BS EN 12015:2014

BSI Standards Publication

# Electromagnetic compatibility — Product family standard for lifts, escalators and moving walks — Emission

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**National foreword**

This British Standard is the UK implementation of EN 12015:2014. It supersedes BS EN 12015:2004 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/4, Lifts, hoists and escalators.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

# Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks - Emission

Compatibilité électromagnétique - Norme famille de produits pour ascenseurs, escaliers mécaniques et trottoirs roulants - Émission

Elektromagnetische Verträglichkeit - Produktfamilien-Norm für Aufzüge, Fahrtreppen und Fahrsteige - Störaussendung

This European Standard was approved by CEN on 6 February 2014.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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# Foreword

This document (EN 12015:2014) has been prepared by Technical Committee CEN/TC 10 “Lifts, escalators and moving walks”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by September 2014.

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

This document supersedes EN 12015:2004.

The limits given in this European Standard recognise the fact that the product family covers a total range of lifts, escalators and moving walks used in residential buildings, offices, hospitals, hotels, industrial plants etc. and that lifts, escalators and moving walks are deemed to have their own dedicated power supply and be connected with the consent of the supply authority to a low impedance source.

The related EMC product family standard for immunity is:

EN 12016, *Electromagnetic compatibility — Product family standard for lifts, escalators and moving walks — Immunity.*

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

# Introduction

This European Standard is a Type C standard as stated in EN ISO 12100.

This European Standard has been prepared to provide one means of complying with the requirements of the Electromagnetic Compatibility (EMC) Directive. The requirements of this European Standard have been specified so as to ensure a level of electromagnetic emission which will cause minimal disturbance to other equipment. The levels, however, do not cover the following cases:

a) where the probability of an occurrence likely to produce emissions in excess of those which would normally be experienced is extremely low, e.g. the emergency stopping of a lift, escalator or moving walk under a fault condition;

b) where highly susceptible apparatus will be used in the close proximity of the equipment covered by this European Standard, in which case further measures may have to be taken to:

   1) reduce the level of electromagnetic emission to below that specified in this European Standard; or

   2) increase the immunity of the affected apparatus.

The given emission limits, are on the basis that equipment of the product family range may be installed both indoor and outdoor in all types of building, involves the switching of heavy currents and high inductive loads and, generally, is connected to a low voltage system.

Values for the harmonic emission limits are taken from the harmonised standard EN 61000-3-12:2005. Taking into account the characteristics and environment of lifts, escalators and moving walks these harmonic values are applicable for all input currents without current limitation stated by EN 61000-3-12:2005.

Due to the size of an installed lift, 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. This applies also to measurements within the car. Similar considerations regarding dimensions apply equally to the testing of escalators and moving walks.

**Rational to the revision of EN 12015:1998**

**a) Important changes**

Introduced requirements to control the emissions below 30 MHz of the drive to machine/motor connection. The emission limits are independent of the magnitude of the conducted current. Limits and test method are referred to EN 55014-1:2000. Regarding other ports, the radiated tests above 30 MHz cover the cable connections and there are no known problems below 30 MHz.

Introduced requirements to control mains electricity supply harmonic emissions and voltage fluctuations.

NOTE The radiation measurements in Table 1 have been harmonised with EN 55011:1998.

The term "installation" has been changed to "system". This is due to the fact that official interpretation defines that fixed installations are not covered by the conformity assessment procedures for CE Marking and declaration of conformity according to the EMC Directive, valid for apparatus and systems. The scope of the standard is applicable to the apparatus and assembly of apparatus of lifts and escalators and assembly into systems.

**b) Environmental issues**

Lifts, escalators and moving walks are systems whose apparatus and assembly of apparatus are distributed (and some of which move) throughout the building. The definition in EMC terms of the use of the building (residential or industrial) cannot be predetermined or assumed to be fixed. Therefore, to cover requirements in all cases, no differentiation between environments has been made and a single set of limits has been maintained. This set of high frequency limits is based on the industrial limits of EN 61000-6-4:1997 and is known to be above the usual limits for the residential environment. This is justified by the experience that systems in compliance with EN 12015:1998 have not been known to cause EMC interference with regard to mains and radiated emissions above 30 MHz.

Regarding conducted limits, these are also based on the fact that the supply cabling is separated from other building supplies at least up to the point of common coupling (PCC). Additionally, system wiring is segregated in accordance with the manufacturers' specifications.

Regarding radiated emission limits above 30 MHz, the lift, escalator or moving walk area is separated, to a large extent, from domestic appliances.

All the limits used take into account that systems have to comply with the safety protection requirements regarding earth leakage currents. The application of more stringent limits than have been shown to be adequate, would require the use of larger filters (both inductance and capacitance). The use of these will increase the susceptibility of the system to low electricity mains supply conditions and increase earth leakage currents. There is also an increase in power dissipation in the filter, causing (in the general case) increased energy consumption, additional ventilation and/or cooling requirement for the building. This is especially valid for higher duty systems.

**Rational to the revision of EN 12015:2004**

In general, lifts, escalators and moving walks are connected to three-phase supply and considered as a combination of a balanced three-phase load and one or more loads connected between phase and neutral or between phases, defined as hybrid equipment in EN 61000-3-12:2005, 3.7. Therefore EN 61000-3-12:2005, Tables 2, 3 and 4 apply to the system in accordance with flow chart of application of harmonic limits. In most of the cases Table 3 and Table 4 apply by prior verification of 3$^{rd}$ order harmonic.

Regarding lifts, escalators and moving walks connected to single-phase supply, EN 61000-3-12:2005, Table 2 is applicable to the A.C. mains port.

As the supply authorities do not guarantee a defined mains impedance, the mains short circuit power may vary from location to location. As these parameters are normally not known in advance, a practical assumption has to be made, based on values already known from other lifts/escalators and moving walks already in service. Due to that fact, a short circuit ratio $R_{sce}$ = 250 is defined as an average value for lifts, escalators and moving walks.

Radio equipment and telecommunications terminal equipment clearly falls under the 1999/5/EC Directive (R&TTE) even if it is used as part of lifts, escalators and moving walks.

## 1 Scope

This European Standard specifies the emission limits in relation to electromagnetic disturbances and test conditions for lifts, escalators and moving walks, which are intended to be permanently installed in buildings. These limits however, may not provide full protection against disturbances caused to radio and TV reception when such equipment is used within distances given in Table 1.

This European Standard is not applicable for apparatus which are manufactured before the date of its publication as EN.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 55011:2009, *Industrial, scientific and medical equipment — Radio-frequency disturbance characteristics — Limits and methods of measurement (CISPR 11:2009, modified)*

EN 55014-1:2006, *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission (CISPR 14-1:2005)*

EN 55022:2010, *Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement (CISPR 22:2008, modified)*

EN 61000-3-2:2006, *Electromagnetic compatibility (EMC) — Part 3-2: Limits — Limits for harmonic current emissions (equipment input current ≤ 16 A per phase) (IEC 61000-3-2:2005)*

EN 61000-3-11:2000, *Electromagnetic compatibility (EMC) — Part 3-11: Limits — Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems — Equipment with rated current ≤ 75 A and subject to conditional connection (IEC 61000-3-11:2000)*

EN 61000-3-12:2005, *Electromagnetic compatibility (EMC) — Part 3-12: Limits —% Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase (IEC 61000-3-12:2004)*

EN 61000-6-3:2007, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006)*

EN 61000-6-4:2007, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-3:2006)*

IEC 60050-161:1990+A1:1997+A2:1998, *International Electrotechnical Vocabulary — Chapter 161: Electromagnetic compatibility*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 61000-6-3:2007, EN 61000-6-4:2007 and IEC 60050-161:1990+A1:1997+A2:1998 and the following apply.

**3.1**
**apparatus**
assembly of components with an intrinsic function as defined by its manufacturer

Note 1 to entry: See Figure 1 and Figure 2 as examples.

Note 2 to entry: Safety components defined by Annex IV of the Lifts Directive (Directive 95/16/EC) are considered as apparatus.

**3.2**
**assembly of apparatus**
arrangement of interconnected apparatus, which can be tested together

Note 1 to entry: See Figure 1 and Figure 2 as examples.

**3.3**
**balanced three-phase equipment**
three-phase equipment which is connected to the three line conductors of a three-phase supply and in which the three line or phase currents are designed to be identical in amplitude and wave-shape, each being displaced from the other two by one-third of a fundamental period

**3.4**
**enclosure port**
physical boundary of the apparatus/assembly of apparatus through which electromagnetic fields can radiate or impinge

Note 1 to entry: See Figure 3 as an example.

**3.5**
**hybrid equipment**
combination of a balanced three-phase load and one or more loads connected between phase and neutral or between phases

**3.6**
**partial weighted harmonic distortion**
**PWHD**
ratio of the r.m.s. value of a selected group of higher order harmonics (here beginning from the 14$^{th}$ harmonic), weighted with the harmonic order *n*, to the r.m.s. value of the fundamental

Note 1 to entry: PWHD is calculated from the formula below. $I_n$ means the r.m.s. value of the current of the $n^{th}$ harmonic and $I_1$ means the r.m.s. value of the fundamental current:

$$PWHD = \sqrt{\sum_{n=14}^{40} n\left(\frac{I_n}{I_1}\right)^2}$$

**3.7**
**point of common coupling**
**PCC**
point in the public mains network which is nearest to the system and to which, other equipment may be connected

**3.8**
**port**
particular interface of the specified apparatus/assembly of apparatus with the external electromagnetic environment

Note 1 to entry: See Figure 3 as an example.

**3.9**
**reference fundamental current**
$I_1$
r.m.s. value of the fundamental component of the rated line current $I_{equ}$ of the system (equipment)

**3.10**
**root mean square**
**r.m.s.**
effective value of the current

**3.11**
**short circuit ratio**
$R_{sce}$
ratio of the short circuit power of the source to the apparent power of the load(s) as defined by EN 61000-3-12:2005, 3.10

**3.12**
**system**
equipment
lift, escalator or moving walk comprising assembly of apparatus with electrical and electronic equipment and interconnections

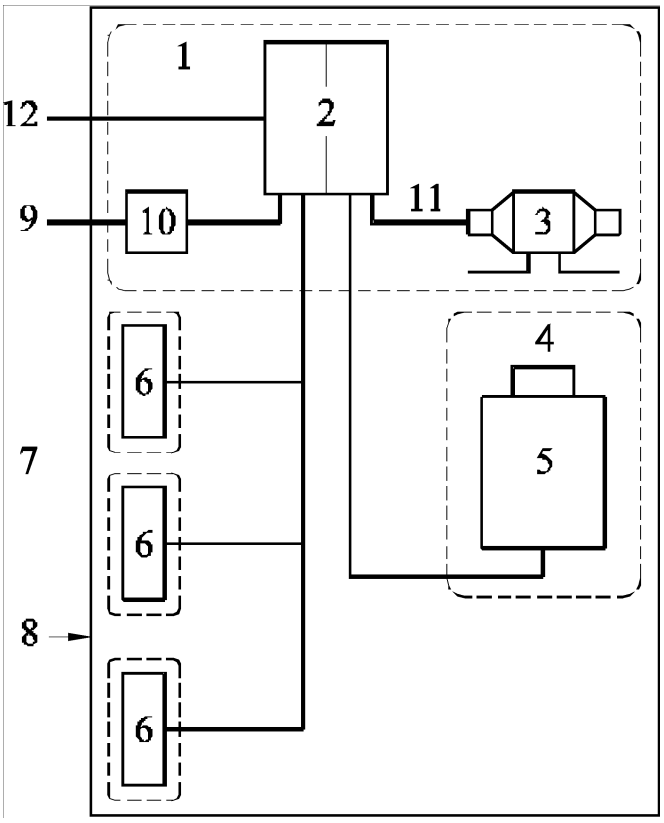
Note 1 to entry: See Figure 1 and Figure 2 as examples.

Note 2 to entry: Term “system” is intended as “equipment” in relation to application of EN 61000-3-12:2005.

**3.13**
**total harmonic distortion**
**THD**
ratio of the r.m.s. value of the harmonics to the r.m.s. value of the fundamental

Note 1 to entry: $THD$ is calculated from the formula below. $I_n$ means the r.m.s. value of the current of the $n^{th}$ harmonic and $I_1$ means the r.m.s. value of the fundamental current:

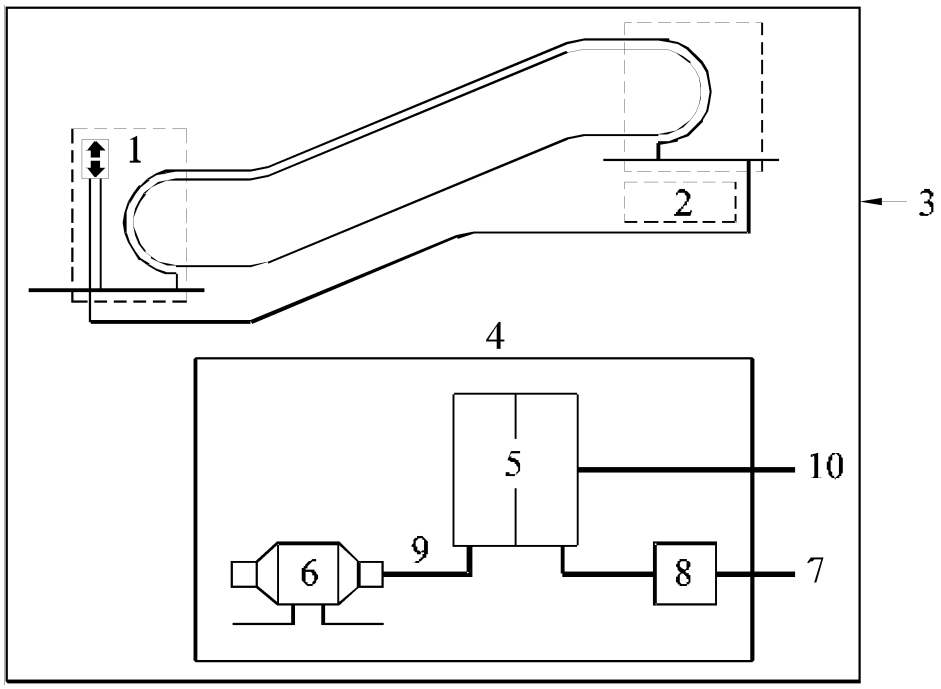
$$THD = \sqrt{\sum_{n=2}^{40}\left(\frac{I_n}{I_1}\right)^2}$$




**Key**

| | | | |
|---|---|---|---|
| ⬚ | assembly of apparatus | | |
| 1 | machinery space | 7 | landings |
| 2 | main control/control cabinet | 8 | system boundary |
| 3 | machine | 9 | AC – and/or DC power ports |
| 4 | door control | 10 | main switch |
| 5 | lift car | 11 | output power port |
| 6 | apparatus installed at the landing (e.g. pushbuttons, indicators) | 12 | ports for monitoring and remote alarm systems |

**Figure 1 — EMC model example (emission) for lift systems**



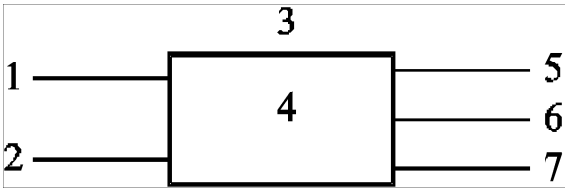

**Key**

assembly of apparatus

| | | | |
|---|---|---|---|
| 1 | control panels | 6 | machine |
| 2 | machinery space (see 4 to 10) | 7 | AC – and/or DC power ports |
| 3 | system boundary | 8 | main switch |
| 4 | machinery space | 9 | output power port |
| 5 | main control/control cabinet | 10 | ports for monitoring |

NOTE The machinery space can also be an external room.

**Figure 2 — EMC model example (emission) for escalator and moving walk systems**




**Key**

| | | | |
|---|---|---|---|
| 1 | AC power port | 5 | ground port |
| 2 | DC power port | 6 | signal/control port |
| 3 | enclosure port | 7 | machine/motor port |
| 4 | apparatus/assembly of apparatus | | |

**Figure 3 — Examples of ports**

# 4 Test set-up procedure

## 4.1 General

**4.1.1** The measurements shall be made in the operation mode producing the highest emissions consistent with normal applications. An attempt shall be made to maximise the emissions by varying the position of the test sample in the test facility.

**4.1.2** It is not always possible to measure emission for every function of the apparatus or assembly of apparatus. In such cases, the most critical period of operation shall be selected under normal operating modes.

**4.1.3** If the normative standards do not specify any other conditions then the tests shall be carried out at a single set of environmental conditions within the manufacturers specified operating range of temperature, humidity, pressure and supply voltage.

**4.1.4** Measurements shall be taken in well-defined and reproducible conditions for each test. The configuration and mode of operation during measurement shall be precisely recorded.

## 4.2 Radiated and conducted radio frequency emissions

**4.2.1** The tests, test methods, characteristics of the tests and test set-ups shall be as stated in EN 55011:2009.

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

**4.2.3** If the apparatus has a large number of similar ports or ports with many similar connections, then a sufficient number shall be selected to simulate actual operating conditions and to ensure that all the different types of termination are covered.

**4.2.4** Measurement shall be taken at the enclosure ports (radiative), A.C. mains and output power ports (conductive) of the apparatus/assembly of apparatus.

## 4.3 Voltage fluctuation and flicker

The tests, test methods, characteristics of the tests and test set-ups shall be as stated in EN 61000-3-11:2000.

## 4.4 Mains supply harmonics

The calculation or measurement, test methods, characteristics of the tests and test set-ups shall be as stated in EN 61000-3-12:2005.

The system shall have stabilised into its normal state as defined by the manufacturer before harmonic measurements are taken.

The calculation or measurement shall be done under load condition with a fundamental current greater than or equal to the reference fundamental current as referred to in 6.7.2.

# 5 Applicability of tests

**5.1** The application of tests for evaluation of levels of emission depends on the type of apparatus/assembly of apparatus, its configuration, ports, technology and operating conditions.

**5.2** It might be determined from consideration of the electrical characteristics and usage of a particular apparatus/assembly of apparatus, that some of the tests are inappropriate and therefore unnecessary. In such a case, the decision and justification not to test shall be recorded.

**5.3** Where deviations from the test methods specified in 4.2.1 and 4.4, are applied, such deviations shall be justified and recorded.

**5.4** For telecommunication ports EN 55022:2010 Class A applies.

# 6 Emission limits

## 6.1 Enclosure ports (radiative)

The electromagnetic emission levels measured at each enclosure port (radiative) of the apparatus/assembly of apparatus shall not exceed the limits specified in Table 1. These limits are not applicable to in-situ measurements.

## 6.2 AC mains ports (conductive)

**6.2.1** The electromagnetic emission levels measured at each A.C. mains port (conductive) of the apparatus/assembly of apparatus operating at less than 1 000 V r.m.s. shall not exceed the limits specified in Table 2. Different limits apply to emissions resulting from certain rates of impulse noise, as stated in 6.4.

**6.2.2** The harmonic emission levels measured at each A.C. mains port (conductive) of the three-phase system, operating at less than or equal to 690 V r.m.s. shall not exceed the limits specified in Table 3 and Table 4.

**6.2.3** The harmonic emission levels measured at each A.C. mains port (conductive) of the single-phase system operating at less than or equal to 240 V r.m.s. shall not exceed the limits specified in Table 5.

## 6.3 Output power ports (conductive)

The electromagnetic emission levels at each machine/motor port (conductive) of the apparatus/assembly of apparatus shall not exceed the limits specified in Table 6. If shielded connectors and shielded cables, in accordance with the apparatus/assembly of apparatus manufacturer's specification are used for machine/motor ports, or the cables are less than or equal to 2 m long, then measurements at those ports are not necessary.

## 6.4 Impulse noise

Electromagnetic emission levels resulting from impulse noise (clicks), measured as for 6.2.1, shall not exceed the limits specified in Table 2 if the clicks occur more frequently than 30 times per minute. Electromagnetic emission levels resulting from clicks which occur between 0,2 times and 30 times per minute shall not exceed the limits specified in Table 2 raised by a value of:

$$20 \log_{10} \frac{30}{N} \text{ dB}(\mu\text{V})$$

where

$N$ is the number of clicks per minute.

These limits do not apply for the exceptions given in EN 55014-1:2006, 4.2.3.

## 6.5 Voltage fluctuations

The requirements of EN 61000-3-11:2000 apply to a system.

Voltage fluctuations are dependent on the impedance of the mains supply for an individual system and the characteristics of the apparatus/assembly of apparatus. The manufacturer shall document the maximum impedance of the electricity mains supply for the system.

Apparatus/assembly of apparatus using controlled speed drives are known not to be a cause of voltage flicker disturbance. However, direct on line or star-delta starting of escalator motors, hoisting and hydraulic pump motors and repetitive direct switching of highly inductive loads (e.g. transformer) should be treated with caution.

## 6.6 Mains supply current harmonics

**6.6.1** Lifts, escalators and moving walks are considered as professional equipment as defined by EN 61000-3-2 therefore the requirements of EN 61000-3-12:2005 shall be applied as well to a system (equipment) less than 16 A per phase.

Harmonic currents of single phase apparatus/assembly of apparatus shall be included in the assessment of harmonic current of system (equipment).

**6.6.2** The limits of Table 3 and Table 4 apply to a balanced three-phase system (equipment) or a hybrid system (equipment) if the $3^{rd}$ harmonic current is less than 5 % of the reference fundamental current.

**6.6.3** The limits of Table 4 apply to a balanced three-phase system (equipment) or a hybrid system (equipment) if the $3^{rd}$ harmonic current is less than 5 % of reference fundamental current under the following specified conditions:

a) The phase angle of the $5^{th}$ harmonic current related to the fundamental phase voltage (see EN 61000-3-12:2005, 3.14) is in the range of 90° to 150° during the whole observation period;

NOTE 1 This condition is normally fulfilled by a system (equipment) where the largest electrical load has a three-phase uncontrolled rectifier bridge and capacitive filter, including a 3 % a.c. or 4 % d.c. reactor.

b) the design of the equipment is such that the phase angle of the $5^{th}$ harmonic current has no preferential value over time and can take any value in the whole interval [0°, 360°];

NOTE 2 This condition is normally fulfilled by a system (equipment) where the largest electrical load is a three-phase converter with fully controlled thyristor bridges.

c) the $5^{th}$ and $7^{th}$ harmonic currents are each less than 5 % of the reference fundamental current during the whole observation period;

NOTE 3 This condition is normally fulfilled by a system (equipment) where the largest electrical load is a three-phase"12 pulse" equipment.

**6.6.4** The limits of Table 5 apply to a single-phase system (equipment) or to a hybrid system (equipment) with $3^{rd}$ harmonic order greater than or equal to 5 % of the reference fundamental current.

The application of Tables 3 to 5 follows the flow chart in EN 61000-3-12:2005, 5.2 with tables corresponding as follows:

a) Table 2 of EN 61000-3-12:2005 corresponds to Table 5 of this European Standard;

b) Table 3 of EN 61000-3-12:2005 corresponds to Table 3 of this European Standard;

c) Table 4 of EN 61000-3-12:2005 corresponds to Table 4 of this European Standard.

## 6.7 Measurement

### 6.7.1 Radiated and conducted radio frequency emission

To determine conformity to the requirements of 6.1 and 6.2.1, emission levels shall be measured by the methods specified in EN 55011:2009 and under the conditions specified in Clause 4.

To determine conformity to the requirements of 6.3, the measurement method as defined in EN 55014-1:2006 for load terminals shall be used.

**Table 1 — Emission limits for enclosure (radiative) ports**

| **Frequency range**<br>MHz | **Limits for measurements on a test site at 10 m distance**[a b]<br>dB(µV/m) |
|---|---|
| 30 ≤ $F$ < 230 | 40 quasi peak |
| 230 ≤ $F$ ≤ 1000 | 47 quasi peak |

[a] These limits are based on those specified in EN 61000-6-4:2007. Measurements made at a distance of less than 10 m shall be made in accordance with EN 55011:2009 Measurements shall not be taken at a distance of less than 3 m.

[b] If a radio equipment as defined by Directive 1999/5/EC (R&TTE) is used in combined apparatus/assembly of apparatus, then the requirements of Directive 1999/5/EC apply to the radio equipment.

**Table 2 — Emission limits for A.C. mains (conductive) ports**

| **Frequency range**<br>MHz | **Limits**[a]<br>dB(µV) | | |
|---|---|---|---|
| | **Measurement for equipment rated current**[b] | | |
| | **< 25 A** | **25 A – 100 A** | **> 100 A**[c] |
| 0,15 ≤ $F$ < 0,5 | 79 quasi peak<br>66 average | 100 quasi peak<br>90 average | 130 quasi peak<br>120 average |
| 0,5 ≤ $F$ < 5,0 | 73 quasi peak<br>60 average | 86 quasi peak<br>76 average | 125 quasi peak<br>115 average |
| 5,0 ≤ $F$ < 30 | 73 quasi peak<br>60 average | 90 to 70[d] quasi peak<br>80 to 60[b] average | 115 quasi peak<br>105 average |

[a] If a radio equipment as defined by Directive 1999/5/EC (R&TTE) is used in combined apparatus/assembly of apparatus, then the requirements of the Directive 1999/5/EC apply to the radio equipment.

[b] The current for which the apparatus has been designed.

[c] This requires a dedicated power supply from a specific transformer.

[d] Decreasing with logarithm of frequency.

**Table 3 — Harmonic distortion for balanced three-phase system (equipment) and hybrid system (equipment) with 3rd harmonic order < 5 % of the reference fundamental current**

| Environmental phenomena | Test set-up | Units % | Limits for permanent emission[a] |
|---|---|---|---|
| Harmonic distortion | EN 61000-3-12:2005 | $I_5/I_1$ | 31 |
| | | $I_7/I_1$ | 20 |
| | | $I_{11}/I_1$ | 12 |
| | | $I_{13}/I_1$ | 7 |
| Harmonic distortion factor | EN 61000-3-12:2005 | $THD$ | 37 |
| | | $PWHD$ | 38 |
| The relative value of even harmonics up to order 12 shall not exceed 16/$n$ [%]. Even harmonics above order 12 are taken into account in $THD$ and $PWHD$ in the same way as odd order harmonics. | | | |
| [a] The given limits are based on EN 61000-3-12:2005 for $R_{sce}$ = 250 (balanced three phase equipment). | | | |

### 6.7.2 Mains Supply Harmonics

The ratios $I_n/I_1$ used for comparison with the limits given in Tables 3 to 5 shall be based on at least the reference fundamental current of the system.

Individual harmonics below 1 % of the reference fundamental current are disregarded.

**Table 4 — Harmonic distortion for balanced three-phase system (equipment) and hybrid system (equipment) and hybrid system (equipment) with 3rd harmonic order < 5 % of the reference fundamental current under specified conditions**

| Environmental phenomena | Test set-up | Units % | Limits for permanent emission[a] |
|---|---|---|---|
| Harmonic distortion | EN 61000-3-12:2005 | $I_5/I_1$ | 40 |
| | | $I_7/I_1$ | 25 |
| | | $I_{11}/I_1$ | 15 |
| | | $I_{13}/I_1$ | 10 |
| Harmonic distortion factor | EN 61000-3-12:2005 | $THD$ | 48 |
| | | $PWHD$ | 46 |
| The relative value of even harmonics up to order 12 shall not exceed 16/$n$ [%]. Even harmonics above order 12 are taken into account in $THD$ and $PWHD$ in the same way as odd order harmonics. | | | |
| [a] The given limits are based on EN 61000-3-12:2005 for $R_{sce}$ = 250 (balanced three phase equipment). | | | |

**Table 5 — Harmonic distortion for single-phase system (equipment) or hybrid system (equipment) with 3rd harmonic order ≥ 5 % of reference fundamental current**

| Environmental phenomena | Test set-up | Units % | Limits for permanent emission[a] |
|---|---|---|---|
| Harmonic distortion | EN 61000-3-12:2005 | $I_3/I_1$ | 35 |
| | | $I_5/I_1$ | 20 |
| | | $I_7/I_1$ | 13 |
| | | $I_9/I_1$ | 9 |
| | | $I_{11}/I_1$ | 8 |
| | | $I_{13}/I_1$ | 6 |
| Harmonic distortion factor | EN 61000-3-12:2005 | $THD$ | 40 |
| | | $PWHD$ | 40 |
| The relative value of even harmonics up to order 12 shall not exceed 16/$n$ [%]. Even harmonics above order 12 are taken into account in $THD$ and $PWHD$ in the same way as odd order harmonics. | | | |
| [a] The given limits are based on EN 61000-3-12:2005 for $R_{sce}$ = 250 (other than balanced three phase equipment). | | | |

**Table 6 — Emission limits for output power (conductive) ports**

| Frequency range | Limits |
|---|---|
| MHz | dB(μV) |
| 0,15 ≤ $F$ < 0,5 | 80 quasi peak<br>70 average |
| 0,5 ≤ $F$ < 5,0 | 74 quasi peak<br>64 average |
| 5,0 ≤ $F$ < 30 | 74 quasi peak<br>64 average |

## 7 Documentation for the installer of the apparatus/assembly of apparatus

The installer shall be provided with documentary information and instructions for installation and use so that compliance with this European Standard is maintained.

This shall include where applicable:

— instructions for assembly and physical arrangement with other apparatus;

— instructions and precautions for interconnection to other apparatus;

— specifications of interconnection cables and devices, especially about the application of shielded cables;

— instructions for commissioning and testing;

— guidance on avoiding incorrect actions and assembly of apparatus which are known to cause non-compliance with this European Standard.

# Annex ZA
(informative)

## Relationship between this European Standard and the Essential Requirements of Directive 2004/108/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conformity to the protection requirements of Annex I Article 1(a) of the EU Directive 2004/108/EC.

Once this European Standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this European Standard confers, within the limits of the scope of this European Standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

**WARNING** — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this European Standard.

# Bibliography

[1] EN 81-1:1998+A3:2009, *Safety rules for the construction and installation of lifts - Part 1: Electric lifts*

[2] EN 81-2:1998+A3:2009, *Safety rules for the construction and installation of lifts - Part 2: Hydraulic lifts*

[3] EN 115-1:2008+A1:2010, *Safety of escalators and moving walks - Part 1: Construction and installation*

[4] EN ISO 12100:2010, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)*

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