliveryReq" <6a> ;
- 從 CC.7.5.10.6 步驟 (6) 至 EV 供電設備收到 "PowerDeliveryReq" <6a> 訊息，$I_{EVSE_SideB_DC-}$ 之最大峰值；
- the maximum peak of $I_{EVSE_SideB_DC-}$ from CC.7.5.10.6 step 6) until the EV supply equipment receives message "PowerDeliveryReq" <6a>;
- 從收到 "PowerDeliveryReq" <6a> 訊息起至 t11，$I_{EVSE_SideB_DC+}$ 之最大峰值；
- the maximum peak of $I_{EVSE_SideB_DC+}$ from the reception of message "PowerDeliveryReq" <6a> until time t11;
- 從收到 "PowerDeliveryReq" <6a> 訊息起至 t11，$I_{EVSE_SideB_DC-}$ 之最大峰值；
- the maximum peak of $I_{EVSE_SideB_DC-}$ from the reception of message "PowerDeliveryReq" <6a> until time t11;
- 從收到 "PowerDeliveryReq" <6a> 訊息起至 t11，計算電流大於 2A 之時間積分值($I$> 2A × t)。
- the integral of the current larger than 2 A over time ($I$> 2A × t) from the reception of message "PowerDeliveryReq" <6a> until time t11.

CC.7.5.10.6 動作

CC.7.5.10.6 Actions

(1) 傳送第一個 "PrechargeReq" <5a> 訊息，包含下列參數：

1) Send the first "PrechargeReq" <5a> message with the following parameter:

- EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_max}$;
- 第一個 "PreChargeReq" <5a> 訊息，對應之時間點為 t7.
- the first "PreChargeReq" <5a> message corresponds to time t7.

(2) 等待直至 $V_{EVSE_SideB}$ 穩定

2) Wait until the $V_{EVSE_SideB}$ has stabilized.

(3) 閉合 $S_T$18。

3) Close $S_T$18.

(4) 等待 1 s。

4) Wait 1 s.

(5) 閉合 $S_T$17。

5) Close $S_T$17.

(6) 傳送 "PowerDeliveryReq" <6a> 訊息，包含參數 "ReadyToChargeState" = 'TRUE' (使用 DIN SPEC 70121:2014) 會參數 "ChargeProgress" = 'Start' (使用 ISO 15118-2:2014)。

6) Send message "PowerDeliveryReq" <6a> with parameter "ReadyToChargeState" = 'TRUE' (using DIN SPEC 70121:2014) or the parameter "ChargeProgress" =

'Start' (using ISO 15118-2:2014).

(7) 等待直到 EV 供電設備傳送 "PowerDeliveryRes" <6b> 訊息。

7) Wait until the EV supply equipment sends message "PowerDeliveryRes" <6b>.

(8) 傳送 "CurrentDemandReq" <7a>訊息 。此時間點為 t11。

8) Send message "CurrentDemandReq" <7a>. This point in time is t11.

(9) 執行一項額外試驗，改變開關裝置之閉合順序(於步驟 3 閉合 $S_T17$ 及步驟 5 閉合 $S_T18$)

9) Perform an additional test changing the switching devices closure order (close $S_T17$ in step 3) and $S_T18$ at step 5).

CC.7.5.10.7 預期結果

CC.7.5.10.7 Expected results

若兩個試驗皆執行達到下列條件，則視為符合：

The test is passed if all the following conditions are met for both test runs:

- 從 t7 至 t11，$I_{EVSE_SideB_DC+}$ 之平均值(亦即，DC 成分)，限制在 [–2 A; 2 A]；
- from t7 to t11, the average (that is, the DC component) of $I_{EVSE_SideB_DC+}$ is limited to [–2 A; 2 A];
- 從 t7 至 t11，$I_{EVSE_SideB_DC-}$ 之平均值(亦即，DC 成分)，限制在 [–2 A; 2 A]；
- from t7 to t11, the average (that is, the DC component) of $I_{EVSE_SideB_DC-}$ is limited to [–2 A; 2 A];
- 從 CC.7.5.10.6 步驟 (6) 至 EV 供電設備收到 "PowerDeliveryReq" <6a> 訊息，$I_{EVSE_SideB_DC+}$ 最大峰值及 $I_{EVSE_SideB_DC-}$ 最大峰值之最低值，限制在 [–20 A; 20 A]；
- from CC.7.5.10.6 step 6) until the EV supply equipment receives the "PowerDeliveryReq" <6a> message, the lower amplitude of the maximum peak of $I_{EVSE_SideB_DC+}$ and the maximum peak of $I_{EVSE_SideB_DC-}$ is limited to [–20 A; 20 A];
- 從 EV 供電設備收到 "PowerDeliveryReq" <6a> 訊息起至 t11，$I_{EVSE_SideB_DC+}$ 之最大峰值限制在 [–125 A; 125 A]；
- from the reception of the "PowerDeliveryReq" <6a> message until time t11, the maximum peak of $I_{EVSE_SideB_DC+}$ is limited to [–125 A; 125 A];
- 從 EV 供電設備收到 "PowerDeliveryReq" <6a> 訊息起至 t11，$I_{EVSE_SideB_DC-}$ 之最大峰值，限制在 [–125 A; 125 A]；
- from the reception of the "PowerDeliveryReq" <6a> message until time t11, the maximum peak of $I_{EVSE_SideB_DC-}$ is limited to [–125 A; 125 A];
- 從收到 "PowerDeliveryReq" <6a> 訊息起至 t11，電流大於 2A 之時間積分值 ($I$> 2A × t)，限制至 3 As。參照公式(CC.17)。
- from the reception of the "PowerDeliveryReq" <6a> message until time t11, the integral of the current larger than 2 A over time ($I$> 2A × t) is limited to 3 As.

See Formula (CC.17).

$$\int I_{>2\,\mathrm{A}}\,\mathrm{d}t \le 3\ \mathrm{As} \qquad \text{(CC.17)}$$

其中

where

$I$> 2 A 為電流> 2 A (單位：A)

$I$> 2 A is the current > 2 A, expressed in ampere.

備考：對 CC.7.5.10.6 步驟(4) 之 $I_{EVSE_SideB_DC+}$ 或 $I_{EVSE_SideB_DC-}$ 的最大峰值，並無符合準則。

NOTE There is no compliance criteria for the maximum peak of $I_{EVSE_SideB_DC+}$ or the maximum peak of $I_{EVSE_SideB_DC-}$ at CC.7.5.10.6 step 4).

CC.7.5.11 B 側於 CCM 包含靜態偏差及漣波之電流調節

CC.7.5.11 Side B current regulation in CCM including static deviation and ripple

CC.7.5.11.1 一般

CC.7.5.11.1 General

符合試驗之試驗點矩陣如圖 CC.28 所示。

The test point matrix for the compliance test is shown in Figure CC.28.

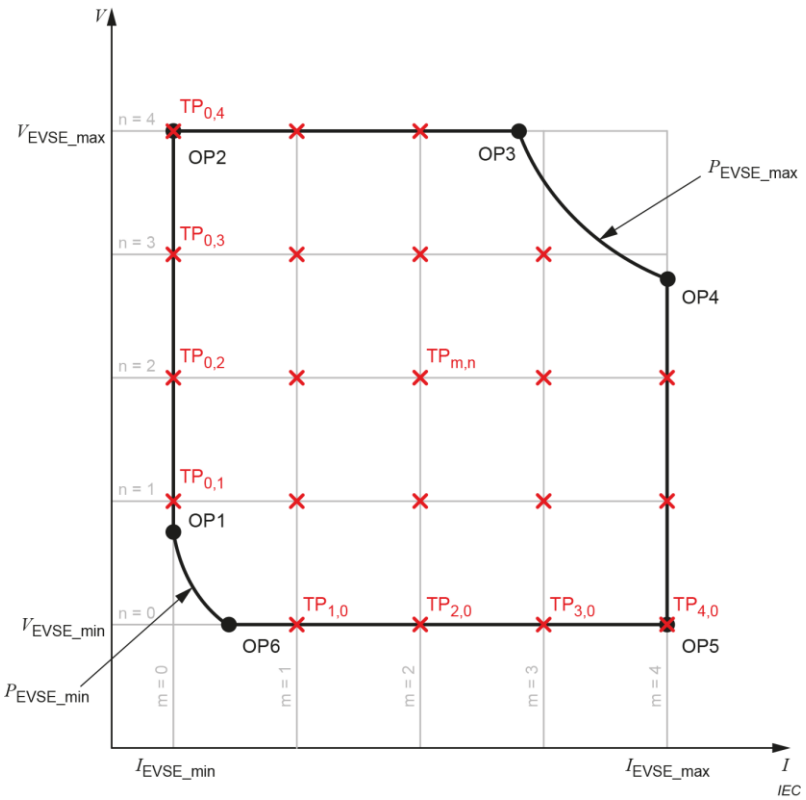



圖 CC. 28 CCM 模式下 B 側電流調節包括靜態偏差及漣波之試驗點矩陣

Figure CC.28 – Test point matrix for side B current regulation in CCM including static deviation and ripple

圖 CC.28 展示試驗點矩陣之簡易範例，在此試驗案例為識別主要的試驗序列，使用引數 m=0...4 及 n=0...4。然而，試驗點矩陣實際使用於試驗案例應包含引數 m = 0...20 及 n = 0...20，且有許多額外的限制如下列所述。應考量以下幾個方面。

Figure CC.28 shows a simplified example of the test point matrix with indices m = 0...4 and n = 0...4 in order to visualize the principal testing sequence of this test case. However, the test point matrix that shall actually be used for this test case shall cover indices m = 0...20 and n = 0...20, with some additional restrictions as described below. The following aspects shall be considered.

- 僅有在 EV 供電設備操作範圍內之試驗點 TPm,n 應進行要求評估之考量。此外，操作範圍之實際形狀可能與圖 CC.28 所描繪之簡易形狀不同。因此可能有一個或多個試驗點 EV 供電設備並無法操作。那些試驗點不應納入要求評估之考量。
- Only the test points TPm,n within the operating range of the EV supply equipment shall be considered for the requirement evaluation. Furthermore, the actual shape of the operating range may differ from the simplified shape as depicted in Figure CC.28. As a result, there might be one or more test points in which the EV supply equipment cannot be operated. Those test points shall not be considered for the requirement evaluation.
- 在試驗期間，EV 供電設備之操作範圍可能會動態改變，例如：因熱能衰退所致。因此可能會有單一試驗點 EV 供電設備並無法繼續操作，其與在試驗開始試驗點矩陣之初始決定不同。那些試驗點不應納入要求評估之考量。
- The operating range of the EV supply equipment may dynamically change during the test, for example, due to thermal degradation. As a result, there might be single test points in which the EV supply equipment can no longer be operated, as opposed to the initial determination of the test point matrix at the beginning of the test. Those test points shall not be considered for the requirement evaluation.

CC.7.5.11.2 參考要求

CC.7.5.11.2 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 101.1.1 B 側電壓、電流及功率之操作範圍；
- 101.1.1 Operating ranges for voltage, current, and power at side B;
- 101.1.2.1 B 側於 CCM 之電流調節；
- 101.1.2.1 Side B current regulation in CCM;

- 101.1.5 週期性和隨機偏差(電流漣波) ；
- 101.1.5 Periodic and random deviation (current ripple);
- 6.3.1.102 量測電流及電壓；
- 6.3.1.102 Measuring current and voltage;
- CC.6.2 B 測電流調節；
- CC.6.2 Side B current regulation;
- CC.6.3 量測電流及電壓。
- CC.6.3 Measuring current and voltage.

CC.7.5.11.3 敘述

CC.7.5.11.3 Description

檢查電流調節是否符合靜態、週期性及隨機偏差之要求。

Check if the current regulation fulfils the requirements for static, periodic, and random deviation.

檢查電流及電壓量測之準確度。

Check the accuracy of the current and voltage measurements.

CC.7.5.11.4 試驗設置

CC.7.5.11.4 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.11.5 預處理

CC.7.5.11.5 Preconditions

依據 EV 供電設備之數據表，EV 模擬器應於 "ChargeParameterDiscoveryReq" <3a> 訊息，傳送下列屬性：

Based on the data sheet of the EV supply equipment, the EV simulator shall communicate the following properties with the message "ChargeParameterDiscoveryReq" <3a>:

- $V_{EV_max} \geq V_{EVSE_max}$;
- $V_{EV_min} \leq V_{EVSE_min}$;
- $I_{EV_max} \geq I_{EVSE_max}$;
- $I$EV_min $\leq I_{EVSE_min}$;
- $P_{EV_max} \geq P_{EVSE_max}$.

EV 供電設備成功以 "ChargeParameterDiscoveryRes" <3b> 訊息，傳送下列屬性至 EV 模擬器：

The EV supply equipment has successfully communicated its following properties to the EV simulator with the message "ChargeParameterDiscoveryRes" <3b>:

- $V_{EVSE_min}$;
- $V_{EVSE_max}$;

- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

CC.7.5.11.6 定義及計算

CC.7.5.11.6 Definitions and calculations

在此試驗案例之步驟中，許多 EV 供電設備之屬性於 EV 供電設備之操作範圍內的特定試驗點進行測試。引數 "m" 及 "n" 之使用依下列引用至特定之試驗點 $TP_{m,n}$：

In the steps of this test case, certain properties of the EV supply equipment are tested at specific test points in the operating range of the EV supply equipment. The indices "m" and "n" are used as follows to refer to a specific test point $TP_{m,n}$:

- m：此引數用來識別預定之電流值；
- m: this index is used to identify the value of the intended current;
- n：此引數用來識別預定之電壓值；
- n: this index is used to identify the value of the intended voltage.

訊息 "CurrentDemandReq" <7a> 應包含以下參數：

The message "CurrentDemandReq" <7a> shall contain the following parameters:

- EVTargetCurrent = $I_{EV_target}$;
- EVTargetVoltage = $V_{EV_target}$;

且應以週期時間 1 s 或更短由 EV 模擬器來循環傳送。

and shall be cyclically sent by the EV simulator with a cycle time of 1 s or less.

試驗點矩陣 $TP_{m,n}$ 之定義

Definition of test point matrix $TP_{m,n}$:

引數範圍：

Indices range:

- m = 0 … 20;
- n = 0 … 20.

$TP_{m,n} = (I_{EVSE_intended_}m / V_{EVSE_intended_}n)$ 及：

- $I_{EVSE_intended_m} = I_{EVSE_min} + m/20 \times (I_{EVSE_max} - I_{EVSE_min})$;
- $V_{EVSE_intended_n} = V_{EVSE_min} + n/20 \times (V_{EVSE_max} - V_{EVSE_min})$.

若符合下列所有條件，格子上之試驗點即為有效可進行試驗：

A test point of the grid is valid for testing if all of the following conditions are fulfilled:

- $V_{EVSE_intended_n} \times I_{EVSE_intended_}m \leq P_{EVSE_max}$;
- $V_{EVSE_intended_n} \times I_{EVSE_intended_}m \geq P_{EVSE_min}$;
- 試驗點涵蓋於 EV 供電設備之範圍，其由 EV 供電設備在初始階段 (ChargeParameterDiscoveryReq/Res) 及電能傳輸期間

(CurrentDemandReq/Res)所傳送。

- the test point is contained in the operating range of the EV supply equipment as communicated by the EV supply equipment in the initialization phase (ChargeParameterDiscoveryReq/Res) and during the energy transfer stage (CurrentDemandReq/Res).

要求目標值接近試驗點 $TP_{m,n}$；

Target values requested to approach test point $TP_{m,n}$:

- $I_{EV_target} = I_{EVSE_inte}$nded_m;
- $V_{EV_target} = V_{EVSE_max}$ (to allow for CCM).

EV 模擬器應以週期時間 1 s 或更短循環傳送 "CurrentDemandReq" <7a> 訊息，使 EV 供電設備能於 "CurrentDemandRes" <7b> 訊息傳送其(可能)採用之操作範圍。

The EV simulator shall cyclically sent "CurrentDemandReq" <7a> messages with a cycle time of 1 s or less in order to enable the EV supply equipment to communicate its (potentially) adapted operating range in "CurrentDemandRes" <7b>.

在每一個 $TP_{m,n}$ 量測期間，應持續進行計算如下：

Calculations done continuously during the measurement duration of each $TP_{m,n}$:

- 測定絕對偏差：
- Determine the absolute deviation:
  - $I_{dev_abs} = \left| I_{EVSE_SideB_DC} - I_{EV_target} \right|$ 對 $I_{EV_target} \leq 50$ A
- 測定相對偏差：
- Determine the relative deviation:
  - $I_{dev_rel} = \left| I_{EVSE_SideB_DC} - I_{EV_target} \right| / I_{EV_target}$ 對 $I_{EV_target} > 50$ A
- 測定絕對偏差：
- Determine the absolute deviation:
  - $I_{dev_abs_measure} = \left| I_{EVSE\ measure} - I_{EVSE_SideB_DC} \right|$

    及 $I_{EVSE_measure}$ ="CurrentDemandRes" <7b> 訊息之 EVSEPresentCurrent
- 測定絕對偏差：
- Determine the absolute deviation:
  - $V_{dev_abs_measure} = \left| V_{EVSE\ measure} - V_{EVSE_SideB_DC} \right|$

    及 $V_{EVSE_measure}$ = "CurrentDemandRes" <7b> 訊息之 EVSEPresentVoltage

試驗矩陣之試驗點應依圖 CC.29 所述之序列進行。

The test points of the test point matrix shall be processed in the sequence described in Figure CC.29:

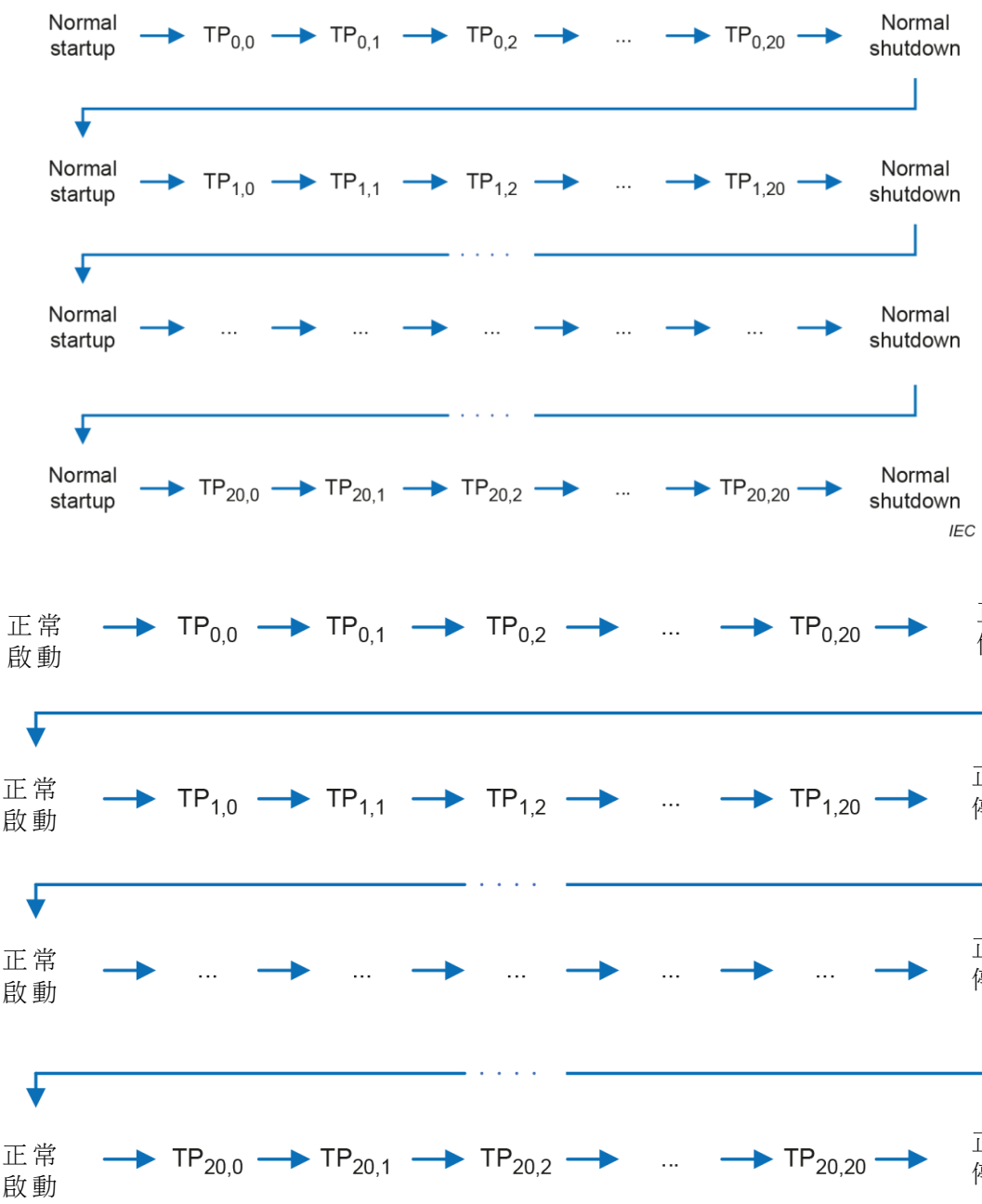



圖 CC. 29 B 側於 CCM 電流調節之試驗點序列

Figure CC.29 – Test point sequence for side B current regulation in CCM

CC.7.5.11.7 動作

CC.7.5.11.7 Actions

應僅對有效的試驗點考量進行本試驗。

Only valid test points shall be considered for the test.

每一個試驗點應依 CC.7.4 之流程進行。

Each of the test points shall be approached according to CC.7.4.

每一個試驗點應進行：

Actions for each of the test points:

(1) 量測 $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$；

1) measure $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$;

(2) 接收 $I_{EVSE_measure}$ and $V_{EVSE_measure}$；

2) receive $I_{EVSE_measure}$ and $V_{EVSE_measure}$;

(3) 對每一個試驗點 $TP_{m,n}$ 執行並完成計算；

3) perform calculations to be done for each test point $TP_{m,n}$;

(4) 檢查是否達到預期結果。

4) check if expected results are achieved.

CC.7.5.11.8 預期結果

CC.7.5.11.8 Expected results

若每一個試驗點 $TP_{m,n}$ 達到下列的任一個試驗準則，則此試驗案例為符合：

This test case is passed if each of the following test criteria is fulfilled for each $TP_{m,n}$:

- 對 $I_{EV_target} \leq 5$ A:

  $I_{dev_abs} \leq 150$ mA;

- 對 $5 \text{ A} < I_{EV_target} \leq 50$ A:

  $I_{dev_abs} \leq 1.5$ A;

- for $I_{EV_target} > 50$ A:

  $I_{dev_rel} \leq 3$ %;

- $I_{dev_abs_measure} \leq$ max(1,5 % of $I_{EVSE_measure}$ / 0.5 A);

- $V_{dev_abs_measure} \leq 10$ V;

- 電流漣波應符合表 CC.24 所示之限制。

- the current ripple shall meet the limits shown in Table CC.24.

表 CC.24 電流漣波限制

Table CC.24 – Current ripple limits

| | 電流漣波，Apeak-to-peak<br>Current ripple, Apeak-to-peak | | |
|---|---|---|---|
| | $I_{EVSE_SideB_DC} \leq$ 200 A | 200 A < $I_{EVSE_SideB_DC} \leq$ 400 A | $I_{EVSE_SideB_DC}$ > 400 A |
| $I_{rip_low}$ | ≤ 1.5 | ≤ ($I_{EVSE_SideB_DC}$ × 0.75 %) | ≤ ($I_{EVSE_SideB_DC}$ × 0.75 %) |
| $I_{rip_mid}$ | ≤ 6.0 | ≤ 6.0 | ≤ ($I_{EVSE_SideB_DC}$ × 1.5 %) |
| $I_{rip_high}$ | ≤ 9.0 | ≤ ($I_{EVSE_SideB_DC}$ × 4.5 %) | ≤ ($I_{EVSE_SideB_DC}$ × 4.5 %) |

CC.7.5.12 電能傳輸期間之零電流(0 A)模式

CC.7.5.12 0 A mode during energy transfer

CC.7.5.12.1 一般

CC.7.5.12.1 General

符合試驗之試驗點矩陣如圖 CC.30 所示。

The test point matrix for the compliance test is shown in Figure CC.30.

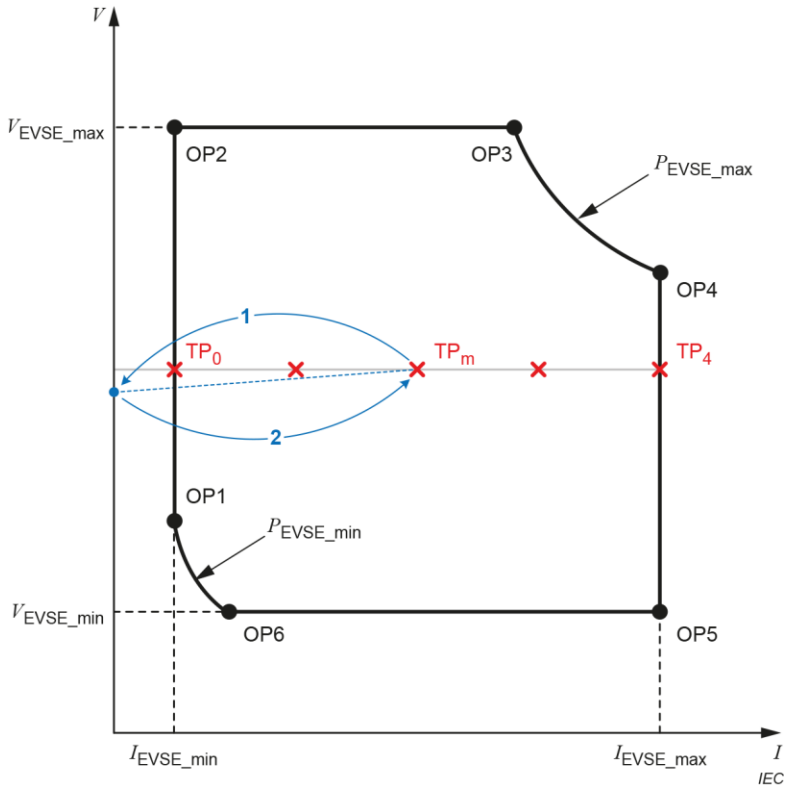



圖 CC. 30 電能傳輸期間 0 A 模式之試驗點矩陣

Figure CC.30 – Test point matrix for 0 A mode during energy transfer

圖 CC.30 展示試驗點矩陣之簡易範例，在此試驗案例為識別主要的試驗序列，使用引數 m=0...4。然而，試驗點矩陣實際使用於試驗案例應包含引數 m = 0...20，且有許多額外的限制如下列所述。應考量以下幾個方面。

Figure CC.30 shows a simplified example of the test points with index m = 0...4 in order to visualize the principal testing sequence of this test case. However, the test points that shall actually be used for this test case shall cover indices m = 0...20, with some additional restrictions as described below. The following aspects shall be considered.

- 操作範圍之實際形狀可能與圖 CC.30 所描繪之簡易形狀不同。因此可能有一個或多個試驗點 EV 供電設備並無法操作。那些試驗點不應納入要求評估之考量。
- The actual shape of the operating range may differ from the simplified shape as depicted in Figure CC.30. As a result, there might be one or more test points in which the EV supply equipment cannot be operated. Those test points shall not be considered for the requirement evaluation.
- 在試驗期間，EV 供電設備之操作範圍可能會動態改變，例如：因熱能衰退所致。因此可能會有單一試驗點其 EV 供電設備並無法繼續操作，其與在試驗

開始試驗點矩陣之初始決定不同。那些試驗點不應納入要求評估之考量。

- The operating range of the EV supply equipment may dynamically change during the test, for example, due to thermal degradation. As a result, there might be single test points in which the EV supply equipment can no longer be operated, as opposed to the initial determination of the test points at the beginning of the test. Those test points shall not be considered for the requirement evaluation.

CC.7.5.12.2 參考要求

CC.7.5.12.2 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 6.3.1.102 量測電流及電壓；
- 6.3.1.102 Measuring current and voltage;
- CC.5.5.2 電能傳輸期間之 0 A 模式；
- CC.5.5.2 0 A mode during energy transfer;
- CC.6.3 量測電流及電壓。
- CC.6.3 Measuring current and voltage.

CC.7.5.12.3 敘述

CC.7.5.12.3 Description

檢查電流調節是否符合 0 A 模式之要求。

Check if the current regulation fulfils the requirements for 0 A mode.

檢查電流及電壓量測之準確度。

Check accuracy of current and voltage measurement.

CC.7.5.12.4 試驗設置

CC.7.5.12.4 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.12.5 預處理

CC.7.5.12.5 Preconditions

無。

None.

CC.7.5.12.6 定義及計算

CC.7.5.12.6 Definitions and calculations

在此試驗案例之步驟中，某些 EV 供電設備之屬性於 EV 供電設備之操作範圍內的特定試驗點進行測試。引數 "m" 之使用依下列引用至特定之試驗點 $TP_m$：

In the steps of this test case, certain properties of the EV supply equipment are tested at specific test points in the operating range of the EV supply equipment. The index m is used as follows to refer to a specific test point $TP_m$:

m：連續性引數用來識別預定電流值。

m: This consecutive index is used to identify the value of the intended current.

訊息 "CurrentDemandReq" <7a> 應包含下列參數：

The message "CurrentDemandReq" <7a> shall contain the following parameters:

- EVTargetCurrent = $I_{EV_target}$；
- EVTargetVoltage = $V_{EV_target}$。

$TP_m$ 試驗點之定義：

Definition of test points $TP_m$:

引數範圍：

Index range:

- m = 0 … 20.

$TP_m = (I_{EVSE_intended_m} / V_{EVSE_intended})$ 及：

- $I_{EVSE_intended_m} = I_{EVSE_min} + m/20 \times (I_{EVSE_max} - I_{EVSE_min})$;
- $V_{EVSE_intended} = V_{EVSE_min} + 0.5 \times (V_{EVSE_max} - V_{EVSE_min})$.
- $V_{EVSE_intended} = V_{EVSE_min} + 0,5 \times (V_{EVSE_max} - V_{EVSE_min})$.

格線上之試驗點若符合下列所有條件，即為有效可進行試驗。

A test point of the grid is valid for testing if all of the following conditions are fulfilled:

- $V_{EVSE_intended} \times I_{EVSE_intended_m} \leq P_{EVSE_max}$;
- $V_{EVSE_intended} \times I_{EVSE_intended_m} \geq P_{EVSE_min}$;
- 試驗點涵蓋於 EV 供電設備之範圍，其由 EV 供電設備在初始階段 (ChargeParameterDiscoveryReq/Res) 及電能傳輸期間 (CurrentDemandReq/Res)所傳送。
- The test point is contained in the operating range of the EV supply equipment as communicated by the EV supply equipment in the initialization phase (ChargeParameterDiscoveryReq/Res) and during the energy transfer stage (CurrentDemandReq/Res).

目標值要求接近試驗點 $TP_n$：

Target values requested to approach test points $TP_n$:

- $I_{EV_target_m} = I_{EVSE_intended_m}$;
- $V_{EV_target} = V_{EVSE_max}$ (容許為 CCM);
- EV 模擬器應以週期時間 1 s 或更短循環傳送 "CurrentDemandReq" <7a> 訊息，使 EV 供電設備能於 "CurrentDemandRes" <7b> 訊息傳送其(可能)採用之操作範圍。
- the EV simulator shall cyclically send "CurrentDemandReq" <7a> messages with a cycle time of 1 s or less in order to enable the EV supply equipment to communicate its (potentially) adapted operating range in "CurrentDemandRes" <7b>.

在每一個 $TP_n$ 量測期間，應持續進行計算如下：

Calculations done continuously during the measurement duration of each $TP_n$:

- 測定絕對偏差：
- Determine the absolute deviation:
  - $I_{dev_abs} = |I_{EVSE_SideB_DC} - I_{EV_target}|$
- 測定絕對偏差：
- Determine the absolute deviation:
  - $I_{dev_abs_measure} = |I_{EVSE\ measure} - I_{EVSE_SideB_DC}|$

    及 $I_{EVSE_measure}$ = "CurrentDemandRes" <7b> 訊息之 EVSEPresentCurrent
- 測定絕對偏差：
- Determine the absolute deviation:
  - $V_{dev_abs_measure} = |V_{EVSE\ measure} - V_{EVSE_SideB_DC}|$

    及 $V_{EVSE\ measure}$ = "CurrentDemandRes" <7b> 訊息之 EVSEPresentVoltage
- 傳輸時間：
- Transition time:
  - $T_{transition_max} = \max\left(1\,s, \frac{|I_{Req_ACK} - I_{EVSE_output}(t_0)|}{20\frac{A}{s}}\right)$

CC.7.5.12.7 動作

CC.7.5.12.7 Actions

每一個試驗點應依 CC.7.4 流程進行。對每一個試驗點進行下列步驟。

Each of the test points shall be approached according to CC.7.4. For each of the test points perform the following steps.

步驟 1：

Step 1:

(1) 於 "CurrentDemandReq" <7a> 訊息，以下列參數請求目標值：

1) Request target values with the following parameters in the message "CurrentDemandReq" <7a>:
   - EVTargetCurrent = $I_{EV_target}$ = 0 A;
   - EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_max}$.

(2) 等待 $T_{transition_max}$ 。

2) Wait for $T_{transition_max}$.

(3) 量測 $I_{EVSE_SideB_DC}$ 。

3) Measure $I_{EVSE_SideB_DC}$.

(4) 接收 $I_{EVSE_measure}$ 及 $V_{EVSE_measure}$ 。

4) Receive $I_{EVSE_measure}$ and $V_{EVSE_measure}$.

(5) 對每一個試驗點 $TP_m$ 執行計算並完成。

5) Perform calculations to be done for each test point $TP_m$.

(6) 檢查是否達到預期結果。

6) Check if expected results are achieved.

步驟 2：

Step 2:

(1) 於 "CurrentDemandReq" <7a> 訊息，以下列參數請求目標值，亦即，回到開始的試驗點：

1) Request target values with the following parameters in the message "CurrentDemandReq" <7a>, that is, go back to starting test point:

- EVTargetCurrent = $I_{EV_target_m} = I_{EVSE_intended_m}$;
- EVTargetVoltage = $V_{EV_target} = V_{EVSE_max}$.

CC.7.5.12.8 預期結果

CC.7.5.12.8 Expected results

若每一個 $TP_m$ 達到下列任一試驗準則，則此試驗案例即為符合。

This test case is passed if each of the following test criteria is fulfilled for each $TP_m$.

在步驟 1 後：

After step 1:

- $I_{dev_abs} \leq 150$ mA;
- $I_{dev_abs_measure} \leq 0.5$ A;
- $I_{dev_abs_measure} \leq 0,5$ A;
- $V_{dev_abs_measure} \leq 10$ V.

在步驟 2 後：

After step 2:

EV 供電設備接近開始之試驗點且維持於電能傳輸階段。

The EV supply equipment approaches the starting test point and remains in the energy transfer stage.

CC.7.5.13 B 側於 CVM 在預充電期間之電壓調節

CC.7.5.13 Side B voltage regulation in CVM during pre-charge

CC.7.5.13.1 一般

CC.7.5.13.1 General

符合試驗之試驗點如圖 CC.31 所示。

The test point matrix for the compliance test is shown in Figure CC.31.

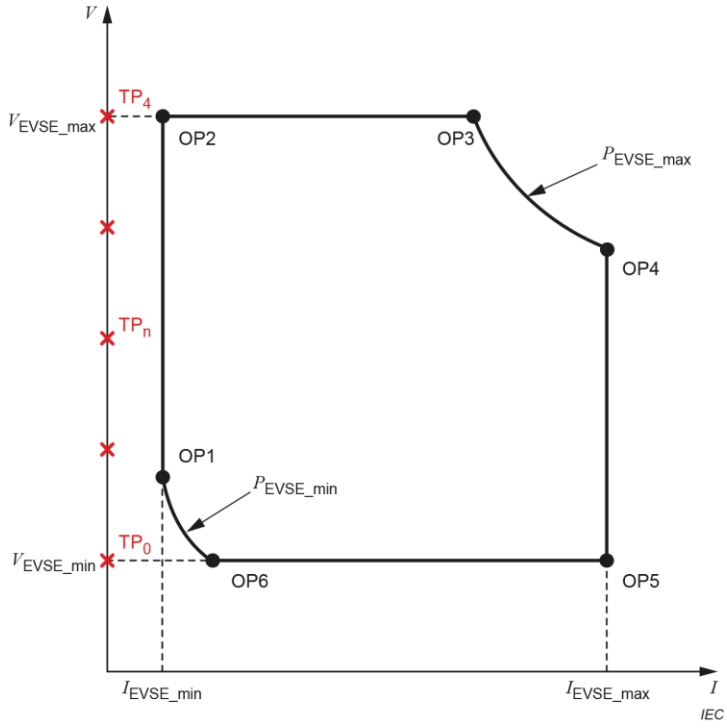



圖 CC. 31 預充電期間 B 側於 CVM 電壓調節之試驗點矩陣

Figure CC.31 – Test point matrix for side B voltage regulation in CVM during pre-charge

圖 CC.31 展示試驗點矩陣之簡易範例，在此試驗案例為識別主要的試驗序列，使用引數 n=0...4。然而，試驗點矩陣實際使用於試驗案例應包含引數 n = 0...20，且有許多額外的限制如下列所述。應考量以下幾個方面。

Figure CC.31 shows a simplified example of the test points with index n = 0...4 in order to visualize the principal testing sequence of this test case. However, the test points that shall actually be used for this test case shall cover index n = 0...20, with some additional restrictions as described below. The following aspects shall be considered.

- 僅有在 EV 供電設備操作範圍內之試驗點 TPn 應進行要求評估之考量。此外，操作範圍之實際形狀可能與圖 CC.31 所描繪之簡易形狀不同。因此可能有一個或多個試驗點 EV 供電設備並無法操作。那些試驗點不應納入要求評估之考量。
- Only the test points TPn within the operating range of the EV supply equipment shall be considered for the requirement evaluation. Furthermore, the actual shape of the operatingrange may differ from the simplified shape as depicted in Figure CC.31. As a result, there might be one or more test points in which the EV supply equipment cannot be operated. Those test points shall not be considered for the requirement evaluation.
- 在試驗期間，EV 供電設備之操作範圍可能會動態改變，例如：因熱能衰退所

致。因此可能會有單一試驗點其 EV 供電設備並無法繼續操作，其與在試驗開始試驗點矩陣之初始決定不同。那些試驗點不應納入要求評估之考量。

- The operating range of the EV supply equipment may dynamically change during the test, for example, due to thermal degradation. As a result, there might be single test points in which the EV supply equipment can no longer be operated, as opposed to the initial determination of the test print grid at the beginning of the test. Those test points shall not be considered for the requirement evaluation.

CC.7.5.13.2 參考要求

CC.7.5.13.2 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 6.3.1.102 量測電流及電壓；
- 6.3.1.102 Measuring current and voltage;
- 101.1.2.2 B 側於 CVM 之電流調節；
- 101.1.2.2 Side B voltage regulation in CVM;
- 101.1.6 週期性及隨機偏差(於 CVM 之電壓漣波)；
- 101.1.6 Periodic and random deviation (voltage ripple in CVM);
- CC.5.1 預充電；
- CC.5.1 Pre-charge;
- CC.6.3 量測電流及電壓。.
- CC.6.3 Measuring current and voltage.

CC.7.5.13.3 敘述

CC.7.5.13.3 Description

檢查在預充電期間，電壓調節是否符合靜態、週期性及隨機偏差之要求。

Check if the voltage regulation during pre-charge fulfils the requirements for static, periodic, and random deviation.

檢查 EV 供電設備是否忽略 EV 的電流請求及限制 B 側當下電流在 DC+ 及 DC– 之雙向連續電流最大至 2 A。

Check if the EV supply equipment ignores the current request of the EV and limits the continuous current on DC+ and on DC– of the present current at side B in both directions to a maximum of 2 A.

檢查電壓量測之準確度。

Check accuracy of voltage measurement.

CC.7.5.13.4 試驗設定

CC.7.5.13.4 Test setup

依圖 CC.14 調整標準試驗設置。

Modified standard test setup as shown in Figure CC.14.

使用規定於表 CC.25 之試驗設置值。

Use the values for the test setup specified in Table CC.25.

表 CC.25 預充電期間於 CVM 模式量測 B 側電壓調節之試驗設置值

Table CC.25 – Test setup values to measure side B voltage regulation in CVM during pre-charge

| 符號<br>Symbol | 預充電期間試驗負載數值<br>設置 1<br>Value for test load during pre-charge<br>Setup 1 | 預充電期間試驗負載數值<br>設置 2<br>Value for test load during pre-charge<br>Setup 2 |
|---|---|---|
| $I_T1$ | 12 mA ± 2 mA | 0 mA |
| $C_T1$, $C_T2$ | 2 µF ± 20 % | 2 µF ± 20 % |
| $C_T9$ | 10 nF ± 20 % | 10 nF ± 20 % |
| $R_T5$, $R_T6$ | 300 kΩ (0+20%) | 300 kΩ (0+20%) |
| $R_T16$, $R_T17$ | 500 kΩ ± 10 % | 2 MΩ ± 10 % |
| $S_T11$, $S_T12$, $S_T13$, $S_T14$,$S_T17$ | 閉合 closed | 閉合 closed |
| $S_T18$ | 斷開 open | 斷開 open |

在穩定階段，於 10 s 期間進行量測。

Measure in the stationary phase for a duration of 10 s.

在此期間之所有量測值，應用來計算及查證預期結果。

All measurements during this time shall be used for calculation and for verification of expected results.

CC.7.5.13.5 預處理

CC.7.5.13.5 Preconditions

依據 EV 供電設備之數據表，EV 模擬器應於 "ChargeParameterDiscoveryReq" <3a> 訊息，傳送下列屬性：

Based on the data sheet of the EV supply equipment, the EV simulator shall communicate the following properties with the message "ChargeParameterDiscoveryReq" <3a>:

- $V_{EV_max} \geq V_{EVSE_max}$;
- $V$EV_min $\leq V_{EVSE_min}$;
- $I_{EV_max} \geq I_{EVSE_max}$;
- $I_{EV_min} \leq I_{EVSE_min}$;
- $P_{EV_max} \geq P_{EVSE_max}$.

EV 供電設備以 "ChargeParameterDiscoveryRes" <3b> 訊息，成功傳送以下屬性至 EV 模擬器：

The EV supply equipment has successfully communicated its following properties to the EV simulator with the message "ChargeParameterDiscoveryRes" <3b>:

- $V_{EVSE_min}$;

- $V_{EVSE_max}$;
- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

CC.7.5.13.6 定義及計算

CC.7.5.13.6 Definitions and calculations

在此試驗案例之步驟中，某些 EV 供電設備之屬性於 EV 供電設備之操作範圍內的特定試驗點進行測試。引數 "n" 之使用依下列引用至特定之試驗點 $TP_n$：

In the steps of this test case, certain properties of the EV supply equipment are tested at specific test points in the operating range of the EV supply equipment. The index n is used as follows to refer to a specific test point TPn:

n：連續性引數用來識別預定電壓值。

n: This consecutive index is used to identify the value of the intended voltage.

訊息 "PreChargeReq" <5a> 應包含下列參數：

The message "PreChargeReq" <5a> shall contain the following parameters:

- EVTargetCurrent = $I_{EV_target}$;
- EVTargetVoltage = $V_{EV_target}$.

試驗點 $TP_n$ 之定義：

Definition of test points TPn:

引數範圍：

Index range:

n = 0 ... 20

$TP_n$ = (0 A / $V_{EVSE_intended\ n}$) 及：

- $V_{EVSE_intended_n} = V_{EVSE_min} + n/20 \times (V_{EVSE_max} - V_{EVSE_min})$.

請求目標值接近試驗點 $TP_n$：

Target values requested to approach test points $TP_n$:

- $I_{EV_target}$ = 10 A;
- $V_{EV_target} = V_{EVSE_intended_n}$.

EV 模擬器應請求目標電流 > 2 A，來試驗 EV 供電設備是否忽略 EV 之目標電流(即使在調整 B 側之當下電壓期間暫時進入 CCM)，且限制 B 側當下電流至 2A。

The EV simulator shall request a target current > 2 A, to test if the EV supply equipment ignores the target current of the EV (even if it momentarily enters CCM while adjusting the present voltage at side B), and limits the present current at side B to 2 A.

時間點之定義：

Definition of times:

- $T_{wait_1}$ = 3 s (依照 CC.5.1);

- $T_{wait_2}$ = 1 s (依照 CC.5.1).

在每一個 $TP_n$ 量測期間持續進行以下計算：

Calculations done continuously during the measurement duration of each $TP_n$:

- 測定相對偏差：
- Determine the relative deviation:
  - $V_{dev_rel_1} = |V_{EVSE_SideB_DC} - V_{EV_target}| / V_{EV_target}$
- 測定相對偏差：
- Determine the relative deviation:
  - $V_{dev_rel_2} = |V_{EVSE_SideB_DC} - V_{EV_target}| / V_{EVSE_max}$
- 測定絕對偏差：
- Determine the absolute deviation:
  - $V_{dev_abs_measure} = |V_{EVSE_measure} - V_{EVSE_SideB_DC}|$
    及 $V_{EVSE_measure}$ = "PreChargeRes" <5b> 訊息之 EVSEPresentVoltage

CC.7.5.13.7 動作

CC.7.5.13.7 Actions

此試驗包含 3 個部分，涵蓋 CC.5.1 所規定預充電階段中不同時間段之電壓調節要求。進行部分(I)及部分(Ⅱ)試驗使用設置 1，進行部分(Ⅲ)試驗則使用設置 2。

This test consists of three parts, covering the requirements for voltage regulation in different time sections of the pre-charge stage as specified in CC.5.1. To test parts (I) and (II), setup 1 shall be used; to test part (III), setup 2 shall be used.

試驗點 $TP_n$ 應涵蓋於由試驗迴圈所產出之序列中。

The test points $TP_n$ shall be covered in a sequence generated by a test loop.

迴圈應包含引數 n (n = 0...20) 之所有範圍，因此將依序試驗不同的預定電壓值

The loop shall cover the index range of index n (n = 0...20) and therefore step through the different values of the intended voltage.

部分(I)：電流調節後 3 s 之試驗：

Part (I): Test of voltage regulation after 3 s:

依設置 1 之數值架構試驗配置。閉合 $S_T11$、$S_T12$、$S_T13$ 及 $S_T14$。

Configure the test setup with the values of setup 1. Close $S_T11$, $S_T12$, $S_T13$ and $S_T14$.

(1) 設定 n = 0.

1) Set n = 0.

(2) 迴圈：

2) Loop:

(a) 執行 FPT 序列直到 EV 供電設備以訊息 "CableCheckRes" <4b> (亦即 CC.3.2 之 t = t6) 傳送已經完成纜線檢查階段。

a) Perform FPT sequence until the EV supply equipment has communicated that the cablecheck phase has been completed with the message "CableCheckRes"

<4b> (that is, t = t6 according to CC.3.2).

(b) 於 "PreChargeReq" <5a> 訊息中，以下列參數請求目標值：

b) Request target values with the following parameters in the message "PreChargeReq" <5a>:

EVTargetCurrent = $I_{EV_target}$ = 10 A

EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_intended_n}$

(c) 等待 $T_{wait_1}$ (開始點：傳送 "PreChargeReq" <5a> 訊息起)

c) Wait for $T_{wait_1}$ (starting point: "PreChargeReq" <5a> message is sent).

(d) 量測 $V_{EVSE_SideB_DC}$ 、 $V_{rip}$、及 $I_{EVSE_SideB}$。

d) Measure $V_{EVSE_SideB_DC}$, $V_{rip}$, and $I_{EVSE_SideB}$.

(e) 接收 $V_{EVSE_measure}$ 。

e) Receive $V_{EVSE_measure}$.

(f) 對每一個試驗點 $TP_n$ 執行計算並完成。

f) Perform calculations to be done for each test point $TP_n$.

(g) 檢查是否達到預期結果(在 $T_{wait_1}$ 時間結束後)

g) Check if expected results are achieved (after $T_{wait_1}$ is elapsed).

(h) 依 CC.3.3 執行正常停機

h) Perform a normal shutdown according to CC.3.3.

(i) 設定 n = n + 1

i) Set n = n + 1.

(j) 若 n ≤ 20，跳至步驟(a)

j) If n ≤ 20, then jump to step a).

(3) 結束部分(I)之試驗。

3) End test part (I).

部分(Ⅱ)：在增加 50 V 電壓請求後，電壓調節 1 s 之試驗：

Part (II): Test of voltage regulation 1 s after increase of voltage request by 50 V:

依設置 1 之數值架構試驗配置。閉合 $S_T11$、$S_T12$、$S_T13$ 及 $S_T14$。

Configure the test setup with the values of setup 1. Close ST11, ST12, ST13 and ST14.

(4) 設定 n = 0。

4) Set n = 0.

(5) 迴圈：

5) Loop:

(a) 執行 FPT 序列直到 EV 供電設備以訊息 "CableCheckRes" <4b> (亦即 CC.3.2 之 t = t6) 傳送已經完成纜線檢查階段。

a) Perform FPT sequence until the EV supply equipment has communicated that the cablecheck phase has been completed with the message "CableCheckRes" <4b> (that is, t = t6 according to CC.3.2).

(b) 於 "PreChargeReq" <5a> 訊息中，以下列參數請求目標值：

b) Request target values with the following parameters in the message "PreChargeReq" <5a>:

EVTargetCurrent = $I_{EV_target}$ = 10 A；

EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_intended_n}$。

(c) 等待 $T_{wait_1}$ (開始點：傳送 "PreChargeReq" <5a> 訊息起)

c) Wait for Twait_1 (starting point: "PreChargeReq" <5a> message in b) is sent).

(d) 於 "PreChargeReq" <5a> 訊息中，以下列參數請求目標值：

d) Request target values with the following parameters in the message "PreChargeReq" <5a>:

EVTargetCurrent = $I_{EV_target}$ = 10 A;

EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_intended_}$n + 50 V.

(e) 等待 $T_{wait_2}$ (開始點：於 (d) 傳送 "PreChargeReq" <5a> 訊息起)

e) Wait for Twait_2 (starting point: "PreChargeReq" <5a> message in d) is sent).

(f) 量測 $V_{EVSE_SideB_DC}$ 、 $V_{rip}$、及 $I_{EVSE_SideB}$。

f) Measure VEVSE_SideB_DC, Vrip, and *I*EVSE_SideB.

(g) 接收 $V_{EVSE_measure}$ 。

g) Receive VEVSE_measure.

(h) 對每一個試驗點 $TP_n$ 執行計算並完成。

h) Perform calculations to be done for each test point TPn.

(i) 檢查是否達到預期結果(在 $T_{wait_2}$ 時間結束後)

i) Check if expected results are achieved (after Twait_2 is elapsed).

(j) 依 CC.3.3 執行正常停機

j) Perform a normal shutdown according to CC.3.3.

(k) 設定 n = n + 1。

k) Set n = n + 1.

(l) 若 [(n ≤ 20) 且 ($V_{EVSE_intended\ n} \leq V_{EVSE_max} - 50$ V)]，則跳至步驟(a)。

l) If [(n ≤ 20) and ($V_{EVSE_intended}$ n ≤ $V_{EVSE_max}$ − 50 V)], then jump to step a).

(6) 結束部分(Ⅱ)之試驗。

6) End test part (II).

部分(III)：在請求增加 50 V 電壓後，電壓調節 1 s 之試驗：

Part (III): Test of voltage regulation 1 s after decrease of voltage request by 50 V:

依設置 2 之數值架構試驗配置。閉合 $S_T11$、$S_T12$、$S_T13$ 及 $S_T14$。

Configure the test setup with the values of setup 2. Close ST11, ST12, ST13 and ST14.

(7) 設定 n = 20。

7) Set n = 20.

(8) 迴圈：

8) Loop:

(a) 執行 FPT 序列直到 EV 供電設備以訊息 "CableCheckRes" <4b> (亦即 CC.3.2 之 t = t6) 傳送已經完成纜線檢查階段。

a) Perform FPT sequence until the EV supply equipment has communicated that the cablecheck phase has been completed with the message "CableCheckRes" <4b> (that is, t = t6 according to CC.3.2).

(b) 於 "PreChargeReq" <5a> 訊息中，以下列參數請求目標值：

b) Request target values with the following parameters in the message "PreChargeReq" <5a>:

EVTargetCurrent = $I_{EV_target}$ = 10 A;

EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_intended_n}$

(c) 等待 $T_{wait_1}$ (開始點：傳送 "PreChargeReq" <5a> 訊息起)

c) Wait for Twait_1 (starting point: "PreChargeReq" <5a> message in b) is sent)

(d) 於 "PreChargeReq" <5a> 訊息中，以下列參數請求目標值：

d) Request target values with the following parameters in the message "PreChargeReq" <5a>:

EVTargetCurrent = $I_{EV_target}$ = 10 A;

EVTargetVoltage = $V_{EV_target}$ = $V_{EVSE_intended_n}$ − 50 V.

(e) 等待 $T_{wait_2}$ (開始點：於 (d) 傳送 "PreChargeReq" <5a> 訊息起)

e) Wait for Twait_2 (starting point: "PreChargeReq" <5a> message in d) is sent).

(f) 量測 $V_{EVSE_SideB_DC}$ 、 $V_{rip}$、及 $I_{EVSE_SideB}$。

f) Measure VEVSE_SideB_DC, Vrip, and *I*EVSE_SideB.

(g) 接收 $V_{EVSE_measure}$ 。

g) Receive VEVSE_measure.

(h) 對每一個試驗點 $TP_n$ 執行並完成計算。

h) Perform calculations to be done for each test point TPn.

(i) 檢查是否達到預期結果(在 $T_{wait_2}$ 時間結束後)

i) Check if expected results are achieved (after Twait_2 is elapsed).

(j) 依 CC.3.3 執行正常停機

j) Perform a normal shutdown according to CC.3.3.

(k) 設定 n = n - 1。

k) Set n = n – 1.

(l) 若 [(n ≥ 0) 且 ($V_{EVSE_intended_n} \geq V_{EVSE_min}$ + 50 V)]，則跳至步驟(a)。

l) If [(n ≥ 0) and ($V_{EVSE_intended_n} \geq V_{EVSE_min}$ + 50 V)], then jump to step a).

(9) 結束部分(Ⅲ)之試驗。

9) End test part (III).

CC.7.5.13.8 預期結果

CC.7.5.13.8 Expected results

若每一個 $TP_n$ 及每一個試驗部分(I)、(Ⅱ)、(Ⅲ) 皆達到下列任一試驗準則，則此試驗案例即為符合。

This test case is passed if each of the following test criteria is fulfilled for each TPn and for each test part (I), (II), (III):

- $V_{dev_rel_1} \leq 5\ \%$；
- $V_{dev_rel_2} \leq 2\ \%$；
- 對 $V_{EV_target} \leq 500\ V$：

  $V_{rip} \leq 5\ V$；
- 對 $V_{EV_target} > 500\ V$:

  $V_{rip} \leq 1\ \%$ of $V_{EV_target}$；
- $-2\ A \leq I_{EVSE_SideB} \leq 2\ A$；
- $V_{dev_abs_measure} \leq 10\ V$。

CC.7.5.14 B 側於 CCM 當下電流之控制延遲

CC.7.5.14 Control delay of present current at side B in CCM

CC.7.5.14.1 一般

CC.7.5.14.1 General

符合試驗之試驗點如圖 CC.32 所示。

The test point matrix for the compliance test is shown in Figure CC.32.

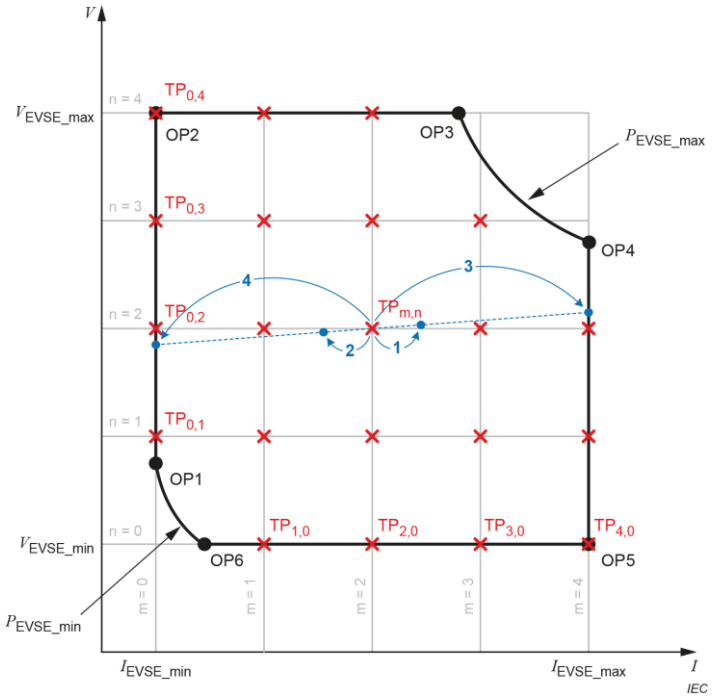



圖 CC.32 在 CCM 模式下充電電流之控制延遲的試驗點矩陣

Figure CC.32 – Test point matrix for control delay of charging current in CCM

圖 CC.32 展示試驗點矩陣之簡易範例，在此試驗案例為識別主要的試驗序列，使

用引數 m=0...4 及 n=0...4。然而，試驗點矩陣實際使用於試驗案例應包含引數 m = 0...20 及 n = 0...20，且有許多額外的限制如下列所述。應考量以下幾個方面。
Figure CC.32 shows a simplified example of the test point matrix with indices m = 0...4 and n = 0...4. However, the test point matrix that shall actually be used for this test case shall cover indices m = 0...20 and n = 0...20, with some additional restrictions as described below.
僅有在 EV 供電設備操作範圍內之試驗點 $TP_{m,n}$ 應進行要求評估之考量。
Only the test points $TP_{m,n}$ within the operating range of the EV supply equipment shall be considered for the requirement evaluation.

CC.7.5.14.2 參考要求
CC.7.5.14.2 Reference requirements
此試驗案例考量下列試驗要求：
This test case considers the following requirements:
- 101.1.1 電壓、電流及功率之操作範圍；
- 101.1.1 Operating ranges for voltage, current, and power;
- 101.1.2.1 B 側於 CCM 之電流調節；
- 101.1.2.1 Side B current regulation in CCM;
- 101.1.3 B 側於 CCM 之當下電流控制延遲；
- 101.1.3 Control delay of present current at side B in CCM;
- 101.1.5 週期性及隨機偏差(B 側在 CCM 期間之電流漣波);
- 101.1.5 Periodic and random deviation (current ripple at side B during CCM);
- CC.6.2 B 側之電流調節。
- CC.6.2 Side B current regulation.

CC.7.5.14.3 敘述
CC.7.5.14.3 Description
檢查電流調節是否符合控制延遲之要求。
Check if the current regulation fulfils the requirements for control delay.

CC.7.5.14.4 試驗設置
CC.7.5.14.4 Test setup
標準試驗設定
Standard test setup.

CC.7.5.14.5 預處理
CC.7.5.14.5 Preconditions
依據 EV 供電設備之數據表，EV 模擬器應於 "ChargeParameterDiscoveryReq"

<3a> 訊息，傳遞下列屬性：

Based on the data sheet of the EV supply equipment, the EV simulator shall communicate the following properties with the message "ChargeParameterDiscoveryReq" <3a>:

- $V_{EV_max} \geq V_{EVSE_max}$;
- $V_{EV_min} \leq V_{EVSE_min}$;
- $I_{EV_max} \geq I_{EVSE_max}$;
- $I_{EV_min} \leq I_{EVSE_min}$;
- $P_{EV_max} \geq P_{EVSE_max}$.

EV 供電設備應以 "ChargeParameterDiscoveryRes" <3b> 訊息，成功傳遞下列屬性至 EV 模擬器：

The EV supply equipment shall have successfully communicated the following properties to the EV simulator with the message "ChargeParameterDiscoveryRes" <3b>:

- $V_{EVSE_min}$;
- $V_{EVSE_max}$;
- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

CC.7.5.14.6 定義及計算

CC.7.5.14.6 Definitions and calculations

在此試驗案例之步驟中，EV 供電設備某些屬性係以 EV 供電設備操作範圍內之特定試驗點進行測試。

In the steps of this test case, certain properties of the EV supply equipment are tested at specific test points in the operating range of the EV supply equipment.

引數 m 及 n 之使用依下列引用至特定之試驗點 $TP_{m,n}$：

The indices m and n are used as follows to refer to a specific test point $TP_{m,n}$:

- m：此引數用於識別預定電流值；
- m: this index is used to identify the value of the intended current;
- n：此引數用於識別預定電壓值；
- n: this index is used to identify the value of the intended voltage.

訊息 "CurrentDemandReq" <7a> 應包含下列參數：

The message "CurrentDemandReq" <7a> shall contain the following parameters:

- EVTargetCurrent = $I_{EV_target}$;
- EVTargetVoltage = $V_{EV_target}$;

且應由 EV 模擬器以週期時間 1 s 或更短來循環傳送。

and shall be cyclically sent by the EV simulator with a cycle time of 1 s or less.

試驗點矩陣 $TP_{m,n}$ 之定義：

Definition of test point matrix $TP_{m,n}$:

引數範圍：

Indices range:

- m = 0 … 20;
- n = 0 … 20.

$TP_{m,n} = (I_{EVSE_intended_m} / V_{EVSE_intended_n})$ 及：

- $I_{EVSE_intended_m} = I_{EVSE_min} + m/20 \times (I_{EVSE_max} - I_{EVSE_min})$;
- $V_{EVSE_intended_n} = V_{EVSE_min} + n/20 \times (V_{EVSE_max} - V_{EVSE_min})$.

若符合下列所有條件，格子上之試驗點即為有效可進行試驗：

A test point of the grid is valid for testing if all of the following conditions are fulfilled:

- $V_{EVSE_intended_n} \times I_{EVSE_intended_m} \leq P_{EVSE_max}$;
- $V_{EVSE_intended_n} \times I_{EVSE_intended_m} \geq P_{EVSE_min}$;
- 試驗點涵蓋於 EV 供電設備之範圍，其由 EV 供電設備在初始階段(ChargeParameterDiscoveryReq/Res)及電能傳輸期間(CurrentDemandReq/Res)所傳送。
- the test point is contained in the operating range of the EV supply equipment as communicated by the EV supply equipment in the initialization phase(ChargeParameterDiscoveryReq/Res) and during the energy transfer stage(CurrentDemandReq/Res).

請求目標值接近試驗點 $TP_{m,n}$：

Target values requested to approach test point $TP_{m,n}$:

- $I_{EV_target_m} = I_{EVSE_intended_m}$;
- $V_{EV_target} = V_{EVSE_max}$ (對 CCM 容許 to allow for CCM);
- EV 模擬器應以週期時間 1 s 或更短循環傳送 "CurrentDemandReq" <7a> 訊息，使 EV 供電設備能於 "CurrentDemandRes" <7b> 訊息傳送其(可能)採用之操作範圍
- the EV simulator shall cyclically sent "CurrentDemandReq" <7a> messages with a cycle time of 1 s or less in order to enable the EV supply equipment to communicate its (potentially) adapted operating range in "CurrentDemandRes" <7b>.

在 $T_{transition_max}$ 完成後繼續進行計算(於 $I_{EV_target}$ 已增加/減少後)：

Calculations done continuously after $T_{transition_max}$ has elapsed (after $I_{EV_target}$ has been increased /decreased):

- 測定絕對偏差：
- determine the absolute deviation:

• $I_{dev_abs} = |I_{EVSE_SideB_DC} - I_{EV_target}|$ 對 $I_{EV_target} \leq 50$ A；

– 測定相對偏差：

– determine the relative deviation:

• $I_{dev_rel}$ = $|I_{EVSE_SideB_DC} - I_{EV_target}| / I_{EV_target}$ 對 $I_{EV_target} > 50$ A

試驗點矩陣之試驗點應依序列之流程進行如圖 CC.33 所示。

The test points of the test point matrix shall be processed in the sequence shown in Figure CC.33.

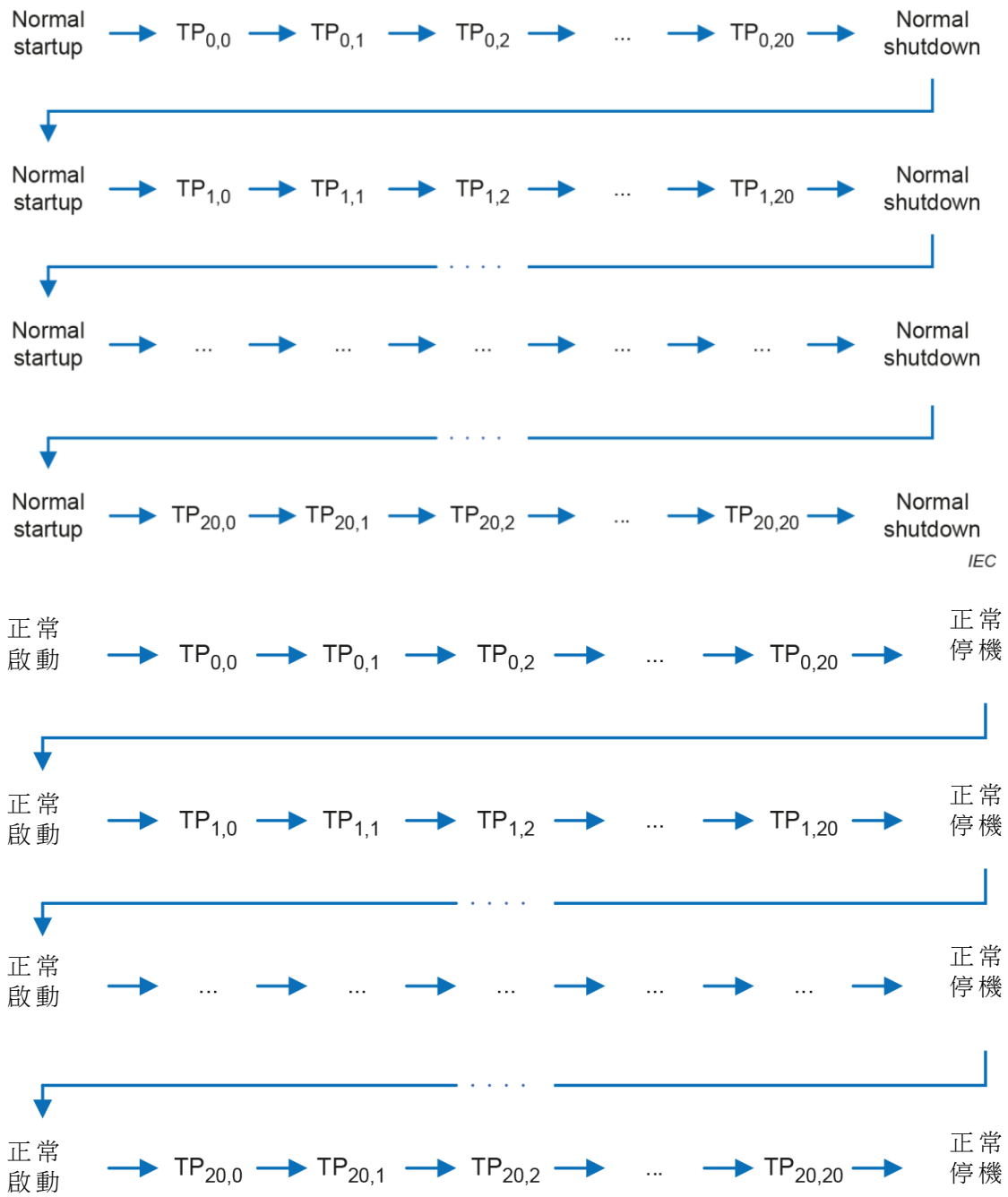



圖 CC. 33 試驗點之序列

Figure CC.33 – Test point sequence

應僅將有效的試驗點納入試驗之考量。

Only valid test points shall be considered for the test.

CC.7.5.14.7 動作

CC.7.5.14.7 Actions

每一個試驗點應依 CC.7.4 流程進行。對每一個試驗點進行下列步驟。

Each of the test points shall be approached according to CC.7.4. For each of the test points, perform the following steps.

步驟 1：

Step 1:

(1) 於單一步驟中，每次增加 $I_{EV_target}$ 電流 20 A。

1) Increase $I_{EV_target}$ by 20 A in a single step.

若此引起操作點不在 EV 供電設備之操作範圍或其無法進入 CCM 模式，則忽略此步驟，繼續進行下一步驟。

If this would result in an operating point which was outside of the operating range of the EV supply equipment or which would not allow for CCM any longer, then disregard this step and proceed with the next step.

(2) 接收下一個已確認之回應電流請求值 $I_{Req_ACK}$ 。

2) Receive the next value of the acknowledged current request $I_{Req_ACK}$.

收到之時間點為 $t_0$。

The time of reception is $t_0$.

在 $t_0$，量測 $I_{EVSE_SideB}(t_0)$。

At $t_0$, measure $I_{EVSE_SideB}(t_0)$.

(3) 從 $t_0$ 起，開始等待 $T_{Transition_max} = \max\left(1\,\text{s}, \frac{\left|I_{Req_ACK} - I_{EVSE_SideB}(t_0)\right|}{20\,\frac{\text{A}}{\text{s}}}\right)$。

3) Wait for $T_{Transition_max} = \max\left(1\,\text{s}, \frac{\left|I_{Req_ACK} - I_{EVSE_SideB}(t_0)\right|}{20\,\frac{\text{A}}{\text{s}}}\right)$ starting at t0.

(4) 在 $T_{Transition_max}$ 後，量測 $I_{EVSE_SideB_DC}$、$I_{rip_low}$、$I_{rip_mid}$ 及 $I_{rip_high}$。

4) After $T_{Transition_max}$, measure $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$.

(5) 對每一個試驗點 $TP_{m,n}$ 進行並完成計算。

5) Perform calculations to be done for each test point $TP_{m,n}$.

(6) 檢查是否達到預期結果。

6) Check if expected results are achieved.

(7) 回復至原始試驗點。

7) Revert to the original test point.

步驟 2：

Step 2:

(1) 於單一步驟中，每次減少 $I_{EV_target}$ 電流 20 A。

1) Decrease $I_{EV_target}$ by 20 A in a single step.

若此引起操作點不在 EV 供電設備之操作範圍或其無法進入 CCM 模式，則忽略此步驟，繼續進行下一步驟。

If this would result in an operating point which was outside of the operating range of the EV supply equipment or which would not allow for CCM any longer, then disregard this step and proceed with the next step.

(2) 接收下一個已確認之回應電流請求值 $I_{Req_ACK}$ 。

2) Receive the next value of the acknowledged current request $I_{Req_ACK}$.

收到之時間點為 $t_0$。

The time of reception is $t_0$.

在 $t_0$，量測 $I_{EVSE_SideB}(t_0)$。

At $t_0$, measure $I_{EVSE_SideB}(t_0)$.

(3) 從 $t_0$ 起，開始等待 $T_{Transition_max} = \max\left(1\,\text{s}, \frac{\left|I_{Req_ACK} - I_{EVSE_SideB}(t_0)\right|}{20\,\frac{\text{A}}{\text{s}}}\right)$。

3) Wait for $T_{Transition_max} = \max\left(1\,\text{s}, \frac{\left|I_{Req_ACK} - I_{EVSE_output}(t_0)\right|}{20\,\frac{\text{A}}{\text{s}}}\right)$ starting at t0.

(4) 在 $T_{Transition_max}$ 後，量測 $I_{EVSE_SideB_DC}$、$I_{rip_low}$、$I_{rip_mid}$ 及 $I_{rip_high}$。

4) After $T_{Transition_max}$, measure $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$.

(5) 對每一個試驗點 $TP_{m,n}$ 進行並完成計算。

5) Perform calculations to be done for each test point $TP_{m,n}$.

(6) 檢查是否達到預期結果。

6) Check if expected results are achieved.

(7) 回復至原始試驗點。

7) Revert to the original test point.

步驟 3 – 僅適用於若($I_{EVSE_intended_m} < I_{EVSE_max}$)：

Step 3 – only applicable if ($I_{EVSE_intended_}$m < $I_{EVSE_max}$):

(1) 於單一步驟中，增加 $I_{EV_target}$ 至 $I_{EVSE_max}$ 。

1) *I*ncrease $I_{EV_target}$ to $I_{EVSE_max}$ in a single step.

若此引起操作點不在 EV 供電設備之操作範圍或其無法進入 CCM 模式，則忽略此步驟，繼續進行下一步驟。

If this would result in an operating point which would not allow for CCM any longer, then disregard this step and proceed with the next step.

(2) 接收下一個已確認之回應電流請求值 $I_{Req_ACK}$ 。

2) Receive the next value of the acknowledged current request $I_{Req_ACK}$.

收到之時間點為 $t_0$。

The time of reception is $t_0$.

在 $t_0$，量測 $I_{EVSE_SideB}(t_0)$。

At $t_0$, measure $I_{EVSE_SideB}(t_0)$.

(3) 從 $t_0$ 起，開始等待 $T_{Transition_max} = \max\left(1\,s, \frac{\left|I_{Req_ACK} - I_{EVSE_SideB}(t_0)\right|}{20\frac{A}{s}}\right)$。

3) Wait for $T_{Transition_max} = \max\left(1\,s, \frac{\left|I_{Req_ACK} - I_{EVSE_output}(t_0)\right|}{20\frac{A}{s}}\right)$ starting at t0.

(4) 在 $T_{Transition_max}$ 後，量測 $I_{EVSE_SideB_DC}$、 $I_{rip_low}$、 $I_{rip_mid}$ 及 $I_{rip_high}$。

4) After $T_{Transition_max}$, measure $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$.

(5) 對每一個試驗點 $TP_{m,n}$ 進行並完成計算。

5) Perform calculations to be done for each test point $TP_{m,n}$.

(6) 檢查是否達到預期結果。

6) Check if expected results are achieved.

(7) 回復至原始試驗點。

7) Revert to the original test point.

步驟 4 – 僅適用於若($I_{EVSE_intended_m} > I_{EVSE_min}$)：

Step 4 – only applicable if ($I_{EVSE_intended_m} > I_{EVSE_min}$):

(1) 於單一步驟中，減少 $I_{EV_target}$ 至 $I_{EVSE_min}$

1) Decrease $I_{EV_target}$ to $I_{EVSE_min}$ in a single step.

若此引起操作點不在 EV 供電設備之操作範圍或其無法進入 CCM 模式，則忽略此步驟，繼續進行下一步驟。

If this would result in an operating point which would not allow for CCM any longer, then disregard this step and proceed with the next step.

(2) 接收下一個已確認之回應電流請求值 $I_{Req_ACK}$ 。

2) Receive the next value of the acknowledged current request $I_{Req_ACK}$.

收到之時間點為 $t_0$。

The time of reception is $t_0$.

在 $t_0$，量測 $I_{EVSE_SideB}(t_0)$。

At $t_0$, measure $I_{EVSE_SideB}(t_0)$.

(3) 從 $t_0$ 起，開始等待 $T_{Transition_max} = \max\left(1\,s, \frac{\left|I_{Req_ACK} - I_{EVSE_SideB}(t_0)\right|}{20\,\frac{A}{s}}\right)$。

3) Wait for $T_{Transition_max} = \max\left(1\,s, \frac{\left|I_{Req_ACK} - I_{EVSE_output}(t_0)\right|}{20\,\frac{A}{s}}\right)$ starting at t0.

(4) 在 $T_{Transition_max}$ 後，量測 $I_{EVSE_SideB_DC}$、$I_{rip_low}$、$I_{rip_mid}$ 及 $I_{rip_high}$。

4) After $T_{Transition_max}$, measure $I_{EVSE_SideB_DC}$, $I_{rip_low}$, $I_{rip_mid}$ and $I_{rip_high}$.

(5) 對每一個試驗點 $TP_{m,n}$ 進行並完成計算。

5) Perform calculations to be done for each test point $TP_{m,n}$.

(6) 檢查是否達到預期結果。

6) Check if expected results are achieved.

(7) 回復至原始試驗點。

7) Revert to the original test point.

CC.7.5.14.8 預期結果

CC.7.5.14.8 Expected results

若每一個下列準則皆達到，則此試驗案例即為符合。

This test case is passed if each of the following test criteria is fulfilled:

- 對 $I_{EV_target} \leq 5$ A:

  $I_{dev_abs} \leq 150$ mA;
- 對 $5\ A < I_{EV_target} \leq 50$ A:

  $I_{dev_abs} \leq 1{,}5$ A;
- 對 $I_{EV_target} > 50$ A:

  $I_{dev_rel} \leq 3$ %;
- 電流漣波應符合表 CC.26 之限制值。
- the current ripple shall meet the limits in Table CC.26.

表 CC.26 電流漣波限制

Table CC.26 – Current ripple limits

| | 電流漣波，Apeak-to-peak<br>Current ripple, Apeak-to-peak | | |
|---|---|---|---|
| | $I_{EVSE_SideB_DC} \leq$ 200 A | 200 A < $I_{EVSE_SideB_DC} \leq$ 400 A | $I_{EVSE_SideB_DC} >$ 400 A |
| $I_{rip_low}$ | ≤ 1,5 | ≤ ($I_{EVSE_SideB_DC}$ × 0,75 %) | ≤ ($I_{EVSE_SideB_DC}$ × 0,75 %) |
| $I_{rip_low}$ | ≤ 6,0 | ≤ 6,0 | ≤ ($I_{EVSE_SideB_DC}$ × 1,5 %) |
| $I_{rip_high}$ | ≤ 9,0 | ≤ ($I_{EVSE_SideB_DC}$ × 4,5 %) | ≤ ($I_{EVSE_SideB_DC}$ × 4,5 %) |

CC.7.5.15 預充電前絕緣電阻檢查(電纜-檢查)

CC.7.5.15 *I*nsulation resistance checks before pre-charge (cable-check)

CC.7.5.15.1 參考要求

CC.7.5.15.1 Reference requirements

此試驗案例考量下列要求：

This test case considers the following requirements:

- 6.3.1.113.3 錯誤停機；
- 6.3.1.113.3 Error shutdown;
- CC.4.1.2 電纜檢查階段。
- CC.4.1.2 Cable-check phase.

CC.7.5.15.2 敘述

CC.7.5.15.2 Description

對低絕緣電阻情況之反應。

Reaction on low insulation resistance condition.

CC.7.5.15.3 試驗設置

CC.7.5.15.3 Test setup

標準試驗設置

Standard test setup.

EV 模擬器在 DC+ 與 PE 間及 DC– 與 PE 間的絕緣電阻，應有充足的阻抗來達到下列規定之試驗電阻。在加入任何試驗電阻前，DC+ 至 PE 及 DC– 至 PE 之每一條導線應有 5 MΩ 阻抗。

The insulation resistance of the EV simulator, between DC+ and PE and between DC– and PE, shall have an impedance sufficient to achieve the test resistances specified below. Each rail, DC+ to PE and DC– to PE, shall have an impedance of 5 MΩ, prior to adding any test resistance.

對稱試驗：

Symmetrical test：

- 案例 1: 兩個試驗電阻器 $R_T5 = R_T6 = 300^{0}_{+2\%}$ kΩ。
- Case 1: Two test resistors $R_T5 = R_T6 = 300^{0}_{+2\%}$ kΩ.
- 案例 2: 兩個試驗電阻器 $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 2: Two test resistors $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ.

非對稱試驗：

Asymmetrical test:

- 案例 3: 兩個試驗電阻器 $R_T5 = 150^{0}_{+2\%}$ kΩ。
- Case 3: Test resistor $R_T5 = 150^{0}_{+2\%}$ kΩ.
- 案例 4: 兩個試驗電阻器 $R_T6 = 150^{0}_{+2\%}$ kΩ。
- Case 4: Test resistor $R_T6 = 150^{0}_{+2\%}$ kΩ.
- 案例 5: 兩個試驗電阻器 $R_T5 = 100^{0}_{+2\%}$ kΩ。

- Case 5: Test resistor $R_T5 = 100^{0}_{+2\%}$ kΩ.
- 案例 6: 兩個試驗電阻器 $R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 6: Test resistor $R_T6 = 100^{0}_{+2\%}$ kΩ.

干擾試驗

Disturbance test

- 案例 7: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ。
- Case 7: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ.
- 案例 8: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ。
- Case 8: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ.
- 案例 9: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ 接著是 $R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 9: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ followed by $R_T6 = 100^{0}_{+2\%}$ kΩ.
- 案例 10: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ 接著是 RT5 = $100^{0}_{+2\%}$ kΩ。
- Case 10: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ followed by RT5 = $100^{0}_{+2\%}$ kΩ.
- 案例 11: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ 接著是 $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 11: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ followed by $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ.

在這些試驗期間，EV 模擬器之試驗負載 Y-電容值應為 $C_T7=C_T8= 2$ μF 、且 $S_T24$ 及 $S_T25$ 應為閉合，EV 供電設備應為如其製造廠商規定之最壞情況。

During these tests, the Y-capacitance value for the test load of the EV simulator shall be $C_T7=C_T8= 2$ μF with $S_T24$ and $S_T25$ closed and for the EV supply equipment shall be worst case as defined by the EV supply equipment manufacturer.

CC.7.5.15.4 預處理

CC.7.5.15.4 Preconditions

依據 CC.4.1 之 IMD。

IMD according to CC.4.1.

CC.7.5.15.5 定義及計算

CC.7.5.15.5 Definitions and calculations

預定試驗點之定義：

Definition of intended test points:

$TP_1 = V_{EV_max} = V_{EVSE_max_rated}$

$TP_2 = V_{EV_max} = V_{EVSE_min_rated}$

CC.7.5.15.6 動作

CC.7.5.15.6 Actions

應以兩個規定之試驗點 TPs 執行下列所有案例。

All the following cases shall be performed for the 2 defined TPs.

對稱

Symmetric

案例 1：

Case 1:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that VT8 is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 1 If VT8 does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 閉合 $S_T11$ 及 $S_T13$.

4) Close $S_T11$ and $S_T13$.

(5) 繼續直到 t = t6.

5) Continue until t = t6.

案例 2：

Case 2:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that VT8 is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 1 If VT8 does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 閉合 $S_T11$ 及 $S_T13$。

4) Close $S_T11$ and $S_T13$.

(5) 繼續直到 t = t6。

5) Continue until t = t6.

非對稱

Asymmetric

案例 3：

Case 3:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考 3：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 3 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 閉合 $S_T11$。

4) Close $S_T11$.

(5) 繼續直到 t = t6。

5) Continue until t = t6.

案例 4：

Case 4:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 4 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 閉合 $S_T13$。

4) Close $S_T13$.

(5) 繼續直到 t = t6。

5) Continue until t = t6.

案例 5：

Case 5:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 5 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 閉合 $S_T11$

4) Close $S_T11$.

(5) 繼續直到 t = t6。

5) Continue until t = t6.

案例 6：

Case 6:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 6 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 閉合 $S_T13$。

4) Close $S_T13$.

(5) 繼續直到 t = t6。

5) Continue until t = t6.

干擾試驗

Disturbance tests

案例 7 – 長期干擾：

Case 7 – long-term disturbance:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 7 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 透過持續交替方式引入電阻值：

4) Introduce resistance values by continuously alternating:

- 閉合 $S_T13$ 持續 1 s。
- Close $S_T13$ for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close $S_T11$ for 1 s.
- 維持 $S_T11$ 及 $S_T13$ 斷開持續 1 s。
- Maintain $S_T11$ and $S_T13$ open for 1 s.

(5) 繼續直到 t = t6。

5) Continue until t = t6.

案例 8 – 無絕緣故障之短期干擾：

Case 8 – short-term disturbance without insulation fault:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 8 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 透過持續交替方式引入電阻值持續 6 s：

4) Introduce resistance values by continuously alternating for 6 s:

- 閉合 $S_T13$ 持續 1 s。
- Close $S_T13$ for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close $S_T11$ for 1 s.
- 維持 $S_T11$ and $S_T13$ 斷開持續 1 s。
- Maintain $S_T11$ and $S_T13$ open for 1 s.

(5) 斷開 $S_T11$ 及 $S_T13$。

5) Open $S_T11$ and $S_T13$.

(6) 繼續直到 t = t6。

6) Continue until t = t6.

案例 9 – 絕緣故障之短期干擾：

Case 9 – short-term disturbance with insulation fault:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 9 If $V_T8$ does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 透過持續交替方式引入電阻值持續 6 s：

4) Introduce resistance values by continuously alternating for 6 s:

- 閉合 $S_T13$ 持續 1 s。
- Close $S_T13$ for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close $S_T11$ for 1 s.
- 維持 $S_T11$ and $S_T13$ 斷開持續 1 s。
- Maintain $S_T11$ and $S_T13$ open for 1 s.

(5) 斷開 $S_T11$ 及 $S_T13$。

5) Open $S_T11$ and $S_T13$.

(6) 改變 $R_T6$ 為 100(0+2%) kΩ 且在 6 s 後閉合 $S_T13$。

6) Change $R_T6$ to 100(0+2%) kΩ and close $S_T13$ after 6 s.

(7) 繼續直到 t = t6。

7) Continue until t = t6.

案例 10 – 絕緣故障之短期干擾：

Case 10 – short-term disturbance with insulation fault:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T8$ 是否符合 CC.4.1.2 之規定。

3) Verify that $V_T8$ is according to CC.4.1.2.

備考：若 $V_T8$ 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 10 If $V_T$8does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 透過持續交替方式引入電阻值持續 6 s：

4) Introduce resistance values by continuously alternating for 6 s:

- 閉合 $S_T$13 持續 1 s。
- Close $S_T$13 for 1 s.
- 閉合 $S_T$11 持續 1 s。
- Close $S_T$11 for 1 s.
- 維持 $S_T$11 and $S_T$13 斷開持續 1 s。
- Maintain $S_T$11 and $S_T$13 open for 1 s.

(5) 斷開 $S_T$11 及 $S_T$13。

5) Open ST11 and ST13.

(6) 改變 $R_T$5 為 100(0+2%) kΩ 且在 6 s 後閉合 $S_T$11。

6) Change $R_T$5 to 100(0+2%) kΩ and close $S_T$11 after 6 s.

(7) 繼續直到 t = t6。

7) Continue until t = t6.

案例 11 – 絕緣故障之短期干擾：

Case 11 – short-term disturbance with insulation fault:

(1) 執行正常啟動序列直到 t = t4 (依照圖 CC.5)

1) The normal startup sequence shall be executed until t = t4 (according to Figure CC.5).

(2) EV 模擬器傳送纜線檢查請求("CableCheckReq")。

2) The EV simulator shall send a cable-check request ("CableCheckReq").

(3) 查證 $V_T$8 是否符合 CC.4.1.2 之規定。

3) Verify that VT8 is according to CC.4.1.2.

備考：若 $V_T$8 未符合 CC.4.1.2 之規定，此試驗即視為未符合。

NOTE 11 If VT8 does not meet the requirements in CC.4.1.2, this is considered a noncompliance.

(4) 透過持續交替方式引入電阻值持續 6 s：

4) Introduce resistance values by continuously alternating for 6 s:

- 閉合 $S_T$13 持續 1 s。
- Close $S_T$13 for 1 s.
- 閉合 $S_T$11 持續 1 s。
- Close $S_T$11 for 1 s.
- 維持 $S_T$11 and $S_T$13 斷開持續 1 s。
- Maintain $S_T$11 and $S_T$13 open for 1 s.

(5) 斷開 $S_T$11 及 $S_T$13。

5) Open ST11 and ST13.

(6) 改變 $R_T5$ 及 $R_T6$ 為 100(0+2%) kΩ 且在 6 s 後閉合 $S_T11$ 及 $S_T13$。

6) Change $R_T5$ and $R_T6$ to 100(0+2%) kΩ and close $S_T11$ and $S_T13$ after 6 s.

(7) 繼續直到 t = t6。

7) Continue until t = t6.

閉合 $S_T12$ 及 $S_T14$、且增加額外之 $C_T1$ 及 $C_T2$ ，其電容值分別為 2.5 µF, 5 µF, 10 µF, 15 µF 及 25 µF，重複進行案例 2、案例 5 及案例 6 5 次。

Cases 2, 5 and 6 shall be repeated five times with $S_T12$ and $S_T14$ closed and with an additional $C_T1$ and $C_T2$ with capacitance values of 2.5 µF, 5 µF, 10 µF, 15 µF and 25 µF.

備考 12：事實上以比 ISO 17409 及 ISO 5474 規定之較高的電容值進行試驗，並非代表那些值在 EV 設計中是可被接受的。

NOTE 12 The fact that the test incorporates higher capacitance values than specified in ISO 17409 and ISO 5474 does not indicate those values are acceptable in the design of the EV.

CC.7.5.15.7 預期結果

CC.7.5.15.7 Expected results

對所有案例：

For all cases:

B 側之當下電壓應符合 CC.4.1.2 之規定。

The present voltage at side B requirements specified in CC.4.1.2 shall be met.

對案例 1、案例 3、案例 4 及案例 8：

For cases 1, 3, 4, and 8:

EV 供電設備應以傳送最後纜線檢查回應訊息，其中包含 "EVSEIsolationStatus" = ‘Valid’ and "EVSEProcessing" = ‘Finished’，來完成纜線檢查。

The EV supply equipment shall complete the cable-check by sending last cable-check response message with "EVSEIsolationStatus" = ‘Valid’ and "EVSEProcessing" = ‘Finished’.

對案例 2、案例 5、案例 6、案例 7、案例 9、案例 10 及案例 11：

For cases 2, 5, 6, 7, 9, 10 and 11:

- EV 供電設備應傳送"CableCheckRes" <4b> 訊息，包含 "EVSEIsolationStatus" = ‘Fault’。
- The EV supply equipment shall send a "CableCheckRes" <4b> message with "EVSEIsolationStatus" = ‘Fault’.
- 最遲於 t = t6 時，EV 供電設備應觸發錯誤停機及應
- Latest at t = t6, the EV supply equipment shall trigger an error shutdown and thus shall
  - 減少 B 側之當下電流至 < 5 A DC ，並於 1 s 內停用 B 側，
  - reduce its present current at side B to < 5 A DC and disable its side B in 1 s

or less,

- 於 2.5 s 內將 B 側 DC+ 與 DC– 間之當下電壓減少至 < 60 V DC，及
- reduce its present voltage at side B to < 60 V DC between DC+ and DC– in 2,5 s or less, and
- 將控制電路的供電電壓 UCC 維持在允許控制電路正常運作的規定範圍內。
- maintain the control circuit supply voltage UCC between the specified range that allows normal operation of the control circuit.

對 IMD 在過高 Y-電容之試驗：

For testing the IMD under excessive Y-capacitance:

對案例 2、案例 5 及案例 6 額外加入 CT1 及 CT2，其電容值為 2.5 uF、5 uF、10 uF、 15 uF 及 25 uF：

For cases 2, 5 and 6 with an additional CT1 and CT2 with capacitance values of 2,5 uF, 5 uF, 10 uF, 15 uF and 25 uF:

- EV 供電設備應傳送 "CableCheckRes" <4b> 訊息，包含 "EVSEIsolationStatus" = ‘Fault’.
- The EV supply equipment shall send "CableCheckRes" <4b> message with "EVSEIsolationStatus" = ‘Fault’.
- 最遲於 t = t6 時，EV 供電設備應觸發錯誤停機及應
- Latest at t = t6, the EV supply equipment shall trigger an error shutdown and thus shall
  - 減少 B 側之當下電流至 < 5 A DC ，並於 1 s 內停用 B 側，
  - reduce its present current at side B to < 5 A DC and disable its side B in 1 s or less,
  - 於 2.5 s 內將 B 側 DC+ 與 DC– 間之當下電壓減少至 < 60 V DC，及
  - reduce its present voltage at side B to < 60 V DC between DC+ and DC– in 2,5 s or less, and
  - 將控制電路的供電電壓 $V_{S}1$ 維持在允許控制電路正常運作的規定範圍內。
  - maintain the control circuit supply voltage $V_{S}1$ between the specified range that allows normal operation of the control circuit.

CC.7.5.16 電能傳輸期間偵測故障之絕緣電阻檢查

CC.7.5.16 Insulation resistance check to detect fault state during energy transfer

CC.7.5.16.1 參考要求

CC.7.5.16.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 6.3.1.108 控制電路供電完整性；

- 6.3.1.108 Control circuit supply integrity;
- 6.3.1.113.3 錯誤停機；;
- 6.3.1.113.3 Error shutdown;
- CC.4.1.6 在纜線檢查階段後之絕緣監測。
- CC.4.1.6 Insulation monitoring after the cable-check phase.

CC.7.5.16.2 敘述

CC.7.5.16.2 Description

試驗在電能傳輸階段，於低絕緣電阻(R ≤ 100 Ω/V)情況下之反應。

Test the reaction on a low insulation resistance condition (R ≤ 100 Ω/V) during the energy transfer phase.

EV 供電設備應觸發錯誤停機。

The EV supply equipment shall trigger an error shutdown.

CC.7.5.16.3 試驗設置

CC.7.5.16.3 Test setup

標準試驗設置。

Standard test setup.

EV 模擬器在 DC+ 與 PE 間及 DC– 與 PE 間的絕緣電阻，應有充足的阻抗來達到下列規定之試驗電阻。在加入任何試驗電阻前，DC+ 至 PE 及 DC– 至 PE 之每一條導線應有 5 MΩ 阻抗。

The insulation resistance of the EV simulator, between DC+ and PE and between DC– and PE, shall have an impedance sufficient to achieve the test resistances shown below. Each rail, DC+ to PE and DC– to PE, shall have an impedance of 5 MΩ, prior to adding any test resistance.

對稱試驗：

Symmetrical test:

- 案例 1: 兩個試驗電阻器 $R_T5 = R_T6 = 300^{0}_{+2\%}$ kΩ。
- Case 1: Two test resistors $R_T5 = R_T6 = 300^{0}_{+2\%}$ kΩ.
- 案例 2: 兩個試驗電阻器 $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 2: Two test resistors $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ.

非對稱試驗：

Asymmetrical test:

- 案例 3: 兩個試驗電阻器 $R_T5 = 150^{0}_{+2\%}$ kΩ。
- Case 3: Test resistor $R_T5 = 150^{0}_{+2\%}$ kΩ.
- 案例 4: 兩個試驗電阻器 $R_T6 = 150^{0}_{+2\%}$ kΩ。
- Case 4: Test resistor $R_T6 = 150^{0}_{+2\%}$ kΩ.

- 案例 5: 兩個試驗電阻器 $R_T5 = 100^{0}_{+2\%}$ kΩ。
- Case 5: Test resistor $R_T5 = 100^{0}_{+2\%}$ kΩ.
- 案例 6: 兩個試驗電阻器 $R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 6: Test resistor $R_T6 = 100^{0}_{+2\%}$ kΩ.

干擾試驗：

Disturbance test:

- 案例 7: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ。
- Case 7: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ.
- 案例 8: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ。
- Case 8: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ.
- 案例 9: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ 接著是 $R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 9: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ followed by $R_T6 = 100^{0}_{+2\%}$ kΩ.
- 案例 10: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ 接著是 $RT5 = 100^{0}_{+2\%}$ kΩ。
- Case 10: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ followed by $RT5 = 100^{0}_{+2\%}$ kΩ.
- 案例 11: 兩個試驗電阻器 $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ 接著是 $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ。
- Case 11: Test resistors $R_T5 = R_T6 = 150^{0}_{+2\%}$ kΩ followed by $R_T5 = R_T6 = 100^{0}_{+2\%}$ kΩ.

在這些試驗期間，EV 模擬器之 Y-電容值應為 CT7= CT8= 2 μF，及閉合 $S_T24$ 及 $S_T25$，且 EV 供電設備應於其製造廠商規定之最差情況。

During these tests, the Y-capacitance value for the EV simulator shall be CT7= CT8= 2 μF with ST24 and ST25 closed and for the EV supply equipment shall be the worst case as defined by the EV supply equipment manufacturer.

CC.7.5.16.4 預處理

CC.7.5.16.4 Preconditions

IMD 依照 CC.4.1。

IMD according CC.4.1.

CC.7.5.16.5 定義及計算

CC.7.5.16.5 Definitions and calculations

無。

None.

CC.7.5.16.6 動作

CC.7.5.16.6 Actions

對稱試驗：

Symmetric tests

案例 1：

Case 1:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 閉合 $S_T$11 及 $S_T$13.。繼續 FPT 持續 1 min。

2) Close ST11 and ST13. Continue FPT for 1 min.

(3) 在 1 min 期間，FPT 不應停止。

3) FPT shall not stop during that 1 min duration.

案例 2：

Case 2:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 閉合 $S_T$11 及 $S_T$13.。嘗試進行 FPT 持續 1 min。

2) Close ST11 and ST13. Attempt FPT for 1 min.

(3) EV 供電設備應於 10 s 內觸發錯誤停機，並執行錯誤停機。

3) The EV supply equipment shall trigger an error shutdown in 10 s or less and the error shutdown shall be executed.

非對稱試驗：

Asymmetric tests

案例 3：

Case 3:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 閉合 $S_T$11。繼續 FPT 持續 1 min。

2) Close ST11. Continue FPT for 1 min.

(3) 在 1 min 期間，FPT 不應停止。

3) FPT shall not stop during that 1 min duration.

案例 4：

Case 4:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until OP5 and then introduce resistance values as indicated below.

(2) 閉合 $S_T$13.。繼續 FPT 持續 1 min。

2) Close ST13. Continue FPT for 1 min.

(3) 在 1 min 期間，FPT 不應停止。

3) FPT shall not stop during that 1 min duration.

案例 5：

Case 5:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 閉合 $S_T$11.。試著 FPT 持續 1 min。

2) Close ST11. Attempt FPT for 1 min.

(3) EV 供電設備應於 10 s 內觸發錯誤停機，並執行錯誤停機。

3) The EV supply equipment shall trigger an error shutdown in 10 s or less and the error shutdown shall be executed.

案例 6：

Case 6:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 閉合 $S_T$11 及 $S_T$13.。嘗試進行 FPT 持續 1 min。

2) Close ST13. Attempt FPT for 1 min.

(3) EV 供電設備應於 10 s 內觸發錯誤停機，並執行錯誤停機。

3) The EV supply equipment shall trigger an error shutdown in 10 s or less and the error shutdown shall be executed.

干擾試驗

Disturbance tests

案例 7 – 長期干擾：

Case 7 – long-term disturbance:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 持續交替操作

2) Continuously alternate:

- 閉合 $S_T$13 持續 1 s。
- Close ST13 for 1 s.
- 閉合 $S_T$11 持續 1 s。
- Close ST11 for 1 s.
- 維持 $S_T$11 及 $S_T$13 斷開持續 1 s。
- Maintain ST11 and ST13 open for 1 s.

(3)嘗試進行 FPT 持續 1 min。

3) Attempt FPT for 1 min.

(4) EV 供電設備應於 30 s 內觸發錯誤停機，錯誤停機應被執行。

4) The EV supply equipment shall trigger an error shutdown in 30 s or less and the error shutdown shall be executed.

案例 8 - 無絕緣故障之短期干擾：

Case 8 – short-term disturbance without insulation fault:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 繼續交替操作持續 6 s：

2) Continuously alternate for 6 s:

- 閉合 $S_T13$ 持續 1 s。
- Close ST13 for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close ST11 for 1 s.
- 維持 $S_T11$ and $S_T13$ 斷開 持續 1 s。
- Maintain ST11 and ST13 open for 1 s.
- 斷開 $S_T11$ 及 $S_T13$。
- Open ST11 and ST13.

(3) 嘗試進行 FPT 持續 1 min。

3) Continue FPT for 1 min.

(4) 在 1 min 期間，FPT 不應停止。

4) FPT shall not stop during that 1 min duration.

案例 9 - 絕緣故障之短期干擾：

Case 9 – short-term disturbance with insulation fault:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 繼續交替操作持續 6 s：

2) Continuously alternate for 6 s:

- 閉合 $S_T13$ 持續 1 s。
- Close ST13 for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close ST11 for 1 s.
- 維持 $S_T11$ and $S_T13$ 斷開 持續 1 s。
- Maintain ST11 and ST13 open for 1 s.

(3) 斷開 $S_T11$ 及 $S_T13$。

3) Open ST11 and ST13.

(3) 變動 $R_T6$ 為 100 $^{0}_{+2\%}$ kΩ，且在 6 s 後閉合 $S_T13$，並嘗試進行 FPT 持續 1 min。

4) Change $R_T6$ to 100 0+2% kΩ and close $S_T13$ after 6 s and attempt FPT for 1 min.

(5) EV 供電設備應於插入故障電阻 100 kΩ 後 10 s 觸發錯誤停機。錯誤停機應被執行。

5) The EV supply equipment shall trigger an error shutdown 10 s after inserting the fault resistance of 100 kΩ. The error shutdown shall be executed.

案例 10 - 絕緣故障之短期干擾：

Case 10 – short-term disturbance with insulation fault:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 繼續交替操作持續 6 s：

2) Continuously alternate for 6 s:

- 閉合 $S_T13$ 持續 1 s。
- Close ST13 for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close ST11 for 1 s.
- 維持 $S_T11$ and $S_T13$ 斷開 持續 1 s。
- Maintain ST11 and ST13 open for 1 s.

(3) 斷開 $S_T11$ 及 $S_T13$。

3) Open ST11 and ST13.

(4) 變動 $R_T5$ 為 100 $^{0}_{+2\%}$ kΩ，且在 6 s 後閉合 $S_T11$，並嘗試進行 FPT 持續 1 min。

4) Change RT5 to 100 0 +2% kΩ and close ST11 after 6 s and attempt FPT for 1 min.

(5) EV 供電設備應於插入故障電阻 100 kΩ 後 10 s 觸發錯誤停機。錯誤停機應被執行。

5) The EV supply equipment shall trigger an error shutdown 10 s after inserting the fault resistance of 100 kΩ. The error shutdown shall be executed.

案例 11 - 絕緣故障之短期干擾：

Case 11 – short-term disturbance with insulation fault:

(1) 啟動 FPT 直到到達 OP5，接著引入下列所示之電阻值。

1) Start FPT until reaching OP5 and then introduce resistance values as indicated below.

(2) 繼續交替操作持續 6 s：

2) Continuously alternate for 6 s:

- 閉合 $S_T13$ 持續 1 s。

- Close ST13 for 1 s.
- 閉合 $S_T11$ 持續 1 s。
- Close ST11 for 1 s.
- 維持 $S_T11$ and $S_T13$ 斷開 持續 1 s。
- Maintain ST11 and ST13 open for 1 s.

(3) 斷開 $S_T11$ 及 $S_T13$。

3) Open ST11 and ST13.

(3) 動變 $R_T5$ 及 $R_T6$ 為 100 $^{0}_{+2\%}$ kΩ，且在 6 s 後閉合 $S_T11$ 及 $S_T13$，並嘗試進行 FPT 持續 1 min。

4) Change RT5 and RT6 to 100 0 +2% kΩ and close ST11 and ST13 after 6 s and attempt FPT for 1 min.

(5) EV 供電設備應於插入故障電阻 100 kΩ 後 10 s 觸發錯誤停機。錯誤停機應被執行。

5) The EV supply equipment shall trigger an error shutdown after inserting the fault resistance of 100 kΩ. The error shutdown shall be executed.

閉合 $S_T12$ 及 $S_T14$、且增加額外之 $C_T1$ 及 $C_T2$ ，其電容值分別為 2.5 µF, 5 µF, 10 µF, 15 µF 及 25 µF，重複進行案例 2、案例 5 及案例 6 5 次。

Cases 2, 5 and 6 shall be repeated five times with $S_T12$ and $S_T14$ closed and with an additional $C_T1$ and $C_T2$ with capacitance values of 2.5 µF, 5 µF, 10 µF, 15 µF and 25 µF.

備考：事實上以比 ISO 17409 及 ISO 5474 規定之較高的電容值進行試驗，並非代表那些值在 EV 設計中是可被接受的。

CC.7.5.16.7 預期結果

CC.7.5.16.7 Expected results

對案例 1、案例 3、案例 4 及案例 8：

For cases 1, 3, 4, and 8:

EV 供電設備應繼續進行 FPT。

The EV supply equipment shall continue FPT.

對案例 2、案例 5、案例 6、案例 7、案例 9、案例 10 及案例 11：

For cases 2, 5, 6, 7, 9, 10 and 11:

- EV 供電設備應在故障注入後 11 s 內(對案例 7 為 31 s 內)，將 B 側當下電流減少至< 5 A。
- The EV supply equipment shall reduce the present current at side B to < 5 A and disable its side B in 11 s or less (31 s or less for case 7) after injection of the fault.
- EV 供電設備在故障注入後 11.5 s 內(對案例 7 為 31.5 s 內)，應於最後回應訊息 CurrentDemandRes 中傳送參數 "ResponseCode" = 'FAILED' 及

"EVSEIsolationStatus" = ‘Fault’。

- The EV supply equipment shall send parameter "ResponseCode" = 'FAILED' and "EVSEIsolationStatus" = ‘Fault’ in at least one of the CurrentDemandRes response messages in 11,5 s or less (31,5 s or less for case 7) after injection of the fault. See IEC 61851-24:2023.
- EV 供電設備在故障注入後 12.5 s 內(對案例 7 為 32.5 s 內)，應將 B 側 DC+ 與 DC– 間之當下電壓開始並減少至 < 60 V DC。
- The EV supply equipment shall start to reduce the present voltage at side B and shall reduce the present voltage at side B to < 60 V DC between DC+ and DC– in 12,5 s or less (32,5 s or less for case 7) after injection of the fault.
- 控制電路之供電電壓 $V_{S}1$ 應維持在允許其正常操作的規定範圍內。
- The control circuit supply voltage $V_{S}1$ shall remain within the specified range that allows normal operation of the control circuit.

對 IMD 在過高 Y-電容之試驗：

For testing the IMD under excessive Y-capacitance:

對案例 2、案例 5 及案例 6 額外加入 CT1 及 CT2，其電容值為 2.5 uF、5 uF、10 uF、 15 uF 及 25 uF：

For cases 2, 5 and 6 with an additional CT1 and CT2 with capacitance values of 2,5 uF, 5 uF, 10 uF, 15 uF and 25 uF:

- EV 供電設備應在故障注入後 11 s 內，開始減少 B 側之當下電流，並將其降至 < 5 A，且停用其 B 側。
- The EV supply equipment shall start to reduce the present current at side B and shall reduce the present current at side B to < 5 A and disable its side B in 11 s or less after injection of the fault.
- EV 供電設備應在故障注入後 11.5 s 內，於最後的一個回應訊息 CurrentDemandRes 中，傳送參數 "ResponseCode" = 'FAILED' 及 "EVSEIsolationStatus" = ‘Fault’。參照 IEC 61851-24:2023。
- The EV supply equipment shall send parameter "ResponseCode" = 'FAILED' and "EVSEIsolationStatus" = ‘Fault’ in at least one of the CurrentDemandRes response messages in 11,5 s or less after injection of the fault. See IEC 61851-24:2023.
- EV 供電設備應在故障注入後 12.5 s 內，開始減少 B 側 DC+ 與 DC– 間之當下電壓，並將其降至< 60 V。
- The EV supply equipment shall start to reduce the present voltage at side B and shall reduce the present voltage at side B to < 60 V between DC+ and DC– in 12,5 s or less after injection of the fault.
- 控制電路之供電電壓 $V_{S}1$ 應維持在允許其正常操作的規定範圍內。
- The control circuit supply voltage $V_{S}1$ shall remain within the specified range

that allows normal operation of the control circuit.

CC.7.5.17 控制導引導體與保護導體之短路

CC.7.5.17 Short-circuit between the control pilot conductor and the protective conductor

CC.7.5.17.1 參考要求

CC.7.5.17.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- CC.4.3 控制導引導體電氣連續性之喪失
- CC.4.3 Loss of electrical continuity of the control pilot conductor;
- 6.3.1.113.4 緊急停機
- 6.3.1.113.4 Emergency shutdown.

CC.7.5.17.2 敘述

CC.7.5.17.2 Description

檢查 EV 供電設備在控制導引導體與保護保體發生短路之情況下，是否會執行緊急停機。

Check if the EV supply equipment will perform an emergency shutdown in case of a short-circuit between the control pilot conductor and the protective conductor.

CC.7.5.17.3 試驗設置

CC.7.5.17.3 Test setup

標準試驗設置

Standard test setup.

CC.7.5.17.4 預處理

CC.7.5.17.4 Preconditions

無。

None.

CC.7.5.17.5 定義及計算

CC.7.5.17.5 Definitions and calculations

預定試驗點之定義：

Definition of intended test point:

TP = ($I_{EVSE\ intended}$ / $V_{EVSE\ intended}$) 及：

- $I_{EVSE\ intended} = I_{EVSE\ max}$
- $V_{EVSE\ intended} = V_{EVSE\ min}$
- TP 對應至 OP5.

CC.7.5.17.6 動作

CC.7.5.17.6 Actions

(1) 試驗點依 CC.7.4 之流程進行。

1) Approach the test point according to CC.7.4.

(2) 閉合 $S_T6$。

2) Close ST6.

(3) 檢查是否達到預期結果。

3) Check if expected results are achieved.

CC.7.5.17.7 預期結果

CC.7.5.17.7 Expected results

EV 供電設備應執行緊急停機。此代表 EV 供電設備應

The EV supply equipment shall perform an emergency shutdown. That means that the EV supply equipment shall

- 在閉合 $S_T6$ 後 20 ms 內，關閉其 CP 振盪器還指示緊急停機，
- turn off its CP oscillator to indicate an emergency shutdown in 20 ms or less after closing ST6,
- 在閉合 $S_T6$ 後 20 ms 內，減少 B 側之當下電流至 ≤ 5 A DC，並停用其 B 側，
- reduce the present current at side B to ≤ 5 A DC and disable its side B in 30 ms or less after closing ST6,
- 在閉合 $S_T6$ 後 1,010 ms 內，減少 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V DC，
- reduce the present voltage at side B to ≤ 60 V DC between DC+ and DC– in 1 010 ms or less after closing ST6, and
- 在閉合 $S_T6$ 後 1,010 ms 內，減少 B 側 DC+ 與保護導體間、及 DC– 與保護導體間之當下電壓至 ≤ 60 V DC。
- reduce the present voltage at side B to ≤ 60 V DC between DC+ and the protective conductor, and between DC– and the protective conductor in 1 010 ms or less after closing ST6

CC.7.5.18 電能傳輸期間短路保護與控制電路供電完整性

CC.7.5.18 Short-circuit protection during energy transfer and control circuit supply integrity

CC.7.5.18.1 參考要求

CC.7.5.18.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 6.3.1.108 控制電路供電完整性；;
- 6.3.1.108 Control circuit supply integrity;
- 13.101 電能傳輸期間 DC 連接器之短路保護
- 13.101 Short-circuit protection of the DC connection during energy transfer.

CC.7.5.18.2 敘述

CC.7.5.18.2 Description

由外部或內部故障所引起之過電流情況之反應。

Reaction on overcurrent condition caused by external or internal faults.

CC.7.5.18.3 試驗設置

CC.7.5.18.3 Test setup

依表 CC.27 規定值之標準試驗設置。

Standard test setup with the values specified in Table CC.27:

表 CC.27 EV 模擬特性

Table CC.27 – EV simulator characteristics

| | 等效電阻<br>Equivalent resistance<br>$R_T2$ | 等效電感<br>Equivalent inductance<br>$L_T1$ |
|---|---|---|
| 組態 1<br>Configuration 1 | 10 mΩ ± 15 % | 0.5 µH ≤ $L_T1$ ≤ 3 µH |
| 組態 2<br>Configuration 2 | 100 mΩ ± 15 % | 2 µH ≤ $L_T1$ ≤ 5 µH |
| 組態 3<br>Configuration 3 | 250 mΩ ± 15 % | 2 µH ≤ $L_T1$ ≤ 7 µH |

$R_T2$ 為 EV 模擬器短路回路之等效電阻。$R_T2$ 之量測應以頻率 $f_{meas}$ = 1 kHz，於 EV 模擬器車輛端插頭之 DC+ 與 DC– 接點間進行(EV 模擬器未對接)。

$R_T2$ is the equivalent resistance of the short-circuit loop of the EV simulator. $R_T2$ shall be measured between DC+ and DC– of the EV simulator vehicle inlet at a frequency of $f_{meas}$ = 1 kHz (EV simulator un-mated).

$L_T1$ 為 EV 模擬器短路回路之等效電感。$L_T1$ 之量測應以頻率 $f_{meas}$ = 1 kHz，於 EV 模擬器車輛端插頭之 DC+ 與 DC– 接點間進行(EV 模擬器未對接)。

$L_T1$ is the equivalent inductance of the short-circuit loop of the EV simulator. $L_T1$ shall be measured between the DC+ and DC– contact of the EV simulator vehicle inlet at a frequency of fmeas = 1 kHz (EV simulator un-mated).

在試驗期間，$S_T7$ 應維持斷開。

During this test, $S_T7$ shall remain open.

電流及電壓量測之頻寬應≥ 500 kHz。

The bandwidth of the current and voltage measurement shall be ≥ 500 kHz.

應選擇合適的開關裝置，避免開關裝置 $S_T8$ 之接點彈跳。

Contact bouncing of the switching device $S_T8$ shall be avoided by selecting an appropriate switching device.

備考：$R_T2$ 與 $L_T1$ 代表不同的短路情況(由不同 HV 導線長度、不同短路電阻等所致)。

NOTE $R_T2$ and $L_T1$ represent different short-circuit conditions (caused by different

HV wiring lengths, different short-circuit resistances, etc.).

CC.7.5.18.4 預處理

CC.7.5.18.4 Preconditions

無。

None.

CC.7.5.18.5 定義及計算

CC.7.5.18.5 Definitions and calculations

預定試驗點之定義：

Definition of intended test points:

TP1 = ($I_{EVSE\ intended\ 1}$ / $V_{EVSE\ intended\ 1}$) 及：

- $I_{EVSE\ intended\ 1} = I_{EVSE\ max}$
- $V_{EVSE\ intended\ 1} = P_{EVSE\ max} / I_{EVSE\ max}$
- TP1 對應至 OP4.

TP2 = ($I_{EVSE\ intended\ 2}$ / $V_{EVSE\ intended\ 2}$) 及：

- $I_{EVSE\ intended\ 2} = P_{EVSE\ max} / V_{EVSE\ max}$
- $V_{EVSE\ intended\ 2} = V_{EVSE\ max}$
- TP2 對應至 OP3.

請求目標值接近試驗點：

Target values requested to approach test point:

- $I_{EV\ target\ m} = I_{EVSE\ intended\ m}$
- $V_{EV\ target} = V_{EVSE\ max}$ (CCM 模式允許)
- $V_{EV\ target} = V_{EVSE\ max}$ (to allow for CCM)

計算：

Calculations:

測定

Determine

$$\sum_n t_n^2 \Delta t_{\text{sample}}$$

從關關 $S_T8$ 閉合之時間點起至 EV 供電設備停機之時間點。

From the point in time when switch $S_T8$ is closed until the point in time when the EV supply equipment has shut down.

CC.7.5.18.6 動作

CC.7.5.18.6 Actions

對所有試驗點依下列執行主要的動作。

The main actions to be performed for all test points are as follows.

(1) 對每一個試驗點 TP，使用試驗設置規定之 EV 模擬器的組態 1、2、3 各進行 3 次單項的試驗。

1) For each test point TP, conduct three single tests using the configurations 1, 2 and 3 of the EV simulator as specified in the test setup.

(2) 試驗點依 CC.7.4 規定之流程進行。

2) Approach the test point according to CC.7.4.

(3) 閉合 $S_T8$。

3) Close $S_T8$.

(3) 從 $S_T8$ 閉合之時間點開始直到 EV 供電設備執行緊急停機之時間點，量測並記錄 $A_T1$ 及 $V_T8$。

4) Measure and log $A_T1$ and $V_T8$ from the point in time when $S_T8$ is closed until the point in time when the EV supply equipment performed the emergency shutdown.

(5) 斷開 $S_T8$。

5) Open ST8.

(5) 檢查是否達到預期結果。

6) Check if the expected results are achieved.

CC.7.5.18.7 預期結果

CC.7.5.18.7 Expected results

EV 供電設備應符合下列要求。

The EV supply equipment shall comply with the following.

- 短路峰值電流 ≤ 10 kA.
- Short-circuit peak current ≤ 10 kA.

$$\sum_n i_n^2 \Delta t_{\text{sample}} \leq 10{,}000{,}000\ A^2 s$$

-

- EV 供電設備應執行緊急停機。此代表 EV 供電設備應
- The EV supply equipment shall perform an emergency shutdown. That means that the EV supply equipment shall
  - 在閉合 $S_T8$ 後 1,010 ms 內，關閉其 CP 振盪器來指示緊急停機，
  - turn off its CP oscillator to indicate an emergency shutdown in 1 010 ms or less after closing ST8,
  - 在閉合 $S_T8$ 後 1,020 ms 內，減少 B 側之當下電流至 ≤ 5 A DC，並停用其 B 側，
  - reduce the present current at side B to ≤ 5 A DC and disable its side B in 1 020 ms or less after closing ST8,
  - 在閉合 $S_T8$ 後 2,000 ms 內，減少 B 側 DC+ 與 DC– 間之當下電壓至 ≤ 60 V DC，及
  - reduce the present voltage at side B to ≤ 60 V DC between DC+ and DC– in 2 000 ms or less after closing ST8, and
  - 在閉合 $S_T8$ 後 2,000 ms 內，減少 B 側 DC+ 與保護導體間、及 DC– 與

保護導體間之當下電壓至 ≤ 60 V DC。

- reduce the present voltage at side B to ≤ 60 V DC between DC+ and the protective conductor, and between DC– and the protective conductor in 2 000 ms or less after closing ST8.

– 控制電路之供電電壓 $V_S1$ 應維持在允許其正常操作的規定範圍內。

– The control circuit supply voltage $V_S1$ shall remain within the specified range that allows normal operation of the control circuit.

CC.7.5.19 熔接偵測期間量測電壓值之試驗

CC.7.5.19 Test of measured voltage values during welding detection

CC.7.5.19.1 一般

CC.7.5.19.1 General

符合試驗之試驗點矩陣如圖 CC.34 所示。

The test point matrix for the compliance test is shown in Figure CC.34.

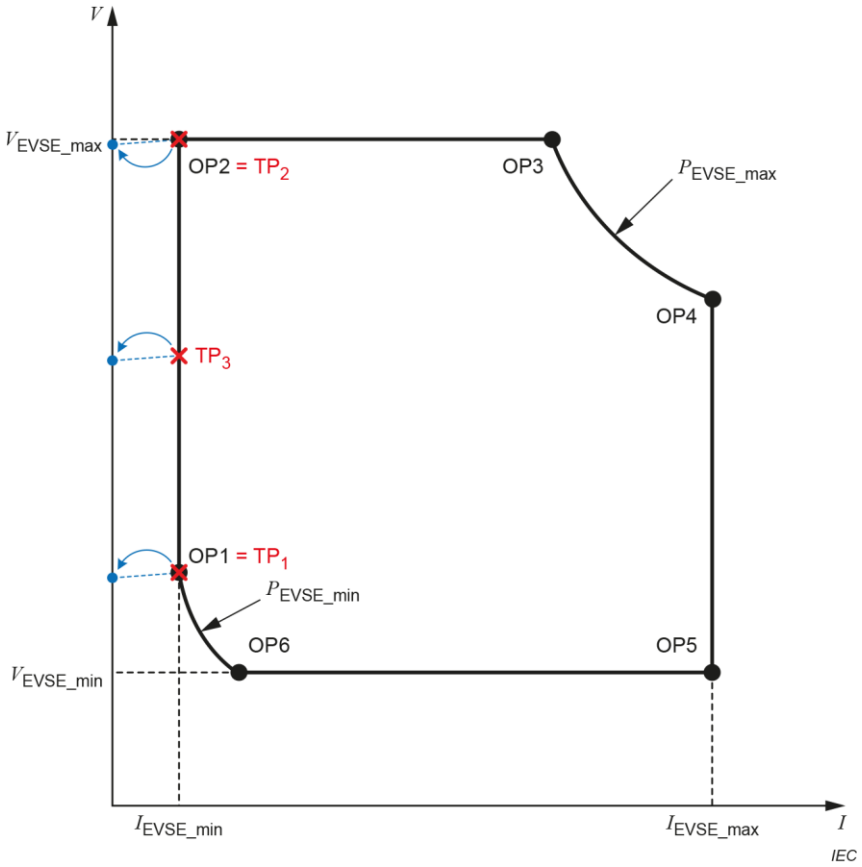



圖 CC.34 在熔接偵測時電壓量測之試驗點

Figure CC.34 – Test points for voltage measurement during welding detection

CC.7.5.19.2 參考要求

CC.7.5.19.2 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 表 CC.9 正常停機(t106 ► t107)之序列敘述；
- Table CC.9 – Sequence description for normal shutdown (t106 ► t107);
- CC.6.3 量測電流及電壓。
- CC.6.3 Measuring current and voltage.

CC.7.5.19.3 敘述

CC.7.5.19.3 Description

檢查 EV 供電設備之電壓量測值與經由數位通訊之傳送是否正確。

Check if the voltage values measured by the EV supply equipment and transferred via digital communication are correct.

CC.7.5.19.4 試驗設置

CC.7.5.19.4 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.19.5 預處理

CC.7.5.19.5 Preconditions

無。

None.

CC.7.5.19.6 定義及計算

CC.7.5.19.6 Definitions and calculations

試驗點 $TP_n$ 之定義：

Definition of test points $TP_n$:

- $TP_1 = (I_{EVSE_intended_1} / V_{EVSE_intended_1})$ 及：
  - $I_{EVSE_intended_1} = I_{EVSE\ min}$;
  - $V_{EVSE_intended_1} = \max(P_{EVSE\ min} / I_{EVSE_min}; V_{EVSE_min})$;
  - TP1 對應至 OP1。
  - TP1 is equal to OP1.
- $TP2 = (I_{EVSE_intended_2} / V_{EVSE_intended_2})$ 及：
  - $I_{EVSE_intended_2} = I_{EVSE\ min}$;
  - $V_{EVSE_intended_2} = V_{EVSE_max}$;
  - TP2 對應至 OP2。
- $TP3 = (I_{EVSE_intended_3} / V_{EVSE_intended_3})$ 及：
  - $I_{EVSE_intended_3} = I_{EVSE_min}$;
  - $V_{EVSE_intended_3} = V_{EVSE_min} + (V_{EVSE_max} - V_{EVSE_min}) / 2$.

計算：

Calculations:

- $V_{dev_abs\ measure}$ = ｜$V_{EVSE_measure}$ − $V_{EVSE_SideB_DC}$｜及：
  $V_{EVSE_measure}$ = "EVSEPresentVoltage" of the message "WeldingDetectionRes" <9b>

CC.7.5.19.7 動作

CC.7.5.19.7 Actions

每一個試驗點應依 CC.7.4 之流程進行。對每一個試驗點，進行以下步驟。

Each of the test points shall be approached according to CC.7.4. For each of the test points, do the following steps.

(1) 於 "CurrentDemandReq" <7a> 訊息中，以下列參數請求目標值：

1) Request target values with the following parameters in the message "CurrentDemandReq" <7a>:
   - EVTargetCurrent = $I_{EV_target}$ = 0 A.

(2) 當 $A_T1$ is < 5 A，傳送 "PowerDeliveryReq" <8a> 訊息(參照圖 CC.6 之 t102)，以請求 EV 供電設備停用其 B 側。

2) Once $A_T1$ is < 5 A, send message "PowerDeliveryReq" <8a> (see t102 in Figure CC.6) in order to request the EV supply equipment to disable its side B.

(3) 等待直到 EV 供電設備停用其 B 側及 "PowerDeliveryRes" <8b> 訊息包含參數如下：

3) Wait until the EV supply equipment has disabled its side B and message "PowerDeliveryRes" <8b> with parameters:
   - EVSEStatusCode = EVSE_Shutdown，或
   - EVSEStatusCode = EVSE_Shutdown, or
   - 接收到 EVSEStatusCode = EVSE_UtilityInterruptEvent (參照圖 CC.6 之 t104).
   - EVSEStatusCode = EVSE_UtilityInterruptEvent has been received (see t104 in Figure CC.6).

(4) 改變 CP 狀態從 C 或 D 至 B (參照圖 CC.6 之 t105)。

4) Change the CP state from C or D to B (see t105 in Figure CC.6).

(5) 傳送 WeldingDetectionReq <9a> 訊息，以讀取於 WeldingDetectionRes <9b> 訊息中由 EV 供電設備所量測之 B 側當下電壓。

5) Send message WeldingDetectionReq <9a> in order to read the present voltage at side B measured by the EV supply equipment in the WeldingDetectionRes <9b> message.

(6) 於 "WeldingDetectionRes" <9b> 訊息，接收參數 EVSEPresentVoltage。

6) Receive parameter EVSEPresentVoltage in "WeldingDetectionRes" <9b> message.

(7) 測定 $V_{dev_abs_measure}$。

7) Determine $V_{dev_abs_measure}$.

(8) 檢查是否達到預期結果。

8) Check if expected results are achieved.

CC.7.5.19.8 預期結果

CC.7.5.19.8 Expected results

$V_{dev_abs\ measure} \leq 10$ V。

CC.7.5.20 由 EV 供電設備之正常停機

CC.7.5.20 Normal shutdown by EV supply equipment

CC.7.5.20.1 參考要求

CC.7.5.20.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- CC.3.3 在電能傳輸後之正常停機或暫停。
- CC.3.3 Normal shutdown or pause after energy transfer.

CC.7.5.20.2 敘述

CC.7.5.20.2 Description

檢查 EV 供電設備是否能執行由使用者互動所觸發(例如：按下停止鈕)之正常停機(依表 CC.9)。

Check if EV supply equipment performs a normal shutdown (according to Table CC.9) triggered by user interaction, for example, by pressing a stop button.

CC.7.5.20.3 試驗設置

CC.7.5.20.3 Test setup

標準試驗設置。

Standard test setup.

CC.7.5.20.4 預處理

CC.7.5.20.4 Preconditions

無。

None.

CC.7.5.20.5 定義及計算

CC.7.5.20.5 Definitions and calculations

試驗點 TP 之定義：

Definition of test point TP:

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 及：

- $I_{EVSE_intended} = I_{EVSE\ max}$;
- $V_{EVSE_intended} = V_{EVSE\ min}$;
- TP 對應至 OP5。
- TP is equal to OP5.

CC.7.5.20.6 動作

CC.7.5.20.6 Actions

每一個試驗點應依 CC.7.4 之流程進行。接著進行以下步驟。

The test point TP shall be approached according to CC.7.4. Then do the following steps.

(1) EV 供電設備停止通訊對話，例如：按下停止鈕。

1) Stop the communication session at the EV supply equipment, for example, by pressing the stop button.

檢查是否達到預期結果(1)及(2)。

Check if expected results 1) and 2) are achieved.

(2) 當 $A_T1$ is < 5 A 傳送"PowerDeliveryReq" <8a>訊息，以請求 EV 供電設備停用其 B 側(參照 t102)。

2) Once $A_T1$ is < 5 A, send message "PowerDeliveryReq" <8a> in order to request the EV supply equipment to disable its side B (see t102).

(3) 斷開試驗負載 $S_T17$ 及 $S_T18$ (參照圖 132)。

3) Open $S_T17$ and $S_T18$ of the test load (see Figure 132).

檢查是否達到預期結果(3)及(4)。

Check if expected results 3) and 4) are achieved.

(4) 改變 CP 狀態從 C 或 D 至 B(參照 t105)。

4) Change the CP state from C or D to B (see t105).

(5) 傳送 "SessionStopReq" <10a> 訊息以終止通訊對話。

5) Send message "SessionStopReq" <10a> in order to terminate the communication session.

若使用 ISO 15118-2:2014，使用參數如下：

If using ISO 15118-2:2014, use following parameter:

- ChargingSession = Terminate

來終止數位通訊(參照 t107)

to terminate digital communication (see t107).

檢查是否達到預期結果(5)及(6)。

Check if expected results 5) and 6) are achieved.

CC.7.5.20.7 預期結果

CC.7.5.20.7 Expected results

(1) EV 供電設備應：

1) The EV supply equipment shall:

- 緩降 $A_T1$ 至 < 5 A，及
- ramp down $A_T1$ to < 5 A, and
- 於下一個 "CurrentDemandRes" <7b> 訊息，依 B 側當下電流調整參數 "EVSEMaximumCurrentLimit" (參照 t100 ► t101)。
- adjust parameter "EVSEMaximumCurrentLimit" in the next "CurrentDemandRes" <7b> messages according to the present current at side B (see t100 ► t101).

(2) 當 $A_T1$ < 5 A，EV 供電設備應設定參數如下

2) Once $A_T1$ is < 5 A, the EV supply equipment shall set parameter

- 於下一個 "CurrentDemandRes" <7b> 訊息，設定參數 EVSEStatusCode = EVSE_Shutdown (參照 t101)
- EVSEStatusCode = EVSE_Shutdown in the next "CurrentDemandRes" <7b> message (see t101).

(3) EV 供電設備應停用 B 側及開啟 EV 供電設備之斷開裝置(若有時)。EV 供電設備應

3) The EV supply equipment shall disable its side B and open the EV supply equipment disconnection device, if any. The EV supply equipment shall

- 在斷開 $S_T17$ 及 $S_T18$ 後 2 s 內，減少 $V_T8$ 至 ≤ 60 V，
- reduce $V_T8$ to ≤ 60 V in 2 s or less after $S_T17$ and $S_T18$ have been opened,
- 在斷開 $S_T17$ 及 $S_T18$ 後 2 s 內，，減少 $V_T6$ 及 $V_T7$ 至 ≤ 60 V ，及
- reduce $V_T6$ and $V_T7$ to ≤ 60 V in 2 s or less after $S_T17$ and $S_T18$ have been opened, and
- 停用 the EVSE IMD (參照 t103)。
- disable the EVSE IMD (see t103).

(4) 當達到預期結果(3)，EV 供電設備應以 "PowerDeliveryRes" <8b> 訊息包含下列參數，來傳送 B 側當下電流≤ 5 A 及已經停用其 B 側(參照 t104)：

4) Once expected results 3) have been achieved, the EV supply equipment shall communicate that the present current at side B is ≤ 5 A and has disabled its side B by sending message "PowerDeliveryRes" <8b> with following parameters (see t104):

- EVSEStatusCode = EVSE_Shutdown.

(5) EV 供電設備在收到 "SessionStopReq" <10a> 訊息及由其完成確認後 1 s 內，應減少及維持 B 側當下電壓至 ≤ 60 V (參照 t107 ► t108)。

5) The EV supply equipment shall reduce and maintain the present voltage at side B ≤ 60 V in 1 s or less after message "SessionStopReq" <10a> has been received and acknowledged by the EV supply equipment (see t107 ► t108).

(6) 當達到預期結果(5)，EV 供電設備應傳送 "SessionStopRes" <10b> 訊息(參照 t108)。

6) Once expected results 5) have been achieved, the EV supply equipment shall send message "SessionStopRes" <10b> (see t108).

- 若使用 ISO 15118-2:2014，EV 供電設備應關閉其 CP 振盪器。
- If using ISO 15118-2:2014 the EV supply equipment shall turn off its CP oscillator.
- 若使用 DIN SPEC 70121:2014，EV 供電設備應於傳送 "SessionStopRes" <10b> 訊息後 1.5 s 關閉其 CP 振盪器。
- If using DIN SPEC 70121:2014 the EV supply equipment shall turn off its CP

oscillator 1,5 s after sending message "SessionStopRes" <10b>.

CC.7.5.21 由 EV 之正常停機

CC.7.5.21 Normal shutdown by EV

CC.7.5.21.1 參考要求

CC.7.5.21.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- CC.3.3 電能傳輸後之正常停機或暫停
- CC.3.3 Normal shutdown or pause after energy transfer.

CC.7.5.21.2 敘述

CC.7.5.21.2 Description

檢查 EV 供電設備是否能執行由 EV 所觸發之正常停機(依照表 CC.7)。

Check if the EV supply equipment performs a normal shutdown (according Table CC.7) triggered by the EV.

CC.7.5.21.3 試驗設置

CC.7.5.21.3 Test setup

標準試驗設置

Standard test setup.

CC.7.5.21.4 預處理

CC.7.5.21.4 Preconditions

無。

None.

CC.7.5.21.5 定義及計算

CC.7.5.21.5 Definitions and calculations

TP = ($I_{EVSE_intended}$ / $V_{EVSE_intended}$) 及：

- $I_{EVSE_intended} = I_{EVSE\ max}$;
- $V_{EVSE_intended} = V_{EVSE\ min}$;
- TP 對應至 OP5.

CC.7.5.21.6 動作

CC.7.5.21.6 Actions

每一個試驗點應依 CC.7.4 之流程進行。接著進行下列步驟。

The test point TP shall be approached according to CC.7.4. Then do the following steps.

(1) 於 "CurrentDemandReq" <7a> 訊息傳送下列參數來請求終止電能傳輸，以模擬由 EV 觸發之停止通訊對話：

1) Request the termination of energy transfer with the following parameter in the message "CurrentDemandReq" <7a> in order to simulate a communication session stop triggered by the EV:

– EVTargetCurrent = 0 A.

檢查是否達到預期結果(1)。

Check if expected results 1) are achieved.

(2) 當 $A_T1$ < 5 A，傳送 "PowerDeliveryReq" <8a>訊息，以請求 EV 供電設備停用其 B 側(參照 t102)。

2) Once $A_T1$ is < 5 A, send message "PowerDeliveryReq" <8a> in order to request the EV supply equipment to disable its side B (see t102).

(3) 斷開 $S_T17$ 及 $S_T18$ (參照圖 132).

3) Open $S_T17$ and $S_T18$ (see Figure 132).

檢查是否達到預期結果(2)及(3)。

Check if expected results 2) and 3) are achieved.

(4) 改變 CP 狀態從 C 或 D 至 B (參照 t105).

4) Change the CP state from C or D to B (see t105).

(5) 傳送 "SessionStopReq" <10a> 訊息來終止通訊對話。

5) Send message "SessionStopReq" <10a> in order to terminate the communication session.

若使用 ISO 15118-2:2014，使用下列參數：

If using ISO 15118-2:2014, use following parameter:

– ChargingSession = Terminate

來終止數位通訊(參照 t107)。

to terminate digital communication (see t107).

檢查是否達到預期結果(4) 及 (5)。

Check if expected results 4) and 5) are achieved.

CC.7.5.21.7 預期結果

CC.7.5.21.7 Expected results

(1) EV 供電設備應

1) The EV supply equipment shall

– 緩降 $A_T1$ 至 < 5 A.

– ramp down AT1 to < 5 A.

2) EV 供電設備應停用其 B 側及開啟 EV 供電設備之斷開裝置(若有時)。EV 供電設備應：

2) The EV supply equipment shall disable its side B and open the EV supply equipment disconnection device, if any. The EV supply equipment shall:

– 在斷開 $S_T17$ 及 $S_T18$ 後 2 s 內，減少 $V_T8$ 至 ≤ 60 V，

– reduce $V_T8$ ≤ 60 V in 2 s or less after $S_T17$ and $S_T18$ have been opened,

– 在斷開 $S_T17$ 及 $S_T18$ 後 2 s 內，減少 $V_T6$ 及 $V_T7$ 至 ≤ 60 V，及

– reduce $V_T6$ and $V_T7$ to ≤ 60 V in 2 s or less after $S_T17$ and $S_T18$ have been opened, and

- 停用 EVSE IMD (參照 t103).
- disable the EVSE IMD (see t103).

3) 當達到預期結果(2)，EV 供電設備應傳送 "PowerDeliveryRes" <8b> 訊息包含下列參數，來傳遞 B 側當下電流 ≤ 5 A 及已經停用其 B 側(參照 t104)：

3) Once expected results 2) have been achieved, the EV supply equipment shall communicate that the present current at side B is ≤ 5 A and has disabled its side B by sending message "PowerDeliveryRes" <8b> with following parameters (see t104):

- EVSEStatusCode = EVSE_Shutdown.

(4) 在收到 "SessionStopReq" <10a> 訊息並由 EV 供電設備確認後 1 s 內，EV 供電設備應減少及維持 B 側當下電流 B ≤ 60 V (參照 t107 ► t108)。

4) The EV supply equipment shall reduce and maintain the present voltage at side B ≤ 60 V in 1 s or less after message "SessionStopReq" <10a> has been received and acknowledged by the EV supply equipment (see t107 ► t108).

5) 當達到預期結果(4)，EV 供電設備應傳送 "SessionStopRes" <10b> 訊息 (參照 t108)。

5) Once expected results 4) have been achieved, the EV supply equipment shall send message "SessionStopRes" <10b> (see t108).

- 若使用 ISO 15118-2:2014，EV 供電設備應關閉其 CP 振盪器。
- If using ISO 15118-2:2014, the EV supply equipment shall turn off its CP oscillator.
- 若使用 DIN SPEC 70121:2014，EV 供電設備應在傳送 "SessionStopRes" <10b> 訊息後 1.5s 關閉其 CP 振盪器。
- If using DIN SPEC 70121:2014, the EV supply equipment shall turn off its CP oscillator 1,5 s after sending message "SessionStopRes" <10b>.

CC.7.5.22 在電能傳輸前之短路

CC.7.5.22 Short-circuit check before energy transfer

CC.7.5.22.1 參考要求

CC.7.5.22.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- 6.3.1.109 在電能傳輸前之短路：
- 6.3.1.109 Short-circuit check before energy transfer;
- 6.3.1.113.3 錯誤停機。
- 6.3.1.113.3 Error shutdown.

CC.7.5.22.2 敘述

CC.7.5.22.2 Description

在電能傳輸前對 DC+ 與 DC– 短路之反應。

Reaction on short-circuit between DC+ and DC– before energy transfer.

CC.7.5.22.3 試驗設置

CC.7.5.22.3 Test setup

標準試驗設置包含 $R_T2$ = 100 Ω ± 10 % (短路回路之等效電阻) 及 $L_T1$ = 0 mH.

Standard test setup with $R_T2$ = 100 Ω ± 10 % (equivalent resistance of the short-circuit loop) and $L_T1$ = 0 mH.

CC.7.5.22.4 預處理

CC.7.5.22.4 Preconditions

EV 供電設備成功傳送其下列屬性至 EV 模擬器：

The EV supply equipment has successfully communicated its following properties to the EV simulator:

- $V_{EVSE_min}$;
- $V_{EVSE_max}$;
- $I_{EVSE_min}$;
- $I_{EVSE_max}$;
- $P_{EVSE_max}$.

依圖 CC.5 FPT 序列應成功執行直到 t = t4 。

The FPT sequence shall be successfully done until t = t4 according to Figure CC.5.

CC.7.5.22.5 定義及計算

CC.7.5.22.5 Definitions and calculations

無。

None.

CC.7.5.22.6 動作

CC.7.5.22.6 Actions

試驗案例應如下所示之單一步驟執行：

The test case shall be executed in single steps as indicated below:

(1) 閉合 $S_T8$。

1) Close $S_T8$.

(2) EV 模擬器應執行絕緣電阻檢查(亦即, 傳送 "CableCheckReq")。

2) The EV simulator shall perform the insulation resistance check (that is, send "CableCheckReq").

CC.7.5.22.7 預期結果

CC.7.5.22.7 Expected results

EV 供電設備應執行錯誤停機。

The EV supply equipment shall perform an error shutdown.

- EVSE 應減少其 B 側當下電流至< 5 A，並於 1 s 內停用其 B 側。

- The EVSE shall reduce its present current at side B to < 5 A and disable its side B in 1 s or less.
- EVSE 應於 2.5，
- The EVSE shall, in 2,5 s or less,
  - 減少 B 側 DC+ 與 DC– 間之當下電壓至 < 60 V，及
  - reduce the present voltage at side B to < 60 V between DC+ and DC–, and
  - 減少 B 側 DC+ 與保護導體間及 DC– 與保護導體間之當下電壓至 < 60 V。
  - reduce the present voltage at side B to < 60 V between DC+ and the protective conductor, and between DC– and the protective conductor.
- EV 供電設備應關閉 CP 振盪器。
- The EV supply equipment shall turn off the CP oscillator.

CC.7.5.23 絕緣監測裝置之功能檢查

CC.7.5.23 Functional check of the insulation monitoring device

CC.7.5.23.1 參考要求

CC.7.5.23.1 Reference requirements

此試驗案例考量下列試驗要求：

This test case considers the following requirements:

- CC.4.1.3 絕緣監測裝置之功能檢查。
- CC.4.1.3 Functional check of the insulation monitoring device.

CC.7.5.23.2 敘述

CC.7.5.23.2 Description

IMD 功能檢查之試驗。

Test of the functional check of the IMD.

應執行下列試驗，以模擬量測連接中斷至 B 側帶電部件（DC+/DC－）及保護導體的情況。

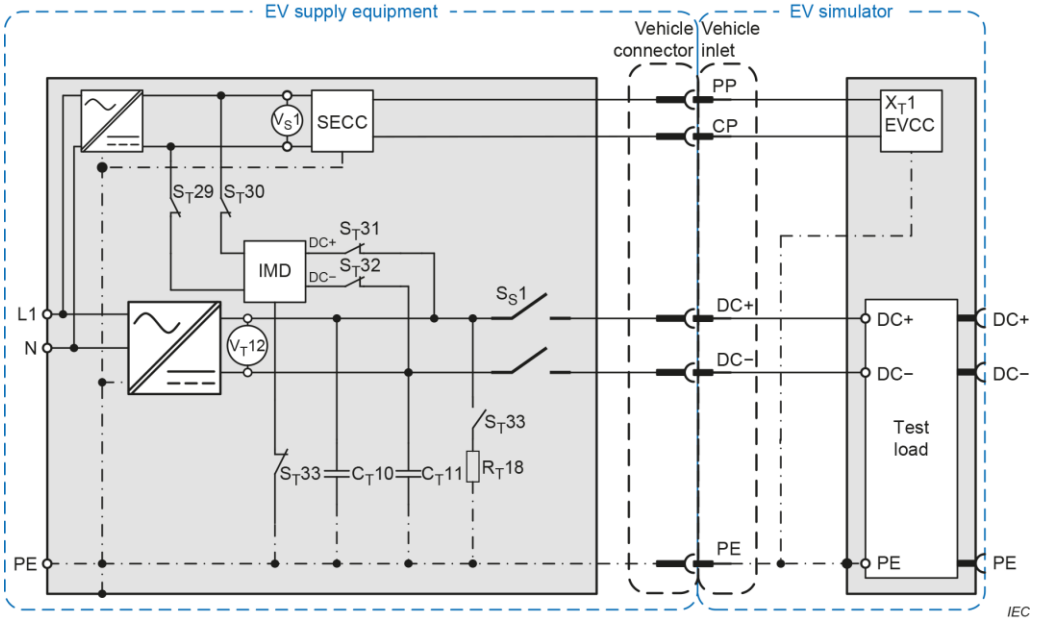
The following tests shall be performed to signal an interruption of the measurement connections to the side B live parts (DC+/DC–) and the protective conductor.

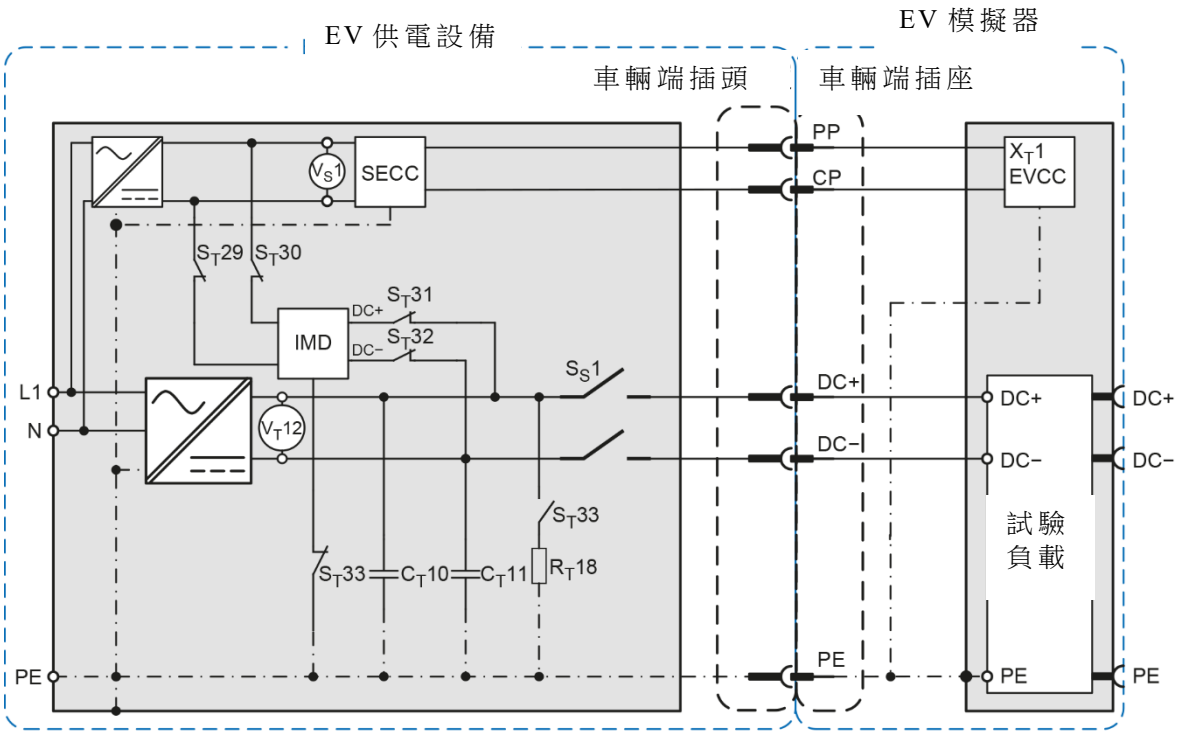
CC.7.5.23.3 試驗設置

CC.7.5.23.3 Test setup

標準試驗設置，如圖 CC.35 (簡易圖)所示，包含額外設施來中斷 IMD 量測連結至 B 側帶電部件（DC+/DC－）及保護導體。

The standard test setup, shown in Figure CC.35 (simplified diagram), includes additional means to interrupt the IMD measurement connections to the side B live parts (DC+/DC–) and the protective conductor.




說明

Key

| | | | |
|---|---|---|---|
| L1, N | AC 或 DC 電網<br>AC or DC supply network | $S_T$ | 試驗設置之開關或繼電器<br>switch or relay in the test setup |
| PE | 保護導體接點<br>protective conductor contact | $C_T$ | 試驗設置之電容器<br>capacitor in the test setup |
| PP | 接近導引線接點<br>proximity pilot conductor contact | $V_T$ | 試驗設置之電壓計<br>voltmeter in the test setup |
| CP | 系統 C 之控制導引導體接點<br>control pilot conductor | $R_T$ | 試驗設置之電阻器<br>resistor in the test setup |

| | | | |
|---|---|---|---|
| | contact of system C | | |
| DC+ | B 側正端子<br>positive terminal of the side B | $V_S$ | EV 供電設備之電壓計<br>voltmeter in the EV supply equipment |
| DC- | B 側負端子<br>negative terminal of the side B | $X_T$ | 接近導引電路之電壓源<br>Voltage source for the proximity pilot circuit |
| SECC | 供電設備通訊控制器<br>supply equipment communication controller | EVCC | EV 通訊控制器<br>electric vehicle communication controller |
| 試驗負載<br>test load | test load according to 102.2.4 unless otherwise specified (see Figure 132) | | |

圖 CC.35 IMD 量測連接之試驗設定

Figure CC.35 – Test setup for IMD measurement connections

應使用下列參數進行試驗。

For the test, the following parameters shall apply.

- $C_T10 = C_T11$ = 裝設於 EV 供電設備 DC+/DC–與保護導體間之電容。
- $C_T10 = C_T11$ = capacitance installed in the EV supply equipment between DC+/DC– and the protective conductor.
- $R_T18$ = 90 kΩ = DC+ 與保護導體間之故障電阻。
- $R_T18$ = 90 kΩ = fault resistance between DC+ and the protective conductor.
- $V_T12$ = 在纜線檢查期間於下列條件施加之最低電壓：
- $V_T12$ = the lowest voltage that can be applied during cable-check at the following condition:

  $V_{EV_max} = V_{EVSE_min}$ + 100 V.

開關 $S_T31$、$S_T32$、$S_T33$ 及 $S_T34$

本試驗中新增開關 $S_T31$、$S_T32$、$S_T33$ 及 $S_T34$。任何冗餘的量測連接應依照圖 CC.35，通過對應於該量測位置的單一開關。

The switches $S_T31$, $S_T32$, $S_T33$ and $S_T34$ are added for this test. Any redundant measurement connections shall be passed through the single switch associated with that measurement location according to Figure CC.35.

EV 供電設備製造廠商應識別試驗之冗餘量測連結。

The EV supply equipment manufacturer should identify redundant measurement connections for this test.

IMD 供應電源應有開關 $S_T29$ 及 $S_T30$ 來模擬 IMD 喪失電源供應。

Power supply for the IMD has switches $S_T29$ and $S_T30$ to simulate loss of supply to the IMD.

在某些設計開關 $S_T29$ 可能與 $S_T33$ 相同。

Switch $S_T29$ may be the same as $S_T33$ in some designs.

依不同的試驗案例進行表 CC.28 所有組合之試驗。

All the combinations in Table CC.28 shall be tested as different test cases.

表 CC.28 IMD 功能檢查試驗案例

Table CC.28 – Test cases for the functional check of the IMD

| 試驗<br>Test | 試驗案例<br>Test case | $S_T34$ | $S_T31$ | $S_T32$ | $S_T33$ | $S_T30$ | $S_T29$ |
|---|---|---|---|---|---|---|---|
| 正常操作<br>Normal operation | 1 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| IMD 連結至保護導體<br>IMD connection to the protective conductor | 2a | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 |
| | 2b | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 |
| IMD 量測連結<br>IMD measurement connections | 3a | Open<br>斷開 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| | 3b | Closed<br>閉合 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| | 3c | Open<br>斷開 | Closed<br>閉合 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| | 3d | Closed<br>閉合 | Closed<br>閉合 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| | 3e | Open<br>斷開 | Open<br>斷開 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| | 3f | Closed<br>閉合 | Open<br>斷開 | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 |
| IMD 供電連結<br>IMD power supply connections | 4a | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Open<br>斷開 | Closed<br>閉合 |
| | 4b | | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Open<br>斷開 |
| | 4c | Open<br>斷開 | Closed<br>閉合 | Closed<br>閉合 | Closed<br>閉合 | Open<br>斷開 | Open<br>斷開 |

NOTE The test with RT18 is necessary because the IMD still detects a mains voltage even if ST33 is open.

CC.7.5.23.4 預處理

CC.7.5.23.4 Preconditions

此試驗為「白箱」試驗，該 EV 供電設備需要依照試驗設置進行準備。

This test is a "white box" test, where the EV supply equipment needs to be prepared according to the test setup.

CC.7.5.23.5 定義及計算

CC.7.5.23.5 Definitions and calculations

無。

None.

CC.7.5.23.6 動作

CC.7.5.23.6 Actions

藉由重複以下動作，試驗所有要求之試驗案例。

Test all required test cases by repeating the following actions.

(1) 對正常操作準備試驗設置。

1) Prepare the test setup for normal operation.

(2) 應成功進行 FPT 序列直到 t = t3。

2) The FPT sequence shall be successfully done until t = t3.

(3) 執行一個要求之試驗條件(1 – 4c)。

3) Execute one of the required test conditions (1 – 4c).

(4) 在完成圖 CC.5 之纜線檢查後，包含傳送訊息 "CableCheckReq <4a>" 並使用 $V_{EV_max} = V_{EVSE_min} + 100$ V，應成功進行 FPT 序列直到 t = t6。

4) The FPT sequence shall be successfully done until t = t6 after completing the cable-check according to Figure CC.5, including message "CableCheckReq <4a>" using $V_{EV_max} = V_{EVSE_min} + 100$ V.

(5) 紀錄 EV 供電設備之回應訊息。

5) Log the response message of the EV supply equipment.

CC.7.5.23.7 預期結果

CC.7.5.23.7 Expected results

最遲在完成電纜檢查階段後，EV 供電設備應依 CC.4.1.4，傳送訊息 CableCheckRes <4b>，並包含參數 "EVSEIsolationStatus"、"EVSEProcessing" = 'Finished'，以及：

At least after completing the cable-check phase, the EV supply equipment shall send message CableCheckRes <4b> with parameters "EVSEIsolationStatus" according to CC.4.1.4, "EVSEProcessing" = 'Finished', and:

- "EVSEStatusCode" = 'Ready', 若在正常操作(試驗案例 1)，絕緣狀況為 'Valid'，或
- "EVSEStatusCode" = 'Ready', if the insulation status is 'Valid' in normal operation (test case1), or
- "ResponseCode" ='FAILED', 若在所有故障試驗案例(試驗案例 2a to 4c)，EV 供電設備偵測到錯誤。
- "ResponseCode" ='FAILED', if the EV supply equipment detects an error in all fault test cases (test cases 2a to 4c).

附錄 CC 結束==========

# 附錄 DD
# Annex DD
# (參考)
# (informative)
# 雙向電力傳輸控制
# Bidirectional power transfer control

## DD.1 一般 General

附錄 DD 針對 BPT EV 供電設備及 EV 間之雙向電力傳輸提供基本的資訊。

Annex DD provides basic information for bidirectional power transfer (BPT) between the BPT EV supply equipment and the EV.

BPT 的一個重要面向是 BPT EV 供電設備能夠在 FPT 及 RPT 間改變電能傳輸方向或保持空閒狀態，即暫停電能傳輸。這可透過 DD.2 中所述之方法來實現。

An important aspect of the BPT is the ability of the BPT EV supply equipment to change the direction of energy transfer between FPT and RPT or to remain idle, that is, to pause energy transfer. This can be achieved by the methods described in Clause DD.2.

若 BPT EV 供電設備設計用於連接住宅或商業建築及/或電網並為其供電，那麼

If the BPT EV supply equipment is designed to be connected and provide power to residential or commercial building(s) and/or the grid, then

- A 側電路應考慮 IEC 62909-1、IEC 62909-2 及 IEC 62909-310 的要求，例：電能品質、負載突降、電壓波動。
- side A circuits should consider the requirements in IEC 62909-1, IEC 62909-2 and IEC 62909-310, for example, power quality, load dump, voltage fluctuations,
- A 側電路與電網的連接應考慮 IEC 60364-5-55 和 IEC 60364-8 系列中的要求，及
- connection of the side A circuits to the supply network should consider the requirements in IEC 60364-5-55 and in the IEC 60364-8 series, and
- 對於上行通訊（例：到家庭），可以參考 IEC 62439 系列。
- for upstream communication, for example, to home, the IEC 62439 series can be considered.

## DD.2 FPT 及 RPT

DD.2 Forward power transfer (FPT) and reverse power transfer (RPT)

除本文件適用要求外，包括 FPT6.3.1 的要求，以下操作模式可使用於 BPT EV 供電設備：

In addition to all applicable requirements in this document, including the requirements in 6.3.1,which defines FPT, the following operation methods can be applied to the BPT EV supply equipment.

a) 動態 BPT

a) Dynamic BPT

在本模式中，序列經由數位通訊前及期間，EV 與 BPT EV 供電設備應交換關於電壓、電流及/或功率限制值。

Under this configuration, the EV and the BPT EV supply equipment will exchange information about voltage, current and/or power limits before and during the sequence through digital communication.

BPT EV 供電設備應於通知之限制值內輸送電流至 EV 或自 EV 汲取電流，並經常通知 EV 電能傳輸期間關於實際電壓及電流。

The BPT EV supply equipm ent will deliver energy to the EV or draw energy from the EV less than or equal to the communicated limits and inform the EV about the actual voltage and current during energy transfer.

電能傳輸的方向在任一時間可完全無縫切換，即 FPT 及 RPT 間不轉換為停機模式(階段)

The direction of the energy transfer can be changed seamlessly anytime, that is, between FPT and RPT without transferring to a shutdown (stage).

b) FPT 與 RPT 間之切換

b) Switching between FPT and RPT

FPT 及 RPT 間切換，BPT EV 供電設備應執行正常關閉並保持暫停狀態。

To switch between FPT and RPT, the BPT EV supply equipment should perform a normal shutdown and remain in pause.

BPT EV 供電設備應重新配置 PEC，以改變能量方向流動。

The BPT EV supply equipment should reconfigure the PEC to change the direction of energy flow.

BPT EV 供電設備應執行必要的階段重新啟動初始化階段，若初始化階段完成，則繼續轉移階段。

The BPT EV supply equipment should re-initiate by performing the necessary phases of the initialization stage and, if the initialisation stage is sufficiently completed, continue with transfer stage.

## 附錄 EE

## Annex EE

## (規定)

## (normative)

## 試驗負載阻抗查證

## Test load impedance verification

### EE.1 一般 General

附錄 EE 指定查證用於本標準規定的試驗負載校準程序。

Annex EE specifies the procedure to verify the calibration of the test load used for

tests as specified in this document.

**EE.2 響應曲線查證 EE.2 Response curve verification**

應於 1 Hz 至 150 kHz 頻率範圍內，查證試驗之負載 DC+及 DC–間的阻抗大小。

From 1 Hz to 150 kHz, the magnitude of the impedance between DC+ and DC– of the test load shall be verified for

- 系統 A 與系統 B：使用公式（EE.1），
- system A and system B: using Formula (EE.1),
- 系統 A 用於電流漣波測量時：使用公式（EE.2），
- system A for current ripple measurements: using Formula (EE.2),
- 系統 C：使用公式（EE.2），
- system C: using Formula (EE.2),

其參數如圖 EE.1 所示，並根據圖 132 簡化版本。

with the parameters in Table EE.1, based on a simplification of Figure 132.

$$\left|Z_{\text{load}}\right| = \left|\frac{1}{\frac{1}{R_{\text{Batt}}}} + j\omega L\right| \qquad \text{(EE.1)}$$

式中 Where

$Z_{\text{Load}}$ 為試驗負載阻抗，以歐姆表示；

$Z_{\text{Load}}$ is the test load impedance, expressed in ohms;

$R_{\text{Batt}}$ 為試驗負載電阻，以歐姆表示；

$R_{\text{Batt}}$ is the test load resistance, expressed in ohms;

L 為試驗負載電感，以亨利表示；

L is the test load inductance, expressed in henrys;

$$\left|Z_{\text{load}}\right| = \left|\frac{1}{\frac{1}{R_{\text{Batt}}} + \frac{1}{R_{\text{Cx}} + \frac{1}{j\omega C_x}}} + j\omega L\right| \qquad \text{(EE.2)}$$

式中 where

$Z_{\text{Load}}$ 為試驗負載阻抗，以歐姆表示；

$Z_{\text{Load}}$ is the test load impedance, expressed in ohms;

$R_{\text{Batt}}$ 為試驗負載電阻，以歐姆表示；

$R_{\text{Batt}}$ is the test load resistance, expressed in ohms;

$C_X$ 為 X 電容，以法拉為單位；

$C_X$ is the X capacitance, expressed in farads;

$R_{\text{Cx}}$ 為 $C_X$ 電容的電阻，以歐姆表示；

$R_{\text{Cx}}$ is the resistance of the CX capacitor, expressed in ohms;

$L$ 為試驗負載電感，以亨利表示；

*L* is the test load inductance, expressed in henrys.

表 EE.1 試驗負載參數

Table EE.1 – Test load parameters

| 系統<br>System | 參數<br>Parameter | 最小值<br>Minimum value | 平均值<br>Average value | 最大值<br>Maximum value |
|---|---|---|---|---|
| A 及 B<br>A and B | RTest_Loada | 50 mΩ | 75 mΩ | 100 mΩ |
| | LT = LT3 + LT4 [d] | 1 µH | 2 µH | 3 µH |
| A[e] | $R_{Test_Load}$[a] | 1 Ω | 3 Ω | 5 Ω |
| | CT6[b] | 3300 µF | 5600 µF | 8200 µF |
| | RCT6[c] | 10 mΩ | 20 mΩ | 30 mΩ |
| | LT = LT3 + LT4 [d] | 1 µH | 2 µH | 3 µH |
| C | $R_{Test_Load}$[a] | 50 mΩ | 75 mΩ | 100 mΩ |
| | $C_T6$[b] | 330 µF | 470 µF | 820 µF |
| | $R_{CT6}$[c] | 10 mΩ | 20 mΩ | 30 mΩ |
| | LT = LT3 + LT4 d | 1 µH | 2 µH | 3 µH |

註：(a)低頻電池系統等效串聯電阻。

a Low frequency battery system equivalent series resistance.

(b) EV X 電容。

b EV X-capacitors.

(c) EV X 電容之等效串聯電阻。

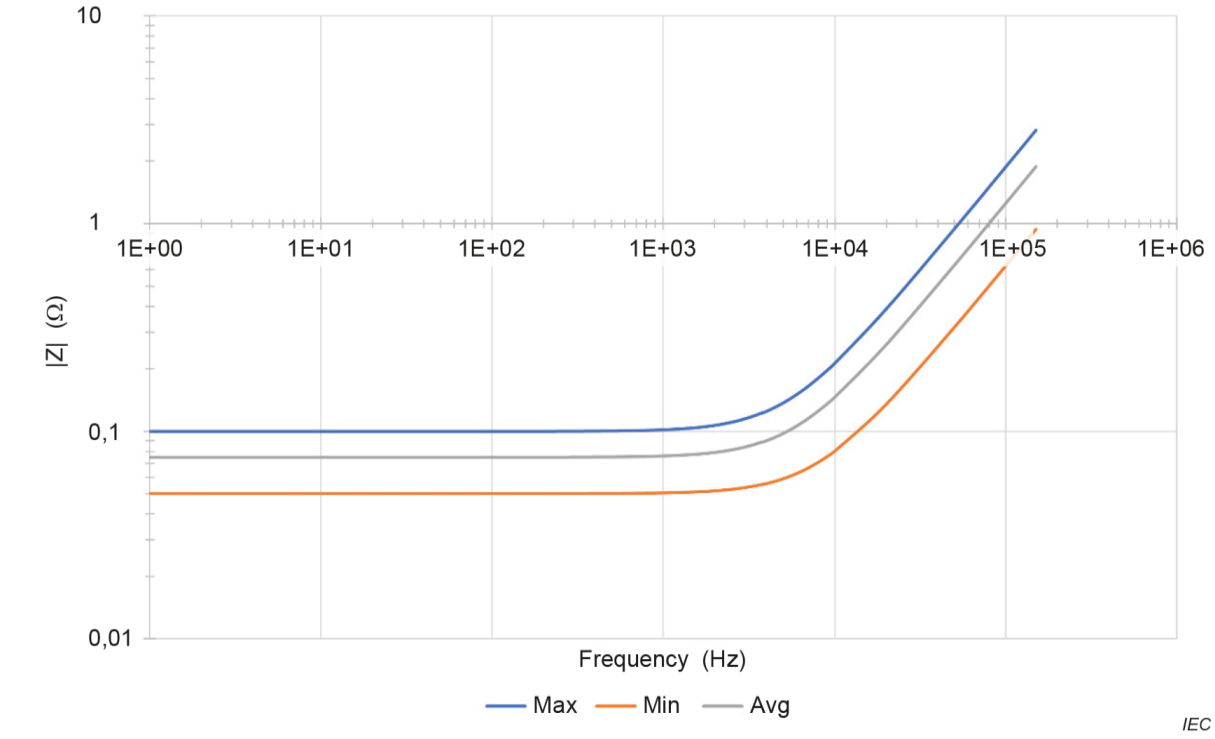
c Equivalent series resistance of EV X-capacitors.

(d)車輛電源電路（例：電纜）電感。

d Inductance of vehicle power supply circuit (for example, cabling).

(e)用於電流漣波量測之負載。電池系統之電阻達到特定工作點的負載電阻。

e Load for current ripple measurements. The battery system resistance is the load resistance to reach a specific operating point.



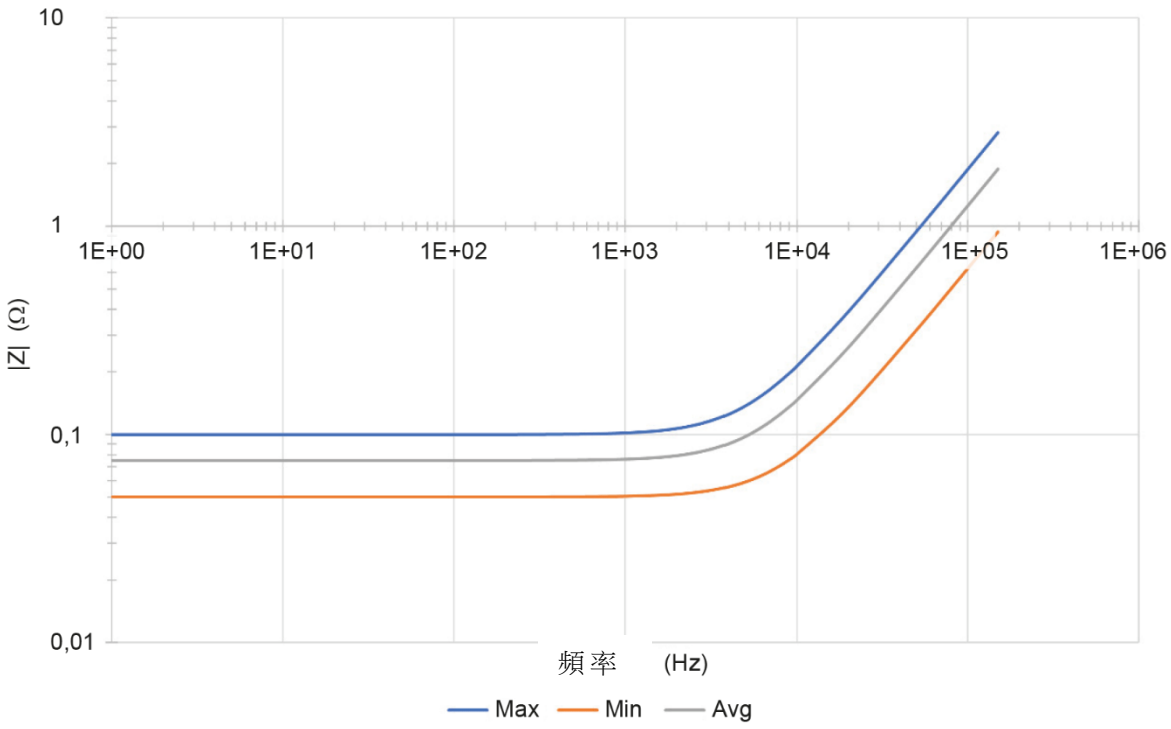
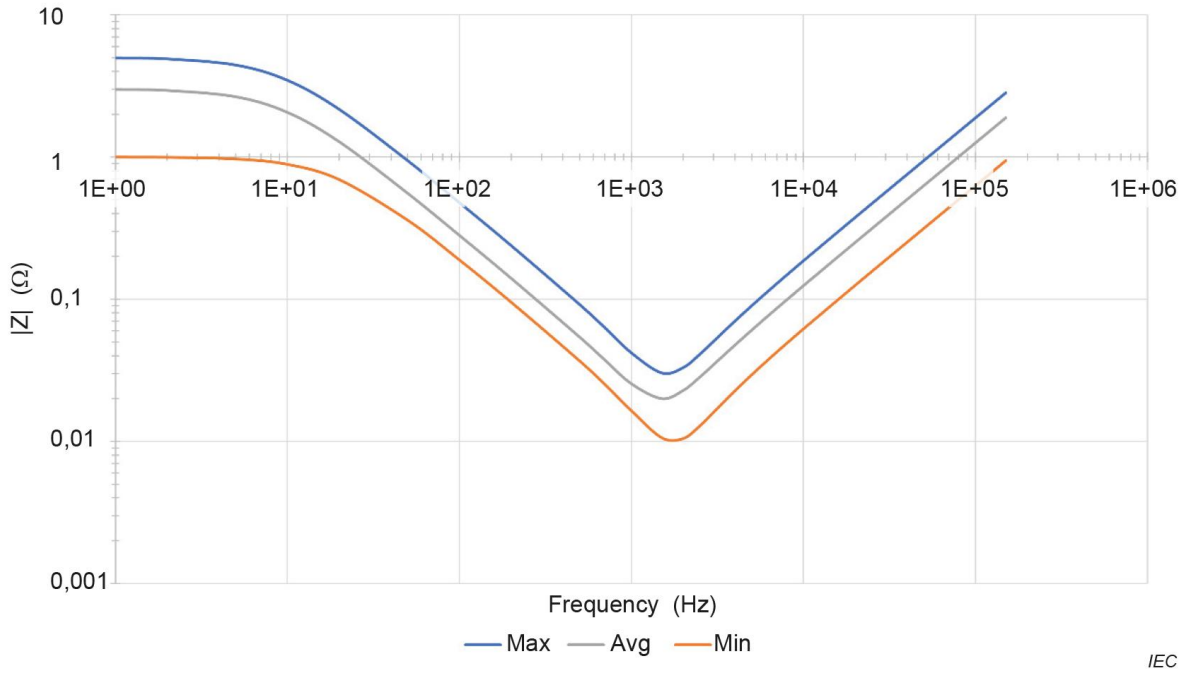




圖 EE.1 – 系統 A 及系統 B 之 DC+/DC-間試驗負載的阻抗大小

Figure EE.1 – Magnitude of the impedance of the test load between DC+ and DC– for system A and system B



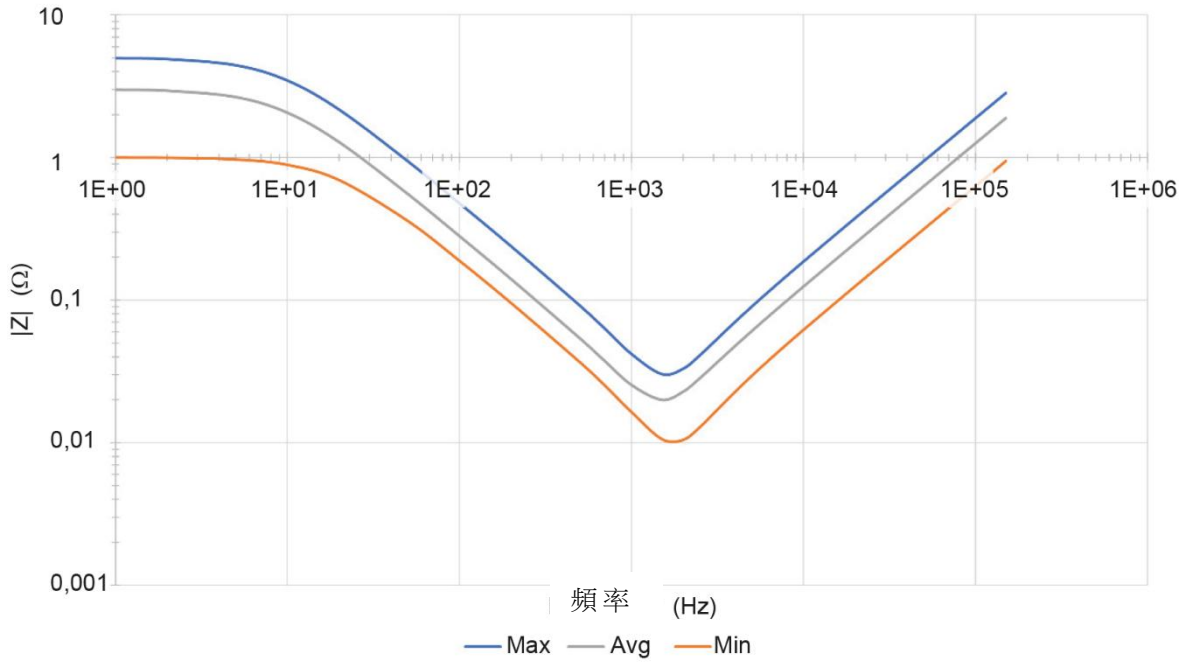
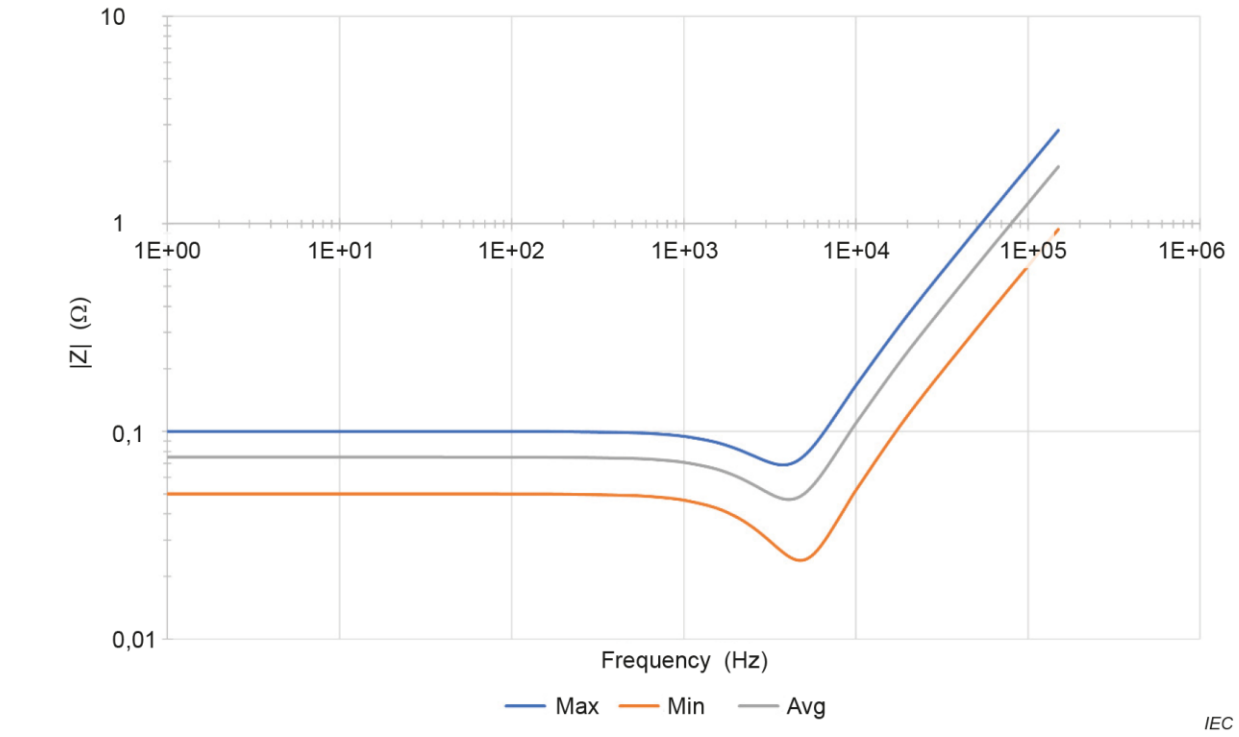




圖 EE.2 – 系統 A 電流漣波量測 DC+及 DC-間試驗負載的阻抗大小

Figure EE.2 – Magnitude of the impedance of the test load between DC+ and DC– for system A for current ripple measurements



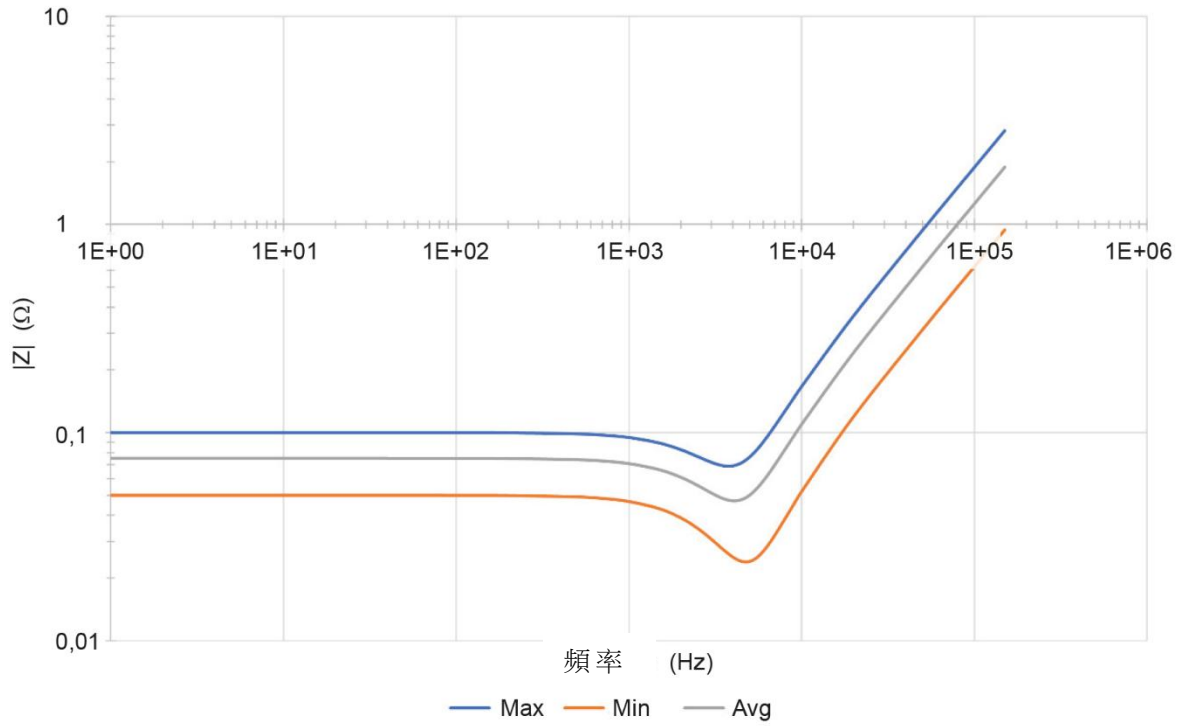




圖 EE.3 – 系統 C 之 DC+及 DC-間試驗負載的阻抗大小

Figure EE.3 – Magnitude of the impedance of the test load between DC+ and DC– for system C

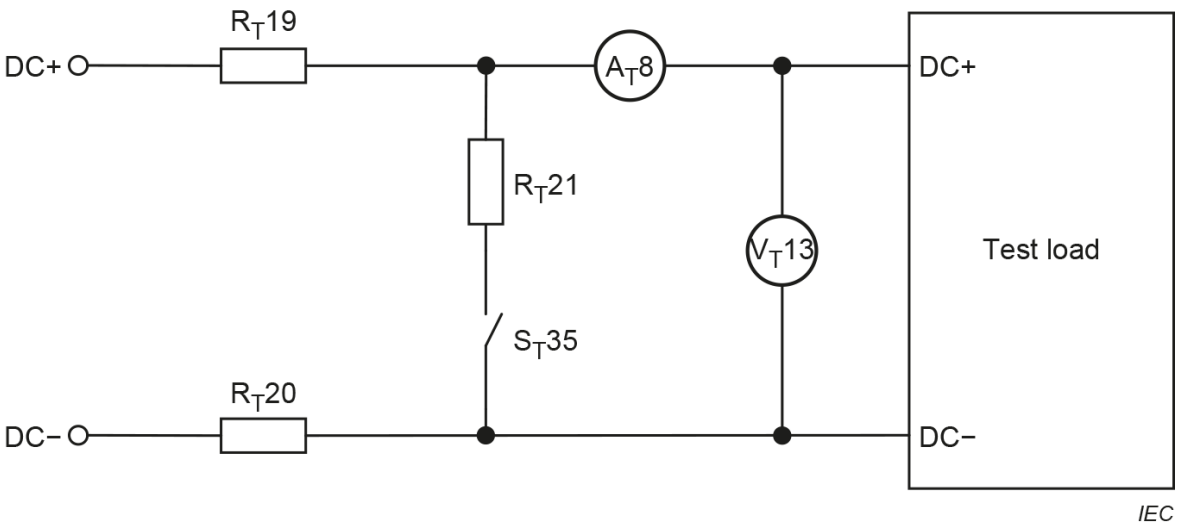
量測得到阻抗大小 |Z| 應繪製在波德圖（Bode plot）上。大小應保持在相應圖表所規定的最小值與最大值間。阻抗的相位角 $\varphi$ 則不需要進行查證。

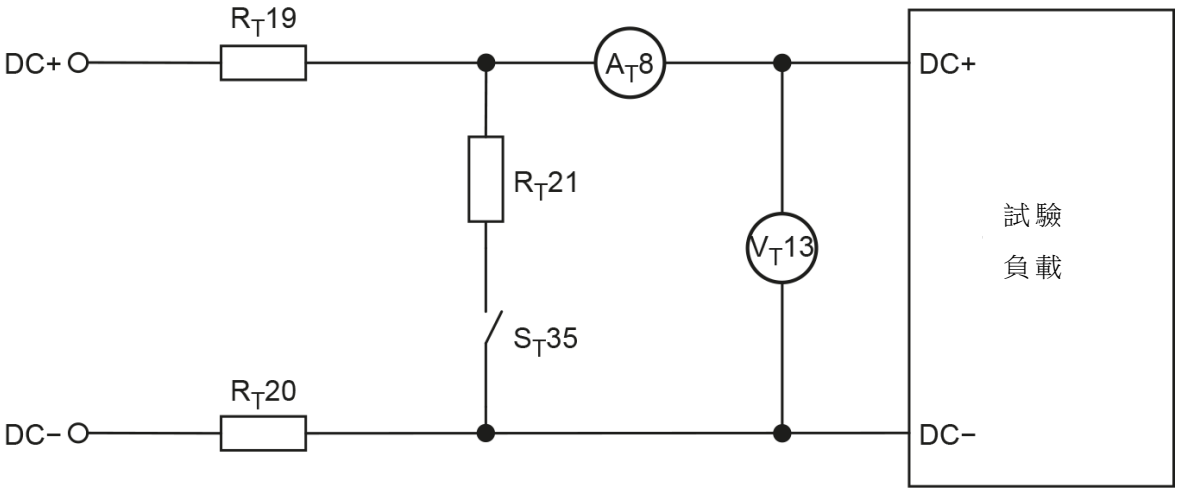
The measured magnitude of the impedance |Z| shall be plotted in a bode-plot. The magnitude shall remain between the minimum and maximum as specified in the

respective figures. The phase shift φ of the impedance does not need to be verified.
試驗負載阻抗會影響 EV 供電設備及 EV 間之性能特性與相容性。若 EV 阻抗與試驗負載的阻抗存在顯著差異，則在電能傳輸過程中相容性與性能可能會受到負面影響，例：出現意料之外的共振頻率、高電感等問題。
The impedance of the test load has influence on the performance characteristics and compatibility between the EV supply equipment and EV. If the EV impedance significantly deviates from the test load impedance, the compatibility and performance during energy transfer can be negatively affected, for example, due to unexpected resonant frequencies, high inductance, etc.
試驗負載製造商應說明在何種條件下需查證阻抗的大小及查證程序，例：每年一次，並使用 EE.3 所描述的方法進行。
The test load manufacturer shall specify under what conditions the magnitude of the impedance shall be verified and the verification procedure, for example once per year, using the method described in Clause EE.3.

**EE.3 試驗負載查證的試驗設置（僅供參考）EE.3 Test setup for test load verification (informative)**

用於多項試驗之試驗負載阻抗需要進行查證。本試驗設置說明如何進行查證。
此方法假設在 102.2.5 所指定所有操作點，負載阻抗皆相同，因此僅於低電流及單一電壓下進行阻抗查證。若此假設不正確，則試驗需進行調整，以涵蓋 102.2.5 規定的所需操作點，或需採用其他方法。試驗裝置範例如圖 EE.4 所示。
The impedance of the test load used in several tests needs to be verified. This test setup describes how to verify this. It assumes that the load impedance will be the same for all operating points specified in 102.2.5, therefore only verifies the impedance at low current and at a single voltage. If this assumption is incorrect, the test needs to be modified to cover the needed operating points specified in 102.2.5, or another method may be needed. An example of the test setup is shown in Figure EE.4.






說明 Key

| | | | |
|---|---|---|---|
| DC+ | 電壓源之正極端子<br>positive terminal of the voltage source | ST | 試驗裝置之開關或繼電器<br>switch or relay in the test setup |
| DC- | 電壓源之負極端子<br>negative terminal of the voltage source | VT | 試驗裝置之電壓表<br>voltmeter in the test setup |
| Test load | 依 102.2.4 之試驗負載 (參照 132)<br>test load according to 102.2.4 (see Figure 132) | AT | 試驗裝置之電流表<br>ammeter in the test setup |
| RT19 | 10 Ω 電阻<br>10 Ω resistor | RT20 | 10 Ω 電阻<br>10 Ω resistor |
| RT21 | 400 Ω 電阻<br>400 Ω resistor | | |

圖 EE.4 試驗負載查證之試驗裝置

Figure EE.4 – Test setup for test load verification

可使用 DC 電壓源為試驗負載提供 DC 定電壓，例：400V dc。該電壓源經由兩個 10 Ω電阻（RT19 及 RT20）進行解偶。

A DC voltage source can be used to supply the test load with a constant DC voltage, for example 400 V DC. The voltage source has been decoupled with 2 × 10 Ω resistors ($R_T19$ and $R_T20$).

試驗負載可以配置為定電壓，例：360V，且電流為 2 A。

The test load can be configured to a constant voltage, with a current of 2 A, for example, 360 V.

開關 $S_T35$ 將以特定頻率進行閉合操作。此頻率將從 1 Hz 掃描至 150kHz，每個十倍取 5 個對數間。於 1kHz 至 10kHz 間可能需要更多的量測點。

Switch $S_T35$ will be opened and closed with a specific frequency. This frequency will

be swept from 1 Hz to 150 kHz with 5 steps for each decade. More measurement points may be needed between 1 kHz and 10 kHz.

量測於負載電流 $A_T8$ 及電壓 $V_T13$ 將通過帶通濾波器進行濾波，僅允許量測頻率。

The measured current AT8 and voltage VT13 over the load will be filtered with a band-pass filter to only allow for the measurement frequency.

**EE.4 結果 EE.4 Result**

量測阻抗大小應介於所示之最小值及最大值間

The measured magnitude of the impedance shall fall between the minimum and maximum limits as shown in

- 圖 EE.1 為系統 A（不包括電流漣波量測），
- Figure EE.1 for system A (excluding current ripple measurements),
- 圖 EE.1 為系統 B，
- Figure EE.1 for system B,
- 圖 EE.2 為系統 A 的電流漣波測量，及
- Figure EE.2 for system A for current ripple measurements, and
- 圖 EE.3 為系統 C。
- Figure EE.3 for system C.

例：平均值（avg）曲線於最小值及最大值間，因此通過試驗。

For example: the line representing the average (avg) falls between the minimum and maximum,and therefore passes the test.

# 附錄 FF
# Annex FF
# (規定)
# (normative)
# 多個 B 側之 EV 供電設備
# Multi-side B separated EV supply equipment

## FF.1 一般 General

附錄 FF 針對使用多個 EV 供電設備 B 側之 FTP 特定要求。

Annex FF provides specific requirements for FPT by using a multi-side B EV supply equipment.

多個 EV 供電設備 B 側為 EV 供電設備具有兩個以上之車輛端插頭。

A multi-side B EV supply equipment is an EV supply equipment with two or more vehicle connectors.

如同 EV 供電設備之一部分，本標準之本文針對 EV 供電設備所有一般要求，除附錄 FF 另有規定外，亦適用多個 B 側之 EV 供電設備。

As a part of the EV supply equipment, all general requirements for EV supply equipment in the body text of this document also apply to the multi-side B EV supply equipment unless otherwise specified in Annex FF.

## FF.2 多個 EV 供電設備 B 側之分類及使用情形 FF.2 Classification and use case of multi-side B EV supply equipment

### FF.2.1 系統操作 FF.2.1 System operation

— 多個 EV 供電設備 B 側使用非同步操作。

– Multi-side B EV supply equipment with non-simultaneous operation.

— 多個 EV 供電設備 B 側使用同步操作。

– Multi-side B EV supply equipment with simultaneous operation.

### FF.2.2 B 側系統 FF.2.2 Side B system

— 多重系統 A。– Multi-system A.

— 多重系統 B。– Multi-system B.

— 多重系統 C。– Multi-system C.

— 系統 A 及系統 B。– System A and system B.

— 系統 A 及系統 C。– System A and system C.

— 系統 B 及系統 C。(研議中)– System B and system C (under consideration).

— 系統 A、系統 B 及系統 C。(研議中)

– System A, system B and system C (under consideration).

**FF.2.3 架構 FF.2.3 Configuration**

(a) 多個 EV 供電設備 B 側使用單獨的 PEC。

a) Multi-side B EV supply equipment with a single PEC.

(b) 多個 EV 供電設備 B 側使用多個(兩個以上) PEC。

b) Multi-side B EV supply equipment with multiple (two or more) PECs.

多個 EV 供電設備 B 側可能之組合的分類如表 FF.1。

The possible combinations for multi-side B EV supply equipment with respect to the classification are shown in Table FF.1.

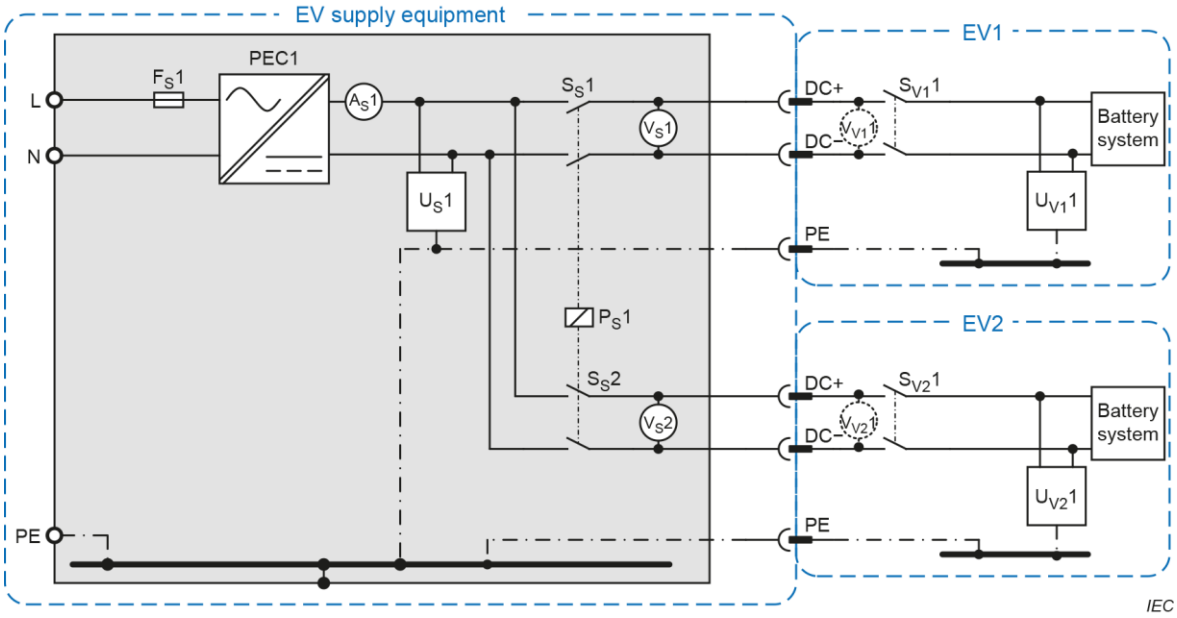
表 FF.1 – 多個 EV 供電設備 B 側可能組合

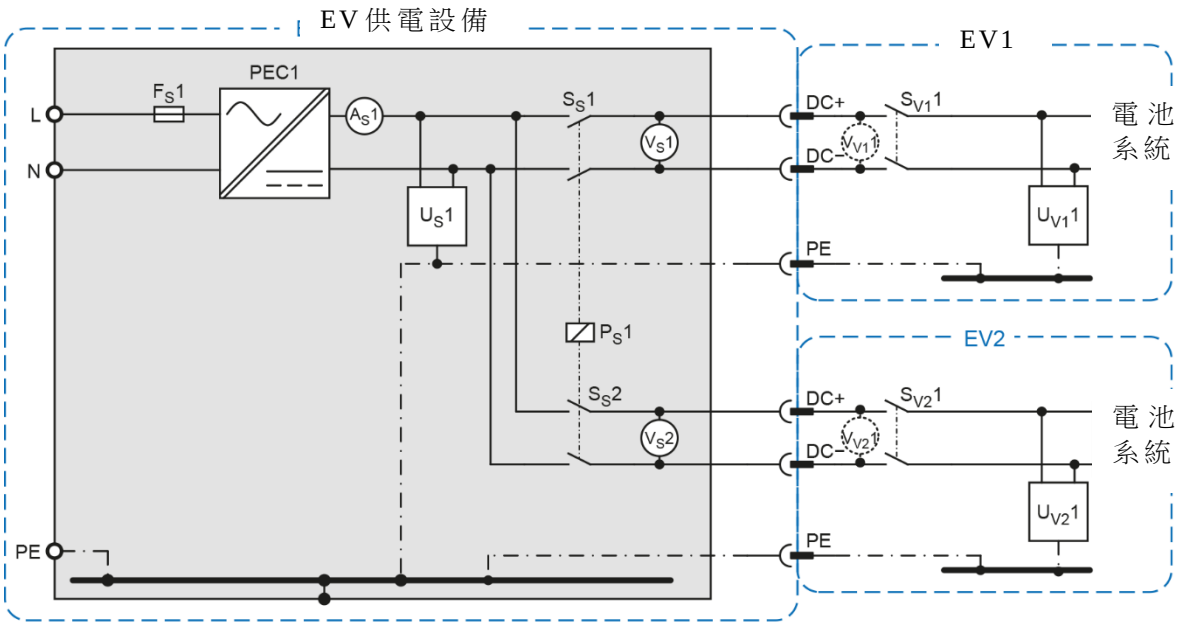
Table FF.1 – Possible combinations for multi-side B EV supply equipment

| Use case 使用情形 | | | | | | | Configuration 架構 | |
|---|---|---|---|---|---|---|---|---|
| Operation 操作 | | Side B system B 側系統 | | | | | PEC | |
| Non-Simultaneous 非同步 | Simultaneous 同步 | A | B | C | A 及 B A and B | A 及 B A and C | Single 單獨 | Multiple 多重 |
| X | | X | | | | | X | |
| X | | | X | | | | X | |
| X | | | | X | | | X | |
| X | | | | | X | | X | |
| X | | | | | | X | X | |
| X | X | X | | | | | | X |
| X | X | | X | | | | | X |
| X | X | | | X | | | | X |
| X | X | | | | X | | | X |
| X | X | | | | | X | | X |

表 FF.1 使用情形衍生出的系統概要範例示於表 FF.1 及表 FF.2。

Examples of system schematics for the use cases derived from Table FF.1 are shown in Figure FF.1 and Figure FF.2.



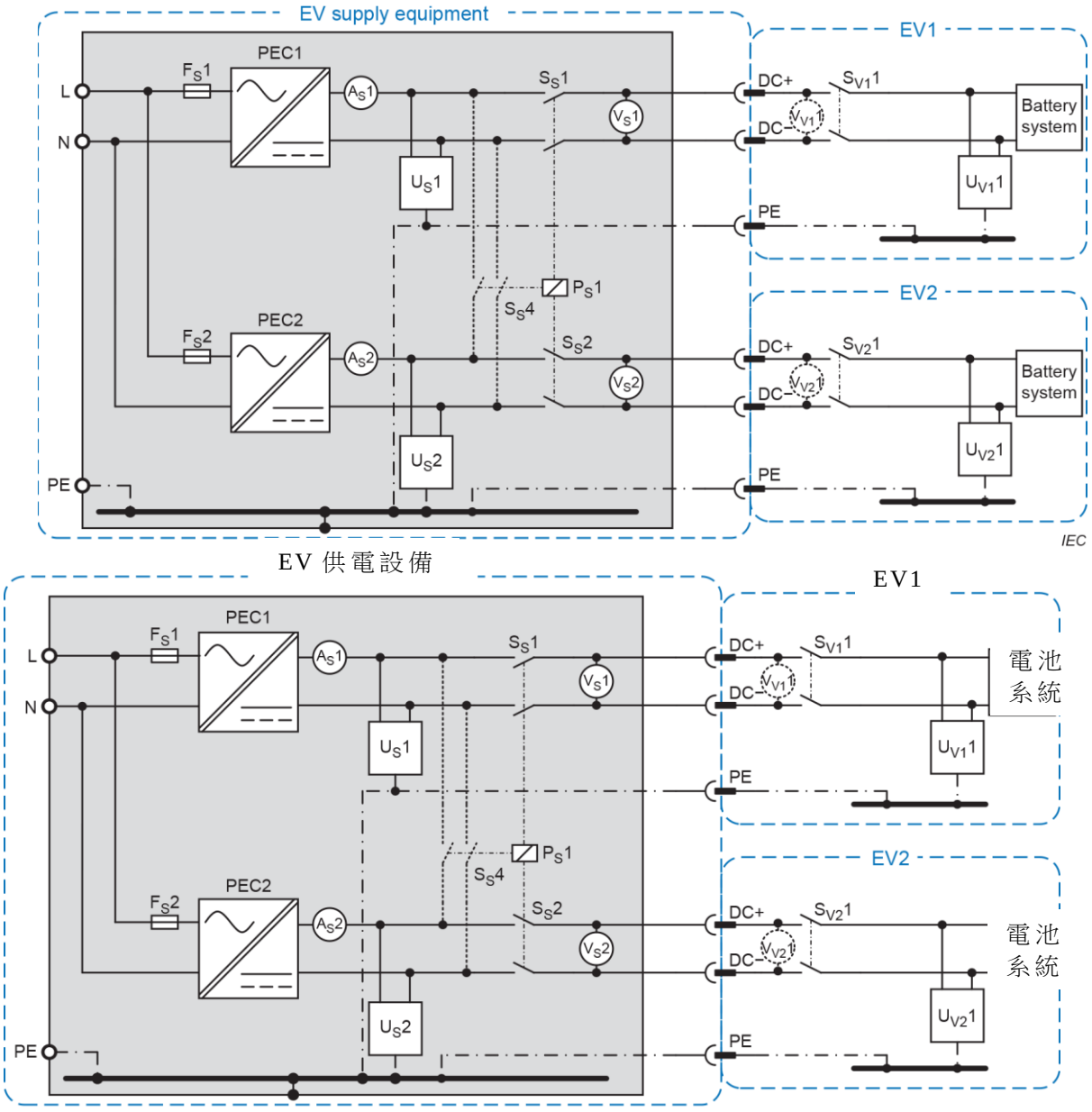

說明 Key

| | | | |
|---|---|---|---|
| L1,N | AC or DC supply network<br>AC 或 DC 電網 | SS | switch or relay in the EV supply equipment<br>EV 供電設備開關或繼電器 |
| PE | protective conductor contact<br>保護性導體接點 | SV | switch or relay in the EV<br>EV 中的開關或繼電器 |
| DC+ | positive terminal of side B<br>B 側正極端子 | AS | ammeter in the EV supply equipment<br>EV 供電設備之電流表 |
| DC- | negative terminal of side B<br>B 側負極端子 | VS | voltmeter in the EV supply equipment |

| | | | |
|---|---|---|---|
| | | | EV 供電設備之電壓表 |
| PEC | power electronic converter<br>電力電子變換器 | VV | voltmeter in the EV<br>EV 之電壓表 |
| US | IMD of the EV supply equipment<br>EV 供電設備的 IMD | FS | over-current protection device in the EV supply equipment<br>EV 供電設備之過電流保護裝置 |
| UV | IMD of the EV<br>EV 的 IMD | PS | electrical and/or mechanical interlock<br>電氣及/或機械互鎖 |

Figure FF.1 – Example of a multi-side B EV supply equipment with a single PEC

圖 FF.1 – 多個 EV 供電設備 B 側具有單一 PEC 範例



說明 Key

| | | | |
|---|---|---|---|
| L1,N | AC or DC supply network<br>AC 或 DC 電網 | SS | EV 供電設備之開關或繼電器<br>switch or relay in the EV supply equipment |
| PE | protective conductor contact<br>保護性導體接點 | SV | EV 之開關或繼電器<br>switch or relay in the EV |
| DC+ | positive terminal of side B<br>B 側正極端子 | AS | ammeter in the EV supply equipment<br>EV 供電設備之電流表 |
| DC- | negative terminal of side B<br>B 側負極端子 | VS | voltmeter in the EV supply equipment<br>EV 供電設備之電壓表 |
| PEC | power electronic converter<br>電力電子變換器 | VV | voltmeter in the EV<br>EV 之電壓表 |
| US | IMD of the EV supply equipment<br>EV 供電設備的 IMD | FS | over-current protection device in the EV supply equipment<br>EV 供電設備中的過電流保護裝置 |
| UV | IMD of the EV<br>EV 的 IMD | PS | electrical and/or mechanical interlock<br>電氣和/或機械互鎖 |

圖 FF.2 －多個 EV 供電設備 B 側具有多重 PEC 範例

Figure FF.2 – Example of a multi-side B EV supply equipment with multiple PECs

**FF.3 B 側系統之結構性要求 FF.3 Constructional requirements of a side B system**

不使用時，應依 IEC 61851-1:2017, 11.7 之儲存方法提供所有車輛端插頭。最長纜線長度應符合國家法規，接觸器在斷開狀態之空間及沿面距離，應符合 12.3 至少的基本絕緣。

A storage means according to IEC 61851-1:2017, 11.7, shall be provided for each vehicle connector when not in use. National codes can apply regarding the maximum cable length.

Clearance and creepage distance of contactors in open state shall be in accordance with 12.3 for at least basic insulation.

B 側輸出系統應亦配備機械式斷開裝置，如繼電器/接觸器。在 B 側當前額定最大

充電電流等於 EV 供電設備 B 側的額定提高電流下，此機械段開裝置應設置在 B 側輸出電路的線路(DC+ and DC–)，且應能斷開 B 側帶電部件（DC+和 DC－）來自 EV 的 EV 供電設備。

The side B system shall also be equipped with a mechanical disconnection device such as a relay/contactor. This mechanical disconnection device shall be installed in each of the side B circuit (DC+ and DC–), and shall be capable of disconnecting the side B live parts (DC+ and DC–) of the EV supply equipment from the EV when the present current at side B is equal to the rated boost current of the EV supply equipment at side B.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.3.1.1 依附錄 AA 之 B 側系統的結構性要求 FF.3.1 Constructional requirements of a side B system according to Annex AA**

B 側系統應依 IEC 62196-3 C 或 IECTS 62196-3-1 或配備架構 AA 之車輛端插頭。為確保適當的功能性，依圖 AA.1，B 側系統應配備需要的硬體，作為通訊及電力傳輸(例：CAN 傳送器、電阻器、開關、接觸器)。系統 A 之 B 側電路應在 DC+和 DC－ 上配備接觸器。

The side B system shall be equipped with a vehicle connector according to IEC 62196-3 or IEC TS 62196-3-1, configuration AA. To ensure proper functionality, the side B system shall be equipped with the necessary hardware for digital communication and energy transfer (for example, CAN transceiver, resistors, switches, contactors), according to Figure AA.1. System A side B circuits shall be equipped with contactors on DC+ and DC–.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.3.1.3 依附錄 BB 之 B 側系統的結構性要求 FF.3.2 Constructional requirements of a side B system according to Annex BB**

B 側系統應依 IEC 62196-3 或 IECTS 62196-3-1 配備架構 BB 之車輛端插頭。為確保適當的功能性，依圖 BB.17，B 側系統應配備需要的硬體，作為通訊及電力傳輸(例：CAN 傳送器、輔助電力裝置、開關、接觸器)。系統 B 之車輛端插頭應配備措施，使用標準試驗指(IPXXB)以確保防護接近危險性部件。

The side B system shall be equipped with a vehicle connector according to IEC 62196-3 or IEC TS 62196-3-1, configuration BB. To ensure proper functionality, the side B system shall be equipped with the necessary hardware for digital communication and energy transfer (for example, CAN transceiver, auxiliary power device, switches, contactors), according to Figure BB.1. Vehicle connectors of system B shall be equipped with a means to ensure protection against access to hazardous parts with a standard test finger (IPXXB).

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.3.1.3 依附錄 CC 之 B 側系統的結構性要求 FF.3.3 Constructional requirements of a side B system according to Annex CC**

B 側系統應依 CNS 15511-3 或 IEC TS 62196-3-1 配備架構 EE 或 FF 之車輛端插頭。為確保適當的功能性，依圖 CC.1 及圖 CC.2，B 側系統應配備需要的硬體，作為通訊及電力傳輸(例：PWM 振盪器、PLC 晶片、接觸器)。

The side B system shall be equipped with a vehicle connector according to IEC 62196-3 or IEC TS 62196-3-1, configuration EE or configuration FF. To ensure proper functionality, the side B system shall be equipped with the necessary hardware for digital communication and energy transfer (for example, PWM oscillator, PLC chip, contactors), according to Figure CC.1 or Figure CC.2.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.4 B 側系統性能**

**FF.4 Side B system performance**

**FF.4.1 一般性能要求**

**FF.4.1 General performance requirements**

B 側系統應為系統 A、系統 B、系統 C 輸出系統應為系統 A 與 B 兩者或系統 A 與 C 兩者。B 側性能應符合本標準本文要求及適用附錄要求。若兩個以上 B 側系統可同步使用，應無個別或組合 B 側系統造成干擾任一其他 B 側系統。

The side B systems shall be system A, system B, system C, both system A and system B or both system A and system C. The side B performance shall comply with the requirements in the body text of this document and with the requirements in the applicable annexes. If two or more side B systems can be used simultaneously, no individual or combination of side B systems shall cause interference with any other side B system.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.4.2 提供同步操作之多個 EV 供電設備 B 側的性能 FF.4.2 Performance of multi-side B EV supply equipment providing simultaneous Operation**

若多個 EV 供電設備 B 側於各個 B 側的額定提高功率總和超過該設備 B 側額定最大功率，設備製造商應在使用手冊中說明可能的功率分配方式。例：包括優先電能傳輸至特定側，或所有 B 側間平均分配可用功率。If the sum of the rated boost power of the multi-side B EV supply equipment at each side B is more than the rated maximum power of the multi-side B EV supply equipment at side B, the multi-side B EV supply equipment manufacturer shall specify the possibilities of power distribution in the user manual (for example, priority energy transfer or evenly distributed present power on each side B).

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.5 安全要求 FF.5 Safety requirements**

**FF.5.1 一般安全要求 FF.5.1 General safety requirements**

多個 EV 供電設備 B 側之每一 B 側電纜線的保護性導體，應連接共模保護性接地導體。

The protective conductor in each side B cable assembly of the multi-side B EV supply equipment

shall be connected to a common protective earthing conductor.

介於 B 側帶電部件 ( DC+ 和 DC– ) 與 EV 供電設備保護裝置間，所有 B 側電路應個別配備絕緣監測措施或洩漏電流監測，如附錄 AA、附錄 BB 或 附錄 CC 規定。每一 B 側電路在輸出端子之 Y-電容，應符合 8.105.3 要求。

All side B circuits shall be individually equipped with a means of insulation monitoring or earth leakage current monitoring, between side B live parts (DC+ and DC–) and the protective conductor of EV supply equipment, as specified in Annex AA, Annex BB or Annex CC.

Y-capacitance at each side B circuit shall comply with the requirement in 8.105.3.

同步操作期間，一 IMD 之反應時間不得影響使用之接地洩漏電流量測裝置或其他 B 側系統的絕緣監測裝置。

The reaction time of an IMD shall not be influenced during simultaneous operation by an earth leakage current monitoring device or other IMD of another side B system.

電路組件包括用於隔離之裝置，考量正常及單一絕緣故障兩者，應額定多個 EV 供電設備 B 側最高電壓，包括 B 側電路之所有規定的許可差。

Circuit components, including devices used for separation, shall be rated for the rated maximum voltage of the multi-side B EV supply equipment at side B, including all specified tolerances of the side B circuits considering both normal and single insulation fault.

支援一種以上系統(A、B 及 C)之多個 EV 供電設備 B 側中的單一故障，不得在車輛端插頭上產生來自不同系統的電壓。

A single fault in a multi-side B EV supply equipment supporting more than one system (A, B and C) shall not cause a present voltage at the vehicle connector of a different system.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.5.2 短路保護**

**FF.5.2 Short-circuit protection**

多個 B 側 EV 充電設備之每一車輛端插頭，應有個別的短路保護措施。此措施應符合 13.101 規定各別 B 側系統之要求。

Each vehicle connector of a multi-side B EV supply equipment shall have individual short-circuit protection means. Such means shall comply with the requirements of the respective side B system given in 13.101.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.5.3 過載保護 FF.5.3 Overload protection**

多個 B 側 EV 充電設備之每一車輛端插頭，應依 13 個別提供過載保護。

Each vehicle connector of a multi-side B EV supply equipment shall individually provide overload protection according to Clause 13.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.5.4 電能傳輸期間經由未嚙合車輛端插頭接近帶電部件 FF.5.4 Access to live parts through an unmated vehicle connector during energy transfer**

電能傳輸期間，導體連接於可接近之車輛端插頭，應藉基本或強化絕緣自 B 側帶電部件。

During energy transfer, a conductor connected to the accessible unmated vehicle connectorshall be separated by basic or reinforced insulation from the live side B.

若隔離藉基本絕緣達成，在正常操作且最早故障下 1 s 後，於未嚙合車輛端插頭之接腳與保護導體間之能量或電壓，應連續不大於 60 Vdc。

If separation is achieved by basic insulation, the voltage between a contact of an unmated vehicle connector and the protective conductor shall be ≤ 60 V DC continuously in normal operation and after 1 s under a first fault.

規定於 8.105.5 之絕緣屏障要求，應施加於每一 B 側輸出電路。

Requirements for the insulation barrier specified in 8.105.5 shall be applied to each side B circuit.

針對正常操作，符合性依以下試驗查核並針對最早故障檢視設計。

Compliance in checked by the following test for normal operation and by design review for first fault.

(1) 多個 EV 供電設備 B 側之一個車輛端插頭，依 102.2.3 規定連接 EV 模擬器。

1) One vehicle connector of the multi-side B EV supply equipment is mated to an EV simulator

as defined in 102.2.3.

(2) 依 102.2.5 在多個 EV 供電設備的車輛端插頭上啟動在 OP3 上運行的通訊會話。

2) Start a communication session operating at OP3 on that vehicle connector of the

multi-outlet EV supply equipment. See 102.2.5.

(3) 針對全部維持車輛端插頭之 EV 供電設備接點，開始量測每個接腳間(DC+/DC–, DC+/PE 及 DC–/PE)電壓

3) Start the measurement of voltage between each contact (DC+/DC–, DC+/PE and DC–/PE) for all remaining vehicle connectors of the multi-outlet EV supply equipment.

(4) 基於停止序列規定，針對系統有關的已對接車輛端插頭停止 FPT。

4) Stop FPT based on the stop sequence defined for the system associated with the mated vehicle connector.

(5) 若觀察到所有接點間電壓值小於 60VDC 以下，則試驗合格：

5) The test is passed if the voltage values between all contacts are < 60 V DC.

(6)試驗一次一個重複車輛端插頭通電多個 EV 供電設備 B 側。

6) The test is repeated for every vehicle connector of the multi-side B EV supply equipment,one at a time.

**FF.5.5 提供同步操作之多個 EV 供電設備 B 側的額外安全要求**

**FF.5.5 Additional safety requirements for multi-side B EV supply equipment providing simultaneous operation**

若 B 側系統配備開關裝置如接觸器，量測應採取預防意外因開關元件失效造成 EV 之電氣連接。此等量測應預防電池系統之不同 EV 並聯。預防可藉以下措施之一或組合達成：

If the side B systems are equipped with switching devices, such as contactors, measures shall be taken to prevent unintended electrical connection of EVs caused by the failure of the switching device. These measures shall prevent a parallel connection between battery systems of different EVs. The protection can be achieved by one or combination of the following measures:

— 每個 B 側電路配置二極體。二極體應安裝於開關裝置與車輛端插頭之每個 B 側電路間。

– allocation of diode to each side B circuit; the diode shall be installed in each side B circuit between the switching device and the vehicle connector;

— 配置熔線於每一 B 側電路配備開關元件。

– allocation of a fuse in each side B circuit equipped with a switching device;

—電氣或機械互鎖之開關元件。

– electrical or mechanical interlock of switching devices.

若偵測到一個或多個 B 側電路故障，多個 EV 供電設備 B 側應終止供應充電電流至全部的 B 側電路。

If a fault is detected in one or more side B circuits, the multi-side B EV supply equipment shall perform a shutdown in all the involved side B circuits.

藉設計審查查核符合性。

Compliance is checked by design review.

**FF.5.6 B 側系統中機械性斷開裝置之診斷查核 FF.5.6 Diagnostic check of mechanical disconnection device in the side B system**

多個 EV 供電設備 B 側應執行設置在 B 側系統之機械性斷開裝置的查核診斷，以預防非預期電能傳輸從 EV 至 EV 供電設備 B 側，或兩輛以上 EV 同步連接於 EV 供電設備 B 側時機械性斷開裝置熔接(ON 卡住)，並防止未嚙合車輛端插頭的危險電壓。

The multi-side B EV supply equipment shall perform the diagnostic check of the mechanical disconnection device installed in the side B system to prevent unexpected energy transfer from an EV to the multi-side B EV supply equipment, or between the two or more EVs simultaneously connected to the multi-side B EV supply equipment in case the mechanical disconnection device

is welded (ON stuck), and to prevent hazardous voltage at the unmated vehicle connector.

如同最低要求，診斷應查核機械性斷開裝置熔接(ON 卡住)。其他失效之診斷查核如 OFF 卡住及不穩定致動為非強制，但仍建議。

As the minimum requirement, the diagnostic shall check the welding (ON stuck) of the mechanical disconnection device. Diagnostic checks of other failures such as OFF stuck and erratic actuation are not mandatory but still recommended.

若電能傳輸階段開始前執行診斷查核且偵測到 ON 卡住失效，多個 EV 供電設備 B 側在所有連接至熔接機械斷路裝置 B 側電路應轉換為停機序列。

If the diagnostic check is performed before the start of the energy transfer stage and the ON stuck failure is detected, the multi-side B EV supply equipment shall perform an error shutdown in all the side B circuits connected to the welded mechanical disconnection device.

若完成單一電能傳輸階段後執行診斷查核並偵測到 ON 卡住失效，多個 EV 供電設備 B 側應針對禁止連接至熔接機械斷路裝置全部 B 側系統進一步通訊，直到機械性斷開裝置適當更換或修理。

If the diagnostic check is performed after the completion of a single energy transfer stage and the ON stuck failure is detected, the multi-side B EV supply equipment shall prohibit further communication sessions for all the side B systems connected to the welded mechanical disconnection device, until the mechanical disconnection device is properly replaced or repaired.

藉設計審查查核符合性。

Compliance is checked by design review.

FF.5.7 多個 EV 供電設備 B 側具有多互連的 B 側帶電部件 (DC+/DC－)

FF.5.7 Interconnected side B live parts (DC+/DC–) in multi-side B EV supply Equipment

多個 EV 供電設備 B 側不容許 B 側帶電部件(DC+/DC–)連接多個 B 側電路。

The multi-side B EV supply equipment shall not connect side B live parts (DC+/DC–) between multiple side B circuits.

# 附錄 GG
# Annex GG
# (參考)
# (informative)

## EV 供電設備與 EV 間之通訊及能量傳遞程序
## Communication and energy transfer process between the EV supply equipment and the EV

### GG.1 一般 General

附錄 GG 提供 EV 供電設備與 EV 間對於通訊及能量傳遞程序的一般資訊。

Annex GG provides the general information on the communication and energy transfer process between EV supply equipment and EV.

EV 供電設備與 EV 間充電控制之數位通訊的要求，規定於 CNS 15511-24。

The requirements of digital communication during the coupling session between EV supply equipment and EV are defined in IEC 61851-24.

配備推進電池組之 EV 此用不同技術及電壓。一般而言，為確保不同型式之車載儲能系統的電能傳輸過程由車輛管理。

EVs are equipped with battery systems with different technologies and voltage. Accordingly,the energy transfer process is managed by the EV in order to ensure energy transfer to different types of battery systems.

EV 配備 EVCC 作為通訊會話管理。EV 供電設備有措施以容許車輛控制 EV 供電設備之電能傳輸參數。

EVs are equipped with an EVCC for communication session management. The EV supply equipent has means allowing the EVs to control the energy transfer parameters of the EV supply equipment.

### GG.2 系統架構 GG.2 System configuration

EV 供電設備與車輛間之通訊，可經由基本通訊及數位通訊建立。

The communication between the EV supply equipment and the EV can be established via basic communication and digital communication.

電能傳輸程序中之關鍵步驟，如開始通訊會話及正常/緊急停機，透過基本通訊使用訊號對 EV 供電設備控制導引線路交換管理

Key steps in the energy transfer control process, such as start of a communication session and normal/emergency shutdown, is managed through the basic communication with signal exchange via the control pilot lines in the EV supply equipment.

除了基本通訊，為了交換控制參數，EV 供電設備配備數位通訊措施，其為 EV 供電設備和 EV 間交換電能傳輸的控制參數。以下用於系統之數位通訊措施規定於附錄 AA、附錄 BB 及附錄 CC：

In addition to the basic communication, the EV supply equipment is equipped with digital communication means in order to exchange the control parameters for energy transfer between the EV supply equipment and the EV. The following digital communication means are used by the systems defined in Annex AA, Annex BB and Annex CC:

(a) 控制區域網路(control area network, CAN)依 ISO 11898-1 透過專用數位通訊電路。

a) control area network (CAN) over dedicated circuits for digital communication according to ISO 11898-1; or

(b)電力線通訊(power line communication, PLC)透過控制導引電路。

b) power line communication (PLC) over control pilot circuit.

**GG.1.3 電能傳輸程序及狀態 GG.3 Energy transfer control process and state**

**GG.1.3.1 一般**

**GG.3.1 General**

EV 供電設備之電能傳輸程序包含以下三個階段：

The energy transfer control process of the EV supply equipment consists of the following three stages:

— 充電開始前程序(初始化)：視需要，初始化包括預充電，預充電為初始化的最後階段。

- process before the start of energy transfer (initialization stage): initialization includes precharge phase if required; pre-charge is the final phase of the initialization stage;

— 電能傳輸期間程序(電能傳送階段)

- process during energy transfer (energy transfer stage);

— 停機程序(停機階段)

- process of shutdown (shutdown stage).

EV 供電設備與車輛同步控制程序彼此互用。以下訊號及資訊針對同步使用：

The EV supply equipment and the EV synchronize control process with each other. The following signals and information are used for the synchronization:

— 訊號經由導引線路

- signals through the pilot wire circuit;

— 參數透過數位通訊

- parameters through the circuits for digital communication;

— 如量測 B 側目前之電壓及電流位準，透過電路數位通訊。

- measurement values such as present current and voltage at side B, through the circuits for digital communication.

EV 供電設備與車輛維持規定的時間侷限並控制時間，確保平穩的充電控制及操作。

The EV supply equipment and the EV preserve specified time constraints and control timings for ensuring smooth energy transfer control and operation.

FPT 序列圖示為系統特性並說明於附錄 AA、附錄 BB 及附錄 CC。數位通訊參數、格式及其他數位通訊要求規定於 IEC 61851-24。

FPT sequence diagrams are system specific and described in Annex AA, Annex BB, and Annex CC. Digital communication parameters, formats, and other digital communication requirements are specified in IEC 61851-24.

**GG.3.2 初始化之程序說明 GG.3.2 Description of the initialization stage**

在此程序中，車輛與 EV 供電設備交換彼此作為電能傳輸控制之操作限制及相關參數。如電壓限制值、最大充電電流等，訊息亦傳送至彼此。開始電能傳輸階段，量測 B 側電壓以查核電池組與 EV 供電設備是否連接，及結束能力傳輸後，電池組與 EV 供電設備是否斷開。EV 供電設備應不繼續進行次一階段之通訊會話，除非其查證與車輛之相容性。相容性查核後，EV 供電設備執行電纜查核階段，車輛端插頭在電纜檢查階段之前被鎖定。

In this stage, the EV and the EV supply equipment exchange their operational limitations and relevant parameters for energy transfer control. Messages, such as rated maximum voltages,rated maximum currents, etc. are also transferred to each other. The present voltage at side B is measured for checking whether the battery system and the EV supply equipment are connected before the start of the energy transfer stage and whether the battery system and the EV supply equipment are disconnected after the end of the energy transfer stage. The EV supply equipment shall not proceed with the next stage of the communication session unless it verifies the compatibility with the EV. After the compatibility check, the EV supply equipment conducts the cable-check phase. The vehicle connector is latched before the cable-check phase.

**GG.3.3 能量傳送之程序說明 GG.3.3 Description of the energy transfer stage**

在此程序中，車輛在整個電能傳輸程序持續送出目標電流或電壓之設定值至 EV 供電設備，採以下兩個演算法之一。

In this stage, the EV continues to send a target current or target voltage values to the EV supply equipment throughout the energy transfer stage. Either of the following two algorithms is taken.

– 車輛電池組可使用 CCM 充電，伴隨車輛為主站(master)及 EV 供電設備為從屬站(slave)。

a) CCM

- The battery system can be charged using CCM with the EV as master and the EV supply equipment as slave.

— EV 供電設備接收整個能量轉移程序之車輛要求的目標電流值(命令值)。

- The EV supply equipment receives the target current of the EV, throughout the energy transfer stage.

—EV 供電設備考慮 EV 的目標電流來設定目標電流 EV 供電設備的電流，並控制 B 側的電流

- The EV supply equipment considers the target current of the EV to set the target current of the EV supply equipment, and control the present current at side B.

— EV 目標電流定期傳達 EV 供電設備，依系統要求。

- The target current of the EV is communicated to the EV supply equipment at regular intervals according to the system requirements.

- EV 供電設備控制 B 側目前電流，響應 EV 目標的電流。

- The EV supply equipment controls the present current at side B, responding to the target current of the EV.

— 車輛電池組可使用 CVM 充電，伴隨車輛為主站(master)及 EV 供電設備為從屬站(slave)。

b) CVM

- The battery system can be charged using CVM with the EV as master and the EV supply equipment as slave.

— EV 供電設備接收 EV 目標電流之能量轉移程序。

- The EV supply equipment receives the target voltage of the EV, throughout the energy transfer stage.

- EV 供電設備考慮 EV 的目標電壓來設定目標電壓，EV 供電設備的電壓，並控制 B 側的目前電壓。

- The EV supply equipment considers the target voltage of the EV to set the target voltage of the EV supply equipment, and control the present voltage at side B.

—依系統要求以 EV 目標電壓在規則的時間間隔通知 EV 供電設備。

- The target voltage the EV is communicated to the EV supply equipment at regular intervals according to the system requirements.

- EV 供電設備控制 B 側的目前電壓，響應電動車的目標電壓。

- The EV supply equipment controls the present voltage at side B, responding to the target voltage of the EV.

**GG.3.4 正常停機之程序說明 GG.3.4 Description of the shutdown stage**

電能傳輸階段完成後，正常停機階段容許 EV 供電設備回到通訊會話前之狀態。車輛或 EV 供電設備指明能量傳遞階段結束時， EV 供電設備減少 B 側當前電流至零。車輛側接觸器於 B 側電流接近零時斷開。EV 供電設備或車輛解閂車輛端插頭，除非在 B 側當前電壓之 DC+與 DC-間之電壓小於 60 Vdc (參照 6.3.1.107)。

After completion of the energy transfer stage, the shutdown stage allows the EV supply equipment to return to the conditions prior to the communication session. When the EV or EV supply equipment indicate the end of the energy transfer stage, the EV supply equipment reduces the present current at side B to 0 A DC. The EV disconnection device open at near zero present current at side B. The EV supply

equipment or the EV unlatches the vehicle connector only if the present voltage at side B between DC+ and DC– is ≤ 60 V DC (see 6.3.1.107).

## 附錄 HH
## Annex HH
## (參考)
## (informative)
## 接觸電流及接觸脈衝電流 Touch current and touch impulse current

### HH.1 一般 General

附錄 HH 提供關於 Y 電容對 EV 及 EV 供電設備於本標準規定試驗的影響資訊。

Annex HH provides information about the influence of Y-capacitances on the EV and the EV supply equipment to tests as specified in this document.

8.105.1 涵蓋 EV 供電設備之 Y-電容限制值的符合性於。

Compliance to the Y-capacitance limit of the EV supply equipment is covered by 8.105.1.

8.101.4 涵蓋穩態接觸電流及接觸脈衝電流之限制的符合性。

Compliance to the limitation of steady state touch current and touch impulse current is covered by 8.101.4.

EV 中強制之總 Y-電容限制值的量測指引規定於 ISO 17409:2020 附錄 A。

Guidance on the measurement of the mandatory total Y-capacitance limit in the EV is specified in ISO 17409:2020, Annex A.

圖 HH.1 EV 及 EV 供電設備為實現電能傳輸而相互連接理想/等效電路。假設 PEC 為理想電壓源。圖 HH.1 等效電路代表 EV 供電設備 PEC、EV/可充電儲能系統（RESS）及電纜，因為這些會互相影響。

Figure HH.1 shows an ideal/equivalent circuit of an EV and an EV supply equipment connected to each other for the purpose of energy transfer. The PEC is assumed to be an ideal voltage source. The equivalent circuit in Figure HH.1 represents the PEC in the EV supply equipment, the EV/RESS and the cabling for this analysis, because they influence each other.

表 HH.1 列出設計驗證的關鍵值及範例值。EV 供電設備 B 側之額定最大電壓由表 HH.1 的 VDC 指定。

Table HH.1 shows key(s) and exemplary values for design verification. The rated maximum voltage at side B of the EV supply equipment is specified by VDC in Table HH.1.

圖 HH.1 及表 HH.1 可用於評估這些權衡，並可用於 EV 供電設備的設計驗證。圖 HH.2 顯示等效電路的簡化版本。於圖 HH.4 依表 HH.1 繪製推導結果，包括穩態接觸電流 $I_H$（頂部點）及接觸脈衝電流 $I_{RMS}$,$T_{3RC}$（脈衝電流點）。這些圖示有助於依本標準規定的試驗對供電設備進行評估。Figure HH.1 and Table

HH.1 allow for an evaluation of these trade-offs and can be used for design verification of the EV supply equipment. A simplification of the equivalent circuit is shown in Figure HH.2. In Figure HH.4, the results of the derivation have been plotted for steady-state touch current IH (top dot), and touch impulse current IRMS,T3RC (impulse current dot) as indicated by Table HH.1. supply equipment to tests as specified in this document.

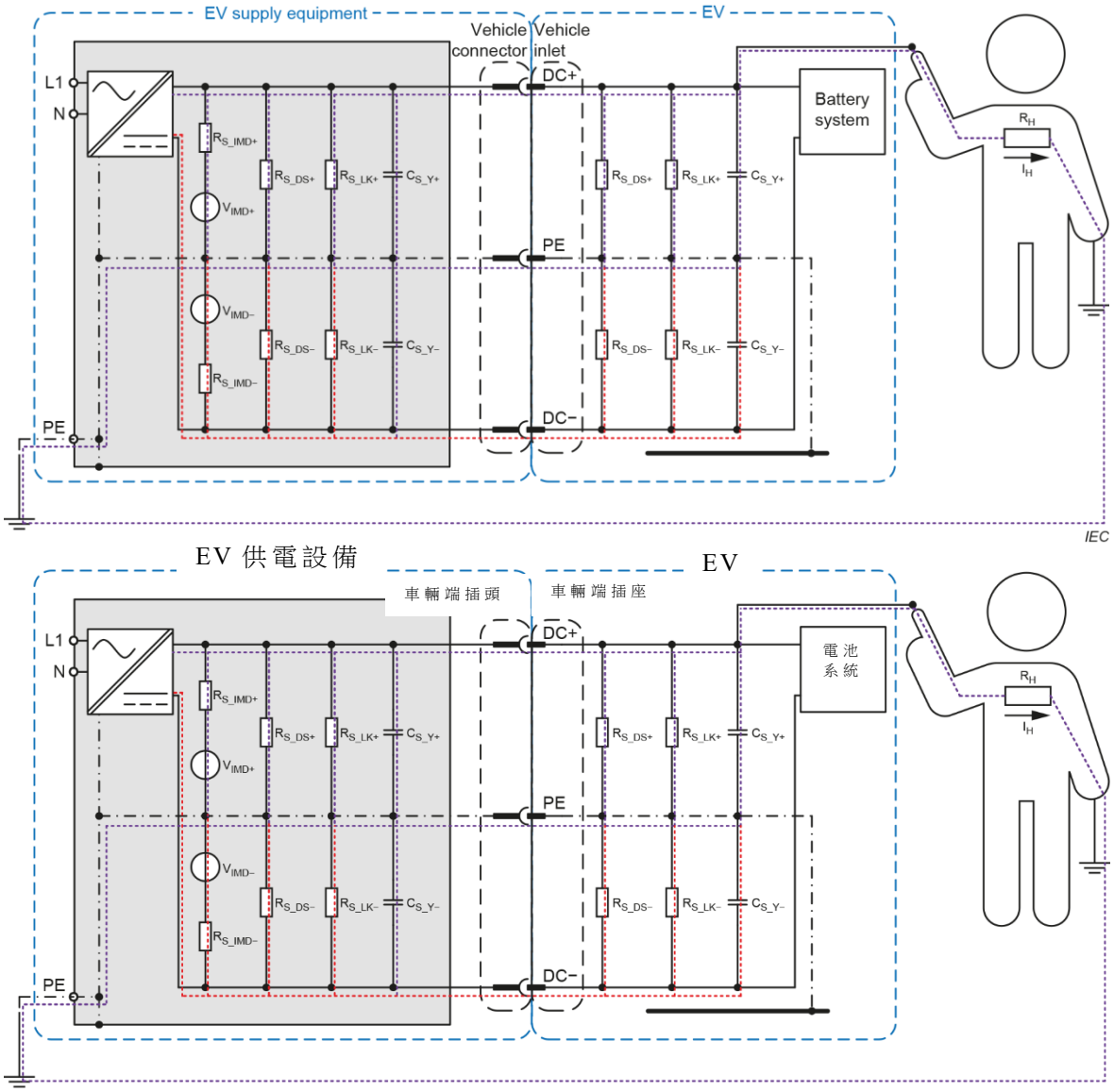



圖 HH.1 –EV 及 EVSE 等效電路

Figure HH.1 – EV and EV supply equipment equivalent circuit

$R_{DS+_EVSE}$ / $RD_{S-_EVSE}$ 表示 EV 供電設備設計所包含的電阻，例：電壓量測電路、放電電阻、具有已知漏電流的元件等。對於 EV 而言，$R_{DS+_EV}$ / $R_{DS-_EV}$ 具有類似的功能。本範例使用 IMD 具有內部量測電路以 $R_{IMD+}$ / $R_{IMD-}$ 表示及一個連接至保護性導體的電壓源，其最大電壓為 50V V DC，以 $V_{IMD}$ 表示。亦可以考慮其他 IMD 實現方案。RDS+_EVSE/RDS-_EVSE represent the resistances in

the EV supply equipment that are part of the design, for example: voltage measurements, discharge resistors, components with a known leakage, etc. Equally for the EV, RDS+_EV/RDS-_EV have a similar function. The IMD used in this example has an internal measurement circuit represented by RIMD+ /RIMD- and a voltage source connected to the protective conductor, with a maximum voltage of 50 V DC, represented by VIMD. Other IMD implementations may be considered.

EV 供電設備從 DC+/DC－連接至保護性導體或其他電路 Y 電容 $C_{Y+_EVSE}/C_{Y-_EVSE}$，依 8.105.1 其最大限制為 500 nF。

The Y-capacitances CY+_EVSE/CY-_EVSE in the EV supply equipment that bridge from DC+/DC– to the protective conductor or any other circuit are specified according to 8.105.1 by a maximum limit of 500 nF for CY+_EVSE/CY-_EVSE.

對於 EV 之 Y 電容（表示為 $C_{Y+_EV}/C_{Y-_EV}$）的限制規定於 ISO 17409:2020 第 9.9 條。

For the EV, the limits for Y-capacitances (indicated by CY+_EV/CY-_EV), are specified in ISO 17409:2020, 9.9.

由於各種元件老化，EV 供電設備 DC+/DC－及保護性導體間可能產生額外漏電流，可用 $R_{LK+_EVSE}/R_{LK-_EVSE}$ 來建模；對於 EV，則用 $R_{LK+_EV}/R_{LK-_EV}$ 來建模。

Due to aging of various components, additional leakage current between DC+ and DC– and the protective conductor may be modelled by RLK+_EVSE/RLK-_EVSE for the EV supply equipment,and by RLK+_EV/RLK-_EV for the EV.

若此漏電主要為非對稱性，則為脈衝電流及穩態接觸電流最嚴重情況。例：表 HH.1 所示，$R_{LK+_EV}$ 具有高阻值，而 $R_{LK-_EV}$ 具有低阻值。假設因兩個獨立故障，一般人可能同時接觸 DC+與保護性導體。

If this leakage is mainly asymmetrical, this is the worst case for the impulse current and the steady state touch current. For example, by having a high value of resistance for RLK+_EV and a low value for RLK-_EV, as shown in Table HH.1. It is assumed that, as a consequence of two independent faults, a person/human body may touch because it is assumed that the ordinary person may touch DC+ and the protective conductor.

人體以電阻 $R_H$ 表示，其數值依 IEC 60479-1:2018 之 10 的手對手最低電阻規定。此路徑模擬人體一手接觸因 B 側纜線組故障而暴露的帶電部件，另一手接觸車輛端插頭、EV 或 EV 供電設備的裸露導電部件。

The human body is represented as a resistor $R_H$, with a value according to the lowest hand-tohand resistance, as specified in IEC 60479-1:2018, Table 10. This pathway is consistent with touching a live part that has become accessible due to a failure of the side B cable assembly with one hand, and an exposed conductive parts of the vehicle connector, EV or EV supply equipment with the other hand of the human body.

表 HH.1 – 關鍵及範例值之設計查證數值

Table HH.1 – Key(s) and exemplary values for design verification

| 數量符號<br>Quantity symbol | 數量名稱<br>Quantity name | 計算式<br>Calculation formula | 值<br>Value | 單位<br>Unit |
|---|---|---|---|---|
| $V_{DC}$ | 最高電壓 B 側<br>Maximum voltage at side B | | 920 | V |
| $V_{IMD+}$ | IMD 量測電壓正+<br>IMD measurement voltage + | | 50 | V |
| $V_{IMD-}$ | IMD 量測電壓負-<br>IMD measurement voltage – | $= -V_{IMD+}$ | -50 | V |
| $R_{IMD+}$ | IMD 量測電阻+<br>IMD measurement resistance + | | 120,000E+03 | Ω |
| $R_{IMD-}$ | IMD 量測負-<br>IMD measurement– | | 120,000E+03 | Ω |
| $R_{DS+_EVSE}$ | 設計電阻 EVSE+<br>Designed resistance EVSE + | | 2,000E+06 | Ω |
| $R_{DS-_EVSE}$ | 設計電阻 EVSE–<br>Designed resistance EVSE – | | 2,000E+06 | Ω |
| $R_{LK+_EVSE}$ | EVSE 洩漏電阻+<br>Leakage resistance EVSE + | | 100,000E+06 | Ω |
| $R_{LK-_EVSE}$ | EVSE 洩漏電阻–<br>Leakage resistance EVSE– | | 100,000E+06 | Ω |
| $R_{DS+_EV}$ | 設計電阻 EV+<br>Designed resistance EV+ | | 100,000E+06 | Ω |
| $R_{DS-_EV}$ | 設計電阻 EV–<br>Designed resistance EV– | | 100,000E+06 | Ω |
| $R_{LK+_EV}$ | EV 洩漏電阻+<br>Leakage resistance EV+ | | 100,000E+06 | Ω |

| | | | | |
|---|---|---|---|---|
| $R_{LK-_EV}$ | EV 洩漏電阻–<br>Leakage resistance EV– | | 112,000E+03 | Ω |
| $R_H$ | 人體電阻表示<br>Human body representation | | 575 | Ω |
| $C_{Y+EV}$ | Y-電容 EV +<br>Y capacitance EV + | | 869,57E-09 | F |
| $C_{Y-EV}$ | Y-電容 EV–<br>Y capacitance EV – | | 869,57E-09 | F |
| $C_{Y+EVSE}$ | Y-電容 EVSE+<br>Y capacitance EVSE + | | 500,00E-09 | F |
| $C_{Y-EVSE}$ | Y-電容 EVSE–<br>Y capacitance EVSE – | | 500,00E-09 | F |
| $C_{TOT}$ | 總 Y-電容系統<br>Total Y capacitance system | $= C_{y+EV} + C_{Y-EV} + C_{Y+EVSE} + C_{Y-EVSE}$ | 2,74E-06 | F |
| $R_{SYS+}$ | 系統電阻+<br>System resistance + | $= 1/ (1/ R_{DS+_EVSE}) + (1/ R_{LK+_EVSE}) + (1/ R_{DS+_EV}) + (1/ R_{LK+_EV}) + (1/ R_H)$ | 575 | Ω |
| $R_{SYS-}$ | 系統電阻–<br>System resistance – | $= 1/ (1/ R_{DS-_EVSE}) + (1/ R_{LK-_EVSE}) + (1/ R_{DS-_EV}) + (1/ R_{LK-_EV})$ | 105,836E+03 | Ω |
| $R_{SYS+NH}$ | $R_{SYS+}$無人體<br>$R_{SYS+}$ without human | $= 1/ (1/ R_{DS+_EVSE}) + (1/ R_{LK+_EVSE}) + (1/ R_{DS+_EV}) + (1/ R_{LK+_EV})$ | 1,887E+06 | Ω |
| $R_{SYS}$ | 總系統電阻<br>Total system resistance | $= 1/ ((1/ R_{SYS+}) + (1/ R_{SYS-}))$ | 572 | Ω |
| $R_{IMD}$ | 總 IMD 電阻<br>Total IMD resistance | $= 1/ ((1/ R_{IMD+}) + (1/ R_{IMD-}))$ | 60,000E+03 | Ω |
| $R_{SYS_NH}$ | $R_{SYS}$無人體<br>$R_{SYS}$ without human | $= 1/ ((1/ R_{SYS+_NH}) + (1/ R_{SYS-}))$ | 100,215 | Ω |

| | | | | |
|---|---|---|---|---|
| $R_{SYS_NH+IMD}$ | $R_{SYS}$包括 IMD 電阻<br>$R_{SYS}$ including IMD resistance | = 1/ ((1/ $R_{SYS_NH}$ ) + (1/ $R_{IMD+}$ ) + (1/ $R_{IMD-}$ )) | 37,530 | Ω |
| $V_1$ | 戴維寧等效電壓 $V_1$<br>Thevenin equiv. $V_1$ | = $V_{DC}$ × ($R_{SYS-}$ / ($R_{SYS+}$ + $R_{SYS-}$ )) | 915 | V |
| $V_2$ | 戴維寧等效電壓 $V_2$<br>Thevenin equiv. $V_2$ | = $V_{IMD-}$ + ($V_{DC}$ −$V_{IMD+}$ −$V_{IMD-}$ )× ($R_{IMD-}$ / ($R_{IMD+}$ + $R_{IMD-}$ )) | 410 | V |
| $V_{1_NH}$ | $V_1$ 無人體<br>$V_1$ without human | = $V_{DC}$ × ($R_{SYS-}$ / ($R_{SYS+NH}$ + $R_{SYS-}$ )) | 48.86 | V |
| $V_{PE}$ | $V_{PE}$ Vs $V_{DC-}$<br>$V_{PE}$ vs $V_{DC-}$ | = $V_2$ + ($V_1$ −$V_2$ )× ($R_{IMD}$ / ($R_{SYS}$ + $R_{IMD}$ )) | 910,26 | V |
| $V_{PE_NH}$ | VPE 無人體<br>VPE without human | = $V_2$ + ($V_{1_NH}$ −$V_2$ )× ($R_{IMD}$ / ($R_{SYS_NH}$ + $R_{IMD}$ )) | 274,76 | V |
| $I_H$ | 穩態人體電流<br>Steady state body current | = ($V_{DC}$ −$V_{PE}$ ) / $R_H$ | 16,933E-03 | A |
| $I_{PK}$ | 峰值人體電流<br>Peak body current | = ($V_{DC}$ −$V_{PE_NH}$ ) / $R_H$ | 1,122E+00 | A |
| $I_{PK_RMS}$ | RMS 人體電流<br>RMS body current | = $I_{PK}$ / √6 | 0.458 | A |
| $T_{3RC}$ | 脈衝持續時間<br>Duration of impulse | = 3 × (1/ ((1/ $R_{SYS}$ ) + (1/ $R_{IMD}$ )))×$C_{TOT}$ | 4,65E-03 | s |
| E | 能量通過人體<br>Energy through body | =(($V_{DC}$-$V_{PE_NH}$)² - ($V_{DC}$-$V_{PE}$)²) ×0.5×$C_{TOT}$ | 570,08E-03 | J |
| $T_{IMD}$ | 最小 IMD 反應時間<br>Minimum IMD reaction time | = 15 × $R_{IMD}$ ×$C_{TOT}$ | 2,465 | S |

電容 $C_{Y+_EVSE}$、$C_{Y-_EVSE}$、$C_{Y+_EV}$、$C_{Y-_EV}$併聯形成 $C_{TOT}$。

The capacitances $C_{Y+_EVSE}$, $C_{Y-_EVSE}$, $C_{Y+_EV}$, $C_{Y-_EV}$, are paralleled to form $C_{TOT}$.

連接至 DC+及 DC－之電阻可分別並聯組成 $R_{SYS+}$及 $R_{SYS-}$，除 IMD 外。不包含人體 $R_{SYS+}$定義為 $R_{SYS+NH}$。系統對保護性導體總電阻（不含 IMD 量測電阻）表示為 $R_{SYS}$。IMD 量測電路的總電阻表示為 $R_{IMD}$。The resistances to DC+ and DC– can be put in parallel to form RSYS+, and RSYS-, except for the IMD. RSYS+

without the human body representation is defined by RSYS+NH. The total resistance of the system to the protective conductor, without the measurement resistance of the IMD, is represented by RSYS. The total resistance of the IMD measurement circuit is represented by RIMD.

IMD 僅量測系統之總電阻，不包含其自身與保護性導體間的電阻。此數值以 $R_{SYS_NH}$ 表示，為不包含人體時 DC+至保護性導體的電阻。此量測值表示 IMD 觸發錯誤停機的判定條件，該條件設定為固定數值，例：100 kΩ。The IMD only measures the total resistance of the system, excluding its own resistance to the protective conductor. This value is represented by RSYS_NH, without the human body representation from DC+ to the protective conductor. This measurement represents when the IMD will trigger an error shutdown, set to a fixed level, for example, 100 kΩ.

DC+/DC－及保護性導體間之總電阻(包含 IMD 量測電阻)以 $R_{SYS_NH+IMD}$ 表示。The total resistance from DC+ and DC– combined to the protective conductor, including the measurement resistance of the IMD, is represented by $R_{SYS_NH+IMD}$.

利用這些計算值，我們可以確定在加入人體前後之系統的電壓，這使我們能夠計算人體所承受的脈衝電流與穩態漏電接觸電流。Using these calculated values, we can determine the voltages before and after the human body representation is added to the system. This allows for the calculation of the impulse current and the steady-state leakage touch current that the human body representation is exposed to.

圖 HH.2 顯示圖 HH.1 簡化電路。圖 HH.3 顯示圖 HH.1 電路的戴維寧等效電路。Figure HH.2 shows a simplified circuit of Figure HH.1. Figure HH.3 shows the Thevenin equivalent circuit of the circuit shown in Figure HH.1.

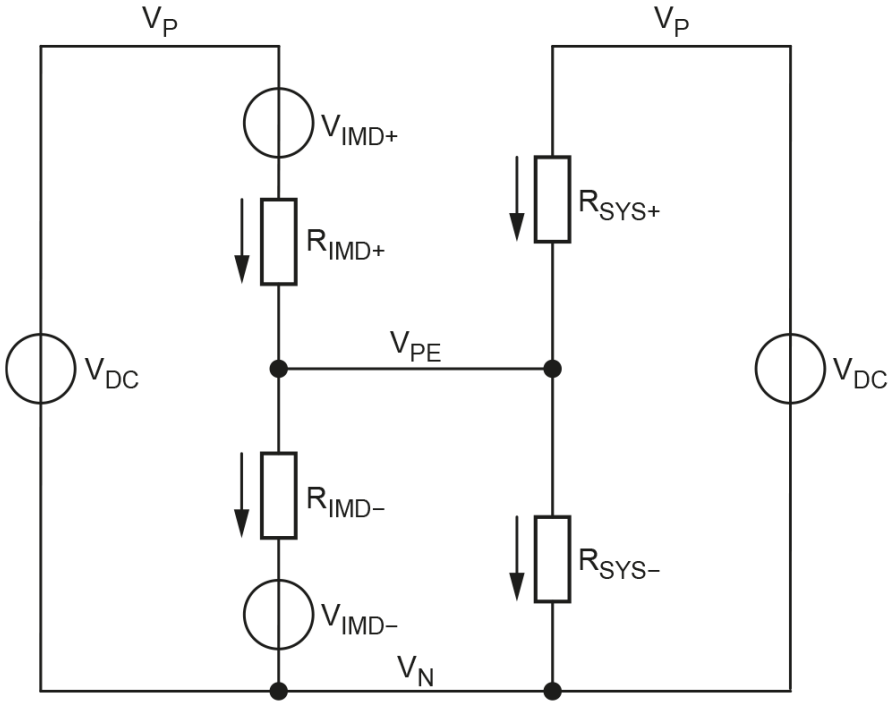


圖 HH.2 – 圖 HH.1 電路的簡化電路圖

Figure HH.2 – Circuit diagram simplification of the circuit in Figure HH.1

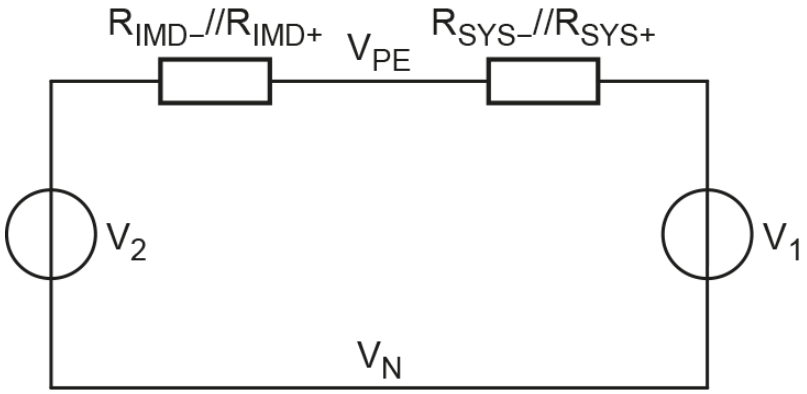



圖 HH.3 顯示圖 HH.1 電路的戴維寧等效電路。

Figure HH.3 –Thevenin equivalent circuit diagram of the circuit in Figure HH.1

透過計算 IMD 中間電壓 $V_2$ 及系統其餘部分的電壓 V1，即可確定保護性導體及 DC－間的電壓。當系統中未加入人體時，則可使用 $V_{1_NH}$。

By calculating the intermediate voltage $V_2$ for the IMD and $V_1$ for the rest of the system, the voltage between the protective conductor and DC– can be determined. When the human body representation is not added to the system, $V_{1_NH}$ can be used.

當已知 DC+及 $V_{PE}$ 間之電壓時，即可推導出穩態漏電流 $I_H$。此數值可用圖 HH.4 的漏電流點（頂部點）表示。

When the voltage between DC+ and $V_{PE}$ is known, the steady state leakage current IH can be derived. This value can be represented by the leakage current dot (top dot) in Figure HH.4.

當人體首次加入系統時，峰值電流 $I_{PK}$ 可利用未加入人體時 DC+及保護性導體電壓（$V_{PE_NH}$，即 $V_{1_NH}$）來計算，因為此電壓即為 Y 電容總值 $C_{TOT}$ 充電至的電壓。

The peak current $I_{PK}$ that will flow on when the human body representation is initially added to the system can be calculated using the voltage between DC+ and VPE_NH when the human body representation is not added to the system ($V_{1_NH}$), because this is what Y-capacitances $C_{TOT}$ have been charged up to.

依 IEC 60479-2:2017 之 11 條，於測定脈衝電流時，需計算 RMS 電流及持續時間。$I_{RMS}$ 電流依 IEC 60479-2:2017 之 11.2.2，由峰值電流 $I_{PK}$ 除$\sqrt{6}$ 計算得出。

When determining the impulse current according to IEC 60479-2:2017, Clause 11, the RMS current and duration need to be calculated. The $I_{RMS}$ current is determined by dividing IPK by $\sqrt{6}$ as described by IEC 60479-2:2017, 11.2.2.

脈衝持續時間 $T_{3RC}$，由人體放電電流所致，透過系統總電阻 $R_{SYS}$（包含 IMD 量測電阻 $R_{IMD}$）與系統總電容 $C_{TOT}$ 之組合計算得出。

The duration of the impulse, $T_{3RC}$, as a consequence of the discharge current through the human body representation, is calculated using the resistance of the

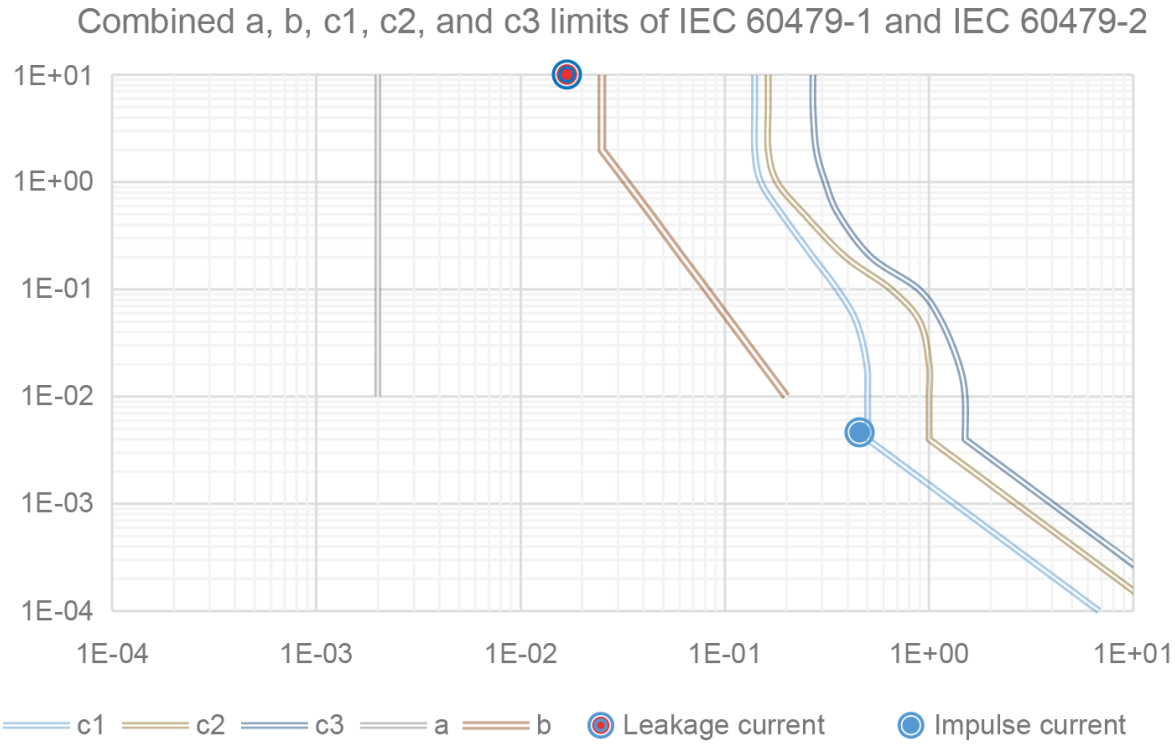
whole system ($R_{SYS}$), including the measurement resistance of the IMD ($R_{IMD}$) in combination with the total capacitance of the system ($C_{TOT}$).

$I_{RMS}$ 及 $T_{3RC}$ 組合可繪製為圖 HH.4 脈衝電流點（底部點）。

The combination of $I_{RMS}$ and $T_{3RC}$ can be plotted as the impulse current dot (bottom dot) in Figure HH.4.

為補充資訊，可依加入人體前後的電壓及系統總電容 $C_{TOT}$ 計算流經的能量 E。此外，最小 IMD 反應時間可依 IMD 量測電路電阻 $R_{IMD}$ 及系統總電容 $C_{TOT}$ 計算。此計算僅代表理想狀況下的量測，實際因電壓波動、干擾及其他因素，IMD 可能需進行超過三次測量，從而延長判定系統對保護性導體電阻所需的時間。

As additional information the energy E that has flown can be calculated based on the voltage before and after adding the human body representation and using the total capacitance of the system $C_{TOT}$. Also, the minimum IMD reaction time can be calculated based on the IMD measurement circuit resistance $R_{IMD}$ and the total capacitance of the system $C_{TOT}$. This only represents a measurement under perfect conditions. Voltage fluctuations, interference and other factors would require the IMD to take more than 3 measurements, therefore, extending the time needed to determine the resistance of the system to the protective conductor.



IEC 60479-1 及 IEC 60479-2 之 a、b、c1、c2 及 c3 組合限制值

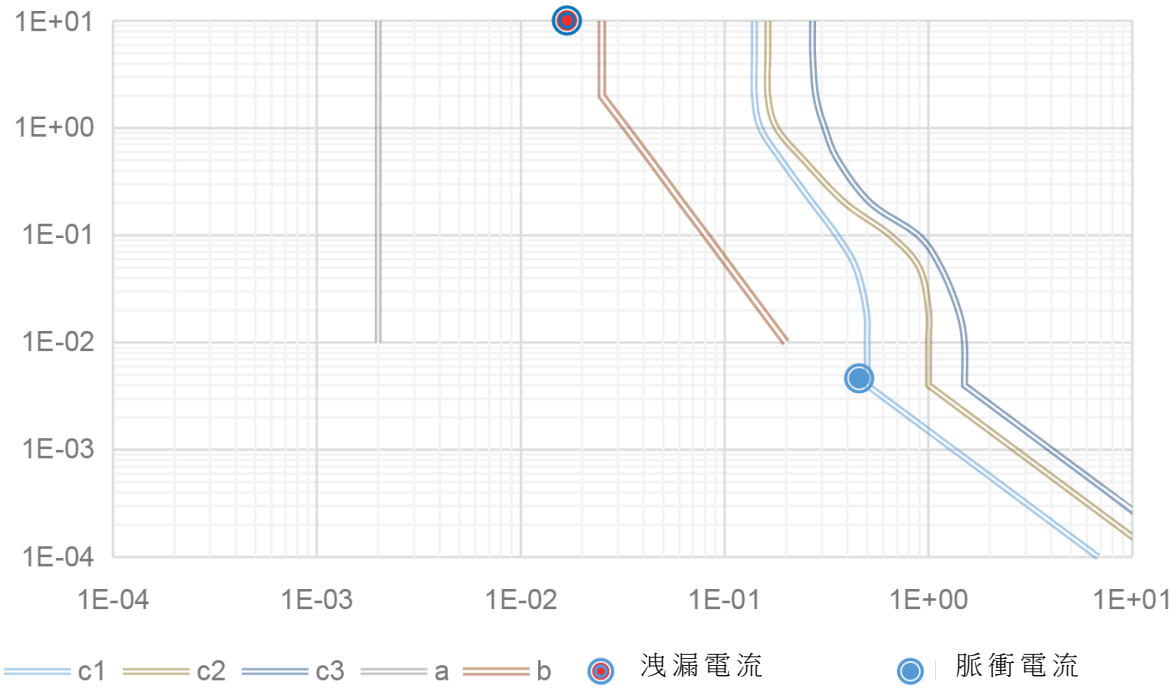



圖 HH.4 – IEC 60479 系列標準關於洩漏電流及脈衝電流之限制規定

Figure HH.4 – Leakage current and impulse current in relation to limits in IEC 60479 series

**HH.2 電流通過之人體阻抗 Current through the human body**

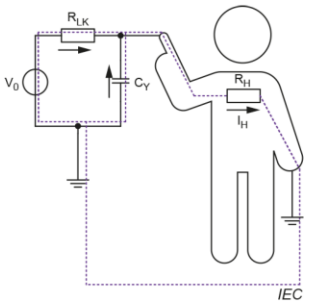
當基本保護及故障保護同時失效時，B 側的某個帶電部件可能變得可接觸，當人員接觸該帶電部件、EV 及 EV 供電設備的其他裸露導電部件（包括保護性導體）時，可能會暴露於危險之電擊下。此情境的危害來自於 Y 電容產生的脈衝電流，及 EV/EV 供電設備之電阻所造成的漏電電流。這些元件構成了從 B 側帶電部件（DC+/DC－）至保護性導體間的絕緣橋接。

In case of a simultaneous failure of basic protection and fault protection, one of the side B live parts can become accessible, a person/human body can be exposed to a hazardous electric shock when touching the live part and other exposed conductive parts of the EV and EV supply equipment, including the protective conductor. The hazards associated with this scenario are formed by the impulse current due to the Y-capacitors and leakage currents due to resistances in the EV and EV supply equipment. These elements are bridging the insulation between the side B live parts (DC+/DC–) and the protective conductor.

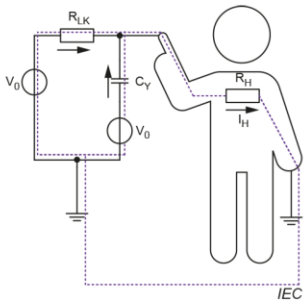
接觸脈衝電流取決於 Y 電容儲存之能量釋放方式：是透過（人體）釋放，而非系統中各元件實際儲存的總能量。在假設 $R_{LK} >> R_H$ 情況下，圖 H.5 所有電路對人體的影響相同，因為電流隨時間的變化一致。然而，電容實際儲存的能量並不相同。

The touch impulse current is determined by the manner that the stored energy in

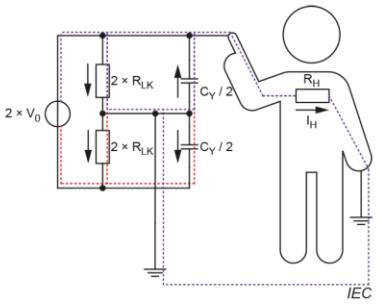
the Y-capacitors is released: through (a representation of) the human body, not the actual energy stored in the various elements of the system. Assuming RLK >> RH, all the circuits depicted in Figure HH.5 have the same effects on the representation of the human body, because the current flow over time is identical. However, the actual energy stored in the capacitors is not identical.



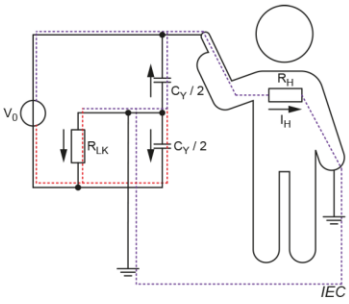

a) Example 1



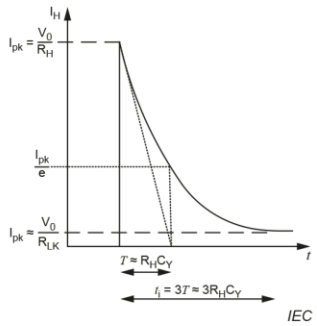

b) Example 2



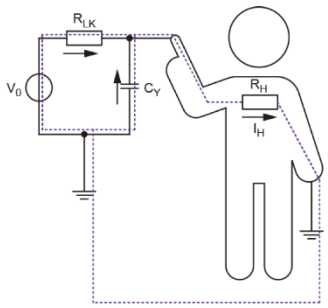

c) Example 3



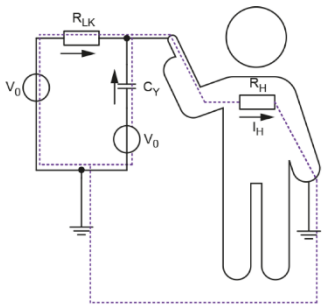

d) Example 4



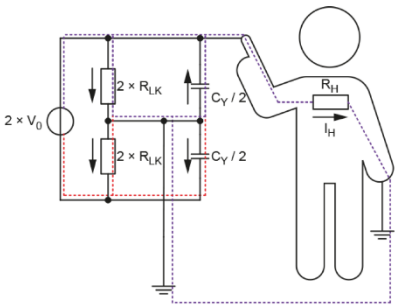

e) Impulse and leakage current



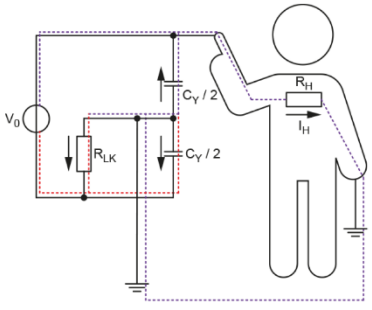

(a)範例 1



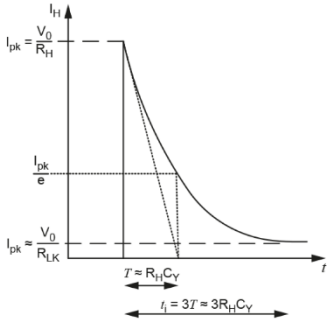

(b)範例 2




(c)範例 3




(d)範例 2




(e)脈衝及洩漏電流

圖 HH.5 – 脈衝電流及洩漏電流經過人體之等效電路範例

Figure HH.5 – Examples of circuits with equivalent impulse current and leakage current through a human body

**HH.3 條件式依閾值** HH.3 Conditional dependent thresholds

在與 DC+及 DC－隔離電路之某些元件可能會跨接絕緣/隔離。例：EMC 濾波器可能設有從帶電部件連接至保護性導體 Y 電容，電壓量測可能會使用橫跨絕緣之高阻值的電阻，或 EV／電池系統可能在車輛電源電路及車體底盤間具有寄生電容等。這些元件可能流動電流會構成危害，因此必須加以限制，以防止有害的電擊。流過此類電容的電流因脈衝電流而構成危險，而接地電阻所產生的電流則因持續流動而構成危險。In circuits separated from DC+ and DC–, some components may bridge that insulation/separation. For example: the EMC filter may have Y-capacitors from live parts to the protective conductor, or a voltage measurement will use some high-value resistances across the insulation, or an EV/battery system will have a parasitic capacitance between the vehicle power supply circuit and the vehicle chassis, etc. The currents that can flow through these components can form a hazard, and therefore need to be limited to protect against harmful electric shock. The current flowing through such capacitances constitutes a hazard due to the impulse current, and the resistances to ground constitutes a hazard due to the continuous current flowing through them.

針對不同類型的操作或故障，使用不同的限制值。於 IEC 61140:2016 之 5.2.7 條，接觸脈衝電流所產生的漏電流及能量被限制如下：

For different types of operation or failures, different limits are used. In IEC 61140:2016, 5.2.7, the leakage current and energy due to a touch impulse current is limited to the following:

— 低於感知之閾值：正常操作下，0.75 mA AC 或 2 mA DC 及 5 $\mu$J。

– less than the threshold of perception: 0,75 mA AC, or 2 mA DC and 5 µJ, under normal operation;

— 低於肌肉反應之閾值：在異常或(單一)故障狀態下 3.5 mA AC 或 10 mA DC 及 0,5 mJ。

– less than the threshold of muscular reaction: 3,5 mA AC, or 10 mA DC and 0,5 mJ under abnormal or (single) fault conditions.

針對基本保護與故障保護於 DC 電路與普通人間失效的情況，本標準補充如下規定：

To this, this document, due to failure of basic and fault protection between the DC circuit and the ordinary person, adds the following:

— 因漏電流引起的強烈無意識之肌肉收縮閾值：依 IEC 60479-1:2018 的曲線 b；

– less than the threshold of strong involuntary muscular contractions: curve b in

IEC 60479-1:2018 due to leakage currents;

因接觸脈衝電流引起心室顫動閾值：依 IEC 60479-1:2018 的曲線 c1 或 IEC 60479-2:2019。

– less than the threshold of ventricular fibrillation: curve c1 in IEC 60479-1:2018 or IEC 60479-2:2019 due to the touch impulse current.

其他標準可能依風險建議不同的閾值。

Other standards may recommend different thresholds, depending on the risk.

例：家用電器的情況下，人在正常操作時觸摸家用電器的金屬外殼，不應感受到可察覺的電流。若保護性導體失效，可能會感覺到微小電流，但不應引起強烈肌肉反應。若在此之外，帶電部件及家用電器之底盤／外殼間也發生失效，形成第二重失效，則可能會有危險的觸電電流流動，直到固定裝置 RCD 於適當時間內或更短時間內切斷電源，以防止心室顫動。

For example: In the case of household appliances, a person/human body touching the metal case of a household appliance under normal operation should not be exposed to a perceivable current. If the protective conductor fails, a small current may be perceived, but this should not result in a strong muscular reaction. If, in addition to that, there is a failure from the live part to the chassis/enclosure of the household appliance, resulting in a second fault, a hazardous touch current may flow until an RCD in the fixed installation disconnects the supply in the appropriate time or less to prevent ventricular fibrillation.

目前尚無適用於 DC RCD，而 EV 供電設備 B 側帶電部件所使用的電壓可達 ≤ 1500 V DC，這需要約 1 ms 極快反應時間，但對於電機式斷開裝置而言技術上不可行。因此，唯一可行的措施是透過限制跨接絕緣／隔離至保護性導體及其他電路元件阻抗所供應的接觸電流及接觸脈衝電流。Currently, there are no RCDs for DC, and the voltages used at side B live parts of EV supply equipment can be ≤ 1 500 V DC, which would require much faster reaction times in the order of approximately 1 ms, which are technically not feasible for electro-mechanical disconnection devices. Therefore, the only available provision is by limiting the touch current and touch impulse current supplied by the impedance of the components bridging the insulation/separation to the protective conductor and other circuits.

**HH.4 B 側帶電部件及保護性導體間因洩漏電流的危害** HH.4 Hazards due to leakage between side B live parts and the protective conductor

由於老化（受污染、濕氣等影響，隨產品壽命而產生），會產生超出設計元件的額外漏電流。因此，需要確保這些跨接元件及額外漏電流的總和保持在 EV 供電設備設計的範圍內。IMD 可量測 B 側帶電部件至保護性導體的總阻抗，從而能夠偵測系統是否無法符合設計限制。

Due to aging (the influence of contamination, moisture, etc., over the lifetime of a product), there will be leakage additional to that of the designed components.

There can be a need to ensure that this combination of bridging components and additional leakage stay within the bounds to which the EV supply equipment has been designed. An IMD measures the combined resistances of the side B live parts to the protective conductor and will therefore be able to detect when the system is not able to meet the designed limitations.

於 ISO 6469-3:2021 之 6.3.3 條，若接觸電流限制 25 mA 以下，且因 Y 電容產生的接觸脈衝電流能量限制在 0.2 J 以內，EV 可使用基本絕緣。

In ISO 6469-3:2021, 6.3.3, the EV can use basic insulation if the touch current is limited to 25 mA and the energy of the touch impulse current due to the Y-capacitors is limited to 0,2 J.

EV 設計可以透過限制系統的總電容來限制因 Y 電容產生的接觸脈衝電流能量，但必須考慮到 EV 供電設備依 8.105.1 規定，對 DC+及 DC－最大電容限制為 1 μF 或 500 nF。隨著老化，電容可能會減少，但這不會構成額外危害。EV 供電設備設計不能指望 EV 會限制因 Y 電容產生的接觸脈衝電流能量，因此需要考慮 ISO 17409:2020 或 ISO 5474-311 允許的 EV 最大 Y 電容值。

The EV design can limit the energy of the touch impulse current due to the Y-capacitors by limiting the total capacitance in the system but has to take into account that the EV supply equipment has a maximum limit of 1μF, or 500 nF for DC+ and DC– as per 8.105.1. Due to aging, the capacitance can reduce, but this will not constitute an additional hazard. The EV supply equipment design cannot expect that the EV will limit the energy in the touch impulse current due to the Y-capacitors and therefore needs to consider that maximum Y-capacitance
that is allowed for the EV in ISO 17409:2020 or ISO 5474-311.

ISO 6469-3 先前版本要求 B 側帶電部件及車輛底盤間的最低絕緣電阻為 100Ω/V；因此，EV 供電設備不應使用低於此值 IMD 跳脫等級。絕緣電阻可能劣化且降低，導致穩態接觸電流增加。因此，當量測到絕緣電阻降至低於 100 Ω/V 時，IMD 將觸發錯誤停機。考慮到 IMD 亦會增加接觸電流，總接觸電流應保持於 25 mA 以下。

Previous editions of ISO 6469-3 required a minimum insulation resistance of 100 Ω/V between side B live parts and the vehicle chassis; therefore, the EV supply equipment should not use a lower trip level for the IMD. The insulation resistance can degrade and become less, which results in a higher steady-state touch current. Therefore, the IMD triggers an error shutdown when the measured insulation resistance drops to < 100 Ω/V. When considering that the IMD also adds to the touch current, the total touch current should remain < 25 mA.

若 EV 設計無法符合接觸電流限制或接觸脈衝電流能量限制之要求，則 EV 設計需確保車輛電源電路的帶電部件受到替代保護措施，例：雙重絕緣或強化絕緣。若雙重絕緣或強化絕緣失效，則可使用不同的接觸電流及接觸脈衝電流能量閾值。

If it is not possible for the EV design to meet the requirements of limitation of touch current or limitation of energy in the touch impulse current, the design of the EV needs to ensure that live parts of the vehicle power supply circuit are protected by alternative measures, for example,double or reinforced insulation. In case the double or reinforced insulation, Chas failed, a different threshold for the touch current and energy in the touch impulse current can be used.

EV 供電設備無法判斷 EV 是否僅採用基本絕緣並限制接觸電流及接觸脈衝電流能量，或採用其他替代措施。因此，IMD 需於系統阻抗降至低於 100 Ω/V 時偵測並觸發錯誤停機。本標準所考慮電容與先前版本相同，EV 可依此限制進行設計。The EV supply equipment is unable to determine if the EV is designed with only basic insulation and a limitation of touch current and a limitation of energy in the touch impulse current, or alternative measure. Therefore, the IMD needs to detect when the resistance of the system drops to < 100 Ω/V and trigger an error shutdown. The capacitance, as considered in this document, is the same as previous editions. EVs may rely on this limitation for their design.

**HH.5 B 側帶電部件的平衡與不平衡電壓（DC+/DC－）** Balanced versus unbalanced voltages at side B live parts (DC+/DC–)

由於 EV 供電設備及車輛電源電路之 B 側、保護接地及其他電路相隔離，B 側各帶電部件（DC+／DC－）相對保護導體的電壓並未明確定義。IMD 利用此特性，透過例如一個較大電阻，對 B 側帶電部件（DC+／DC－）施加共模信號。由於設計或漏電造成的不對稱，可能使某一側 B 側帶電部件（DC+或 DC－）的電位向保護導體／車輛底盤電位偏移，進而使另一側 B 側帶電部件（DC+ 或 DC－）的電壓相對保護導體／車輛底盤的電壓偏移更遠。若人在不平衡狀態下觸摸其中一個 DC 帶電部件，因該帶電部件對保護導體／車輛底盤的電壓較高，人體所受的脈衝電流將遠高於平衡系統。Because the side B of the EV supply equipment and vehicle power supply circuit are separated from the protective conductor and any other circuit, the voltage of each side B live part (DC+/DC–) to the protective conductor is not clearly defined.

The IMD uses this to apply a common mode signal to the side B live parts (DC+/DC–), for example through a significant resistance. Any asymmetry, due to design or leakage, can shift the potential of a side B live part (DC+ or DC–) to the potential of the protective conductor/vehicle chassis, thereby shifting the voltage of the other side B live part (DC+ or DC–) to a voltage further away from the protective conductor/vehicle chassis. If a human body would touch one of the DC live parts when the voltage to the protective conductor/vehicle chassis is higher due to an unbalance, the impulse current that human body is exposed to is significantly higher compared to a balanced system.

若系統對保護導體的設計阻抗較高，即使微小的不對稱漏電流，也可能使某一側 B 側帶電部件（DC+／DC－）的電壓遠離保護導體。反之，當系統對保護導

體的設計阻抗較低時，該效應將受到限制。因為 IMD 會在預定的限制值觸發錯誤停機並終止通訊，故當設計阻抗較低時，B 側帶電部件（DC+／DC－）及保護導體間的最大電壓會較小，因此接觸脈衝電流將大幅減少。

If the designed resistance to the protective conductor of the system is high, already a small asymmetric leakage current can shift the voltage of one side B live part (DC+/DC–) far away from the protective conductor. When the designed resistance to the protective conductor of the system is lower, this effect will be limited. Because the IMD will trigger an error shutdown and terminate the communication session at a predetermined limit, the maximum voltage between the side B live part (DC+/DC–) and the protective conductor will be less when the design resistance to protective conductor is lower, therefore the touch impulse current will be greatly reduced.

對保護導體的阻抗及其分布，對可產生的接觸脈衝電流有顯著影響，同時也是 Y 電容放電後產生持續接觸電流的原因。IMD 量測的是對保護導體的總阻抗，無論該阻抗是對稱還是不對稱。對電荷分布及流過人體的實際觸電電流所造成的影響可能有所不同。

The resistances to the protective conductor and their distribution therefore have a significant impact on the available touch impulse current, but also are the cause of a steady-state touch current once the Y-capacitors have been discharged. An IMD measures the total resistance to the protective conductor, irrespective if it is symmetric or asymmetric. The effect on the distribution of charge and the actual touch current that flows through the human body can be different.

需在持續接觸電流及 Y 電容之電荷的分布，及 IMD 觸發閾值之間進行權衡。

A trade-off needs to be made between the steady-state touch current and the distribution of charge in the Y-capacitors, in combination with the threshold of the IMD.

**HH.6 IMD** Insulation monitoring device

於 EV 充電設備中，B 側 IMD 增加保護導體阻抗的裝置之一。依 IEC 61557-8 或同等標準的 IMD 量測 DC+/DC－及保護導體間的總阻抗，但不包括其自身的阻抗。因此，即使 IMD 本身對保護導體的阻抗較低，亦可對 1000 V DC 系統跳脫電阻設為 100 kΩ，並在無故障情況下進行通訊。IEC 61851-23:2014 要求當 DC+/DC－及保護導體間的「實際總物理絕緣阻抗」小於 100 Ω/V 乘以 EV 充電設備 B 側額定最高電壓（不含負公差）計算出值時，IMD 必須觸發錯誤停機並終止通訊。然而，目前尚不清楚實務上是否已考慮 IMD 對保護導體的阻抗。

One of the devices that adds resistance to the protective conductor in the EV supply equipment is the IMD at side B. An IMD according to IEC 61557-8 or equivalent, measures the total resistance between DC+/DC– and the protective conductor, excluding its own resistance. It is therefore possible to set the trip level to 100 kΩ for a 1 000 V DC system, and perform a communication session without a fault,

even though the IMD itself has a lower resistance to the protective conductor. IEC 61851-23:2014 requires the IMD to trigger an error shutdown and terminate the communication session if "the actual total physical insulation resistance" between DC+/DC– to the protective conductor is less than the value calculated by 100 Ω/V multiplied by the rated maximum voltage at side B of the EV supply equipment (without negative tolerance).However, it is unclear if, in practice, the resistance to the protective conductor of the IMD has been considered.

依 IEC 61557-8 或同等標準之 IMD 對保護導體的阻抗可能相對較低，可對 Y 電容器中的電荷進行平衡。然而，必須考慮 IMD 量測的動態行為。依所使用的 IMD 量測技術（例：電阻對保護導體的交替切換），無法保證電荷平衡的穩定性。

Based on IEC 61557-8 or equivalent, the resistance to the protective conductor of the IMD can be relatively low, providing balancing of the charge in the Y-capacitors. However, the dynamic behaviour of the IMD measurement needs to be considered. Depending on the used IMD measurement technology (for example, the alternating switching of resistors against the protective conductor), stable balancing cannot be guaranteed.

SAE J1772:2017 之 6.5.4.2.4 條要求任一 B 側帶電部件至保護導體的絕緣電阻必須> $50^{0}_{+10}$ kΩ（即 500 V 時為 100 Ω/V）。IMD 對保護導體的電阻必須明顯更高，因為 SAE J1772:2017 之 6.5.4.1 條規定，每個 B 側帶電部件（DC+/DC－）的絕緣電阻包含任何量測裝置，而總絕緣電阻是兩個 B 側帶電部件（DC+/DC－）絕緣電阻的並聯組合。B 側總絕緣電阻應不低於 1.25 MΩ，包含任何量測或監測設備。這意味著對絕緣電阻於兩個 B 側帶電部件（DC+/DC－）及保護導體之間均勻分布的 EV 供電設備，任一 B 側帶電部件至保護導體的絕緣電阻必須不低於 2.5 MΩ。因此，IMD 對保護導體的電阻對於穩態洩漏電流的影響不大；但同時，降低的保護導體電阻所可能帶來的電荷平衡優勢也不存在。

In SAE J1772:2017, 6.5.4.2.4 requires an insulation resistance of either side B live part to the protective conductor of > $50^{0}_{+10}$ kΩ (100 Ω/V at 500 V). The IMD resistance to the protective conductor has to be significantly higher, because SAE J1772:2017, 6.5.4.1, states that the insulation resistance of each side B live part (DC+/DC–) includes any measuring device and that the total insulation resistance is the parallel combination of the insulation resistances of both side B live parts (DC+/DC–). The total insulation resistance of side B shall be ≥ 1,25 MΩ,including any measurement/monitoring devices. This implies ≥ 2,5 MΩ insulation resistance between each side B live parts (DC+/DC–) and the protective conductor for an EV supply equipment with insulation resistance equally distributed between each side B live part (DC+/DC–) and the protective conductor. As a result, the impact of the IMD resistance to the protective conductor is not significant when it comes to steady-state leakage current; however, there is also no advantage of any balancing that a lower resistance to the protective conductor may enable.

系統 A 使用接地漏電電流監測裝置代替 IMD，6.3.1.105 閾值基於 100 Ω/V 乘以 EV 供電設備 B 側之額定最大電壓。於 AA.3.1.2 定義，系統 A 故障電流應小於或等於 DC-2，因此系統 A 允許監測系統對保護導體具有相對較低的電阻，這可以用來平衡 Y 電容器的電荷。

For system A, an earth leakage current monitoring device is used instead of an IMD, where the threshold in 6.3.1.105 is based on 100 Ω/V multiplied by the rated maximum voltage at side B of the EV supply equipment. In AA.3.1.2, it is defined that the fault current from system A shall be less than or equal to DC-2, therefore system A allows for relatively low resistances to the protective conductor for the detection system, which can be used to balance the charge in the Y-capacitors.

對於系統 B，於電能傳輸期間檢測與保護導體導體間的故障屬於 EV 的一部分責任，因此 EV 供電設備僅能在電纜檢查階段考慮電荷平衡的問題。For system B, the detection of faults to the protective conductor during energy transfer is part of the EV, therefore the EV supply equipment only has an opportunity to take balancing into consideration during the cable-check phase.

**HH.7 IMD 反應時間 IMD reaction time**

IMD 反應時間主要受到其量測電路對保護導體導體的電阻，以及 EV 及 EV 供電設備總電容的影響。如果量測電路的電阻較低，則反應時間可以更短。The reaction time of the IMD is mainly influenced by the resistance to the protective conductor of its measurement circuit, and the total capacitance of the EV and EV supply equipment combined. If the resistance of the measurement circuit is lower, the reaction time can be shorter.

依 ISO 17409:2020 之 9.9 規定，EV 於每一個 B 側帶電部件（DC+ / DC–）及保護導體導體間允許的最大電容應為≤ 2 μF（總計為 4 μF），以確保 IMD 能在規定時間內作出反應。反應時間之所以需要明確規定，是因為它與 8.105.11 所規定的保護導體導體的橫截面積有關。若合理的時間內偵測到保護導體第一次故障，就可以避免第二個故障產生，進而導致保護導體上的短路電流風險。The EV is allowed a maximum capacitance according to ISO 17409:2020, 9.9, and should be ≤ 2 μF between each side B live part (DC+/DC–) and the protective conductor (4 μF in total) in order to guarantee the reaction time of the IMD. The reaction time needs to be defined because it bears relation to the protective conductor cross-sectional area as specified in 8.105.11. If the first fault to the protective conductor is detected in a reasonable time, a second fault that may result in a short-circuit current through the protective conductor can be avoided.

於 UL 2231-2:2016 中，要求反應時間為 10 秒。然而，依 SAE J1772:2017 對保護導體電阻的規定，當考慮到 EV 的 Y 電容時，這樣的反應時間就變得不可行，但實際的符合性試驗卻是在不包含該電容的情況下進行的。

而在本標準系統 C 反應時間同樣設定為 10 秒，但符合性試驗是包含代表性之 EV 的 Y 電容進行。

In UL 2231-2:2016, a 10 s reaction time is required.With requirements for the resistance to the protective conductor in SAE J1772:2017, this reaction time becomes unviable when EV Y-capacitance is included, but compliance testing is performed without this capacitance. In this document, the reaction time for system C is also set to 10 s, but compliance is tested with a representative EV Y-capacitance.

**HH.8 結論 Conclusion**

—若需要限制接觸電流與接觸脈衝電流，且電池系統電壓> 500 V DC，則所有標準的先前版本並未為整個系統，特別是 EV，保留足夠的 Y 電容。

– If a limitation of touch current and touch impulse current is required, at a battery system voltage > 500 V DC, the previous editions of all the standards do not leave enough Ycapacitance for the system, and the EV in particular.

— 在本標準中，ISO 17409:2020 及 SAE J1772:2017 建議在每個 B 側帶電部件（DC+/DC－）及人體間採用保護性隔離（雙重絕緣、加強絕緣或基本絕緣加保護屏蔽），以允許 EV 使用較高的 Y 電容。

– In this document, ISO 17409:2020 and SAE J1772:2017, protective separation (double insulation, reinforced insulation or basic insulation + protective shielding) between each side B live parts (DC+/DC–) and a human body are proposed, to allow higher Y-capacitance for the EV.

— 為了與現有產品向下相容，EV 供電設備應維持相同 IMD 閾值（於 1000 V 時為 100 Ω/V），並於 B 側電路中，每個 B 側帶電部件（DC+/DC－）及保護導體間之最大 Y 電容應為 500 nF。

– For backwards compatibility with existing products, the EV supply equipment should maintain the same threshold for the IMD (100 Ω/V at 1 000 V) and, in the side B circuit,maximum Y-capacitance of 500 nF between each side B live part (DC+/DC–) and the protective conductor.

– 透過降低 EV 供電設備保護導體的電阻，可以：

– By lowering the resistance to the protective conductor of the EV supply equipment, it is possible to:

• 在較大穩態觸電電流與因 Y 電容產生的接觸脈衝電流最大能量間進行取捨。

• trade off a larger steady-state touch current vs. the maximum energy in the touch impulse current due to the Y-capacitors, and

• 藉由降低 IMD 對保護導體的電阻，即使在最大電容負載下，也能縮短反應時間，並在 UL 2231-2:2016 規定 10 秒或更短時間內作出反應。

• with a lower IMD resistance to the protective conductor, lower the reaction times and react in 10 s or less as defined in the UL 2231-2:2016, even when loaded with the maximum capacitance.

— 即使 B 側帶電部件（DC+/DC－）與人體間的（保護）隔離失效，穩態接觸電流仍可限制於 25 mA（b 曲線）以內，接觸脈衝電流則可限制於 c1 曲線以下，

以防止心室纖維顫動，如圖 HH.4 所示。

– Even if the (protective) separation between side B live parts (DC+/DC–) and a human body fails, the steady-state touch current can be limited to 25 mA (b curve), and the touch impulse current to less than the c1 curve to prevent ventricular fibrillation, as shown in Figure HH.4.

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