中華民國國家標準 CNS	低電壓開關裝置及控制裝置組裝品－第 1 部：一般規則	總號	
		類號	C4

Low-voltage switchgear and controlgear assemblies – Part 1: General rules

編訂說明：本草案建議案號為「建-制 1000262」，草案編號為「CNS 草-制 1030078」，係參照 IEC 61439-1:2011 編擬而成。本案依程序辦理徵求意見，敬請　惠賜卓見。

1. 適用範圍

備考 1. 本標準中，〝組裝品〞(參照 3.1.1)一詞係使用於低電壓開關裝置及控制裝置組裝品。

本標準規定低電壓開關裝置及控制裝置組裝品之定義，並說明其使用條件、構造要求、技術特性及查證要求。

本標準不能單獨使用於規定組裝品，或用於決定一致性。組裝品應符合 CNS __(IEC 61439)系列之相關標準。

僅當下列相關組裝品標準有要求時，本標準始適用於低電壓開關裝置及控制裝置組裝品。

- 交流額定電壓不超過 1,000 V 或直流額定電壓不超過 1,500 V 之組裝品。
- 具有或不具有箱體之靜置型(stationary)或可動型組裝品。
- 預定使用於產生、傳輸、配電及轉換電能之組裝品及控制能消耗設備之組裝品。

1 Scope

NOTE 1 Throughout this standard, the term ASSEMBLY (see 3.1.1) is used for a low-voltage switchgear and controlgear assembly.

This part of the IEC 61439 series lays down the definitions and states the service conditions, construction requirements, technical characteristics and verification requirements for low-voltage switchgear and controlgear assemblies.

This standard cannot be used alone to specify an ASSEMBLY or used for a purpose of determining conformity. ASSEMBLIES shall comply with the relevant part of the IEC 61439 series; Parts 2 onwards.

This standard applies to low-voltage switchgear and controlgear assemblies (ASSEMBLIES) only when required by the relevant ASSEMBLY standard as follows:

- ASSEMBLIES for which the rated voltage does not exceed 1 000 V in case of a.c. or 1 500 V in case of d.c.;
- stationary or movable ASSEMBLIES with or without enclosure;
- ASSEMBLIES intended for use in connection with the generation, transmission, distribution and conversion of electric energy, and for the control of electric energy consuming equipment;

- 設計供特殊使用條件(例：在船上及軌道車輛上)下使用之組裝品(若已符合其他相關特定要求)。

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印行年月年月

備考 2. 有關船用組裝品之補充要求，參照 IEC 60092-302。

– 設計供機器之電氣設備用之組裝品(若已符合其他相關特定要求)。

備考 3. 有關構成機器之一部分的組裝品之補充要求，參照 IEC 60204。

本標準適用於所有組裝品，無論該組裝品係在一次性基礎上設計、製造及查證，或完全標準化並量產。

可由原始製造廠商(參照 3.10.1)以外之廠商進行製造及/或組裝。

本標準不適用於個別裝置及獨立性(self-contained)組件，例：電動機啟動器、熔線開關、電子設備等，其可符合相關產品標準。

– ASSEMBLIES designed for use under special service conditions, for example in ships and in rail vehicles provided that the other relevant specific requirements are complied with;

NOTE 2 Supplementary requirements for ASSEMBLIES in ships are covered by IEC 60092-302.

– ASSEMBLIES designed for electrical equipment of machines provided that the other relevant specific requirements are complied with.

NOTE 3 Supplementary requirements for ASSEMBLIES forming part of a machine are covered by the IEC 60204 series.

This standard applies to all ASSEMBLIES whether they are designed, manufactured and verified on a one-off basis or fully standardised and manufactured in quantity.

The manufacture and/or assembly may be carried out other than by the original manufacturer (see 3.10.1).

This standard does not apply to individual devices and self-contained components, such as motor starters, fuse switches, electronic equipment, etc. which will comply with the relevant product standards.

2. 引用標準

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)。

IEC 60068-2-2:2007	Environmental testing – Part 2-2: Tests – Test B: Dry heat
IEC 60068-2-11:1981	Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist
IEC 60068-2-30:2005	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 12 h cycle)
IEC 60073:2002	Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators
IEC 60085:2007	Electrical insulation – Thermal evaluation and designation
IEC 60216 (all parts)	Electrical insulating materials – Properties of thermal endurance
IEC 60227-3:1993	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring
IEC 60245-3:1994	Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone

	insulated cables
IEC 60245-4:1994	Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables
IEC 60364 (all parts)	Low-voltage electrical installations
IEC 60364-4-41:2005	Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
IEC 60364-4-44:2007	Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances
IEC 60364-5-52:2009	Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems
IEC 60364-5-53:2001	Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control
IEC 60364-5-54:2011	Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors
IEC 60439 (all parts)	Low-voltage switchgear and controlgear assemblies
IEC 60445:2010	Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors
IEC 60447:2004	Basic and safety principles for man-machine interface, marking and identification – Actuating principles
IEC 60529:1989	Degrees of protection provided by enclosures (IP Code) [1]
IEC 60664-1:2007	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

1 There is a consolidated edition 1.1 (2001) that includes IEC 60529 (1989) and its amendment 1 (1999).

註[1] 1.1 版(2001 年)之合訂本包括 IEC 60529 (1989)及其修正版 1 (1999)。

IEC 60695-2-10:2000	Fire Hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure
IEC 60695-2-11:2000	Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products
IEC 60695-11-5:2004	Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance
IEC 60865-1:1993	Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods
IEC 60890:1987	A method of temperature-rise assessment by extrapolation for partially typetested assemblies (PTTA) of low-voltage switchgear and controlgear
IEC 60947-1:2007	Low-voltage switchgear and controlgear – Part 1: General

	rules
IEC 61000-4-2:2008	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
IEC 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio frequency, electromagnetic field immunity test [(2)]
IEC 61000-4-4:2004	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
IEC 61000-4-5:2005	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
IEC 61000-4-6:2008	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61000-4-8:2009	Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test
IEC 61000-4-11:2004	Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests
IEC 61000-4-13:2002	Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low-frequency immunity tests [(3)]
IEC 61000-6-4:2006	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments [(4)]
IEC 61082-1	Preparation of documents used in electrotechnology – Part 1:Rules
IEC 61180 (all parts)	High-voltage test techniques for low-voltage equipment

2 There is a consolidated edition 3.2 (2010) that includes IEC 61000-4-3 (2006) and amendment 1 (2007) and amendment 2 (2010).

3 There is a consolidated edition 1.1 (2009) that includes IEC 61000-4-13 (2002) and its amendment 1 (2009).

4 There is a consolidated edition 2.1 (2011) that includes IEC 61000-6-4 (2006) and its amendment 1 (2010).

註(2) 3.2 版(2010 年)之合訂本包括 IEC 61000-4-3 (2006)及其修正版 1 (2007)及修正版 2 (2010)。

註(3) 1.1 版(2009 年)之合訂本包括 IEC 61000-4-13 (2002)及其修正版 1 (2009)。

註(4) 3.1 版(2011 年)之合訂本包括 IEC 61000-6-4 (2006)及其修正版 1 (2010)。

IEC/TS 61201:2007	Use of conventional touch voltage limits – Application guide
IEC 61439 (all parts)	Low-voltage switchgear and controlgear assemblies
IEC 62208	Empty enclosures for low-voltage switchgear and controlgear assemblies – General requirements
IEC 62262:2002	Degrees of protection provided by enclosures for electrical

	equipment against external mechanical impacts (IK code)
IEC 81346-1	Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules
IEC 81346-2	Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 2: Classification of objects and codes for classes
CISPR 11:2009	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement5
CISPR 22	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ISO 178:2001	Plastics – Determination of flexural properties
ISO 179 (all parts)	Plastics – Determination of Charpy impact strength
ISO 2409:2007	Paints and varnishes – Cross-cut test
ISO 4628-3:2003	Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting
ISO 4892-2:2006	Plastics – Methods of exposure to laboratory light sources – Part 2: Xenonarc lamps

5 There is a consolidated edition 5.1 (2010) that includes CISPR 11 (2009) and its amendment 1 (2010).

註(5) 5.1 版(2010 年)之合訂本包括 CISPR 11 (2009)及其修正版 1 (2010)。

3 Terms and definitions

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

3.1 General terms

3.1.1
low-voltage switchgear and controlgear assembly
ASSEMBLY
combination of one or more low-voltage switching devices together with associated control, measuring, signalling, protective, regulating equipment, with all the internal electrical and mechanical interconnections and structural parts

3. 用語及定義

下列用語及定義適用於本標準。

3.1 一般用語

3.1.1 低電壓開關裝置及控制裝置組裝品(組裝品)(low-voltage switchgear and controlgear (ASSEMBLY))

1 個或多個低電壓開關裝置及控制裝置組裝品連同關聯之控制、量測、發出訊號、保護、調節設備，與所有內部電器及機械互連及結構零件之組合。

3.1.2
ASSEMBLY system
full range of mechanical and electrical components (enclosures, busbars, functional units, etc.), as defined by the original manufacturer, which can be assembled in accordance with the original manufacturer's instructions in order to produce various ASSEMBLIES

3.1.2 組裝品系統(ASSEMBLY system)

全系列之機械或電器組件(箱體、匯流排、功能性單元等)。如原始製造廠商之定義，可依原始製造廠商說明書組裝，以產出各種組裝品。

3.1.3
main circuit (of an ASSEMBLY)
all the conductive parts of an ASSEMBLY included in a circuit which is intended to transmit electrical energy

[IEC 60050-441:1984, 441-13-02]

3.1.3 (組裝品之)主電路(main circuit (of an ASSEMBLY))

為一種電路，包含組裝品內所有傳送電能之導電零件。

[IEC 60050-441:1984, 441-13-02]

3.1.4
auxiliary circuit (of an ASSEMBLY)
all the conductive parts of an ASSEMBLY included in a circuit (other than the main circuit) intended to control, measure, signal, regulate and process data, etc.

NOTE The auxiliary circuits of an ASSEMBLY include the control and the auxiliary circuits of the switching devices.

[IEC 60050-441:1984, 441-13-03, modified]

3.1.4 輔助電路(auxiliary circuit)

為一種電路(非為主電路)，包括組裝品內供控制、量測、發出訊號、調節及處理資料用之所有導電零件。

備考：組裝品之輔助電路包括開關操作裝置之控制電路及輔助電路。

[IEC 60050-441:1984, 441-13-03，修正版]

3.1.5
busbar
low-impedance conductor to which several electric circuits can be separately connected

NOTE The term "busbar" does not presuppose the geometrical shape, size or dimensions of the conductor.

3.1.5 匯流排(busbar)

低阻抗之導體，數個電路可分別連接至此導體。

備考：〝匯流排〞一詞並不預先假定導體之幾何形狀、大小或尺寸。

3.1.6
main busbar
busbar to which one or several distribution busbars and/or incoming and outgoing units can be connected

3.1.6 主匯流排(main busbar)

一種匯流排，1 個或數個配電匯流排及/或內向與外向單元可可連接至此匯流排。

3.1.7
distribution busbar
busbar within one section which is connected to a main busbar and from which outgoing units are supplied

NOTE Conductors that are connected between a functional unit and a busbar are not considered as a part of the distribution busbars.

3.1.7 配電匯流排(distribution busbar)

在 1 個區段內之匯流排，其連接至主匯流排，並對外向單元供電。

備考：連接於功能性單元與匯流排之間的導體，不視為配電匯流排之一部分。

3.1.8
functional unit
part of an ASSEMBLY comprising all the electrical and mechanical elements including switching devices that contribute to the fulfilment of the same function

3.1.8 功能性單元(functional unit)

為組裝品之一部分，由所有電氣及機械元件組成，包括能執行相同功能之開關操作裝置。

NOTE Conductors which are connected to a functional unit but which are external to its compartment or enclosed protected space (e.g. auxiliary cables connected to a common compartment) are not considered to form part of the functional unit.

備考：連接至功能性單元，但在其分隔室或閉合之保護空間之外的導體(例：連接至共同分隔室之輔助電纜)，不視為能形成功能性單元之一部分。

3.1.9
incoming unit
functional unit through which electrical energy is normally fed into the ASSEMBLY

3.1.9 內向單元(incoming unit)

一種功能性單元，電能通常係透過此單元饋入至組裝品中。

3.1.10
outgoing unit
functional unit through which electrical energy is normally supplied to one or more external circuits

3.1.10 外向單元(outgoing unit)

一種功能性單元，電能通常係透過此單元供應至 1 個或多個外部電路中。

3.1.11
short-circuit protective device
SCPD
device intended to protect a circuit or parts of a circuit against short-circuit currents by interrupting them

[2.2.21 of IEC 60947-1:2007]

3.1.11 短路保護裝置(short-circuit protective device, SCPD)

用於保護電路或電路之一部分的裝置，其係藉由中斷短路電流之方式，以防止短路電流。

[CNS 14816-1 之 2.2.21]

3.2 Constructional units of ASSEMBLIES

3.2.1
fixed part
part consisting of components assembled and wired on a common support and which is designed for fixed installation

3.2 組裝品之構造單元(constructional units of ASSEMBLIES)

3.2.1 固定式零件(fixed part)

一種零件，其包括在共用支撐物上組裝及配線之組件，且其係設計供固定式安裝之用。

3.2.2
removable part
part consisting of components assembled and wired on a common support which is intended to be removed entirely from the ASSEMBLY and replaced whilst the circuit to which it is connected may be live

3.2.2 可動零件(removable part)

一種零件，其包括在共用支撐物上組裝及配線之組件，在此零件所連接之電路可能帶電之情況下，其將完全從組裝品中移除並替換。

3.2.3
connected position
position of a removable part when it is fully connected for its intended function

3.2.3 連接之位置(connected position)

當可動零件基於其預定功能而完全連接時之位置。

3.2.4
removed position
position of a removable part when it is outside the ASSEMBLY, and mechanically and electrically separated from it

3.2.4 移除之位置(removed position)

當可動零件位於組裝品外部且在機械與電氣方面與組裝品分離時之位置。

3.2.5
insertion interlock
device preventing the introduction of a removable part into a location not intended for that removable part

3.2.5 插入互鎖(insertion interlock)

防止可動零件導入至非該可動零件預定位置之一種裝置。

3.2.6
fixed connection
connection which is connected or disconnected by means of a tool

3.2.6 固定式連接(fixed connection)

藉由工具連接或切離之連接。

3.2.7
section
constructional unit of an ASSEMBLY between two successive vertical delineations

3.2.7 區段(section)

2 個連續垂直劃分(delineation)之間的組裝品之構造單元。

3.2.8
sub-section
constructional unit of an ASSEMBLY between two successive horizontal or vertical delineations within a section

3.2.8 次區段(sub-section)

於 1 個區段中，2 個連續水平或垂直劃分(delineation)之間的組裝品之構造單元。

3.2.9
compartment
section or sub-section enclosed except for openings necessary for interconnection, control or ventilation

3.2.9 分隔室(compartment)

除互連、控制或通風所必要之開口以外被封閉之區段或次區段。

3.2.10
transport unit
part of an ASSEMBLY or a complete ASSEMBLY suitable for transportation without being dismantled

3.2.10 運送單元(transport unit)

組裝品或整個組裝品中，適合運送而無須拆卸之部分。

3.2.11
shutter
part which can be moved between:

– a position in which it permits engagement of the contacts of a removable part with fixed contacts, and

– a position in which it becomes a part of a cover or a partition shielding the fixed contacts

[IEC 60050-441:1984, 441-13-07, modified]

3.2.11 擋門(shutter)

能於下列位置之間移動之零件。

– 容許可動零件之接點與固定接點嵌合之位置。

– 變成蓋板或隔板之一部分而能遮蔽固定接點之位置。

[IEC 60050-441:1984, 441-13-07，修正版]

3.3 External design of ASSEMBLIES

3.3.1
open-type ASSEMBLY
ASSEMBLY consisting of a structure which supports the electrical equipment, the live parts of the electrical equipment being accessible

3.3 組裝品之外部設計(external design of ASSEMBLIES)

3.3.1 開放型組裝品(open-type ASSEMBLY)

一種組裝品，其由支撐電氣設備之結構所組成，該電氣設備之帶電零件為可接近式。

3.3.2
dead-front ASSEMBLY
open-type ASSEMBLY with a front cover; live parts may be accessible from directions other than the front

3.3.2 前封閉型組裝品(dead-front ASSEMBLY)

具前蓋板之開放型組裝品；可從前方以外之方向接近帶電零件。

3.3.3
enclosed ASSEMBLY
ASSEMBLY which is enclosed on all sides with the possible exception of its mounting surface in such a manner as to provide a defined degree of protection

3.3.3 封閉型組裝品(enclosed ASSEMBLY)

除了裝設面以外，所有各側皆封閉之組裝品，可提供界定之保護等級。

3.3.4
cubicle-type ASSEMBLY
enclosed ASSEMBLY of the floor-standing type which may comprise several sections, sub-sections or compartments

3.3.4 櫃型組裝品(cubicle-type ASSEMBLY)

落地式之封閉型組裝品，其可包含數個區段、次區段或分隔室。

3.3.5
multi-cubicle-type ASSEMBLY
combination of a number of mechanically joined cubicle-type ASSEMBLIES

3.3.5 多櫃型組裝品(multi-cubicle-type ASSEMBLY)

若干以機械式連結之櫃型組裝品的組合。

3.3.6
desk-type ASSEMBLY
enclosed ASSEMBLY with a horizontal or inclined control panel or a combination of both, which incorporates control, measuring, signalling apparatus, etc.

3.3.6 桌上型組裝品(desk-type ASSEMBLY)

具有水平或傾斜面板或具上述兩種組合之封閉型組裝品，其含有控制、量測、

訊號儀器等。

3.3.7
box-type ASSEMBLY
enclosed ASSEMBLY, intended to be mounted on a vertical plane

3.3.7 箱型組裝品(box-type ASSEMBLY)

一種封閉型組裝品，其係預定裝設在垂直平面上。

3.3.8
multi-box-type ASSEMBLY
combination of box-type ASSEMBLIES mechanically joined together, with or without a common supporting frame, the electrical connections passing between two adjacent boxes through openings in the adjoining faces

3.3.8 多箱型組裝品(multi-box-type ASSEMBLY)

以機械式連結在一起之箱型組裝品的組合，其具有或不具有共同支撐架，透過毗鄰之面的開口，使其電氣連接通過 2 個相鄰之箱。

3.3.9
wall-mounted surface type ASSEMBLY
ASSEMBLY for installation on the surface of a wall

3.3.9 壁掛式表面型組裝品(wall-mounted surface type ASSEMBLY)

供安裝在牆面上之組裝品。

3.3.10
wall-mounted recessed type ASSEMBLY
ASSEMBLY for installation into a wall recess, where the enclosure does not support the portion of wall above

3.3.10 壁掛式凹入型組裝品(wall-mounted recessed type ASSEMBLY)

供安裝在牆凹處之組裝品，其箱體並不支撐上方之牆部分。

3.4 Structural parts of ASSEMBLIES

3.4.1
supporting structure
structure forming part of an ASSEMBLY designed to support various components of the ASSEMBLY and any enclosure

3.4 組裝品之結構零件(structural parts of ASSEMBLY)

3.4.1 支撐結構(supporting structure)

形成組裝品之一部分的結構，其係設計用於支撐組裝品之各種組件及任何箱體。

3.4.2
mounting structure
structure not forming part of an ASSEMBLY designed to support an ASSEMBLY

3.4.2 裝設結構(mounting structure)

未形成組裝品之一部分的結構，其係設計用於支撐組裝品。

3.4.3
mounting plate
plate designed to support various components and suitable for installation in an ASSEMBLY

3.4.3 裝設板(mounting plate)

設計用於支撐各種組件並適合安裝在組裝品中之板。

3.4.4
mounting frame
framework designed to support various components and suitable for installation in an ASSEMBLY

3.4.4 裝設架(mounting frame)

設計用於支撐各種組件並適合安裝在組裝品中之骨架。

3.4.5
enclosure
housing affording the type and degree of protection suitable for the intended application

[IEC 60050-195:1998, 195-02-35]

3.4.5 箱體(enclosure)

提供適合於預定應用所需之保護型式及保護等級的遮蓋物。

[IEC 60050-195:1998, 195-02-35]

3.4.6
cover
external part of the enclosure of an ASSEMBLY

3.4.6 蓋板(cover)

組裝品之箱體的外部部位。

3.4.7
door
hinged or sliding cover

3.4.7 門(door)

鉸鏈式或滑動式外蓋。

3.4.8
removable cover
cover which is designed for closing an opening in the external enclosure and which can be removed for carrying out certain operations and maintenance work

3.4.8 可動外蓋(removable cover)

設計用於閉合外部箱體中之開口的外蓋，且在進行某些操作及維護工作時，可予移除。

3.4.9
cover plate
part of an ASSEMBLY which is used for closing an opening in the external enclosure and designed to be held in place by screws or similar means

NOTE 1 It is not normally removed after the equipment is put into service.

NOTE 2 The cover plate can be provided with cable entries.

3.4.9 外蓋板(cover plate)

組裝品之一部分，其係用於封閉外部箱體中之開口，且係以螺釘或類似工具夾持於適當處。

備考 1. 在設備運轉使用後，通常不予移除外蓋板。

備考 2. 外蓋板可具有電纜入口。

3.4.10
partition
part of the enclosure of a compartment separating it from other compartments

3.4.10 隔板(partition)

分隔室之箱體的一部分，用於與其他分隔室分隔之用。

3.4.11
barrier
part providing protection against direct contact from any usual direction of access

[IEC 60050-195:1998, 195-06-15, modified]

3.4.11 障壁(barrier)

提供保護的部位，防止與任何正常接近方向直接接觸。

[IEC 60050-195:1998, 195-06-15，修訂版]

3.4.12
obstacle
part preventing unintentional direct contact, but not preventing direct contact by deliberate action

[IEC 60050-195:1998, 195-06-16, modified]

NOTE Obstacles are intended to prevent unintentional contact with live parts but not intentional contact by deliberate circumvention of the obstacle. They are intended to protect skilled or instructed persons but are not intended to protect ordinary persons.

3.4.12 障礙物(obstacle)

用於防止非蓄意直接接觸之部位，但非以蓄意之動作防止直接接觸。

[IEC 60050-195:1998, 195-06-16，修訂版]

備考：障礙物係供防止與帶電零件意外接觸，但非刻意繞過障礙物之蓄意接觸。障礙物係供保護技術人員或指導人員，但非供保護一般人員。

3.4.13
terminal shield
part enclosing terminals and providing a defined degree of protection against access to live parts by persons or objects

3.4.13 端子屏蔽(terminal shield)

用於閉合端子，並提供防止人員或物體接近帶電零件之界定保護等級的零件。

3.4.14
cable entry
part with openings which permit the passage of cables into the ASSEMBLY

3.4.14 電纜入口(cable entry)

具有開口之部位，容許電纜通過並進入組裝品內。

3.4.15
enclosed protected space
part of an ASSEMBLY intended to enclose electrical components and which provides defined protection against external influences and contact with live parts

3.4.15 封閉型保護空間(enclosed protected space)

用於封閉電氣組件之組裝品零件，且其提供界定之保護，防止外部影響及與帶電零件接觸。

3.5 Conditions of installation of ASSEMBLIES

3.5.1
ASSEMBLY for indoor installation
ASSEMBLY which is designed for use in locations where the normal service conditions for indoor use as specified in 7.1 are fulfilled

3.5 組裝品之安裝條件(condition of installation of ASSEMBLIES)

3.5.1 供屋外安裝之組裝品(ASSEMBLY for indoor installation)

設計供使用於 7.1 所規定之屋內使用的正常使用條件下之組裝品。

3.5.2
ASSEMBLY for outdoor installation
ASSEMBLY which is designed for use in locations where the normal service conditions for outdoor use as specified in 7.1 are fulfilled

3.5.2 供屋內安裝之組裝品(ASSEMBLY for outdoor installation)

設計供使用於 7.1 所規定之屋外使用的正常使用條件下之組裝品。

3.5.3
stationary ASSEMBLY
ASSEMBLY which is designed to be fixed at its place of installation, for instance to the floor or to a wall, and to be used at this place

3.5.3 靜置型組裝品(stationary ASSEMBLY)

係設計固定於某安裝位置(例：地板或牆)並於此位置使用之組裝品。

3.5.4
movable ASSEMBLY
ASSEMBLY which is designed so that it can readily be moved from one place of use to another

3.5.4 可動型組裝品(movable ASSEMBLY)

能輕易從某些使用位置移至另一位置之組裝品。

3.6 Insulation characteristics

3.6.1
clearance
the distance between two conductive parts along a string stretched the shortest way between these conductive parts

[IEC 60050-441:1984, 441-17-31]

3.6 絕緣特性(insulation characteristics)

3.6.1 空間距離(clearance)

在 2 個導電零件之間，沿著此等導電零件之間最短路徑所拉直之線的距離。

[IEC 60050-441:1984, 441-17-31]

3.6.2
creepage distance
the shortest distance along the surface of a solid insulating material between two conductive parts

[IEC 60050-151:2001, 151-15-50]

NOTE A joint between two pieces of insulating material is considered part of the surface.

3.6.2 沿面距離(creepage distance)

兩個導體之間，沿著固體絕緣材料表面之最短距離。

[IEC 60050-151:2001, 151-15-50]

備考：2 片絕緣材料之間的接合處，視為表面之部位。

3.6.3
overvoltage
any voltage having a peak value exceeding the corresponding peak value of the maximum steady-state voltage at normal operating conditions

[definition 3.7 of IEC 60664-1:2007]

3.6.3 過電壓(overvoltage)

峰值超過正常操作條件下最大穩態電壓之相對應峰值的任何電壓。

[IEC 60664-1:2007 之 3.7 定義]

3.6.4
temporary overvoltage
overvoltage at power frequency of relatively long duration (several seconds)

[definition 3.7.1 of IEC 60664-1:2007, modified]

3.6.4 暫時過電壓(temporary overvoltage)

商頻下，持續時間相對較長(數秒)之過壓。

[IEC 60664-1:2007 之 3.7.1 定義，修訂]

3.6.5
transient overvoltage
short duration overvoltage of a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped

[IEC 60050-604:1987, 604-03-13]

3.6.5 暫態過電壓(transient overvoltage)

持續時間(數 ms 或更短)之過壓，其為振盪或非振盪，通常為高阻尼。

[IEC 60050-604:1987，604-03-13]

3.6.6
power-frequency withstand voltage
r.m.s. value of a power-frequency sinusoidal voltage which does not cause breakdown under specified conditions of test

[definition 2.5.56 of IEC 60947-1: 2007]

NOTE The power-frequency withstand voltage is equivalent to the short-term temporary overvoltage in IEC 60664-1.

3.6.6 商頻耐電壓(power-frequency withstand voltage)

在規定之試驗條件下，不會造成擊穿之商頻正弦電壓的均方根值。

[IEC 60947-1:2007 之 2.5.56 定義]

備考：商頻耐電壓等於 IEC 60664-1 之短期暫時過壓。

3.6.7
impulse withstand voltage
highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation under specified conditions

[definition 3.8.1 of IEC 60664-1: 2007]

3.6.7 衝擊耐電壓(impulse withstand voltage)

具有規定之形狀及極性的衝擊電壓之最高峰值，其在規定條件下，不會造成絕緣擊穿。

[IEC 60664-1:2007 之定義 3.8.1]

3.6.8
pollution
any addition of solid, liquid or gaseous foreign matter, that can result in a reduction of the dielectric strength or surface resistivity of insulation

[definition 3.11 of IEC 60664-1: 2007, modified]

3.6.8 污染(pollution)

添加任何固體、液體或氣體異物，並造成電介質強度或絕緣物表面電阻率下降。

[IEC 60664-1:2007 之定義 3.11]

3.6.9
pollution degree (of environmental conditions)
conventional number based on the amount of conductive or hygroscopic dust, ionized gas or salt, and on the relative humidity and its frequency of occurrence resulting in hygroscopic absorption or condensation of moisture leading to reduction in dielectric strength and/or surface resistivity

NOTE 1 The pollution degree to which the insulating materials of devices and components are exposed may be different from that of the macro-environment where the devices or components are located because of protection offered by means such as an enclosure or internal heating to prevent absorption or condensation of moisture.

NOTE 2 For the purpose of this standard, the pollution degree is of the micro-environment.

[definition 2.5.58 of IEC 60947-1: 2007]

3.6.9 (環境條件之)污染等級(pollution degree (of environmental conditions))

以導電性或吸濕性粉塵、游離氣體或鹽之量為基礎，並以及相對溼度及其現象的發生頻度為基準所決定的號碼，此現象會造成在空氣中吸濕或凝露，導致介電強度及/或絕緣物表面電阻率降低。

備考 1. 暴露設備的污染等即可不同於提供外殼或內部加熱方法防止其吸濕或凝露的處於宏觀環境的設備污染等級。

備考 2. 關於本標準之目的，污染等級為微環境。

[IEC 60947-1:2007 之定義 2.5.58]

3.6.10
micro-environment (of a clearance or creepage distance)
immediate environment of the insulation which particularly influences the dimensioning of the creepage distances

NOTE The micro-environment of the creepage distance or clearance and not the environment of the ASSEMBLY or components determines the effect on the insulation. The micro-environment may be better or worse than the environment of the ASSEMBLY or components.

[definition 3.12.2 of IEC 60664-1:2007, modified]

3.6.10 (空間距離或沿面距離之)微環境 (micro-environment (of a clearance or creepage distance))

絕緣之直接環境，其尤其會影響沿面距離之尺寸。

備考：沿面距離或空間距離之微環境及非組裝品或組件之環境決定在絕緣之影響。微環境可較組裝品或組件之環境更佳或更差。

[IEC 60664-1:2007 之定義 3.12.2，修訂]

3.6.11
overvoltage category (of a circuit or within an electrical system)
conventional number based on limiting (or controlling) the values of prospective transient overvoltages occurring in a circuit (or within an electrical system having different nominal voltages) and depending upon the means employed to influence the overvoltages

NOTE In an electrical system, the transition from one overvoltage category to another of lower category is obtained through appropriate means complying with interface requirements, such as an overvoltage protective device or a series-shunt impedance arrangement capable of dissipating, absorbing, or diverting the energy in the associated surge current, to lower the transient overvoltage value to that of the desired lower overvoltage category.

[definition 2.5.60 of IEC 60947-1: 2007]

3.6.11 (電路或電氣系統內之)過電壓類別(overvoltage category (of a circuit or within an electrical system))

以限制(或控制)電路(或具不同標稱電壓之電氣系統)中所發生之預期暫態過電壓為基礎，並依據取決於影響過電壓所採用之方法的傳統號碼。

備考：在電氣系統中，從一過電壓類別至較低過電壓類別之轉換，係藉由符合介面要求之適當工具(例：能吸收、消耗或轉移相聯結之突波電流能量的過電壓保護器或串/並聯阻抗配置)所獲得，將暫態過電壓值降至所希望之較低過電壓類別。

[IEC 60947-1:2007 之定義 2.5.60]

3.6.12
surge arrester
surge protective device
SPD
device designed to protect the electrical apparatus from high transient overvoltages and to limit the duration and frequently the amplitude of the follow-on current

[definition 2.2.22 of IEC 60947-1: 2007]

3.6.12 突波吸收器；突波保護裝置 SPD (surge arrester; surge protective device)

一種裝置，係設計用於保護電氣設備，防止高暫態過電壓，並用於限制續流電流之持續時間及振幅。

[IEC 60947-1:2007 之定義 2.2.22]

3.6.13
insulation co-ordination
correlation of insulating characteristics of electrical equipment with the expected overvoltages and the characteristics of overvoltage protective devices on the one hand, and with the expected micro-environment and the pollution protective means on the other hand

[definition 2.5.61 of IEC 60947-1: 2007, modified]

3.6.13 絕緣協調(insulation co-ordination)

電氣設備之絕緣特性，一方面與預期過電壓及過電壓保護設備之特性有關，一方面與預期微觀環境及污染保護方式有關。

[IEC 60947-1:2007 之定義 2.5.61，修訂]

3.6.14
inhomogeneous (non-uniform) field
electric field which has not an essentially constant voltage gradient between electrodes

[definition 2.5.63 of IEC 60947-1: 2007]

3.6.14 異質(非均勻)場 (inhomogeneous (non-uniform) field)

於電極間，電壓梯度不為恆定之電場。

[IEC 60947-1:2007 之定義 2.5.63]

3.6.15
tracking
progressive formation of conducting paths which are produced on the surface of a solid insulating material, due to the combined effects of electric stress and electrolytic contamination on this surface

[definition 2.5.64 of IEC 60947-1: 2007]

3.6.15 電痕(tracking)

固體絕緣材料表面上，由於電應力及電解污染之聯合作用下，逐漸形成導電通路之過程。

[IEC 60947-1:2007 之定義 2.5.64]

3.6.16
comparative tracking index
CTI
numerical value of the maximum voltage in volts at which a material withstands 50 drops of a defined test liquid without tracking

NOTE The value of each test voltage and the CTI should be divisible by 25.

[definition 2.5.65 of IEC 60947-1: 2007, modified]

3.6.16 比較電痕指數 CTI (comparative tracking index)

材料承受 50 滴指定之試驗溶液而未形成電痕的最高電壓值，以 V 表示。

備考： 每一試驗電壓值及 CTI 宜為 25 之倍數。

[IEC 60947-1:2007 之定義 2.5.65，修訂]

3.6.17
disruptive discharge
phenomena associated with the failure of insulation under electrical stress, in which the discharge completely bridges the insulation under test, reducing the voltage between the electrodes to zero or nearly zero

NOTE 1 A disruptive discharge in a solid dielectric produces permanent loss of dielectric strength; in a liquid or gaseous dielectric, the loss may be only temporary.

NOTE 2 The term "sparkover" is used when a disruptive discharge occurs in a gaseous or liquid dielectric.

NOTE 3 The term "flashover" is used when a disruptive discharge occurs over the surface of a dielectric in a gaseous or liquid medium.

NOTE 4 The term "puncture" is used when a disruptive discharge occurs through a solid dielectric.

3.6.17 迅裂放電(disruptive discharge)

在電氣應力下，與絕緣失效有關之現象。在此現象中，放電完全橋接受試驗之絕緣，使電極之間的電壓降至零或幾乎為零。

備考 1. 固體電介質內之迅裂放電使電介質強度產生永久性損失；在液體或氣體電介質中，損失可僅為暫時性。

備考 2. 〝火花(sparkover)〞一詞係用於當迅裂放電發生在氣體或液體電介質時。

備考 3. 〝閃絡(flashover)〞一詞係用於當迅裂放電發生在氣體或液體媒介中之電介質表面時。

備考 4. 〝擊穿放電(puncture)〞一詞係用於當迅裂放電發生在固體電介質內時。

3.7 Protection against electric shock

3.7.1
live part
conductor or conductive part intended to be energized in normal operation, including a neutral conductor, but by convention not a PEN conductor

NOTE This term does not necessarily imply a risk of electric shock.

[IEC 60050-195:1998, 195-02-19, modified]

3.7 防電擊之保護(protection against electric shock)

3.7.1 帶電零件(live part)

在正常操作中預期會通電之導體或導電部位，包括中性導體，但傳統上不包括 PEN 導體。

備考：此用語並不一定意味有電擊之風險。

[IEC 60050-195:1998, 195-02-19，修訂]

3.7.2
hazardous live part
live part which, under certain conditions, can give a harmful electric shock

[IEC 60050-195:1998, 195-06-05]

3.7.2 危險帶電零件(hazardous live part)

在某些情況下，會產生有害之電擊的帶電零件。

[IEC 60050-195:1998, 195-06-05]

3.7.3
exposed conductive part
conductive part of the ASSEMBLY, which can be touched and which is not normally live, but which may become a hazardous live part under fault conditions

[IEC 60050-826:2004, 826-12-10, modified]

3.7.3 暴露性導電零件(exposed conductive part)

組裝品之導電零件，其可能會被接觸且正常中不帶電，但在故障情況下可能會成為危險之帶電零件。

[IEC 60050-826:2004, 826-12-10，修訂]

3.7.4
protective conductor
(identification: PE)
conductor provided for purposes of safety, for example protection against electric shock

[IEC 60050-826:2004, 826-13-22]

NOTE As an example the protective conductor can electrically connect the following parts:
- exposed conductive parts;
- extraneous conductive parts;
- main earthing terminal;
- earth electrode;
- earthed point of the source or artificial neutral.

3.7.4 保護性導體(protective conductor) (識別：PE)

提供安全性用途(例：防電擊之保護)之導體。

[IEC 60050-826:2004, 826-13-22]

備考：舉例而言，保護性導體在電性上可連接下列零件。

－暴露性導電零件。

－外部導電零件。

－主接地端子。

－接地電極。

－電源或人造中性點之接地點。

3.7.5
neutral conductor
N
conductor electrically connected to the neutral point and capable of contributing to the distribution of electric energy

[IEC 60050-195:1998, 195-02-06, modified]

3.7.5 中性導體(neutral conductor N)

在電性上連接至中性點，並能促進電能分配之導體。

[IEC 60050-195:1998, 195-02-06，修訂]

3.7.6
PEN conductor
conductor combining the functions of both a protective earthing conductor and a neutral conductor

[IEC 60050-195:1998, 195-02-12]

3.7.6 保護接地中性導體(PEN conductor)

結合保護接地導體與中性導體兩者之功能的導體。

[IEC 60050-195:1998, 195-02-12]

3.7.7
fault current
current resulting from an insulation failure, the bridging of insulation or incorrect connection in an electrical circuit

3.7.7 故障電流(fault current)

因絕緣故障、絕緣橋接或電路之不正確連接所產生之電流。

3.7.8
basic protection
protection against electric shock under fault-free conditions

[IEC 60050-195:1998, 195-06-01]

NOTE Basic protection is intended to prevent contact with live parts and generally corresponds to protection against direct contact.

3.7.8 基本保護(basic protection)

在無故障情況下防止電擊之保護。

[IEC 60050-195:1998, 195-06-01]

備考：基本保護係用於防止與帶電零件接觸，且一般對應於防止直接接觸之保護。

3.7.9
basic insulation
insulation of hazardous live parts, which provide basic protection

[IEC 60050-195:1998, 195-06-06]

NOTE This concept does not apply to insulation used exclusively for functional purposes.

3.7.9 基本絕緣(basic insulation)

危險帶電零件之絕緣，其提供基本保護。

[IEC 60050-195:1998, 195-06-06]

備考：此概念不適用於功能性用途所專用之絕緣。

3.7.10
fault protection
protection against electric shock under single-fault conditions (e.g. failure of basic insulation)

[IEC 60050-195:1998, 195-06-02, modified]

NOTE Fault protection generally corresponds to protection against indirect contact, mainly with regard to failure of basic insulation.

3.7.10 故障保護(fault protection)

在單一故障條件下(例：基本絕緣失效)，防止電擊之保護。

[IEC 60050-195:1998, 195-06-02，修訂]

備考：故障失效一般係相對應於防止直接接觸之保護，主要與基本絕緣之失效有關。

3.7.11
extra-low voltage
ELV
any voltage not exceeding the relevant voltage limit specified in IEC 61201

3.7.11 超低電壓 ELV (extra-low voltage)

不超過 IEC 61201 所規定之相關電壓限制的任何電壓。

3.7.12
skilled person
person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create

[IEC 60050-826:2004, 826-18-01]

3.7.12 技術人員(skilled person)

具相關教育及經驗，能察知危險並避開電所產生之危險的人員。

[IEC 60050-826:2004, 826-18-01]

3.7.13
instructed person
person adequately advised or supervised by skilled persons to enable him or her to perceive risks and to avoid hazards electricity can create

[IEC 60050-826:2004, 826-18-02]

3.7.13 指導人員(instructed person)

獲技術人員充分告知或監督而能察知危險，並能避開電所產生之危險的人員。

[IEC 60050-826:2004, 826-18-02]

3.7.14
ordinary person
person who is neither a skilled person nor an instructed person

[IEC 60050-826:2004, 826-18-03]

3.7.14 一般人員(ordinary person)

既非技術人員，亦非指導人員之人員。

[IEC 60050-826:2004, 826-18-03]

3.7.15
authorized person
skilled or instructed person, who is empowered to execute defined work

3.7.15 獲授權人員(authorized person)

技術人員或指導人員，其獲授權執行指定之工作。

3.8 Characteristics

3.8.1
nominal value
value of a quantity used to designate and identify a component, device, equipment or system

NOTE The nominal value is generally a rounded value.

[IEC 60050-151:2001, 151-16-09]

3.8 特性(characteristics)

3.8.1 標稱值(nominal value)

用於標明並識別組件、裝置、設備或系統之量值。

備考：標稱值一般為四捨五入值。

[IEC 60050-151:2001, 151-16-09]

3.8.2
limiting value
in a specification of a component, device, equipment or system, the greatest or smallest admissible value of a quantity

[IEC 60050-151:2001, 151-16-10]

3.8.2 限制值(limiting value)

於組件、裝置、設備或系統之規格中的最大或最小可容許量值。

[IEC 60050-151:2001, 151-16-10]

3.8.3
rated value
value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment, or system

[IEC 60050-151:2001, 151-16-08]

3.8.3 額定值(rated value)

針對規格用途而使用、為規定之組件、裝置、設備或系統之操作條件組所建立之量值。

[IEC 60050-151:2001, 151-16-08]

3.8.4
rating
set of rated values and operating conditions

[IEC 60050-151:2001, 151-16-11]

3.8.4 定額(rating)

額定值及操作條件之集合。

[IEC 60050-151:2001, 151-16-11]

3.8.5
nominal voltage (of an electrical system)
approximate value of voltage used to designate or identify an electrical system

[IEC 60050-601:1985, 601-01-21 modified]

3.8.5 電氣系統之標稱電壓(nominal voltage (of an electrical system))

用於標明或識別電氣系統所使用之電壓的近似值。

[IEC 60050-101:1985, 601-01-21，修訂]

3.8.6
short-circuit current
I_c
over-current resulting from a short circuit due to a fault or an incorrect connection in an electric circuit

[IEC 60050-441:1984, 441-11-07]

3.8.6 短路電流 I_c (short-circuit current)

因電路中之故障或錯誤連接，而導致之短路所產生的過電流。

[IEC 60050-441:1985, 441-11-07]

3.8.7
prospective short-circuit current
I_{cp}
r.m.s. value of the current which would flow if the supply conductors to the circuit are short-circuited by a conductor of negligible impedance located as near as practicable to the supply terminals of the ASSEMBLY (see 10.11.5.4)

3.8.7 預期短路電流 I_{cp} (prospective short-circuit current)

若電源導體至電路間，以可予忽略阻抗之導體儘可能置於接近組裝品電源端子之處予以短路時，會流過之電流的均方根值(參照 10.11.5.4)。

3.8.8
cut-off current
let-through current
maximum instantaneous value of current attained during the breaking operation of a switching device or a fuse

NOTE This concept is of particular importance when the switching device or the fuse operates in such a manner that the prospective peak current of the circuit is not reached.

[IEC 60050-441:1984, 441-17-12]

3.8.8 切離電流；允通電流(cut-off current, let-through current)

在開關操作裝置或熔線之啟斷操作期間所達到之最大瞬間電流值。

備考：當開關操作裝置或熔線在未達到電路預期峰值電流之情況下操作時，此概念尤其重要。

[IEC 60050-441:1984, 441-17-12]

3.8.9
voltage ratings

3.8.9.1
rated voltage
U_n
highest nominal voltage of the electrical system, a.c. (r.m.s.) or d.c., declared by the ASSEMBLY manufacturer, to which the main circuit(s) of the ASSEMBLY is (are) designed to be connected

NOTE 1 In polyphase circuits, it is the voltage between phases.

NOTE 2 Transients are disregarded.

NOTE 3 The value of the supply voltage may exceed the rated voltage due to permissible system tolerances.

3.8.9 電壓定額(voltage ratings)

3.8.9.1額定電壓 U_n (rated voltage)

組裝品之主電路所設計連接之交流(均方根)或直流電氣系統的最高標稱電壓。此電壓係由組裝品製造廠商所宣告。

備考 1. 在多相電路中，其為相間之電壓。

備考 2. 忽略暫態。

備考 3. 由於可容許之系統許可差，供應電壓值可超過額定電壓值。

3.8.9.2
rated operational voltage (of a circuit of an ASSEMBLY)
U_e
value of voltage, declared by the ASSEMBLY manufacturer, which combined with the rated current determines its application

NOTE In polyphase circuits, it is the voltage between phases.

3.8.9.2(組裝品電路之)額定操作電壓 U_e (rated operational voltage (of a circuit of an ASSEMBLY))

由組裝品製造廠商所宣告之電壓值，其與額定電流共同決定其應用。

備考：在多相電路中，其為相間之電壓。

3.8.9.3
rated insulation voltage
U_i
r.m.s withstand voltage value, assigned by the ASSEMBLY manufacturer to the equipment or to a part of it, characterising the specified (long-term) withstand capability of the insulation

[definition 3.9.1 of IEC 60664-1: 2007, modified]

NOTE 1 In polyphase circuits, it is the voltage between phases.

NOTE 2 The rated insulation voltage is not necessarily equal to the rated operational voltage of equipment, which is primarily related to functional performance.

3.8.9.3額定絕緣電壓 U_i (rated insulation voltage)

組裝品製造廠商對設備或設備之一部分所指定之均方根耐電壓值，其描述絕緣耐受能力之特性。

[IEC 60664-1: 2007 之 3.9.1，修訂]

備考 1. 在多相電路中，其為相間之電壓。

備考 2. 額定絕緣電壓不必然等於設備之額定操作電壓，額定操作電壓主要與功能表現有關。

3.8.9.4
rated impulse withstand voltage
U_{imp}
impulse withstand voltage value, declared by the ASSEMBLY manufacturer, characterising the specified withstand capability of the insulation against transient overvoltages

[definition 3.9.2 of IEC 60664-1: 2007, modified]

3.8.9.4額定衝擊耐電壓 U_{imp} (rated impulse withstand voltage)

組裝品製造廠商所宣告之衝擊耐電壓值，其描述所規定之絕緣耐受能力反抗暫態過電壓之特性。

[IEC 60664-1: 2007 之 3.9.2，修訂]

3.8.10
current ratings

3.8.10.1
rated current
value of current, declared by the ASSEMBLY manufacturer which can be carried without the temperature-rise of various parts of the ASSEMBLY exceeding specified limits under specified conditions

NOTE For rated current of the ASSEMBLY (I_{nA}) see 5.3.1, and for rated current of a circuit (I_{nc}) see 5.3.2.

3.8.10 電流定額(current ratings)

3.8.10.1 額定電流(rated current)

由組裝品製造廠商所宣告之電流值，其係在規定之條件下所能承載，而不會使組裝品各零件之溫升超過限制值。

備考：有關組裝品之額定電流，參照 5.3.1。有關電路之額定電流，參照 5.3.2。

3.8.10.2
rated peak withstand current
I_{pk}
value of peak short-circuit current, declared by the ASSEMBLY manufacturer, that can be withstood under specified conditions

3.8.10.2 額定峰值耐電流 I_{pk} (rated peak withstand current)

在規定之條件下所能耐受之峰值短路電流值，其係由組裝品製造廠商宣告。

3.8.10.3
rated short-time withstand current
I_{cw}
r.m.s value of short-time current, declared by the ASSEMBLY manufacturer, that can be withstood under specified conditions, defined in terms of a current and time

3.8.10.3 額定短時間耐電流 I_{cw} (rated short-time withstand current)

在規定之條件下所能耐受之短時間電流均方根值，其係由組裝品製造廠商宣告，並以電流及磁間定義。

3.8.10.4
rated conditional short-circuit current
I_{cc}
value of prospective short-circuit current, declared by the ASSEMBLY manufacturer, that can be withstood for the total operating time (clearing time) of the short-circuit protective device (SCPD) under specified conditions

NOTE The short-circuit protective device may form an integral part of the ASSEMBLY or may be a separate unit.

3.8.10.4 額定限制短路電流 I_{cc} (rated conditional short-circuit current)

在規定之條件下所能耐受之預期短路電流值，其耐受時間為短路保護裝置之總操作時間(清除時間)，且此值係由組裝品製造廠商宣告。

備考：短路保護裝置可為組裝品之一部分，或可為獨立單元。

3.8.11
rated diversity factor
RDF
per unit value of the rated current, assigned by the ASSEMBLY manufacturer, to which outgoing circuits of an ASSEMBLY can be continuously and simultaneously loaded taking into account the mutual thermal influences

3.8.11 額定多樣性因數 RDF (rated diversity factor)

額定電流之標么值，其由組裝品製造廠商指定，係在考量相互熱影響下，組裝品之外向電路所能連續且同時承載至此電流值。

3.8.12
rated frequency
f_n
value of frequency, declared by the ASSEMBLY manufacturer, for which a circuit is designed and to which the operating conditions refer

NOTE A circuit may be assigned a number or a range of rated frequencies or be rated for both a.c. and d.c.

3.8.12 額定頻率 f_n (rated frequency)

電路所設計使用之頻率值，其係由組裝品製造廠商宣告，且代表操作條件。

備考:可對電路指定若干或某一範圍之額定頻率,或針對交流及直流兩者額定。

3.8.13
electromagnetic compatibility
EMC

NOTE For EMC related terms and definitions, see J.3.8.13.1 to J.3.8.13.5 of Annex J.

3.8.13 電磁相容性 EMC (electromagnetic compatibility)

備考：有關 EMC 之相關用語及定義，參照附錄 J 之 J.3.8.13.1 至 J.3.8.13.5。

3.9 Verification

3.9.1
design verification
verification made on a sample of an ASSEMBLY or on parts of ASSEMBLIES to show that the design meets the requirements of the relevant ASSEMBLY standard

NOTE Design verification may comprise one or more equivalent methods see 3.9.1.1, 3.9.1.2 and 3.9.1.3.

3.9 查證(verification)

3.9.1 設計查證(design verification)

於組裝品樣本或組裝品零件上所進行之查證，其用以顯示該設計符合相關組裝品標準之要求。

備考：設計查證可包含 1 個或多個等效方法，參照 3.9.1.1、3.9.1.2 及 3.9.1.3。

3.9.1.1
verification test
test made on a sample of an ASSEMBLY or on parts of ASSEMBLIES to verify that the design meets the requirements of the relevant ASSEMBLY standard

NOTE Verification tests are equivalent to type tests.

3.9.1.1 查證試驗(verification test)

於組裝品樣本或組裝品零件上所進行之試驗，其用以查證該設計符合相關組裝品標準之要求。

備考：查證試驗相當於型式試驗。

3.9.1.2
verification comparison
structured comparison of a proposed design for an ASSEMBLY, or parts of an ASSEMBLY, with a reference design verified by test

3.9.1.2 查證比較(verification comparison)

對於組裝品或組裝品零件，以經試驗查證過之參考設計，對所提議之設計所進行之結構比較。

3.9.1.3
verification assessment
design verification of strict design rules or calculations applied to a sample of an ASSEMBLY or to parts of ASSEMBLIES to show that the design meets the requirements of the relevant ASSEMBLY standard

3.9.1.3 查證評鑑(verification assessment)

對施於組裝品樣本或組裝品零件之嚴格設計規則或計算所進行的設計查證，其用以顯示該設計符合相關組裝品標準之要求。

3.9.2
routine verification
verification of each ASSEMBLY performed during and/or after manufacture to confirm whether it complies with the requirements of the relevant ASSEMBLY standard

3.9.2 例行查證(routine verification)

於製造期間及/或製造後對每一組裝品所執行之查證，其用以確認是否符合相關組裝品標準之要求。

3.10 Manufacturer/user

3.10.1
original manufacturer
organization that has carried out the original design and the associated verification of an ASSEMBLY in accordance with the relevant ASSEMBLY standard

3.10 製造廠商/使用者(manufacturer/user)

3.10.1原始製造廠商(original manufacturer)

已依相關組裝品標準對組裝品進行原始設計及相關查證之組織。

3.10.2
ASSEMBLY manufacturer
organization taking the responsibility for the completed ASSEMBLY

NOTE The ASSEMBLY manufacturer may be a different organisation to the original manufacturer.

3.10.2組裝品製造廠商(ASSEMBLY manufacturer)

對完整之組裝品負責的組織。

備考：組裝品製造廠商與原始製造廠商可為不同之組織。

3.10.3
user
party who will specify, purchase, use and/or operate the ASSEMBLY, or someone acting on their behalf

3.10.3使用者(user)

會指定、購買、使用及/或操作組裝品之團體，或代其行事之個人。

4 Symbols and abbreviations

Alphabetical list of terms with symbols and abbreviations together with the subclause where they are first used:

4. 符號及縮寫

依字母順序排列之用語與其符號、縮寫及第 1 次出現之節次的列表如下。

Symbol/Abbreviation	Term	Subclause
CTI	comparative tracking index	3.6.17
ELV	extra-low voltage	3.7.11
EMC	electromagnetic compatibility	3.8.13
f_n	rated frequency	3.8.12
I_c	short-circuit current	3.8.6
I_{cc}	rated conditional short-circuit current	3.8.10.4
I_{cp}	prospective short-circuit current	3.8.7
I_{cw}	rated short-time withstand current	3.8.10.3
I_{nA}	rated current of the ASSEMBLY	5.3.1
I_{nc}	rated current of a circuit	5.3.2
I_{pk}	rated peak withstand current	3.8.10.2
N	neutral conductor	3.7.5
PE	protective conductor	3.7.4
PEN	PEN conductor	3.7.6
RDF	rated diversity factor	3.8.11
SCPD	short-circuit protective device	3.1.11
SPD	surge protective device	3.6.12
U_e	rated operational voltage	3.8.9.2
U_i	rated insulation voltage	3.8.9.3
U_{imp}	rated impulse withstand voltage	3.8.9.4
U_n	rated voltage	3.8.9.1

符號/縮寫	用語	節次
CTI	相對電痕指數	3.6.17
ELV	超低電壓	3.7.11
EMC	電磁相容性	3.8.13
f_n	額定頻率	3.8.12
I_c	短路電流	3.8.6
I_{cc}	額定限制短路電流	3.8.10.4
I_{cp}	預期短路電流	3.8.7
I_{cw}	額定短時間耐電流	3.8.10.3

I_{nA}	組裝品之額定電流	5.3.1
I_{nc}	電路之額定電流	5.3.3
I_{pk}	額定峰值耐電流	3.8.10.2
N	中性導體	3.7.5
PE	保護性導體	3.7.4
PEN	PEN 導體	3.7.6
RDF	額定多樣性因數	3.8.11
SCPD	短路保護裝置	3.1.11
SPD	突波保護裝置	3.6.12
U_e	額定操作電壓	3.8.9.2
U_i	額定絕緣電壓	3.8.9.3
U_{imp}	額定衝擊耐電壓	3.8.9.4
U_n	額定電壓	3.8.9.1

5 Interface characteristics

5.1 General

The characteristics of the ASSEMBLY shall ensure compatibility with the ratings of the circuits to which it is connected and the installation conditions and shall be declared by the ASSEMBLY manufacturer using the criteria identified in 5.2 to 5.6.

5. 介面特性

5.1 一般

組裝品特性應確保與所連接之電路的定額及安裝條例具有相容性，且應使用 5.2 至 5.6 所識別準則由製造廠商宣告。

5.2 Voltage ratings

5.2.1 Rated voltage (U_n) (of the ASSEMBLY)

The rated voltage shall be at least equal to the nominal voltage of the electrical system.

5.2 電壓定額

5.2.1 (組裝品之)額定電壓(U_n)

額定電壓應至少等於電氣系統之標稱電壓。

5.2.2 Rated operational voltage (U_e) (of a circuit of an ASSEMBLY)

The rated operational voltage of any circuit shall not be less than the nominal voltage of the electrical system to which it is to be connected.

If different from the rated voltage of the ASSEMBLY, the appropriate rated operational voltage of the circuit shall be stated.

5.2.2 (組裝品電路之)額定操作電壓(U_e)

任何電路之額定操作電壓不應小於其所連接之電氣系統的標稱電壓。

若與組裝品額定電壓不同時，應聲明合適之電路額定操作電壓。

5.2.3 Rated insulation voltage (U_i) (of a circuit of an ASSEMBLY)

The rated insulation voltage of a circuit of an ASSEMBLY is the voltage value to which dielectric test voltages and creepage distances are referred.

The rated insulation voltage of a circuit shall be equal or higher than the values stated for U_n and for U_e for the same circuit.

NOTE For single-phase circuits derived from IT systems (see IEC 60364-5-52), the rated insulation voltage should be at least equal to the voltage between phases of the supply.

5.2.3 (組裝品電路之)額定絕緣電壓(U_i)

組裝品電路之額定絕緣電壓係與電介質試驗電壓及沿面距離有關之電壓值。

電路之額定絕緣電壓應等於或高於相同電路中對 U_n 及 U_e 所指定之值。

備考：關於從 IT 系統所衍生之單相電路，其額定絕緣電壓宜至少等於供應電壓之相間電壓。

5.2.4 Rated impulse withstand voltage (U_{imp}) (of the ASSEMBLY)

The rated impulse withstand voltage shall be equal to or higher than the values stated for the transient overvoltages occurring in the electrical system(s) to which the circuit is designed to be connected.

NOTE The preferred values of rated impulse withstand voltage are those given in Table G.1 of Annex G.

5.2.4 (組裝品之)額定衝擊耐電壓(U_{imp})

額定衝擊耐電壓應等於或高於對暫態過電壓所聲明之值，該暫態過電壓係出現在電路所設計連接之電器系統中。

備考：有關額定衝擊耐電壓之首選值，如附錄 G 表 G.1 所示。

5.3 Current ratings

5.3.1 Rated current of the ASSEMBLY (I_{nA})

The rated current of the ASSEMBLY is the smaller of:

- the sum of the rated currents of the incoming circuits within the ASSEMBLY operated in parallel;
- the total current which the main busbar is capable of distributing in the particular ASSEMBLY arrangement.

This current shall be carried without the temperature rise of the individual parts exceeding the limits specified in 9.2.

NOTE 1 The rated current of an incoming circuit may be lower than the rated current of the incoming device (according to the respective device standard) installed in the ASSEMBLY.

NOTE 2 The main busbar in this context is a single busbar or a combination of single busbars that are normally connected in service e.g. by means of a bus coupler.

NOTE 3 The rated current of the ASSEMBLY is the maximum permissible load current which can be distributed by the ASSEMBLY and which cannot be exceeded by adding further outgoing units.

5.3 電流定額

5.3.1 (組裝品之)額定電流(I_{nA})

組裝品之額定電流應小於下列值。

－ 並聯操作之組裝品內的內向電路(incoming circuit)之額定電流總和。

－ 主匯流排在特別組裝品配置中所能配電之總電流。

應在個別組面之溫升未超過 9.2 所規定之限制下承載此電流。

備考 1. 內向電路之額定電流可低於安裝在組裝品內之內向裝置的額定電流(依個別裝置標準)。

備考 2. 本文所述之主匯流排為單匯流排，或為正常連接使用(例：以匯流排耦合器)之單匯流排的組合。

備考 3.組裝品之額定電流為組裝品所能配電之最大可容許負載電流，且在增加額外之外向單元後，不能超過此值。

5.3.2 Rated current of a circuit (I_{nc})

The rated current of a circuit is the value of the current that can be carried by this circuit loaded alone, under normal service conditions. This current shall be carried without the temperature rise of the various parts of the ASSEMBLY exceeding the limits specified in 9.2.

NOTE 1 The rated current of a circuit may be lower than the rated currents of the devices (according to the respective device standard) installed in this circuit.

NOTE 2 Due to the complex factors determining the rated currents, no standard values can be given.

5.3.2 電路之額定電流(I_{nc})

電路之額定電流為該電路在正常使用條件下所能單獨承載之電流值。應在組裝品之各零件溫升未超過 9.2 所規定之限制下承載此電流。

備考 1.電路之額定電流可低於安裝在此電路內之裝置的額定電流(依個別裝置標準)。

備考 2.由於決定額定電流之因數複雜，因此無法提供標準值。

5.3.3 Rated peak withstand current (I_{pk})

The rated peak withstand current shall be equal to or higher than the values stated for the peak value of the prospective short-circuit current of the supply system(s) to which the circuit(s) is (are) designed to be connected (see also 9.3.3).

5.3.3 額定峰值耐電流(I_{pk})

額定峰值耐電流應等於或高於對電路連接之供電系統的預期短路電流峰值所指定之值。

5.3.4 Rated short-time withstand current (I_{cw}) (of a circuit of an ASSEMBLY)

The rated short-time withstand current shall be equal to or higher than the prospective r.m.s. value of the short-circuit current (I_{cp}) at each point of connection to the supply, (see also 3.8.10.3).

Different values of I_{cw} for different durations (e.g. 0,2 s; 1 s; 3 s) may be assigned to an ASSEMBLY.

For a.c., the value of the current is the r.m.s. value of the a.c. component.

5.3.4 (組裝品電路之)額定短時間耐電流(I_{cw})

額定短時間耐電流應等於或高於供應電源之每一連接點的短路電流(I_{cp})之預期均方根值(參照 3.8.10.3)。

可對 1 個組裝品之不同持續時間(例：0.2 s、1 s、3 s)指定不同之值。

關於交流，其電流值為交流組件之均方根值。

5.3.5 Rated conditional short-circuit current of an ASSEMBLY (I_{cc})

The rated conditional short-circuit current shall be equal to or higher than the prospective r.m.s. value of short-circuit current (I_{cp}) for a duration limited by the operation of the short-circuit protective device that protects the ASSEMBLY.

The breaking capacity and current limitation characteristic (I^2t, I_{pk}) of the specified short-circuit protective device shall be stated by the ASSEMBLY manufacturer, taking into consideration the data given by the device manufacturer.

5.3.5 組裝品之額定限制短路電流(I_{cc})

額定限制短路電流應等於或高於短路電流(I_{cp})之預期均方根值，其持續時間受

限於保護組裝品之短路保護裝置的操作。

所規定之短路保護裝置的啟斷容量及電流限制特性(I^2t, I_{pk})應由組裝品製造廠商聲明。

5.4 Rated diversity factor (RDF)

The rated diversity factor is the per unit value of the rated current, assigned by the ASSEMBLY manufacturer, to which outgoing circuits of an ASSEMBLY can be continuously and simultaneously loaded taking into account the mutual thermal influences.

Rated diversity factor can be stated:

- for groups of circuits;
- for the whole ASSEMBLY.

The rated diversity factor multiplied by the rated current of the circuits shall be equal to or higher than the assumed loading of the outgoing circuits. The assumed loading of outgoing circuits shall be addressed by the relevant ASSEMBLY standard.

NOTE 1 The assumed loading of the outgoing circuits can be a steady continuous current or the thermal equivalent of a varying current (See Annex E).

The rated diversity factor is applicable with the ASSEMBLY operating at rated current (I_{nA}).

NOTE 2 The rated diversity factor recognizes that multiple functional units are in practice not fully loaded simultaneously or are intermittently loaded.

See Annex E for further details.

NOTE 3 In Norway, the overload protection of conductors shall not solely be based on the use of diversity factors of the downstream circuits.

5.4 額定多樣性因數(RDF)

額定多樣性因數為額定電流之標么值，其係由製造廠商指定，在考量相互熱動影響下，組裝品之外向電路可連續及同時承載至該值。

可針對下列項目指定額定多樣性因數。

- 電路群組。
- 整個組裝品。

備考 1.所假設之外向電路的承載，可為穩定連續電流，或熱動等效之變動電流(參照附錄 E)。

額定多樣性因數可適用於在額定電流(I_{nA})下操作之組裝品。

備考 2.額定多樣性因數認定多重功能性單元實際上並不同時承載，或為間歇性承載。

有關進一步之細節，參照附錄 E。

備考 3.在挪威，導體之過載保護不應僅依據下游電路之多樣性因數的使用。

5.5 Rated frequency (f_n)

The rated frequency of a circuit is the value of frequency to which the operating conditions are referred. Where the circuits of an ASSEMBLY are designed for different values of frequency, the rated frequency of each circuit shall be given.

NOTE The frequency should be within the limits specified in the relevant IEC standards for the incorporated components. Unless otherwise stated by the ASSEMBLY manufacturer, the limits are assumed to be 98 % and 102 % of the rated frequency.

5.5 額定頻率(f_n)

電路之額定頻率為操作條件所涉及之頻率值。當組裝品係設計供不同頻率值時，

應提供每一電路之額定頻率。

備考：頻率宜在相關標準對結合之組件所規定之限制內。除非組裝品製造廠商另有規定，該限制假設為額定頻率之 98 %及 102 %。

5.6 Other characteristics

The following characteristics shall be declared:

a) additional requirements depending on the specific service conditions of a functional unit (e.g. type of coordination, overload characteristics);
b) pollution degree (see 3.6.9);
c) types of system earthing for which the ASSEMBLY is designed;
d) indoor and/or outdoor installation (see 3.5.1 and 3.5.2);
e) stationary or movable (see 3.5.3 and 3.5.4);
f) degree of protection;
g) intended for use by skilled or ordinary persons (see 3.7.12 and 3.7.14);
h) electromagnetic compatibility (EMC) classification (see Annex J);
i) special service conditions, if applicable (see 7.2);
j) external design (see 3.3);
k) mechanical impact protection, if applicable (see 8.2.1);
l) the type of construction – fixed or removable parts (see 8.5.1 and 8.5.2.);
m) the nature of short-circuit protective device(s) (see 9.3.2);
n) measures for protection against electric shock;
o) overall dimensions (including projections e.g handles, covers, doors), if required;
p) the weight, if required.

5.6 其他特性

應宣告下列特性。

(a) 額外要求，視功能性單元之特定條件(例：協調型式、過載特性)而定。

(b) 污染等級(參照 3.6.9)。

(c) 組裝品所設計使用之系統接地的型式。

(d) 屋內型及/或屋外型安裝(參照 3.5.1 及 3.5.2)。

(e) 靜置型或可動型(參照 3.5.3 及 3.5.4)。

(f) 保護等級。

(g) 預定供技術人員或一般人員使用(參照 3.7.12 及 3.7.14)。

(h) 電磁相容性(EMC)分類(參照附錄 J)。

(i) 特殊使用條件(若適用時) (參照 7.2)。

(j) 外部設計(參照 3.3)。

(k) 機械撞擊保護(若適用時) (參照 8.2.1)。

(l) 構造型式－固定型或可動型零件(參照 8.5.1 及 8.5.2)。

(m) 短路保護裝置之種類(參照 9.3.2)。

(n) 防電擊保護之措施。

(o) 整體尺寸(包括凸出部位，例：外蓋、門) (若有需要時)。

(p) 重量(若有需要時)。

6 Information

6.1 ASSEMBLY designation marking

The ASSEMBLY manufacturer shall provide each ASSEMBLY with one or more labels, marked in a durable manner and located in a place such that they are visible and legible when the ASSEMBLY is installed and in operation. Compliance is checked according to the test of 10.2.7 and by inspection.

The following information regarding the ASSEMBLY shall be provided on the designation label(s):

a) ASSEMBLY manufacturer's name or trade mark (see 3.10.2);

b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the ASSEMBLY manufacturer;

c) means of identifying date of manufacture;

d) IEC 61439-X (the specific part "X" shall be identified).

NOTE The relevant ASSEMBLY standard may specify where additional information is to be provided on the designation label.

6. 資訊

6.1 組裝品名稱標示

組裝品製造廠商應針對每一組裝品提供 1 個或多個標籤，並以經久耐用之方式標示在適當位置，使得當組裝品在安裝及操作時，標籤可明顯易見及清楚易讀。以檢驗及 10.2.7 之試驗檢查其符合性。

應在名稱標籤上，提供下列有關組裝品之資訊。

(a) 組裝品製造廠商之名稱及商標(參照 3.10.2)。

(b) 型號名稱或識別號碼或其他識別方法，以便能從組裝品製造廠商獲得相關資訊。

(c) 識別製造日期之方法。

(d) IEC 61439-X (應識別特定之〝X〞)。

備考：相關組裝品標準中，可具體規定須於名稱標籤上提供之額外資訊。

6.2 Documentation

6.2.1 Information relating to the ASSEMBLY

All interface characteristics according to Clause 5, where applicable, shall be provided in the ASSEMBLY manufacturer's technical documentation supplied with the ASSEMBLY.

6.2 文件

6.2.1 與組裝品有關之資訊

隨組裝品提供之組裝品製造廠商技術文件中，應提供第 5 節可適用之所有介面特性。

6.2.2 Instructions for handling, installation, operation and maintenance

The ASSEMBLY manufacturer shall provide in documents or catalogues the conditions, if any, for the handling, installation, operation and maintenance of the ASSEMBLY and the equipment contained therein.

If necessary, the instructions shall indicate the measures that are of particular importance for the proper and correct transport, handling, installation and operation of the ASSEMBLY. The provision of weight details is of particular importance in connection with the transport and handling of ASSEMBLIES.

The correct location and installation of lifting means and the thread size of lifting attachments, if applicable, shall be given in the ASSEMBLY manufacturer's documentation or the instructions on how the ASSEMBLY has to be handled.

The measures to be taken, if any, with regard to EMC associated with the installation, operation and maintenance of the ASSEMBLY shall be specified (see Annex J).

If an ASSEMBLY specifically intended for environment A is to be used in environment B the following warning shall be included in the operating instructions:

CAUTION

This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.

Where necessary, the above-mentioned documents shall indicate the recommended extent and frequency of maintenance.

If the circuitry is not obvious from the physical arrangement of the apparatus installed, suitable information shall be supplied, for example wiring diagrams or tables.

6.2.2 有關搬運、安裝、操作及維護之資訊

組裝品製造廠商應在文件或型錄(若有時)中，提供有關組裝品及其內含設備之搬運、安裝、操作及維護的資訊。

若有必要，說明書應指示關於適當及正確運送、安裝及操作組裝品之特別重要措施。在運送及搬運組裝品方面，有關重量之細節尤其重要。

在組裝品製造廠商文件，應提供吊運裝置之正確位置與安裝及吊運附屬裝置(若適用時)之螺紋大小，或在說明書中應提供如何搬運組裝品。

在與組裝品之安裝、操作及維護有關之 EMC 方面，應規定所採取之措施(若有時) (參照附錄 J)。

若專門供環境 A 使用之組裝品必須使用在環境 B 時，操作說明書中應包括下列警語。

注意

本產品係供環境 A 使用。若在環境 B 中使用，可能產生不必要之電磁擾動，使用者可能需要採取充分緩和之措施。

當有必要時，上述文件應指示維護之建議範圍及頻率。

若設備安裝之實體配置中的電路系統不明顯時，應提供適合之資訊，例：配線圖或配線表。

6.3 Device and/or component identification

Inside the ASSEMBLY, it shall be possible to identify individual circuits and their protective devices. Identification tags shall be legible, permanent and appropriate for the physical environment. Any designations used shall be in compliance with IEC 81346-1 and IEC 81346-2 and identical with those used in the wiring diagrams, which shall be in accordance with IEC 61082-1.

6.3 裝置及/或組件識別

組裝品內，應能識別個別電路及其保護裝置。識別標籤應清楚易讀、永久且適合於物理環境中。所使用之任何名稱，應符合 IEC 81346-1 及 IEC 81346-2 之規定，且與配線圖中所使用之名稱相同，該配線圖應符合 IEC 61082-1。

7 Service conditions

7.1 Normal service conditions

ASSEMBLIES conforming to this standard are intended for use under the normal service conditions detailed below.

NOTE If components, for example relays, electronic equipment, are used which are not designed for these conditions, appropriate steps should be taken to ensure proper operation.

7. 使用條件

7.1 正常使用條件

符合本標準之組裝品，係供下述正常使用條件下使用。

備考 1. 若使用非設備供此等條件使用之組件(例：電驛、電子設備)，宜採取適當步驟，以確保正常操作。

7.1.1 Ambient air temperature

7.1.1.1 Ambient air temperature for indoor installations

The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C.

The lower limit of the ambient air temperature is –5 °C.

7.1.1.2 Ambient air temperature for outdoor installations

The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C.

The lower limit of the ambient air temperature is –25 °C.

7.1.1 周圍空氣溫度

7.1.1.1 屋內型安裝之周圍空氣溫度

周圍空氣溫度不超過+40℃，且其在 24 h 期間內之不超過平均+35℃。

周圍空氣溫度之下限為-5℃。

7.1.1.2 屋外型安裝之周圍空氣溫度

周圍空氣溫度不超過+40℃，且其在 24 h 期間內之不超過平均+35℃。

周圍空氣溫度之下限為-25℃。

7.1.2 Humidity conditions

7.1.2.1 Humidity conditions for indoor installations

The relative humidity of the air does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidity may be permitted at lower temperatures, for example 90 % at +20 °C. Moderate condensation should be borne in mind which may occasionally occur due to variations in temperature.

7.1.2 濕度條件

7.1.2.1 屋內型安裝之濕度條件

在最高溫度+40℃下，空氣之相對濕度不超過 50 %。在較低溫度下，可容許較高之相對濕度，例：+20℃為 90 %。宜牢記，由於溫度變化，可能偶爾發生適度凝結。

7.1.2.2 Humidity conditions for outdoor installations

The relative humidity may temporarily be as high as 100 % at a maximum temperature of +25 °C.

7.1.2.2 屋外型安裝之濕度條件

在最高溫度+25℃下，相對濕度可暫時高達 100%。

7.1.3 Pollution degree

The pollution degree (see 3.6.9) refers to the environmental conditions for which the ASSEMBLY is intended.

For switching devices and components inside an enclosure, the pollution degree of the environmental conditions in the enclosure is applicable.

For the purpose of evaluating clearances and creepage distances, the following four degrees of pollution in the micro-environment are established.

Pollution degree 1:

No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

Pollution degree 2:

Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.

Pollution degree 3:

Conductive pollution occurs or dry, non-conductive pollution occurs which is expected to become conductive due to condensation.

Pollution degree 4:

Continuous conductivity occurs due to conductive dust, rain or other wet conditions.

Pollution degree 4 is not applicable for a micro-environment inside the ASSEMBLY to this standard.

Unless otherwise stated, ASSEMBLIES for industrial applications are generally for use in a pollution degree 3 environment. However, other pollution degrees may be considered to apply, depending upon particular applications or the micro-environment.

NOTE The pollution degree of the micro-environment for the equipment may be influenced by installation in an enclosure.

7.1.3 污染等級

污染等級(參照 3.6.9)與組裝品所處之環境條件有關。

有關箱體內之開關操作裝置及組件，可適用箱體中環境條件之污染等及。

針對評估沿面距離及空間距離之目的，建立下列 4 種微環境之污染等級。

污染等級 1

無污染，或僅發生乾式、非傳導性污染。此污染未具影響性。

污染等級 2

除了預期偶爾由凝結造成暫時性傳導外，僅發生非傳導性污染。

污染等級 3

傳導性污染發生，或發生預期因凝結而變成具有傳導性之乾式、非傳導性污染。

污染等級 4

因傳導性粉塵、雨或其他濕式條件而發生之連續傳導性。

對於組裝品內之微環境，污染等級 4 不適用於本標準。

除非另有規定，工業用組裝品一般供使用於污染等級 3 之環境中。然而，可考量適用其他污染等級，視特別應用或微環境而定。

備考： 設備用微環境之污染等級可能受箱體中安裝而影響。

7.1.4 Altitude

The altitude of the site of installation does not exceed 2 000 m.

NOTE For equipment to be used at higher altitudes, it is necessary to take into account the reduction of the dielectric strength, the switching capability of the devices and of the cooling effect of the air.

7.1.4 海拔

安裝現場之海拔不超過 2,000 m。

備考： 對於須在高海拔使用之設備，有必要考量電介質強度、開關操作能力及空氣冷卻效果之降低。

7.2 Special service conditions

Where any special service conditions exist, the applicable particular requirements shall be complied with or special agreements shall be made between the ASSEMBLY manufacturer and the user. The user shall inform the ASSEMBLY manufacturer if such exceptional service conditions exist.

7.2 特殊使用條件

當有任何特殊使用條件存在時，應符合可適用之特別要求，或者組裝品製造廠商與使用者之間應達成特殊協議。若有此種例外使用條件存在時，使用者應通知組裝品製造廠商。

Special service conditions include, for example:

a) values of temperature, relative humidity and/or altitude differing from those specified in 7.1;
b) applications where variations in temperature and/or air pressure take place at such a speed that exceptional condensation is liable to occur inside the ASSEMBLY;
c) heavy pollution of the air by dust, smoke, corrosive or radioactive particles, vapours or salt;
d) exposure to strong electric or magnetic fields;
e) exposure to extreme climatic conditions;
f) attack by fungus or small creatures;
g) installation in locations where fire or explosion hazards exist;
h) exposure to heavy vibration, shocks, seismic occurrences;
i) installation in such a manner that the current-carrying capacity or breaking capacity is affected, for example equipment built into machines or recessed into walls;
j) exposure to conducted and radiated disturbances other than electromagnetic, and electromagnetic disturbances in environments other than those described in 9.4;
k) exceptional overvoltage conditions or voltage fluctuations;
l) excessive harmonics in the supply voltage or load current.

特殊使用條件包括下列實例。

(a) 溫度、相對濕度及/或海拔之值與 7.1 所規定者不同。

(b) 溫度及/或空氣壓力變化發生之速度使得組裝品內易發生異常凝結的情況。

(c) 空氣因粉塵、煙、腐蝕性或輻射性顆粒、蒸汽或鹽而產生之重度污染。

(d) 暴露於強電場或強磁場中。

(e) 暴露於極端氣候條件中。

(f) 受菌類植物或小型生物攻擊。

(g) 在存有失火或爆炸危險之位置的安裝。

(h) 暴露於強烈振動、衝擊、地震。

(i) 載流容量或啟斷容量易受影響時之安裝，例：建造於機器中或凹進牆中之設備。

(j) 暴露於電磁除外之傳導及輻射擾動，及暴露於非 9.4 所述環境之電磁擾動。

(k) 例外之過壓條件或電壓波動。

(l) 供應電壓或負載電流中諧波過大。

7.3 Conditions during transport, storage and installation

A special agreement shall be made between the ASSEMBLY manufacturer and the user if the conditions during transport, storage and installation, for example temperature and humidity conditions, differ from those defined in 7.1.

7.3 運送、儲存及安全期間之條件

運送、儲存及安裝期間之條件(例：溫度及濕度)若與 7.1 所定義者不同時，組裝品製造廠商與使用者應達成特殊協議。

8 Constructional requirements

8.1 Strength of materials and parts

8.1.1 General

ASSEMBLIES shall be constructed of materials capable of withstanding the mechanical, electrical, thermal and environmental stresses that are likely to be encountered in specified service conditions.

The external shape of the ASSEMBLY enclosure can vary to suit the application and use, some examples have been defined in 3.3. These enclosures may also be constructed from various materials e.g. insulating, metallic or a combination of these.

8. 構造要求

8.1 材料及零件之強度

8.1.1 一般

組裝品應由能耐受在規定之使用條件中有可能遭遇之機械、電氣、熱及環境應力的材料建構。

可變化組裝品箱體之外部形狀，以適合其應用及使用，3.3 已定義某些範例。此等箱體亦可由各種不同材料(例：絕緣、金屬或此 2 者之組合)建構。

8.1.2 Protection against corrosion

Protection against corrosion shall be ensured by the use of suitable materials or by protective coatings to the exposed surface, taking account of the normal service conditions (see 7.1). Compliance to this requirement is checked by the test of 10.2.2.

8.1.2 防腐蝕之保護

應使用適當材料或對暴露表面施以保護性塗層，並考量正常使用條件(參照 7.1)，以確保防腐蝕之保護。以 10.2.2 之試驗檢查此要求之符合性。

8.1.3 Properties of insulating materials

8.1.3.1 Thermal stability

For enclosures or parts of enclosures made of insulating materials, thermal stability shall be verified according to 10.2.3.1.

8.1.3.2 Resistance of insulating materials to heat and fire

8.1.3.2.1 General

Parts of insulating materials which might be exposed to thermal stresses due to internal electrical effects, and the deterioration of which might impair the safety of the ASSEMBLY, shall not be adversely affected by normal (operational) heat, abnormal heat or fire.

8.1.3.2.2 Resistance of insulating materials to heat

The original manufacturer shall select insulating materials either by reference to the insulation temperature index (determined for example by the methods of IEC 60216) or by compliance with IEC 60085.

8.1.3 絕緣材料之特性

8.1.3.1熱穩定性

對於由絕緣材料製之箱體或箱體零件，應依 10.2.3.1 查證熱穩定性。

8.1.3.2 絕緣材料之耐熱及耐火性

8.1.3.2.1 一般

可能因內部電氣效應而暴露於熱應力之絕緣材料的零件，以及可能損害組裝品安全性之劣化，不應受正常(操作)熱、異常熱或火之不利的影響。

8.1.3.2.2 絕緣材料之耐熱性

原始製造廠商應參考絕緣溫度指數(例：依 IEC 60216 之方法決定)或依 IEC 60085 選取絕緣材料。

8.1.3.2.3 Resistance of insulating materials to abnormal heat and fire due to internal electric effects

Insulating materials used for parts necessary to retain current carrying parts in position and parts which might be exposed to thermal stresses due to internal electrical effects, and the deterioration of which might impair the safety of the ASSEMBLY, shall not be adversely affected by abnormal heat and fire and shall be verified by the glow-wire test in 10.2.3.2. For the purpose of this test, a protective conductor (PE) is not considered as a current-carrying part.

For small parts (having surface dimensions not exceeding 14 mm x 14 mm), an alternative test may be used (e.g. needle flame test, according to IEC 60695-11-5). The same procedure may be applicable for other practical reasons where the metal material of a part is large compared to the insulating material.

8.1.3.2.3 絕緣材料耐受因內部電氣效應之異常熱及火

使載流零件保持在適當位置所必要之零件及可能暴露於因內部電氣效應所產生之熱應力的零件，此等零件之劣化可能損害組裝品之安全性，故此等零件使用之絕緣材料，不應受異常熱及火不利的影響，且應以 10.2.3.2 之熾熱線試驗進行查證。關於本試驗之目的，保護性導體(PE)不視為載流零件。

關於小型零件(表面尺寸不超過 14 mm×14 mm)，可使用替代性試驗(例：IEC 60695-11-5 之針焰試驗)。當金屬材料相較於絕緣材料為大時，基於實際之原因，可適用相同之程序。

8.1.4 Resistance to ultra-violet radiation

For enclosures and external parts made of insulating materials which are intended to be used outdoor, resistance to ultra-violet radiation shall be verified according to 10.2.4.

8.1.5 Mechanical strength

All enclosures or partitions including locking means and hinges for doors shall be of a mechanical strength sufficient to withstand the stresses to which they may be subjected in normal service, and during short-circuit conditions (see also 10.13).

The mechanical operation of removable parts, including any insertion interlock, shall be verified by test according to 10.13.

8.1.6 Lifting provision

Where required, ASSEMBLIES shall be provided with the appropriate provision for lifting. Compliance is checked according to the test of 10.2.5.

8.1.4 耐紫外線輻射

對於由絕緣材料製、預定於屋外使用之箱體或箱體零件，應依 10.2.4 查證耐紫外線輻射性。

8.1.5 機械強度

含有鎖定裝置及門用鉸鏈之所有箱體或隔板，應具有足以耐受正常使用中及短路條件期間(參照 10.13)可能遭遇之應力的機械強度。

可動零件(包括任何插入互鎖)之一定操作，應依 10.13 之試驗查證。

8.1.6 吊運規定

當有要求時，組裝品應備有適當之吊運規定。依 10.2.5 之試驗檢查符合性。

8.2 Degree of protection provided by an ASSEMBLY enclosure

8.2.1 Protection against mechanical impact

The degree of protection provided by an ASSEMBLY enclosure against mechanical impact, if necessary, shall be defined by the relevant ASSEMBLY standards and verified in accordance with IEC 62262 (see 10.2.6).

8.2 組裝品箱體所提供之保護等級

8.2.1 耐機撞擊之保護

若有必要時，組裝品箱體所提供耐機撞擊之保護等級，應以相關組裝品標準予以定義，並依 IEC 62262(參照 10.2.6)進行查證。

8.2.2 Protection against contact with live parts, ingress of solid foreign bodies and water

The degree of protection provided by any ASSEMBLY against contact with live parts, ingress of solid foreign bodies and water is indicated by the IP code according to IEC 60529 and verified according to 10.3

NOTE 1 In the United States of America (USA), Canada and in Mexico enclosure "type" designations are used to specify "the degree of protection" provided to the ASSEMBLY. For applications in the USA, the appropriate enclosure type designation should be used as specified in NEMA 250. For applications in Canada, the appropriate enclosure type designation should be used as specified in CSA standard C22.2 No. 94.1 and 94.2. For applications in Mexico, the appropriate enclosure Type designation should be used as specified in NMX-J-235/1-ANCE y NMX-J-235/2-ANCE

8.2.2 防止與帶電零件接觸、固體外物及水侵入之保護

組裝品箱體所提供防止與帶電零件接觸、固體外物及水侵入之保護等級，應以 CNS 14165 之 IP 碼予以指示，並依 10.3 進行查證。

備考 1. 在美國、加拿大及墨西哥，〝型式〞名稱係用於規定供組裝品用之〝保護等級〞。關於在美國之應用，宜使用 CSA 標準 C22.2 No.94.1 及 N9. 94.2 所規定之適當箱體型式名稱。。關於在墨西哥之應用，宜使用 NMX-J-235/1-ANCE y NMX-J-235/2-ANC 所規定之適當箱體型式名稱。

The degree of protection of an enclosed ASSEMBLY shall be at least IP 2X, after installation in accordance with the ASSEMBLY manufacturer's instructions. The degree of protection provided from the front of a dead front ASSEMBLY shall be at least IP XXB.

For fixed ASSEMBLIES not subject to tilting in normal service IP X2 is not applicable.

For ASSEMBLIES for outdoor use having no supplementary protection, the second characteristic numeral shall be at least 3.

NOTE 2 For outdoor installation, supplementary protection may be protective roofing or the like.

Unless otherwise specified, the degree of protection indicated by the ASSEMBLY manufacturer applies to the complete ASSEMBLY when installed in accordance with the ASSEMBLY manufacturer's instructions, for example sealing of the open mounting surface of an ASSEMBLY, etc.

Where the ASSEMBLY does not have the same IP rating throughout, the ASSEMBLY manufacturer shall declare the IP rating for the separate parts.

Different IP ratings shall not impair the intended use of the ASSEMBLY.

NOTE 3 Examples include:

- Operating face IP 20, other parts IP 00.
- Drain holes in the base IP XXD, other parts IP 43.

No IP codes can be given unless the appropriate verifications have been made according to 10.3.

Enclosed ASSEMBLIES, for outdoor and indoor installation, intended for use in locations with high humidity and temperatures varying within wide limits, shall be provided with suitable arrangements (ventilation and/or internal heating, drain holes, etc.) to prevent harmful condensation within the ASSEMBLY. However, the specified degree of protection shall at the same time be maintained.

封閉型組裝品在依組裝品製造廠商之說明書安裝之後，其保護等級應至少為 IP 2X。從靜止面(dead front)組裝品所提供之保護等級，應至少為 IP XXB。

對於正常使用中未承受抬升之固定型組裝品，不適用 IP X2。

對於無補充保護之屋外用組裝品，其第 2 個特性數字應至少為 3。

備考 2. 關於屋外安裝，補充保護可為保護性屋頂或類似物。

除非另有規定，當組裝品依製造廠商說明書進行安裝(例：使組裝品之開放式裝設面密封等)時，製造廠商所指示之保護等級適用於整組組裝品。

當整個組裝品不具有相同 IP 定額時，組裝品製造廠商應對個別零件宣告 IP 定額。

不同之 IP 定額不應損害組裝品之預定使用。

備考 3. 範例包括下列情況。

- 操作面為 IP 20，其他零件為 IP 40。
- 基座之排水孔為 IP XXD，其他零件為 IP 43。

無 IP 碼可提供，除非已依 10.3 進行適當之查證。

對於屋外用及屋內用、預定於高濕度及溫度在寬廣範圍變化之地點使用之封閉

式組裝品，應備有適合之配置(通風及/或內部加熱、排水孔等)，以防止組裝品內產生有害之凝結。然而，應同時維持保護等級。

8.2.3 ASSEMBLY with removable parts

The degree of protection indicated for ASSEMBLIES normally applies to the connected position (see 3.2.3) of removable parts.

If, after the removal of a removable part, it is not possible to maintain the original degree of protection e.g. by closing a door, an agreement shall be reached between the ASSEMBLY manufacturer and the user as to what measures shall be taken to ensure adequate protection. Information provided by the ASSEMBLY manufacturer may take the place of such an agreement.

When shutters are used to provide adequate protection to live parts they shall be secured to prevent unintentional removal.

8.2.3 具可動零件之組裝品

對組裝品所指示之保護等級，正常中係適用於可動零件之連接位置(參照 3.2.3)。於移除可動零件後，若不可能維持原始之保護等級時(例：使門閉合)，在關於應採取何種措施以確保有充分之保護方面，組裝品製造廠商與使用者應達成協議。

當使用擋門(shutter)以對帶電零件提供充分保護時，應固定擋門，以防止其被意外移除。

8.3 Clearances and creepage distances

8.3.1 General

The requirements for clearances and creepage distances are based on the principles of IEC 60664-1 and are intended to provide insulation co-ordination within the installation.

The clearances and creepage distances of equipment that form part of the ASSEMBLY shall comply with the requirements of the relevant product standard.

When incorporating equipment into the ASSEMBLY, the specified clearances and creepage distances shall be maintained during normal service conditions.

For dimensioning clearances and creepage distances between separate circuits, the highest voltage ratings shall be used (rated impulse withstand voltage for clearances and rated insulation voltage for creepage distances).

8.3 空間距離及沿面距離

8.3.1 一般

有關空間距離及沿面距離之要求，係以 IEC 60664-1 之原理為基礎，且係用於在安全範圍內提供絕緣協調。

形成組裝品之一部分的設備，其空間距離及沿面距離應符合相關產品標準之要求。

當設備併入組裝品內時，在正常使用條件期間，應維持所規定之空間距離及沿面距離。

關於在分離之電路之間標定空間距離及沿面距離之尺寸時，應使用最高之電壓定額(在空間距離方面為額定衝擊耐電壓，且在沿面距離方面為額定絕緣電壓)。

The clearances and creepage distances apply to phase to phase, phase to neutral, and except where a conductor is connected directly to earth, phase to earth and neutral to earth.

For bare live conductors and terminations (e.g. busbars, connections between equipment and cable lugs), the clearances and creepage distances shall at least be equivalent to those specified for the equipment with which they are directly associated.

The effect of a short-circuit up to and including the declared rating(s) of the ASSEMBLY shall not reduce permanently the clearances or creepage distances between busbars and/or connections, below the values specified for the ASSEMBLY. Deformation of parts of the enclosure or of the internal partitions, barriers and obstacles due to a short-circuit shall not reduce permanently the clearances or creepage distances below those specified in 8.3.2 and 8.3.3 (see also 10.11.5.5).

空間距離及沿面距離適用於相對相、相對中性點，且除了導體直接連接至地之情況外，適用相對地及中性點對地。

關於裸帶電導體及終端(例：匯流排、設備與電纜掛耳(lug)間之連接)，其空間距離及沿面距離應至少等同於對直接相連結之設備所規定之空間距離及沿面距離。

在組裝品宣告定額以下之短路效應，在匯流排及/或連接線之間，不應使空間距離或沿面距離永久降低。箱體零件之變形，或內部隔板、障壁及障礙物因短路產生之變形，不應使空間距離或沿面距離永久降低至 8.3.2 及 8.3.3(亦可參照 10.11.5.5)所規定之值以下。

8.3.2 Clearances

The clearances shall be sufficient to enable the declared rated impulse withstand voltage (U_{imp}) of a circuit to be achieved. The clearances shall be as specified in Table 1 unless a design verification test and routine impulse withstand voltage test is carried out in accordance with 10.9.3 and 11.3, respectively.

The method of determining clearances by measurement is given in Annex F.

NOTE In the United States of America (USA) and Mexico National Electrical Codes, are used to specify minimum clearances. In the USA National Electric Code NFPA 70, Article 408.56 is applicable. In Mexico NOM-001-SEDE is applicable. For these applications, it is recommended that clearances be selected using Annex L, Table L.1 of this standard. For applications in Canada minimum electrical clearances are specified in the Canadian Electrical Code, Part 2 Product Safety Standards.

8.3.2 空間距離

空間距離應足夠，以便達到所宣告之電路額定衝擊耐電壓(U_{imp})。空間距離應如表 1 之規定，除非分別依 10.9.3 及 11.3 進行設計查證試驗及例行衝擊耐電壓試驗。

以量測決定空間距離之方法，如附錄 F 所示。

備考：在美國及墨西哥，國家電氣法規係用於規定最低空間距離。在美國，可適用國家電氣法規 NFPA 70 之 408.56 文章。在墨西哥，可適用 NOM-001-SEDE。關於此等應用，建議使用本標準附錄 L 之表 L.1 選取空間距離。關於在加拿大之應用，加拿大電氣法規第 2 部產品安全標準中已有規定最低電氣空間距離。

8.3.3 Creepage distances

The original manufacturer shall select a rated insulation voltage(s) (U_i) for the circuits of the ASSEMBLY from which the creepage distance(s) shall be determined. For any given circuit the rated insulation voltage shall not be less than the rated operational voltage (U_e).

The creepage distances shall not, in any case, be less than the associated minimum clearances.

Creepage distances shall correspond to a pollution degree as specified in 7.1.3 and to the corresponding material group at the rated insulation voltage given in Table 2.

The method of determining creepage distances by measurement is given in Annex F.

NOTE 1 For inorganic insulating materials, e.g. glass or ceramics, which do not track, creepage distances need not be greater than their associated clearances. However, the risk of disruptive discharge should be considered.

NOTE 2 In the United States of America (USA) and Mexico National Electrical Codes are used to specify minimum creepage distances. In the USA National Electric Code NFPA 70, Article 408.56 is applicable. In Mexico NOM-001-SEDE is applicable. For these applications, it is recommended that creepage distances be selected using Annex L, Table L.2 of this standard. For applications in Canada minimum creepage distances are specified in the Canadian Electrical Code, Part 2 Product Safety Standards.

By using ribs of a minimum height of 2 mm the creepage distance may be reduced but, irrespective of the number of ribs, shall be not less than 0,8 of the value of Table 2 and not less than the associated minimum clearance. The minimum base of the rib is determined by mechanical requirements (see Clause F.2).

8.3.3 沿面距離

原始製造廠商應為組裝品電路選取額定絕緣電壓(U_i)，並應從該電路中決定沿面距離。對於任何已知電路，額定絕緣電壓不應小於額定操作電壓(U_e)。

在任何情況中，沿面距離不應小於相聯結之最低沿面距離。

沿面距離應對應於 7.1.3 所規定之污染等級，且在表 2 所示之額定絕緣電壓下，應對應於相對應之材料群組。

以量測決定空間距離之方法，如附錄 F 所示。

備考 1. 無機絕緣材料(例：玻璃或陶器)不會留下痕跡，其沿面距離不需要大於其相聯結之空間距離。然而，宜考量迅裂放電之風險。

備考 2. 在美國及墨西哥，國家電氣法規係用於規定最低空間距離。在美國，可適用國家電氣法規 NFPA 70 之 408.56 文章。在墨西哥，可適用 NOM-001-SEDE。關於此等應用，建議使用本標準附錄 L 之表 L.1 選取空間距離。關於在加拿大之應用，加拿大電氣法規第 2 部產品安全標準中已有規定最低電氣空間距離。

藉由使用最小高度為 2 mm 之肋，沿面距離可降低，但無論肋之數量為何，皆不應低於表 2 之值的 0.8 倍，且不應小於相聯結之最小空間距離。以機械性之要求，決定肋之最小基座(參照 F.2)。

8.4 Protection against electric shock

8.4.1 General

The apparatus and circuits in the ASSEMBLY shall be so arranged as to facilitate their operation and maintenance, and at the same time to ensure the necessary degree of safety.

The following requirements are intended to ensure that the required protective measures are obtained when an ASSEMBLY is installed in an electrical system conforming to the IEC 60364 series.

NOTE For generally accepted protective measures refer to IEC 61140 and IEC 60364-4-41.

Those protective measures, which are of particular importance for an ASSEMBLY, are reproduced in 8.4.2 to 8.4.6.

8.4 防電擊之保護

8.4.1 一般

組裝品中，設備及電路應予以適當配置，以便於其操作及維護...且同時間應確保必要之安全等級。

下列要求係用於當組裝品安裝於符合 IEC 60364 系列之電氣系統中時，能確保獲得所要求之保護性措施。

備考：有關一般可接受之保護性措施，參照 IEC 61140 及 IEC 60364-4-41。

此等保護性措施對於組裝品尤其重要，將在 84.2 至 8.4.6 中重述。

8.4.2 Basic protection

8.4.2.1 General

Basic protection is intended to prevent direct contact with hazardous live parts.

Basic protection can be achieved either by appropriate constructional measures on the ASSEMBLY itself or by additional measures to be taken during installation; this may require information to be given by the ASSEMBLY manufacturer.

An example of additional measures to be taken is the installation of an open-type ASSEMBLY without further provisions in a location where access is only permitted for authorized personnel.

Where basic protection is achieved by constructional measures one or more of the protective measures given in 8.4.2.2 and 8.4.2.3 may be selected. The choice of the protective measure shall be declared by the ASSEMBLY manufacturer if not specified within the relevant ASSEMBLY standard.

8.4.2 基本保護

8.4.2.1一般

基本保護係用於防止與危險帶電零件直接接觸。

可在組裝品本身上藉由適當構造措施，或在安裝期間採取額外措施，以達到基本保護；此可能需要由組裝品製造廠商提供資訊。

所須採取之額外措施的範例，為在僅容許獲授權之人員接近之處安裝開放型組裝品之安裝，而無進一步提供。

當以構造性措施達到基本保護時，可選擇 8.4.2.2 及 8.4.2.3 所示之 1 種或多種保護性措施。若相關組裝品標準內未規定保護性措施時，保護性措施之選擇應由組裝品製造廠商宣告。

8.4.2.2 Basic insulation provided by insulating material

Hazardous live parts shall be completely covered with insulation that can only be removed by destruction or by the use of a tool.

The insulation shall be made of suitable materials capable of durably withstanding the mechanical, electrical and thermal stresses to which the insulation may be subjected in service.

NOTE Examples are electrical components embedded in insulation and insulated conductors.

Paints, varnishes and lacquers alone are not considered to satisfy the requirements for basic insulation.

8.4.2.2由絕緣材料提供之基本絕緣

應以僅能以破壞方式或使用工具始可移除之絕緣，完全覆蓋危險帶電零件。

絕緣應由能經久耐受在使用中可能遭受之機械、電氣及熱動應力的適當材料製成。

備考：範例為嵌入絕緣之電氣組件及絕緣導體。

僅油漆、清漆及亮漆不視為能滿足基本絕緣之要求。

8.4.2.3 Barriers or enclosures

Air insulated live parts shall be inside enclosures or behind barriers providing at least a degree of protection of IP XXB.

Horizontal top surfaces of accessible enclosures having a height equal to or lower than 1,6 m above the standing area, shall provide a degree of protection of at least IP XXD.

Barriers and enclosures shall be firmly secured in place and have sufficient stability and durability to maintain the required degrees of protection and appropriate separation from live parts under normal service conditions, taking account of relevant external influences. The distance between a conductive barrier or enclosure and the live parts they protect shall not be less than the values specified for the clearances and creepage distances in 8.3.

Where it is necessary to remove barriers or open enclosures or to remove parts of enclosures, this shall be possible only if one of the conditions a) to c) is fulfilled:

a) By the use of a key or tool, i.e. any mechanical aid, to open the door, cover or overide an interlock.

b) After isolation of the supply to live parts, against which the barriers or enclosures afford basic protection, restoration of the supply being possible only after replacement or reclosure of the barriers or enclosures. In TN-C systems, the PEN conductor shall not be isolated or switched. In TN-S systems and TN-C-S systems the neutral conductors need not be isolated or switched (see IEC 60364-5-53:2001, 536.1.2).

   Example: By interlocking the door(s) with a disconnector so that they can only be opened when the disconnector is open, and closing of the disconnector without the use of a tool is impossible while the door is open.

   NOTE In Norway, the neutral conductor shall be isolated or switched.

c) Where an intermediate barrier providing a degree of protection of at least IP XXB prevents contact with live parts, such a barrier being removable only by the use of a key or tool.

8.4.2.3障壁或箱體

空氣絕緣之帶電零件應位於箱體之內，或位於保護等級至少為 IP XXB 之障壁之後。

在站立區以上之高度等於或低於 1.6 m 的可接近式箱體，其水平頂部表面應提供至少 IP XXD 之保護等級。

在考量相關外部影響下，障壁及箱體應穩固固定於適當位置，且應具有充分穩定性及耐久性，以維持所需要之保護等級，並在正常使用條件下與帶電零件有適當之分隔。傳導性障壁或箱體與障壁所保護之帶電零件之間的距離，不應小於在 8.3 中對空間距離及沿面距離所規定之值。

當有必要移除障壁或開啟箱體或移除箱體之零件時，僅在符合下列(a)至(c)其中 1 項條件時始可。

(a) 使用鑰匙或工具(例：任何機械之輔助)開啟門、外蓋或使互鎖無效。

(b) 在電源與帶電零件隔離後，障壁或箱體提供基本保護以防止帶電零件，僅在替換後或障壁或箱體再閉合後，始可能恢復電源。在 TN-S 系統及 TN-C-S 系統中，中性導體不需要隔離或切換(switched) (參照 IEC 60364-5-53:2001,

536.1.2)。

範例：藉由以隔離器使門互鎖，使得當隔離器開啟時，門始能開啟，且當門開啟時，在未使用工具情況下不可能使隔離器閉合。

備考：在挪威，中性點導體應予以隔離或切換(switched)。

(c) 當保護等級至少 IP XXB 之中間障壁防止與帶電零件接觸(例：僅使用鑰匙或工具使可移除障壁)。

8.4.3 Fault protection

8.4.3.1 Installation conditions

The ASSEMBLY shall include protective measures and be suitable for installations designed to be in accordance with IEC 60364-4-41. Protective measures suitable for particular installations (e.g. railways, ships) shall be subject to agreement between the ASSEMBLY manufacturer and the user.

When a TT earthing system is being used in the electrical network one of the following measures shall be applied in the ASSEMBLY:

a) double or reinforced insulation of the incoming connections, or
b) residual current device (RCD) protection on the incoming circuit

Such provisions are subject to agreement between user and manufacturer.

8.4.3 故障保護

8.4.3.1 安裝條件

組裝品應包括保護性措施，並應適合於依 IEC 60364-4-41 所設計之安裝。適合於特別安裝(例：鐵道、船)之保護性措施，應由組裝品製造廠商與使用者達成協議。

當在電氣網路中使用 TT 接地系統時，應在組裝品中採用下列措施。

(a) 內向連接之雙重或強化絕緣。或

(b) 內向電路上之殘餘電流裝置(RCD)保護。

此規定須由使用者與製造廠商協議。

8.4.3.2 Requirements for the protective conductor to facilitate automatic disconnection of the supply

8.4.3.2.1 General

Each ASSEMBLY shall have a protective conductor to facilitate automatic disconnection of the supply for:

a) protection against the consequences of faults (e.g. failure of basic insulation) within the ASSEMBLY;
b) protection against the consequences of faults (e.g. failure of basic insulation) in external circuits supplied through the ASSEMBLY.

The requirements to be complied with are given in the following subclauses.

Requirements for identification of the protective conductor (PE, PEN) are given in 8.6.6.

8.4.3.2 關於保護性導體在促進自動切離供應電源方面之要求

8.4.3.2.1 一般

每一組裝品應具有保護性導體，以便於自動切離供應電源，並提供下列保護。

(a) 對組裝品內之故障結果(例：基本絕緣之失效)的保護。

(b) 對通過組裝品供電之外部電路故障結果(例：基本絕緣之失效)的保護。

有關須符合之要求，如下列節次所示。

有關識別保護性導體(PE、PEN)之要求，如 8.6.6 所示。

8.4.3.2.2 Requirements for earth continuity providing protection against the consequences of faults within the ASSEMBLY

All exposed conductive parts of the ASSEMBLY shall be interconnected together and to the protective conductor of the supply or via an earthing conductor to the earthing arrangement.

These interconnections may be achieved either by metal screwed connections, welding or other conductive connections or by a separate protective conductor.

NOTE With metal parts of the ASSEMBLY where abrasion resistant finishes are used, e.g. gland plates with powder coatings, connection for protective earthing requires removal or penetration of the coating.

The method to verify the earth continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit is given in 10.5.2.

For the continuity of these connections the following shall apply:

a) When a part of the ASSEMBLY is removed, for example for routine maintenance, the protective circuits (earth continuity) for the remainder of the ASSEMBLY shall not be interrupted.

   Means used for assembling the various metal parts of an ASSEMBLY are considered sufficient for ensuring continuity of the protective circuits if the precautions taken guarantee permanent good conductivity.

   Flexible or pliable metal conduits shall not be used as protective conductors unless they are designed for that purpose.

b) For lids, doors, cover plates and the like, the usual metal screwed connections and metal hinges are considered sufficient to ensure continuity provided that no electrical equipment exceeding the limits of extra low voltage (ELV) is attached to them.

8.4.3.2.2 關於在組裝品內提供防止發生故障結果之保護的接地連續性之要求

組裝品之所有暴露性導電零件應予以互連在一起，且連接至供應電源之保護性導體，或經由接地導體連接至接地配置。

可藉由金屬螺釘連接、焊接或其他傳導性連接，或藉由分離之保護性導體，達到此等互連。

備考：以使用耐磨面漆(abrasion resistant finish)之組裝品的金屬零件(例：具粉末塗層之壓蓋板(gland plate))，保護性接地之連接需要移除或穿透塗層。

有關查證在組裝品暴露性導電零件與保護性電路之間的接地連續性之方法，如 10.5.2 所示。

有關此等連接之連續性，應適用下列項目。

(a) 當移除組裝品之一部分時(例：於例行維護時)，組裝品其餘部分之保護性電路不應中斷。

若所採取之預防措施能保證永久具有良好之導電率(conductivity)，則在組裝組裝品之各種不同金屬零件時所使用之工具，視為能足以確保保護性電路之連續性。

可撓性或易折曲之金屬電路不應作為保護性導體，除非其係設備供此種用途。

(b) 倘若超過超低電壓(ELV)之限制值的電氣設備未連接至蓋子(lid)、門板及類似物時，則一般之金屬螺釘連接及金屬鉸鏈視為足以確保連續性。

If apparatus with a voltage exceeding the limits of extra-low voltage are attached to lids, doors, or cover plates additional measures shall be taken to ensure earth continuity. These parts shall be fitted with a protective conductor (PE) whose cross-sectional area is in accordance with Table 3 depending on the highest rated operational current I_e of the apparatus attached or, if the rated operational current of the attached apparatus is less than or equal to 16 A, an equivalent electrical connection especially designed and verified for this purpose (sliding contact, hinges protected against corrosion).

Exposed conductive parts of a device that cannot be connected to the protective circuit by the fixing means of the device shall be connected to the protective circuit of the ASSEMBLY by a conductor whose cross-sectional area is chosen according to Table 3.

Certain exposed conductive parts of an ASSEMBLY that do not constitute a danger

- either because they cannot be touched on large surfaces or grasped with the hand,
- or because they are of small size (approximately 50 mm by 50 mm) or so located as to exclude any contact with live parts,

need not be connected to a protective conductor. This applies to screws, rivets and nameplates. It also applies to electromagnets of contactors or relays, magnetic cores of transformers, certain parts of releases, or similar, irrespective of their size.

When removable parts are equipped with a metal supporting surface, these surfaces shall be considered sufficient for ensuring earth continuity of protective circuits provided that the pressure exerted on them is sufficiently high.

若電壓超過超低電壓限制值之設備附屬在蓋子(lid)、門或蓋板，則應採取額外措施，以確保接地連續性。此等零件應裝配保護性導體(PE)，其截面積依表 3 之規定，視所附屬之設備的最高額定操作電流 I_e 而定。或若所附屬之設備的額定操作電流小於或等於 16 A 時，應針對此用途(防腐蝕保護之滑動接點、鉸鏈)特別設計及查證等效電氣連接。

無法藉由裝置之固定工具(fixing mens)連接至保護性電路之裝置，其暴露性導電零件應以依表 3 之截面積所選取的導體，連接至組裝品之保護性電路。基於下列原因，不會構成危險之組裝品，其暴露性導電零件不需要連接至保護性導體。

－ 因為無法接觸其大表面或以手握持。

－ 或因為其體型小(約 50 mm×50 mm)，或位於不會接觸帶電零件之處。

此適用於螺釘、鉚釘及銘牌。其亦適用於接觸器或電驛之電磁體、變壓器之磁芯、釋放器之某些零件或類似物，無論其大小為何。

當可動零件配備金屬支撐表面時，倘若，施於此等表面之壓力足夠大時，此等表面應視為足以確保保護性電路之接地連續性。

8.4.3.2.3 Requirements for protective conductors providing protection against the consequences of faults in external circuits supplied through the ASSEMBLY

A protective conductor within the ASSEMBLY shall be so designed that it is capable of withstanding the highest thermal and dynamic stresses arising from faults in external circuits at the place of installation that are supplied through the ASSEMBLY. Conductive structural parts may be used as a protective conductor or a part of it.

Except where verification of the short-circuit withstand strength is not required in accordance with 10.11.2, verification shall be made in accordance with 10.5.3.

In principle, with the exception of the cases mentioned below, protective conductors within an ASSEMBLY shall not include a disconnecting device (switch, disconnector, etc.).

In the run of protective conductors links shall be permitted which are removable by means of a tool and accessible only to authorized personnel (these links may be required for certain tests).

Where continuity can be interrupted by means of connectors or plug-and-socket devices, the protective circuit shall be interrupted only after the live conductors have been interrupted and continuity shall be established before the live conductors are reconnected.

In the case of an ASSEMBLY containing structural parts, frameworks, enclosures, etc., made of conducting material, a protective conductor, if provided, need not be insulated from these parts. Conductors to voltage-operated fault detection devices including the conductors connecting them to a separate earth electrode shall be insulated when specified by their manufacturer. This can also apply to the earth connection of the transformer neutral.

The cross-sectional area of protective conductors (PE, PEN) in an ASSEMBLY to which external conductors are intended to be connected shall be not less than the value calculated with the aid of the formula indicated in Annex B using the highest fault current and fault duration that may occur and taking into account the limitation of the short-circuit protective devices (SCPDs) that protect the corresponding live conductors. The short-circuit withstand strength is verified according to 10.5.3.

8.4.3.2.3 關於透過組裝品供電之外部電路中，提供防止發生故障結果之保護的保護性導體之要求

組裝品內之保護性導體應予妥善設計，使其能耐受外部電路中之故障所產生之最高熱動及動態應力，該外部電路係位於透過組裝品供電之安裝地點。可使用傳導性結構零件，作為保護性導體或保護性導體之一部分。

除了不需要依 10.11.2 查證短路耐受強度者之外，應依 10.5.3 進行查證。

原則上，除了下述情況除外，組裝品內之保護性導體不應包括切離裝置(開關、隔離器等)。

在保護性導體運行中，應容許鏈結，其可藉由工具移除，且僅可由獲授權之人員接近(此等鏈結可能需要進行某些試驗)。

當可藉連接器裝置或插頭/插座裝置中斷連續性時，保護性電路應僅在帶電導體已中斷後始中斷，且應在帶電導體重新連接之前建立連續性。

在含有傳導性材料製之結構性零件、骨架、箱體等之組裝品，若備有保護性導體，其不需要與此等零件絕緣。電壓操作式故障偵測裝置之導體(包括連接至分離之接地電極的導體)，當其製造廠商有規定時，應予以絕緣。

外部導體預定連接之組裝品，其內之保護性導體的截面積，不應小於以附錄 B 所示之公式輔助下計算所得之值，此計算係使用可能發生之最高故障電流及故障持續期間並考量用以保護相對應帶電導體之短路保護性裝置(SCPD)的限制。

For PEN conductors, the following additional requirements apply:

- the minimum cross-sectional area shall be 10 mm^2 copper or 16 mm^2 aluminium;
- the PEN conductor shall have a cross-sectional area not less than that required for a neutral conductor (see 8.6.1);
- the PEN conductors need not be insulated within an ASSEMBLY;
- structural parts shall not be used as a PEN conductor. However, mounting rails made of copper or aluminium may be used as PEN conductors.

For details of requirements for terminals for external protective conductors, see 8.8.

關於 PEN 導體，適用下列額外要求。

- 最小截面積應為 10 mm^2 (銅)或 16 mm^2 (鋁)。
- PEN 導體之截面積應不小於對中性點導體(參照 8.6.1)所要求之截面積。
- 在組裝品內，PEN 導體不需要絕緣。
- 結構性零件不應作為 PEN 導體使用。然而，可使用銅或鋁製之裝設軌，作為 PEN 導體。

有關外部保護性導體用之端子的要求細節，參照 8.8。

8.4.3.3 Electrical separation

Electrical separation of individual circuits is intended to prevent electrical shock through contact with exposed-conductive-parts, which may be energized by a fault in basic insulation of the circuit.

For this type of protection, see Annex K.

8.4.3.3 電氣隔離

個別電路之電氣隔離係用於防止透過接觸暴露性導電零件而電擊，該暴露性導電零件可能因電路基本絕緣中之故障而通電

有關此種保護型式，參照附錄 K。

8.4.4 Protection by total insulation

NOTE According to 412.2.1.1 of IEC 60364-4-41, "total insulation" is equivalent to Class II equipment.

For basic and fault protection, by total insulation, the following requirements shall be met.

a) The apparatus shall be completely enclosed in insulating material which is equivalent of double or reinforced insulation. The enclosure shall carry the symbol ⧈ which shall be visible from the outside.

8.4.4 藉由總絕緣之保護

備考：依 IEC 60364-4-41 之 412.2.1.1，〝總絕緣〞等同於第 II 類設備。

關於基本及故障保護，在使用總絕緣下，應符合下列要求。

(a) 設備應完全封閉在絕緣材料內，該材料等同於雙重或強化絕緣。箱體應載有⧈符號，從外面應可顯而易見該符號。

b) The enclosure shall at no point be pierced by conducting parts in such a manner that there is the possibility of a fault voltage being brought out of the enclosure.

This means that metal parts, such as actuator shafts which for constructional reasons have to be brought through the enclosure, shall be insulated on the inside or the outside of the enclosure from the live parts for the maximum rated insulation voltage and the maximum rated impulse withstand voltage of all circuits in the ASSEMBLY.

If an actuator is made of metal (whether covered by insulating material or not), it shall be provided with insulation rated for the maximum rated insulation voltage and the maximum impulse withstand voltage of all circuits in the ASSEMBLY.

If an actuator is principally made of insulating material, any of its metal parts which may become accessible in the event of insulation failure shall also be insulated from live parts for the maximum rated insulation voltage and the maximum rated impulse withstand voltage of all circuits in the ASSEMBLY.

(b) 在任何時候，箱體不應被導電零件刺穿，以致故障電壓可能從箱體內部引至外部。

此表示金屬零件(例：致動器軸)基於構造之理由必須穿過箱體，應在相體內部及外部使金屬零件與帶電零件予以絕緣，使其免於組裝品內之所有電路的最高額定絕緣電壓及最高額定衝擊耐電壓。

若致動器係由金屬製成(無論有無以絕緣材覆蓋)，其應備有針對組裝品內所有電路之最大額定絕緣電壓及最大衝擊耐電壓所額定之絕緣。

若致動器主要係由絕緣材料製成，在絕緣失效事件中可能變成可接近式之任何金屬零件，亦應與帶電零件絕緣，使其免於組裝品內之所有電路的最高額定絕緣電壓及最高額定衝擊耐電壓。

c) The enclosure, when the ASSEMBLY is ready for operation and connected to the supply, shall enclose all live parts, exposed conductive parts and parts belonging to a protective circuit in such a manner that they cannot be touched. The enclosure shall give at least the degree of protection IP 2XC (see IEC 60529).

If a protective conductor, which is extended to electrical equipment connected to the load side of the ASSEMBLY, is to be passed through an ASSEMBLY whose exposed conductive parts are insulated, the necessary terminals for connecting the external protective conductors shall be provided and identified by suitable marking.

Inside the enclosure, the protective conductor and its terminal shall be insulated from the live parts and the exposed conductive parts in the same way as the live parts are insulated.

d) Exposed conductive parts within the ASSEMBLY shall not be connected to the protective circuit, i.e. they shall not be included in a protective measure involving the use of a protective circuit. This applies also to built-in apparatus, even if they have a connecting terminal for a protective conductor.

e) If doors or covers of the enclosure can be opened without the use of a key or tool, a barrier of insulating material shall be provided that will afford protection against unintentional contact not only with the accessible live parts, but also with the exposed conductive parts that are only accessible after the cover has been opened; this barrier, however, shall not be removable except with the use of a tool.

(c) 當組裝品準備操作且連接至電源時，箱體應封閉所有帶電零件、暴露性導電零件及屬於保護性電路之零件，使其無法被觸及。箱體應提供至少 IP 2XC 之保護等級(參照 CNS 14165)。

保護性導體延伸至與組裝品負載側連街之電氣設備，該保護性導體若須通過暴露導電零件已絕緣之組裝品，則應備有供連接外部保護性導體用之必要端子，且以適合之標示予以識別。

在箱體內部，應以使帶電零件絕緣之相同方法，使保護性導體及其端子與帶電零件及暴露性導電零件絕緣。

(d) 組裝品內之暴露的導電零件，不應連接至保護性電路，換言之，其不應包含於使用保護性電路之保護措施中。此亦適用於內建式設備，即使其具有工保護性導體用之連接端子。

(e) 箱體之門或外蓋若不需要使用工具即能開啟，則應提供絕緣材料製之障壁，其不僅將提供防止意外接觸可接近之帶電零件的保護，亦提供防止接

觸僅在開啟後始具可接近性之暴露的導電零件。然而，除了在使用工具之情況外，此障壁不應可被移除。

8.4.5 Limitation of steady-state touch current and charge

If the ASSEMBLY contains items of equipment that may have steady-state touch current and charges after they have been switched off (capacitors, etc.) a warning plate is required.

Small capacitors such as those used for arc extinction, for delaying the response of relays, etc., shall not be considered dangerous.

NOTE Unintentional contact is not considered dangerous if the voltages resulting from static charges fall below a d.c. voltage of 60 V in less than 5 s after disconnection from the power supply.

8.4.5 穩態接觸電流及電荷之限制

若組裝品含有之設備項目在關閉(switch off)後可能具有穩態接觸電流及電荷(電容器等)，需要有警告牌。

小電容(例：使用在滅弧、延遲電驛反應等)不應視為具危險性。

備考： 在與供應電源切離後，若靜電荷產生之電壓在不到 5 s 內降至低於於直流電壓 60 V，則意外之接觸不視為具危險性。

8.4.6 Operating and servicing conditions

8.4.6.1 Devices to be operated or components to be replaced by ordinary persons

Protection against any contact with live parts shall be maintained when operating devices or when replacing components.

The minimum level of protection shall be IP XXC. During the replacement of certain lamps or fuselinks openings larger than those defined by degree of protection IP XXC are allowed.

8.4.6 操作及使用條件

8.4.6.1 由一般人員操作之裝置及由一般人員更換之組件

當操作裝置時或更換組件時，應維持防止與帶電零件有任何接觸之保護。

最小之保護位準應為 IP XXC。在更換某些燈泡或熔絲鏈期間，容許大於 IP XXC 保護等級所定義之開口。

8.4.6.2 Requirements related to accessibility in service by authorized persons

8.4.6.2.1 General

For accessibility in service by authorized persons, one or more of the following requirements in 8.4.6.2.2 to 8.4.6.2.4 shall be fulfilled subject to agreement between the ASSEMBLY manufacturer and the user. These requirements shall be complementary to the basic protection specified in 8.4.2.

If doors or covers of the ASSEMBLY can be opened by authorized persons by overriding an interlock to obtain access to live parts, then the interlock shall automatically be restored on reclosing the door(s) or replacing the cover(s).

8.4.6.2 與獲授權人員使用之可接近性有關的要求

8.4.6.2.1 一般

關於獲授權人員使用之可接近性，在組裝品製造廠商與使用者協議下，應符合下列 8.4.6.2.2 至 8.4.6.2.4 之其中 1 種要求。此等要求應與 8.4.2 所規定之基本保護互補。

若獲授權人員可使互鎖失效而開啟組裝品之門或外蓋，則互鎖應自動恢復以

復閉合門或更換外蓋。

8.4.6.2.2 Requirements related to accessibility for inspection and similar operations

The ASSEMBLY shall be constructed in such a way that certain operations, according to agreement between the ASSEMBLY manufacturer and the user, can be performed when the ASSEMBLY is in service and under voltage.

Such operations may consist of:

- visual inspection of
  - switching devices and other apparatus,
  - settings and indicators of relays and releases,
  - conductor connections and marking;
- adjusting and resetting of relays, releases and electronic devices;
- replacement of fuse-links;
- replacement of indicating lamps;
- certain fault location operations, for example voltage and current measuring with suitably designed and insulated devices.

8.4.6.2.2 與檢驗及類似操作之可接近性有關的要求

組裝品應妥善建構，使得依組裝品製造廠商與使用者之協議下，當在組裝品在使用中及欠電壓時，可執行某些操作。

此種操作可包括下列項目。

- 目視檢驗下列項目。
  - 開關操作裝置及其他設備。
  - 電驛及釋放器之設定及指示器。
  - 導體之連接及標示。
- 電驛、釋放器及電子裝置之調整及重置。
- 熔線鏈之更換。
- 指示燈之更換。
- 某些故障位置操作，例：以經適當設計及絕緣之裝置所量測之電壓及電流。

8.4.6.2.3 Requirements related to accessibility for maintenance

To enable maintenance as agreed upon between the ASSEMBLY manufacturer and the user on an isolated functional unit or isolated group of functional units in the ASSEMBLY, with adjacent functional units or groups still under voltage, necessary measures shall be taken. The choice depends on such factors as service conditions, frequency of maintenance, competence of the authorized person, as well as local installation rules. Such measures may include:

- sufficient space between the actual functional unit or group and adjacent functional units or groups. It is recommended that parts likely to be removed for maintenance have, as far as possible, retainable fastening means;
- use of barriers or obstacles designed and arranged to protect against direct contact with equipment in adjacent functional units or groups;
- use of terminal shields;
- use of compartments for each functional unit or group;
- insertion of additional protective means provided or specified by the ASSEMBLY manufacturer.

8.4.6.2.3 與維護時之接近性有關之要求

於鄰近之功能性單元或群組仍在欠電壓情況下，為了能依組裝品製造廠商與使用者之協議於組裝品中隔離之功能性單元或功能性單元之隔離群組上進行維護，應採取必要措施。其選擇取決於使用條件、維護頻率、獲授權人員之能力及當地安裝規則等因素。此措施包括下列項目。

- 實際之功能性單元或群組與鄰近之功能性單元或群組之間有充分之空間。維修期間有可能移除之零件，建議儘可能具有可保留之緊固裝置。
- 使用所設計及配置之障壁或障礙物以提供保護，防止與鄰近之功能性單元或群組中之設備直接接觸。
- 使用端子屏蔽。
- 每一功能性單元或群組使用分隔室。
- 插入組裝品製造廠商所提供或規定之額外保護裝置。

8.4.6.2.4 Requirements related to accessibility for extension under voltage

When it is required to enable future extension of an ASSEMBLY with additional functional units or groups, with the rest of the ASSEMBLY still under voltage, the requirements specified in 8.4.6.2.3 shall apply, subject to agreement between the ASSEMBLY manufacturer and the user. These requirements also apply for the insertion and connection of additional outgoing cables when the existing cables are under voltage.

The extension of busbars and connection of additional units to their incoming supply shall not be made under voltage, unless the ASSEMBLY is designed for this purpose.

8.4.6.2.4 在欠電壓下，與延伸接近性有關之要求

在組裝品之其他部位仍在欠電壓之情況下，當有需要使具有額外功能性單元或群組之組裝品能進一步延伸，則應在組裝品製造廠商與使用者協議下，適用 8.4.6.2.3 所規定之要求。當既存之電纜在欠電壓情況下，此等要求亦適用於額外外向電纜之插入及連接。

匯流排之延伸及額外單元與其內向電源之連接，不應在欠電壓下進行，除非組裝品係設計供此用途。

8.4.6.2.5 Obstacles

Obstacles shall prevent either:

- unintentional bodily approach to live parts, or
- unintentional contact with live parts during the operation of live equipment in normal service.

Obstacles may be removed without using a key or tool but shall be so secured as to prevent unintentional removal. The distance between a conductive obstacle and the live parts they protect shall not be less than the values specified for the clearances and creepage distances in 8.3.

Where a conductive obstacle is separated from hazardous live parts by basic protection only, it is an exposed conductive part, and measures for fault protection shall also be applied.

8.4.6.2.5 障礙物

障礙物應避免下列情況。

- 人體意外接近帶電零件。或
- 在正常使用中，於帶電設備之操作期間意外與帶電零件接觸。

障礙物可在未使用鎖匙或工具之下移除，但應予以固定，以防止意外移除。

導電性障礙物與其所保護之帶電零件之間的距離，不應小於 8.3 對空間距離及沿面距離所規定之值。

當導電性障礙物與危險帶電零件之間僅以基本保護隔開，則其為暴露性導電性零件，且亦應採用故障保護用之措施。

8.5 Incorporation of switching devices and components

8.5.1 Fixed parts

For fixed parts (see 3.2.1), the connections of the main circuits (see 3.1.3) shall only be connected or disconnected when the ASSEMBLY is not under voltage. In general, removal and installation of fixed parts requires the use of a tool.

The disconnection of a fixed part shall require the isolation of the complete ASSEMBLY or part of it.

In order to prevent unauthorized operation, the switching device may be provided with means to secure it in one or more of its positions.

NOTE Where working on live circuits is permitted, relevant safety precautions may be necessary.

8.5 開關操作裝置與組件之合併

8.5.1 固定型零件

關於固定型零件(參照 3.2.1)，主電路(參照 3.1.3)之連接僅應當組裝品非在欠電壓情況下始連接或切離。通常，固定型零件之移除及安裝，需要使用工具。

固定型零件之切離，應需要使整個或部分組裝品隔離。

為防止未獲授權之操作，開關操作裝置可備有裝置，使其固定在 1 個或多個位置。

備考：當容許在帶電電路上工作時，相關安全預防措施可能是有必要的。

8.5.2 Removable parts

The removable parts shall be so constructed that their electrical equipment can be safely removed from or connected to the main circuit whilst this circuit is live. The removable parts may be provided with an insertion interlock (see 3.2.5).

Clearances and creepage distances (see 8.3) shall be complied with during transfer from one position to another.

A removable part shall be fitted with a device, which ensures that it can only be removed and inserted after its main circuit has been switched off from the load.

In order to prevent unauthorized operation, the removable parts or their associated ASSEMBLY location may be provided with a lockable means to secure them in one or more of their positions.

8.5.2 可動零件

可動零件應妥善建構，使得當主電路在帶電情況下，其電氣設備能安全地從主電路移開或連接至主電路。可動零件可備有插入互鎖(參照 3.2.5)。

從一個位置轉移至另一位置期間，空間距離及沿面距離(參照 8.3)應符合要求。

可動零件應配備一裝置，其確保僅在主電路已與負載切離之後，可動零件始能移除或插入。

為防止未獲授權之操作，可動零件或其相關聯之組裝品位置可備有可鎖定之裝置，使其固定在 1 個或多個位置。

8.5.3 Selection of switching devices and components

Switching devices and components incorporated in ASSEMBLIES shall comply with the relevant IEC standards.

The switching devices and components shall be suitable for the particular application with respect to the external design of the ASSEMBLY (e.g. open type or enclosed), their rated voltages, rated currents, rated frequency, service life, making and breaking capacities, short-circuit withstand strength, etc.

The rated insulation voltage, and rated impulse withstand voltage of the devices installed in the circuit shall be equal or higher than the corresponding value assigned to that circuit. In some cases overvoltage protection may be necessary e.g. for equipment fulfilling overvoltage category II (see 3.6.11).The switching devices and components having a short-circuit withstand strength and/or a breaking capacity which is insufficient to withstand the stresses likely to occur at the place of installation, shall be protected by means of current-limiting protective devices, for example fuses or circuit-breakers. When selecting current-limiting protective devices for built-in switching devices, account shall be taken of the maximum permissible values specified by the device manufacturer, having due regard to co-ordination (see 9.3.4).

Co-ordination of switching devices and components, for example co-ordination of motor starters with short-circuit protective devices, shall comply with the relevant IEC standards.

NOTE Guidance is given in IEC/TR 61912-1 and IEC/TR 61912-2.

8.5.3 開關操作裝置與組件之選擇

合併於組裝品中之開關操作裝置及組件，應符合相關標準之規定。

關於組裝品之外部設計方面(例：開放型或封閉型)、其額定電壓、額定電流、額定頻率、使用壽命、投入與啟斷容量、短路耐受強度等，開關操作裝置及組件應適合於特別應用。

額定絕緣電壓及安裝在電路中之裝置的額定衝擊耐電壓，應等於或高於對該電路所指定之相對應值。在某些情況中，過電壓保護可能有必要，例：符合過電壓類別 II 之設備(參照 3.6.11)。具有短路耐受強度及/或啟斷容量之開關操作裝置及組件，其不足以耐受在安裝位置所可能發生之應力，應以限流保護裝置(例：熔線或斷錄器)予以保護。當選擇內建式開關操作裝置用之限流保護裝置時，應考量裝置製造廠商所規定之最大可容許值，並同時考量協調(參照 9.3.4)。開關操作裝置及組件之協調，例：具短路保護裝置之電動機啟動器的協調，應符合相關標準之規定。

備考：有關指引，參照 IEC/TR 61912-1 及 IEC/TR 61912-2。

8.5.4 Installation of switching devices and components

Switching devices and components shall be installed and wired in the ASSEMBLY in accordance with instructions provided by their manufacturer and in such a manner that their proper functioning is not impaired by interaction, such as heat, switching emissions, vibrations, electromagnetic fields, which are present in normal operation. In the case of electronic assemblies, this may necessitate the separation or screening of all electronic signal processing circuits.

When fuses are installed the original manufacturer shall state the type and rating of the fuse-links to be used.

8.5.4 開關操作裝置與組件之安裝

開關操作裝置及組件應依製造廠商提供之說明書安裝，並用金屬線縛在組裝品中，並使得在正常操作中所出現之相互影響(例：熱、開關操作放射、振動、電

磁場)下，不會損害其正常之功能性。在電子組裝品方面，此可能有必要分離或掩蔽所有電子訊號處理電路。

當安裝熔線時，原始製造廠商應敘明須使用之熔線鏈的型式及定額。

8.5.5 Accessibility

Adjusting and resetting devices, which have to be operated inside the ASSEMBLY shall be easily accessible.

Functional units mounted on the same support (mounting plate, mounting frame) and their terminals for external conductors shall be so arranged as to be accessible for mounting, wiring, maintenance and replacement.

Unless otherwise agreed between the ASSEMBLY manufacturer and the user, the following accessibility requirements associated with floor-mounted ASSEMBLIES shall apply:

- The terminals, excluding terminals for protective conductors, shall be situated at least 0,2 m above the base of the ASSEMBLIES and, moreover, be so placed that the cables can be easily connected to them.
- Indicating instruments that need to be read by the operator shall be located within a zone between 0,2 m and 2,2 m above the base of the ASSEMBLY.
- Operating devices such as handles, push buttons, or similar shall be located at such a height that they can easily be operated; this means that their centreline shall be located within a zone between 0,2 m and 2 m above the base of the ASSEMBLY. Devices which are infrequently operated, e.g less than once per month, may be installed at a height up to 2,2 m.
- Actuators for emergency switching devices (see 536.4.2 of IEC 60364-5-53:2001) shall be accessible within a zone between 0,8 m and 1,6 m above the base of the ASSEMBLY.

NOTE In some countries, national codes or regulations may further limit the minimum and maximum height.

8.5.5 可接近性

調整及重置裝置必須在組裝品內操作，應可容易接近。

裝設在相同支撐物(裝設板、裝設架)上之功能性單元及其外部導體用之端子，應予以適當配置，使得在裝設、配線、維護及更換時可予以接近。

除非組裝品製造廠商與使用者之間另有協議，應適用下列與落地裝設式組裝品有關之接近性要求。

- 端子(不包括保護性導體用之端子)應位於組裝品基座以上至少 0.2 m 之處，且此外，應置於能容易連接至電纜之處。
- 須由操作者讀取之指示儀表，應位於組裝品基座以上 0.2 m 與 2.2 m 之間的區域內。
- 操作裝置(例：把手、按扭)或類似物，應位於適當高度，使其可容易操作；此表示其中心線應位於組裝品基座以上 0.2 m 與 2.2 m 之間的區域內。不常操作之裝置(例：每月少於 1 次)，可安裝在 2.2 m 以下之高度。
- 在組裝品基座以上 0.8 m 與 1.6 m 之間的區域內，應可接近緊急開關操作裝置用之致動器(參照 IEC 60364-5-53:2001 之 536.4.2)。

備考：在某些國家，國家法規或規定可進一步限制最低及最高之高度。

8.5.6 Barriers

Barriers for manual switching devices shall be so designed that the switching emissions do not present a danger to the operator.

To minimize danger when replacing fuse-links, interphase barriers shall be applied, unless the design and location of the fuses makes this unnecessary.

8.5.6 障壁

手動開關操作裝置用之障壁應予以妥善設計，使得開關操作放射不會對操作者造成危險。

為使更換熔線鏈之危險降至最低，應採用相間障壁(interphase barrier)，除非熔線之設計及位置不需要採用。

8.5.7 Direction of operation and indication of switching positions

The operational positions of components and devices shall be clearly identified. If the direction of operation is not in accordance with IEC 60447, then the direction of operation shall be clearly identified.

8.5.7 操作方向及開關操作位置之指示

組件及裝置之操作位置應能清楚識別。若操作方向不符合 IEC 60447 之規定，則應能清楚識別操作方向。

8.5.8 Indicator lights and push-buttons

Unless otherwise specified in the relevant product standard the colours of indicator lights and push-buttons shall be in accordance with IEC 60073.

8.5.8 指示器燈及按鈕

除非相關標準另有規定，指示器燈及按鈕之顏色，應符合 IEC 60073 之規定。

8.6 Internal electrical circuits and connections

8.6.1 Main circuits

The busbars (bare or insulated) shall be arranged in such a manner that an internal short-circuit is not to be expected. They shall be rated at least in accordance with the information concerning the short-circuit withstand strength (see 9.3) and designed to withstand at least the short-circuit stresses limited by the protective device(s) on the supply side of the busbars.

Within one section, the conductors (including distribution busbars) between the main busbars and the supply side of functional units as well as the components included in these units may be rated on the basis of the reduced short-circuit stresses occurring on the load side of the respective short-circuit protective device within each unit, provided that these conductors are arranged so that under normal operation an internal short-circuit between phases and/or between phases and earth is not to be expected (see 8.6.4).

8.6 內部電路及連接

8.6.1 主電路

匯流排(裸露或絕緣)應予以妥善配置，使其不預期會發生內部短路。其額定應至少符合有關短路耐受強度(參照 9.3)之規定，並應設計為能至少耐受匯流排之電源側上的保護裝置所限制之短路應力。

在 1 個區段內，倘若主匯流排與功能性單元電源側之間的導體經適當配置後，在正常操作下不會超過相間及/或相與地間之內部短路，則主匯流排與功能性單元電源側之間的導體及此等單元所包含之組件，其額定可為每一單元內之個別短路保護裝置之負載側上所發生之降級短路應力之基底。

Unless otherwise agreed between the ASSEMBLY manufacturer and the user, the minimum cross-sectional area of the neutral within a three phase and neutral circuit shall be:

- For circuits with a phase conductor cross-sectional area up to and including 16 mm^2, 100 % of that of the corresponding phases.

- For circuits with a phase conductor cross-sectional area above 16 mm², 50 % of that of the corresponding phases with a minimum of 16 mm².

It is assumed that the neutral currents do not exceed 50 % of the phase currents.

NOTE For certain applications which lead to high values of zero sequence harmonics (e.g. 3rd order harmonics) higher cross-sections of the N conductor might be required as these harmonics of the phases are added in the N conductor and lead to high current load at higher frequencies. This is subject to special agreement between the ASSEMBLY manufacturer and the user.

The PEN shall be dimensioned as specified in 8.4.3.2.3.

除非組裝品製造廠商與使用者另有協議，三相及中性電路內之中性點最小截面積應如下。

- 對於相導體截面積在 16 mm² 以下之電路，為相對應之相的截面積之 100 %。
- 對於相導體截面積超過 16 mm² 之電路，為相對應之相的截面積之 50 %，但最小為 16 mm²。

其係假定中性電劉不超過相電流之 50 %。

備考：對於會導致高的零序諧波(例：3 次諧波)值之某些應用，可能需要較大截面之 N 導體，因為此等相諧波加總至 N 導體中，並導致在較高頻率下有高電流負載。此須由組裝品製造廠商與使用者進行特殊協議。

PEN 之尺寸應依 8.4.3.2.3 之規定。

8.6.2 Auxiliary circuits

The design of the auxiliary circuits shall take into account the supply earthing system and ensure that an earth-fault or a fault between a live part and an exposed conductive part shall not cause unintentional dangerous operation.

In general, auxiliary circuits shall be protected against the effects of short circuits. However, a short-circuit protective device shall not be provided if its operation is liable to cause a danger. In such a case, the conductors of auxiliary circuits shall be arranged in such a manner that a short-circuit is not to be expected (see 8.6.4).

8.6.2 輔助電路

輔助電路之設計應考量電源接地系統，並確保帶電零件與暴露導電零件之間的接地故障或故障，不應造成意外之危險操作。

通常，輔助電路應予以保護，防止短路之影響。然而，若短路保護裝置易於造成危險，則不應備有短路保護裝置。在此種情況中，輔助電路之導體應予以妥善配置，使其預期不會發生短路。

8.6.3 Bare and insulated conductors

The connections of current-carrying parts shall not suffer undue alteration as a result of normal temperature rise, ageing of the insulating materials and vibrations occurring in normal operation. In particular, the effects of thermal expansion and of the electrolytic action in the case of dissimilar metals, and the effects of the endurance of the materials to the temperatures attained, shall be taken into consideration.

Connections between current-carrying parts shall be established by means that ensure a sufficient and durable contact pressure.

8.6.3 裸導體及絕緣導體

在正常操作中發生之正常溫升、絕緣材料老化及震動的作用後，載流零件之連接不應遭受過大之變更。特別是，應考量在不同金屬之熱膨脹及電解作用的影響，以及材料對所達到之溫度的耐久性影響。

應以確保有充分且持久之接觸壓力的方式，建立載流零件之間的連接。

If verification of temperature rise is carried out on the basis of tests (see 10.10.2) the selection of conductors and their cross-sections used inside the ASSEMBLY shall be the responsibility of the original manufacturer. If verification of temperature rise is made following the rules of 10.10.3, the conductors shall have a minimum cross-section according to IEC 60364-5-52. Examples on how to adapt this standard for conditions inside an ASSEMBLY are given in the tables included in Annex H. In addition to the current-carrying capacity of the conductors, the selection is governed by:

- the mechanical stresses to which the ASSEMBLY may be subjected;
- the method used to lay and secure the conductors;
- the type of insulation;
- the type of components being connected (e.g. switchgear and controlgear in accordance with IEC 60947 series; electronic devices or equipment).

若在試驗之基礎(參照 10.10.2)上進行溫升之查證，則導體之選擇及在組裝品嫩所使用之截面積，應為原始製造廠商之責任。若依 10.10.3 之規則進行溫升之查證，則導體之最小截面積應依 IEC 60364-5-52 之規定。有關如何針對組裝品內之條件調整本標準之範例，如附錄 H 之表所示。除了導體之載流容量之外，依下列原則選取。

- 組裝品可能承受之機械應力。
- 用於設置及固定導體之方法。
- 絕緣之型式。
- 所連接之組件型式(例：符合 IEC 60947 系列之開關裝置及控制裝置；電子裝置或設備)。

In the case of insulated solid or flexible conductors:

- They shall be rated for at least the rated insulation voltage (see 5.2.3) of the circuit concerned.
- Conductors connecting two termination points shall have no intermediate joint, e.g. spliced or soldered.
- Conductors with only basic insulation shall be prevented from coming into contact with bare live parts at different potentials.
- Contact of conductors with sharp edges shall be prevented.
- Supply conductors to apparatus and measuring instruments in covers or doors shall be so installed that no mechanical damage can occur to the conductors as a result of movement of these covers or doors.
- Soldered connections to apparatus shall be permitted in ASSEMBLIES only in cases where provision is made for this type of connection on the apparatus and the specified type of conductor is used.
- For apparatus other than those mentioned above, soldering cable lugs or soldered ends of stranded conductors are not acceptable under conditions of heavy vibration. In locations where heavy vibrations exist during normal operation, for example in the case of dredger and crane operation, operation on board ships, lifting equipment and locomotives, attention should be given to the support of conductors.
- Generally only one conductor should be connected to a terminal; the connection of two or more conductors to one terminal is permissible only in those cases where the terminals are designed for this purpose.

The dimensioning of solid insulation between separate circuits shall be based on the circuit of highest rated insulation voltage.

在絕緣實心或可撓性導體方面，

- 其額定應至少有關電路之額定絕緣電壓(參照 5.2.3)。