
**Electromagnetic compatibility — Product
family standard of lifts, escalators and
moving walks — Immunity**

*Compatibilité électromagnétique — Norme pour la famille de produits:
ascenseurs, escaliers mécaniques et trottoirs roulants — Immunité*

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 22200 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

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Introduction

This International Standard is based upon the European Standard EN 12016:1998. This International Standard contains no technical deviations from EN 12016:1998. In the meantime, EN 12016:2004, which supersedes EN 12016:1998, has been published with new requirements on radio-frequency electromagnetic fields above 500 MHz, for surge testing on safety circuits and on radio-frequency electromagnetic fields with respect to safety devices.

Higher requirements have also been introduced on several environmental phenomena, taking into consideration the progress on EMC technology and the results of the risk assessment, and for immunity to mains power supply voltage interruptions and voltage dips. As of the date of publication of this International Standard, an ISO/TC 178 resolution has been opened to address these new requirements in the next revision of ISO 22200.

The levels of immunity and the resultant performance criteria which are given in this International Standard reflect the fact that lifts, escalators and moving walks are deemed to consist of self-contained subsystems and apparatus (e.g. machine room, lift car etc.). This International Standard is the product family standard for the electromagnetic compatibility of lifts, escalators and moving walks (immunity) and takes precedence over all aspects of the generic standard.

The related EMC product family standard for emission is ISO 22199.

The requirements of this International Standard have been specified so as to ensure a level of electromagnetic immunity that allows minimal disturbance to the product family.

Two levels of immunity are given which have been selected such that the immunity levels for safety circuit apparatus are higher than the immunity levels for normal operation apparatus. The higher levels cover the possibility for example of disturbances emanating from hand-held transmitters in close proximity to safety circuit apparatus.

Neither level, however, covers cases where an extremely low probability of occurrence exists.

The immunity levels given, are on the basis that equipment of the product family range is installed both indoor and outdoor in all types of building and, generally, is connected to a low voltage system.

It is known that in the field of EMC provision, technology changes often require amendment to standards. During the preparation of this International Standard, equipment operating in the radio frequency (RF) field above 500 MHz has been introduced into the market. A revision to this International Standard will be prepared stating the performance criteria and associated test values at these frequencies. In the meantime, due to distances, etc., it is assumed that equipment utilizing frequencies above 500 MHz is not used in close proximity to lift, escalator and moving walks controls.

Electromagnetic compatibility — Product family standard of lifts, escalators and moving walks — Immunity

1 Scope

This International Standard specifies the immunity levels that represent essential EMC requirements, and test conditions for lifts, escalators and moving walks that are permanently installed in buildings and for which ISO/TC 178 has direct responsibility for the production of International Standards, in relation to continuous and transient, conducted and radiated disturbances including electrostatic discharges. It addresses commonly known EMC related hazards and hazardous situations relevant to lifts, escalators and moving walks, when they are used as intended and under the conditions foreseen by the manufacturer.

Since lifts travel large vertical distances in buildings, it becomes impracticable to test the total assembly either in a test laboratory or *in situ* (where the uncontrolled environment may also influence the test procedures and results). Likewise, due to practical restrictions imposed by the lift car internal dimensions, it is impracticable to test the lift car from within. Similar considerations regarding dimensions apply equally to the testing of escalators and passenger conveyors. Therefore, this international Standard applies to the subsystems and/or apparatus of lifts, escalators and passenger conveyors, an assembly of which will comprise an installation, the boundaries of which are indicated by example in Figures 2 and 3. However, this International Standard does not apply to lighting apparatus and also other services already proven to be in conformity to the national EMC regulations.

2 Normative references

The following referenced documents are indispensable for the application 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 801-3¹⁾, *Electromagnetic Compatibility for Industrial — Process Measurement and control Equipment — Part: Radiated electromagnetic field requirements*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests*

1) It is noted that the IEC 801-3 has been superseded by IEC 61000-4-3, but this later standard does not cover band widths from 27 MHz to 80 MHz and the test methods differ. The reference is kept for consistency with other tests in this International Standard.

3 Terms and definitions

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

- 3.1 installation**
lift, escalator or passenger conveyor installation comprising subsystems with electrical and electronic equipment and interconnections
- 3.2 subsystem**
assembly of apparatus which is appropriate for assessment for conformity to this standard and, by means of interconnection with other subsystems, forms an installation (see Clause 4)
- 3.3 apparatus**
assembly of components with an intrinsic function intended for use in a subsystem or installation
- 3.4 port**
particular interface of the specified subsystem or apparatus with the external electromagnetic environment (see Figure 1)
- 3.5 enclosure port**
boundary of the subsystem or apparatus through which electromagnetic fields can radiate or impinge
- 3.6 safety circuit**
electric safety device conforming to national lift or escalator safety standards
- 3.7 general function circuit**
circuitry used in a subsystem or apparatus which does not incorporate safety circuits

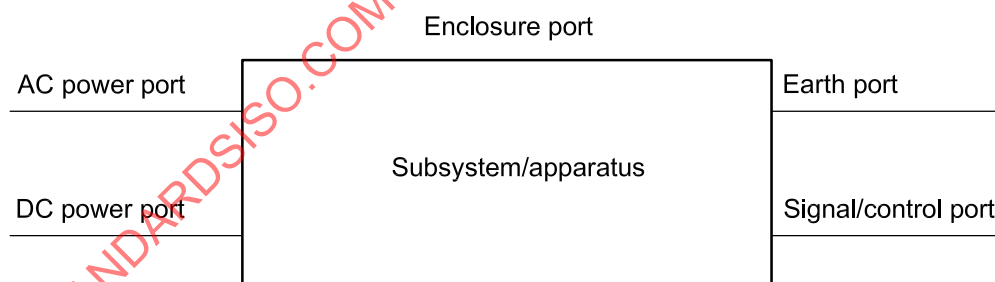


Figure 1 — Examples of ports

4 Composition of subsystems

The following assemblies of apparatus shall be considered as subsystems and are exemplified in Figures 2 and 3:

a) for lifts:

- 1) all machine room apparatus connected to the lift main switch,
- 2) apparatus associated with the lift car, e.g. door gear, control panel, door protection devices etc.,
- 3) apparatus associated with each lift floor excluding the lift car;

b) for escalators and moving walks:

- 1) all machine room apparatus connected to the escalator or passenger conveyor main switch,
- 2) apparatus associated with escalator or passenger conveyor landings.

Other assemblies of apparatus can also be considered as subsystems.

5 Test set-up

5.1 The tests, test methods, characteristics of the tests and test set-ups shall be as stated in IEC 61000-4-2, IEC 801-3, IEC 61000-4-4 and IEC 61000-4-11 as appropriate (see Tables 1 to 7).

5.2 The test shall be carried out in the most susceptible mode under any operating conditions. An attempt shall be made to maximize the susceptibility by varying the configuration of the test sample.

5.3 Travelling cables or any other cables likely to be more than 5 m long shall be represented by a sample at least 5 m long connected to the relevant port for the purpose of testing for susceptibility.

5.4 It is not always possible to measure the immunity levels for every function of the apparatus or subsystem. In such cases, the most critical period of operation shall be selected under normal operating modes, such as normal use, inspection control, etc.

5.5 The test shall be carried out at a single set of environmental conditions within the manufacturers specified operating range of temperature, humidity, pressure and supply voltage, unless otherwise indicated in the standards referred to in 5.1 (see also Tables 1 to 7).

5.6 Tests shall be carried out in well-defined and reproducible conditions for each test.

5.7 Tests shall be carried out at the following ports of the apparatus or subsystem where they exist:

- enclosure port (see Table 1);
- ports for signal lines and data busses not involved in process control, etc. (see Table 2);
- ports for process measurement and control lines (see Table 3);
- input and output d.c. power ports with current rating ≤ 100 A (see Table 4);
- input and output d.c. power ports with current rating > 100 A (see Table 5);
- input and output a.c. power ports rated at ≤ 100 A per phase (see Table 6);
- input and output a.c. power ports rated at > 100 A per phase (see Table 7).

5.8 The configuration and mode of operation during measurement shall be precisely noted in the test report if one is produced.

NOTE The purpose of the test report is to support the manufacturers declaration of conformity.

6 Applicability of tests

NOTE The application of tests for evaluation of immunity depend on the type of apparatus or subsystem, its configuration, ports, technology and operating conditions.

6.1 The fast transient tests shall be applied only to subsystem ports crossing the installation boundary.

6.2 It might be determined from consideration of the electrical characteristics and usage of a particular apparatus or subsystem, that some of the tests can be judged inappropriate and therefore unnecessary. In such a case, the decision and justification not to test shall be recorded in the test report if one is produced.

NOTE The purpose of the test report is to support the manufacturers declaration of conformity.

6.3 Where deviations from the test methods specified in 5.1 are applied, such deviations shall be justified and recorded in the test report if one is produced.

NOTE The purpose of the test report is to support the manufacturers declaration of conformity.

7 Immunity tests

Test values shall be applied as specified in Tables 1 to 7 and the performance criteria given in 8.2 shall be met as appropriate.

The tests shall be carried out as single tests in sequence in any order.

The apparatus or subsystem shall not become dangerous or unsafe as a result of the application of these tests.

8 Evaluation of tests results

8.1 Introduction

The special requirements of the product family makes it necessary to define precise criteria for the evaluation of the immunity test results.

A performance criterion derived from the immunity levels of IEC 61000-6-1 is deemed sufficient for most functions. However, for safety circuits, where no malfunction that can produce an unsafe operating mode may be tolerated, higher immunity levels are stipulated.

8.2 Performance criteria

A functional description of the apparatus or subsystem and a definition of performance criteria, during or as a consequence of testing, should be noted in the test report if one is produced.

NOTE The purpose of the test report is to support the manufacturers declaration of conformity.

The definition of performance criteria shall be based on the following.

Performance criterion A: The apparatus or subsystem shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus or subsystem is used as intended. In some cases, the performance level may be replaced by a

permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user can reasonably expect from the apparatus or subsystem if used as intended.

Performance criterion B: The apparatus or subsystem shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the apparatus or subsystem is used as intended. In some cases, the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is, however, allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user can reasonably expect from the apparatus or subsystem if used as intended.

Performance criterion C: Not used.

Performance criterion D: The apparatus or subsystem shall continue to operate as intended. No degradation of performance or loss of function is allowed, other than a failure into a safe mode.

9 Documentation for the user of the subsystem or apparatus

The user shall be provided with documentary information on any measures that have to be observed to achieve compliance with this standard.

10 Notices

A notice or pictogram shall be provided in the machine room limiting the use of portable phones operating above 500 MHz if the operation of the lift, escalator or passenger conveyor would be affected.

Table 1 — Immunity — Enclosure port

Environmental phenomena	Test set-up	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Radio frequency electromagnetic field	IEC 801-3 ¹⁾	MHz V/m (rms, unmod)	27-500 3 (see note 3)	27-500 10	A	D
Electrostatic discharge	IEC 61000-4-2	kV (charge voltage)	4 contact 8 air discharge	6 contact 15 air discharge	B	D
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						
NOTE 3 Except for the ITU ISM frequencies 27.120 MHz, 40.680 MHz and 433.920 MHz, where the level shall be 10 V/m (rms, unmod).						

Table 2 — Immunity — Ports for signal lines and data busses not involved in process control, etc.

Environmental phenomena	Test set-up	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Fast transients common mode	IEC 61000-4-4	kV (peak) Tr/Th ns Rep. frequency kHz	0,5 5/50 5	N/A	B	N/A
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						
GENERAL NOTE Applicable only to ports interfacing with cables whose total length according to the manufacturers functional specification may exceed 3 m.						

Table 3 — Immunity — Ports for process measurement and control lines

Environmental phenomena	Test set-up	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Fast transients common mode	IEC 61000-4-4	kV (peak) Tr/Th ns Rep. frequency kHz	1,0 5/50 5	2,0 5/50 5	B	D
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						

Table 4 — Immunity — Input and output d.c. power ports with current rating ≤ 100 A

Environmental phenomena	Test set-up	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Fast transients common mode	IEC 61000-4-4	kV (peak) Tr/Th ns Rep. frequency kHz	0,5 5/50 5	2,0 5/50 5	B	D
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						
GENERAL NOTE Not applicable to input ports intended for connection to dedicated non-rechargeable power supplies.						

Table 5 — Immunity – input and output d.c. power ports with current rating > 100 A

Environmental phenomena	Test setup	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Fast transients common mode	IEC 61000-4-4	kV (peak) Tr/Th ns Rep. frequency kHz	1,0 5/50 5	4,0 5/50 2,5	B	D
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						
GENERAL NOTE Not applicable to input ports intended for connection to dedicated non-rechargeable power supplies.						

Table 6 — Immunity – input and output a.c. power ports rated at ≤ 100 A per phase

Environmental phenomena	Test setup	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Fast transients common mode	IEC 61000-4-4	kV (peak) Tr/Th ns Rep. frequency kHz	1,0 5/50 5	2,0 5/50 5	B	D
Voltage dips (see Notes 3 and 4)	IEC 61000-4-11	% reduction ms	N/A	30 10 60 100	N/A	D
Voltage interruptions (see Notes 3 and 4)	IEC 61000-4-11	% reduction ms	N/A	> 95 5 000	N/A	D
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						
NOTE 3 Applicable to single-phase systems only; three-phase tests are under consideration.						
NOTE 4 For input ports only — changes in luminance are allowed.						
GENERAL NOTE Not applicable to input ports intended for connection to dedicated non-rechargeable power supplies.						

Table 7 — Immunity – input and output a.c. power ports rated at > 100 A per phase

Environmental phenomena	Test set-up	Units	Test values		Performance criteria	
			General function circuits (see Note 1)	Safety circuits (see Note 2)	General function circuits (see Note 1)	Safety circuits (see Note 2)
Fast transients common mode	IEC 61000-4-4	kV (peak) Tr/Th ns Rep. frequency kHz	2,0 5/50 5	4,0 5/50 2,5	B	D
NOTE 1 Test values for ports containing general function circuits only.						
NOTE 2 Test values for ports containing safety circuits.						