

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Switchgear and controlgear and their assemblies for low voltage – Integration of radiocommunication device above 380 MHz into an equipment**

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**Appareillages et ensembles d'appareillages à basse tension – Intégration d'un dispositif de radiocommunication de plus de 380 MHz à un équipement**

[IEC 63404:2024](#)

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## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Implementation categories.....	10
5 Characteristics .....	13
5.1 Radiocommunication.....	13
5.2 Radiocommunication device interfaces .....	13
5.3 Radiofrequency capability profile of the host equipment.....	14
6 Product information and marking .....	15
6.1 General.....	15
6.2 Identification .....	15
6.3 Characteristics.....	15
6.4 Instruction for the upgrade of the radiocommunication device .....	15
7 Normal service, mounting and transport conditions.....	16
8 Constructional and performance requirements.....	16
8.1 General.....	16
8.2 Constructional.....	16
8.2.1 Upgrade of the radiocommunication device.....	16
8.2.2 Addition of an antenna port.....	17
8.2.3 Electromagnetic field .....	17
8.3 Radio communication performance .....	17
8.4 EMC .....	17
8.4.1 Radiocommunication .....	17
8.4.2 Radiofrequency capability profile .....	18
8.4.3 Addition or withdrawal of antenna port.....	18
9 Tests .....	18
9.1 Capability profile test procedure.....	18
9.2 Evaluation procedure for assemblies.....	19
9.3 Constructional.....	19
9.3.1 Upgrade of the radiocommunication device.....	19
9.3.2 Electromagnetic field .....	19
9.4 Performance .....	19
9.4.1 EMC immunity performance criteria .....	19
9.4.2 Radiocommunication performance .....	20
9.5 EMC .....	21
9.5.1 Radiated emissions .....	21
9.5.2 Conducted emissions.....	21
9.5.3 Immunity.....	22
Annex A (informative) Radiocommunication device integration use cases .....	23
A.1 General.....	23
A.2 Use case A – Wireless & battery-less position switch.....	23
A.3 Use case B – Proximity switch according to IEC 60947-5-2 with external voltage supply or integrated battery and integrated universal radio module and antenna.....	25

A.4	Use case C – Circuit-breaker with an embedded radiocommunication device for wireless interface.....	28
A.5	Use case D – Upgrade of a low-voltage assembly to become an intelligent assembly .....	29
Annex B (informative)	Example of radiocommunication devices .....	31
Annex C (informative)	Guidance on additional aspects to be considered in product standards.....	32
C.1	General.....	32
C.2	Configuration .....	32
C.3	Information to be provided with the equipment .....	32
C.4	Integration .....	32
C.4.1	General .....	32
C.4.2	Constructional .....	32
C.4.3	Performance .....	33
C.4.4	Electromagnetic compatibility .....	33
C.4.5	Coexistence management and electromagnetic environment .....	33
C.4.6	Embedded software .....	34
C.4.7	Security aspects .....	34
C.4.8	Routine and sampling tests.....	34
Bibliography.....		35
Figure 1	– Example of radiocommunication implementation category 1 .....	11
Figure 2	– Example of radiocommunication implementation category 1 with distributed embedded software .....	11
Figure 3	– Example of radiocommunication implementation category 2 .....	11
Figure 4	– Example of radiocommunication implementation category 2 on two printed circuit boards .....	12
Figure 5	– Example of radiocommunication implementation category 3 .....	12
Figure 6	– Example of radiocommunication implementation category 4 .....	12
Figure 7	– Examples of radiofrequency capability profile.....	14
Figure 8	– Example of transmit mask .....	21
Figure B.1	– Example of integration of a radiocommunication device into a wireless communication interface .....	31
Table 1	– Performance criterion .....	20

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SWITCHGEAR AND CONTROLGEAR AND  
THEIR ASSEMBLIES FOR LOW VOLTAGE – INTEGRATION OF  
RADIOCOMMUNICATION DEVICE ABOVE 380 MHZ INTO AN EQUIPMENT**

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The text of this International Standard is based on the following documents:

Draft	Report on voting
121/151/FDIS	121/158/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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## INTRODUCTION

In the context of the fast evolution of radiocommunication technologies and the long lifetime of low voltage equipment, this document proposes the evaluation and verification of the initial integration and update of radiocommunication devices within host equipment, including the hardware or the software.

The aim of this document is to define the tasks of testing the host equipment when integrating and updating the radiocommunication device into low voltage equipment (e.g. circuit-breaker, sensor, electric actuator, etc.). In general, this document gives requirements for components hosting a radiocommunication device in order to facilitate their integration into an assembly.

This document is intended to be referenced by product standards as common radiocommunication requirements (see Annex C).

The test program has been elaborated based on the result of actual IEC 61000-4-39 testing by equipment manufacturers and test laboratories. This test allows the characterisation of radiofrequency band(s) and amplitude(s) which is called a capability profile. This capability profile can be used to demonstrate the capability of an equipment to host various radiocommunication devices when their characteristics are within the limits given by the capability profile.

The integration of a pre-evaluated radiocommunication device according to its radiotechnology standard into a host equipment can affect its radio transmitter performances. This document includes the verification of the radiocommunication functions after integration following the main guidance from ETSI EG 203 367, FCC KDB 996369 D04, MIIT No.129:2021 and GRFC N 07-20-03-001:2007.

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# SWITCHGEAR AND CONTROLGEAR AND THEIR ASSEMBLIES FOR LOW VOLTAGE – INTEGRATION OF RADIOCOMMUNICATION DEVICE ABOVE 380 MHZ INTO AN EQUIPMENT

## 1 Scope

This document defines radiocommunication related requirements for equipment intended to integrate a radiocommunication device. It includes the initial integration and update of a radiocommunication device, having a carrier frequency greater than 380 MHz, into new or updated host equipment with:

- The classification of integration categories;
- The EMC immunity verification using a capability profile approach;
- The verification of the unwanted emission level of the radio transceiver.

This document also provides typical radiocommunication device integration use cases (see Annex A).

The object of this document is to define the required evaluation when incorporating a radiocommunication device into a new or updated host equipment.

This document is intended to be referred by the product standard of the host equipment for providing additional characteristics, performance, and evaluation regarding the integration and update of a radiocommunication device (see Annex C). It can also be used by the manufacturer of the host equipment when no applicable product standard exists.

In addition, this document provides guidance on considerations to be addressed in product standards including safety and security matter.

This document does not cover:

- The test of the radiocommunication device according to its radiotechnology standard or specification (e.g. IEEE 802.11, IEEE 802.15.4);
- Allocation of radio frequencies;
- The impact on the application of the equipment;
- The safety related requirements of the host equipment (see the applicable product standard)
- Hazards related to remote control operations (see the applicable product standard);
- Over the air software updates (under consideration for the next revision).

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60417, *Graphical symbols for use on equipment*, available at <http://www.graphical-symbols.info/equipment>

IEC 61000-4-39:2017, *Electromagnetic compatibility (EMC) – Part 4-39: Testing and measurement techniques – Radiated fields in close proximity – Immunity test*

IEC 62479, *Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)*

IEC 62657-2, *Industrial networks – Coexistence of wireless systems – Part 2: Coexistence management*

ISO 7000, *Graphical symbols for use on equipment*, available at <http://www.graphical-symbols.info/equipment>

### 3 Terms and definitions

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

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

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

#### 3.1

##### **radiocommunication device**

radio transceiver intended to be integrated into an equipment for communication purposes

Note 1 to entry: The form of the device can be a complete single unit (module) or a set of associated elements (antenna, transmitter, power supply, etc.).

Note 2 to entry: The original evaluation of the transmitter and receiver functions can be associated with specific integration instructions and operating conditions.

#### 3.2

##### **radio transceiver transmitter-receiver**

combination in a single unit of a radio transmitter and a radio receiver employing common circuit components and usually the same antenna for both transmitting and receiving

Note 1 to entry: A transceiver is often used as a portable or mobile station. In French, the terms “talkie-walkie” and “walkie-talkie” are strongly deprecated in the sense of portable transmitter-receiver.

[SOURCE: IEC 60050-713:1998, 713-08-02 modified by adding radio in the term]

#### 3.3

##### **radio link**

telecommunication facility of specified characteristics between two points provided by means of radio waves

[SOURCE: ITU-R V.573-5:2015, A21]

### 3.4 antenna gain

ratio, generally expressed in decibels, of the radiation intensity produced by an antenna in a given direction to the radiation intensity that would be obtained if the power accepted by the antenna were radiated equally in all directions

Note 1 to entry: If no direction is specified, the direction of maximum radiation intensity from the given antenna is implied.

Note 2 to entry: The gain is frequently expressed in decibels with respect to an isotropic antenna which is expressed in dBi.

[SOURCE: IEC TR 62630: 2010, 3.1.6, modified with a new Note 2 to entry replacing the original one]

### 3.5 antenna port

port that is connected to an antenna, either direct or by a cable. The antenna may be external or internal to the equipment or the radiocommunication device

Note 1 to entry: Antenna ports connected to antennas internal to the equipment or the radiocommunication device are covered by signal ports.

[SOURCE: IEC 61000-6-6:2003, 4.1, modified with equipment or the radiocommunication device]

### 3.6 equivalent radiated power ERP

product of the power supplied to the antenna and the maximum antenna gain relative to a half-wave dipole

[SOURCE: ITU-T K.70:2020]

### 3.7 equivalent isotropically radiated power EIRP

product of the power accepted by the antenna and the maximum antenna gain relative to an isotropic antenna

[SOURCE: ITU-T K.100:2019]

### 3.8 host equipment

<radiocommunication> switchgear, controlgear or other equipment or assembly, intended to host a radiocommunication device

### 3.9 switchgear

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy

[SOURCE: IEC 60050-441:1984, 441-11-02, modified by deleting the first article]

### **3.10 controlgear**

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for the control of electric energy consuming equipment

[SOURCE: IEC 60050-441:1984, 441-11-03, modified by deleting the first article]

### **3.11 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, as defined by the original manufacturer, which can be assembled in accordance with the original manufacturer's instructions

[SOURCE: IEC 61439-1:2020, 3.1.1, modified – removal of notes to entry]

### **3.12 intelligent assembly**

assembly which includes facilities for intelligent operation and maintenance for the full life cycle by using advanced sensor technology, digital technology, network technology, communication technology and artificial intelligence technology

[SOURCE: IEC TS 63290:—, 3.1, modified – removal of Note 1 to entry]

### **3.13 original manufacturer**

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

[SOURCE: IEC 61439-1:2011, 3.10.1]

### **3.14 capability profile**

<nearfield radiofrequency> spectral envelope of electromagnetic radiated nearfield which an equipment is able to withstand without degradation of its non-radio functions

## **4 Implementation categories**

For the purpose of managing the update of the radiocommunication device of an equipment, the following implementation categories are defined. These depend on whether the equipment has electronic circuits and where the embedded software, called also firmware, if any, supporting the non-radio functions of the equipment, is hosted.

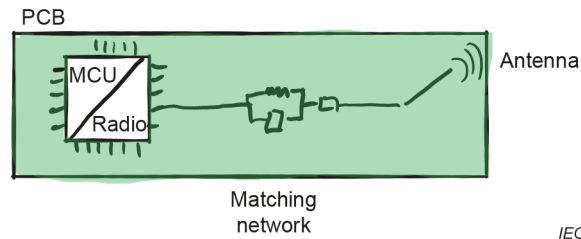
The electronic circuit, including the embedded software, if any, supporting the non-radio functions of the host equipment, can be either of:

- a) Integrated fully or partially into the radiocommunication device or
- b) Hosted only on the equipment, separately from the radiocommunication device or electronic circuits without embedded software.

NOTE For the purpose of this document, the term "electronic circuit" excludes circuits in which all components are passive (including diodes, resistors, varistors, capacitors, surge suppressors, inductors).

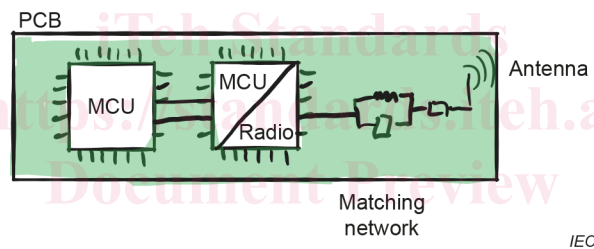
Five implementation categories are defined as follows:

- 1) Category 0: Equipment composed of a host part without electronic circuits and a radiocommunication device intended to monitor and transmit the contact position, actuator position or similar signal.
- 2) Category 1: The radiocommunication device is hosting the embedded software of the equipment (a) including the radiocommunication functions as illustrated in Figure 1, fully integrated and Figure 2, partially integrated.



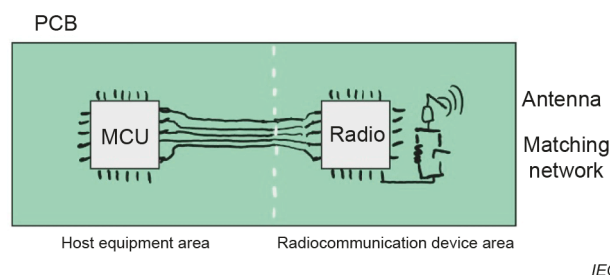
**Figure 1 – Example of radiocommunication implementation category 1**

Within the equipment, the embedded software can be distributed in several microcontroller units (MCU) as shown in Figure 2. If one of them is also hosting the radiocommunication capabilities, then the equipment falls in category 1.

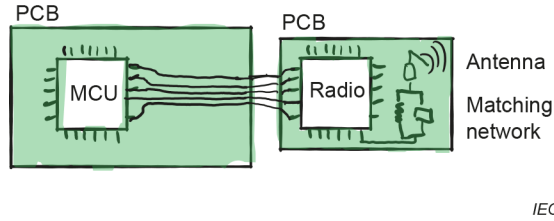


**Figure 2 – Example of radiocommunication implementation category 1 with distributed embedded software**

- 3) Category 2: The electronic circuit of the equipment including embedded software, if any, of the equipment is not hosted by the radiocommunication device (b)). The radiocommunication device area is located inside the equipment, non-user removable and placed on an identified separate location either on the same printed circuit board as illustrate in Figure 3 or on a different printed circuit board as illustrated in Figure 4 and is only managing the radiocommunication functions. The connection to the radiocommunication device is grouped in an identified path (PCB traces, board to board connection, ribbon cable, etc.) and follows the implementation requirements given by the manufacturer of the radiocommunication device.



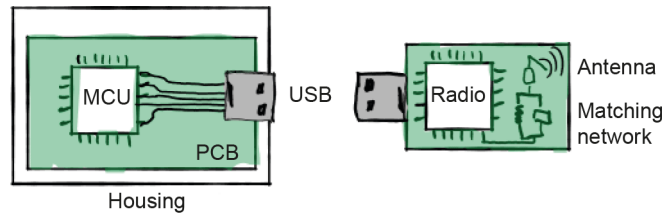
**Figure 3 – Example of radiocommunication implementation category 2**



**Figure 4 – Example of radiocommunication implementation category 2 on two printed circuit boards**

NOTE In the case of two separate printed circuit boards, the connection between them can be realised by various connecting means: e.g. flat cable, connectors, wires, direct soldering, etc.

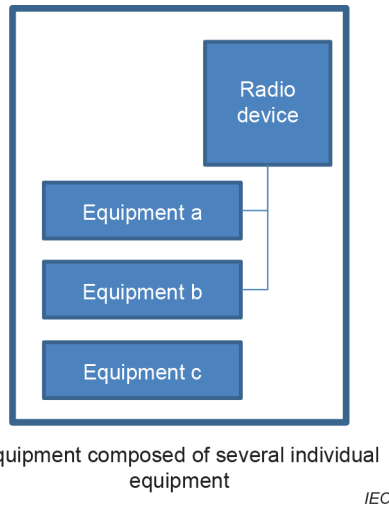
- 4) Category 3: The radiocommunication device is integrated into a removable part of the equipment which is hosting the radiocommunication functions (b)). This part as illustrated on the right end side of Figure 5 can be added or removed on site.



**Figure 5 – Example of radiocommunication implementation category 3**

NOTE Figure 5 shows a USB connection as an example. This connection can be realised also with other standardised or manufacturer specific connection.

- 5) Category 4: The radiocommunication device is a separate device used as an interface to several equipment as illustrated in Figure 6 where equipment a and b are connected through field bus to a common radiocommunication interface named Radio device and equipment c is a non-communicating equipment.



**Figure 6 – Example of radiocommunication implementation category 4**

Examples for radiocommunication devices are shown in Annex B.