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**Electromagnetic compatibility (EMC) —
Part 3-2: Limits — Limits for harmonic
current emissions (equipment input
current ≤ 20 A per phase)**

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Institute of Electrical Engineers of Japan (IEEEJ)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS C 61000-3-2:2011** is replaced with this Standard.

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JIS C 61000 series consists of the following 15 parts under the general title *Electromagnetic compatibility (EMC)*

JIS C 61000-3-2 *Part 3-2 : Limits — Limits for harmonic current emissions (equipment input current ≤ 20 A per phase)*

JIS C 61000-4-2 *Part 4-2 : Testing and measurement techniques — Electrostatic discharge immunity test*

JIS C 61000-4-3 *Part 4-3 : Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test*

JIS C 61000-4-4 *Part 4-4 : Testing and measurement techniques — Electrical fast transient/burst immunity test*

JIS C 61000-4-5 *Part 4-5 : Testing and measurement techniques — Surge immunity test*

JIS C 61000-4-6 *Part 4-6 : Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields*

JIS C 61000-4-7 *Part 4-7 : Testing and measurement techniques — General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

JIS C 61000-4-8 *Part 4-8 : Testing and measurement techniques — Power frequency magnetic field immunity test*

JIS C 61000-4-11 *Part 4-11 : Testing and measuring techniques — Voltage dips, short interruptions and voltage variations immunity tests*

JIS C 61000-4-16 *Part 4-16 : Testing and measurement techniques — Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz*

JIS C 61000-4-20 *Part 4-20 : Testing and measurement techniques — Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

JIS C 61000-4-22 *Part 4-22 : Testing and measurement techniques — Radiated emissions and immunity measurements in fully anechoic rooms (FARs)*

JIS C 61000-4-34 *Part 4-34 : Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase*

JIS C 61000-6-1 *Part 6-1 : Generic standards — Immunity standard for residential, commercial and light industrial environments*

JIS C 61000-6-2 *Part 6-2 : Generic standards — Immunity standard for industrial environments*

Electromagnetic compatibility (EMC) — Part 3-2 : Limits — Limits for harmonic current emissions (equipment input current ≤ 20 A per phase)

Introduction

This Japanese Industrial Standard has been prepared based on **IEC 61000-3-2 : 2018**, Edition 5, with some modifications of the technical contents, taking into consideration of e.g. the difference of electric power systems.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard specifies the limitation of harmonic currents injected into the public electricity supply system.

It specifies limits of harmonic components of the input current which can be produced by equipment tested under specified conditions.

This Standard is applicable to electrical and electronic equipment (household electrical appliances and general-purpose products) (hereafter referred to as equipment) having a rated input current up to and including 20 A per phase, and intended to be connected to public electricity supply systems having a voltage not more than 300 V. However, being outside the ranges given above does not preclude the application of this Standard.

Arc welding equipment which is not professional equipment, with a rated input current up to and including 20 A per phase, is included in the scope of this Standard. Arc welding equipment intended for professional use, as specified in **JIS C 9300-1**, is excluded from the scope of this Standard.

The tests according to this Standard are type tests.

NOTE The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

IEC 61000-3-2 : 2018 *Electromagnetic compatibility (EMC) — Part 3-2 : Limits — Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and the revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent edition (including amendments) shall be applied.

JIS C 7603 *Glow-starters for fluorescent lamps*

NOTE 1 Corresponding International Standard : IEC 60155 *Glow-starters for fluorescent lamps*

NOTE 2 IEC 60155 has been divided into two parts to establish JIS C 7619 and JIS C 7622, which are combined into the product standard JIS C 7603.

JIS C 9335-2-24 : 2017 *Household and similar electrical appliances — Safety — Part 2-24 : Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers*

NOTE Corresponding International Standard : IEC 60335-2-24 : 2010 *Household and similar electrical appliances — Safety — Part 2-24 : Particular requirements for refrigerating appliances, ice-cream appliances and ice makers*

JIS C 60050-161 *International Electrotechnical Vocabulary : Electromagnetic compatibility*

NOTE Corresponding International Standard : IEC 60050-161 *International Electrotechnical Vocabulary. Chapter 161 : Electromagnetic compatibility*

IEC 60268-3 *Sound system equipment — Part 3 : Amplifiers*

IEC 61000-4-7 : 2002 *Electromagnetic compatibility (EMC) — Part 4-7 : Testing and measurement techniques — General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61000-4-7 : 2002/Amendment 1 : 2008

NOTE **JIS C 61000-4-7 : 2007** corresponds to **IEC 61000-4-7 : 2002**; however, it does not include **IEC 61000-4-7 : 2002/Amendment 1 : 2008**.

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS C 60050-161**, and the following apply.

3.1

portable tool

electrical tool which is hand-held during normal operation and used for a short time (a few minutes) only

NOTE Hand-held means that no part of the tool, except the power cord, rests on

the floor during normal operation.

3.2

lamp

source intended to produce an optical radiation, usually visible

NOTE For the purposes of this Standard, a lamp can also be a solid state lighting module which can contain further components, for example optical, electrical, mechanical and/or electronic components.

3.3

self-ballasted lamp

unit which cannot be dismantled without being permanently damaged, is provided with a lamp cap and incorporates a light source and the lighting control gear necessary for the operation of the light source

3.4

luminaire

apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for supporting, fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply

3.5

input current

current directly supplied to an equipment or a part of equipment by the public electricity supply system

3.6

circuit power factor

ratio of the measured active input power to the product of the RMS supply voltage and the RMS supply current

3.7

active power

mean value of the instantaneous power, taken over 10 (50 Hz systems) or 12 (60 Hz systems) fundamental periods and measured in accordance with **IEC 61000-4-7**

NOTE The active input power is the active power measured at the input supply terminals of the equipment under test.

3.8

balanced three-phase equipment

equipment having rated line current modules which differ by no more than 20 %

3.9

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professional equipment

equipment for use in trades, professions or industries and which is not intended for sale to the general public, as designated by the manufacturer

3.10**total harmonic current, *THC***

total RMS value of the harmonic current components of orders 2 to 40

$$THC = \sqrt{\sum_{n=2}^{40} I_n^2}$$

3.11**total harmonic distortion, *THD***

ratio of the RMS value of the sum of the harmonic components (in this context, harmonic current components of orders 2 to 40) to the RMS value of the fundamental component

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

3.12**partial odd harmonic current, *POHC***

total RMS value of the odd harmonic current components of orders 21 to 39

$$POHC = \sqrt{\sum_{n=21,23}^{39} I_n^2}$$

3.13**lighting equipment**

equipment with a primary function of generating and/or regulating and/or distributing optical radiation

NOTE See also 5.2.

3.14**stand-by mode**

non-operational, low power consumption mode (usually indicated in some way on the equipment) that can persist for an indefinite time

3.15**repeatability**

<results of measurements> closeness of the agreement between the results of measurements of harmonic currents on the same equipment under test, carried out with the same test system, at the same location, under identical test conditions

3.16

reproducibility

<results of measurements> closeness of the agreement between the results of measurements of harmonic currents on the same equipment under test, carried out with different test systems under conditions of measurement intended to be the same in each case

NOTE The test system and test conditions are assumed to fulfil all normative requirements in the applicable standards.

3.17

variability

<results of measurements> closeness of the agreement between the results of measurements of harmonic currents on different samples of the same type of equipment under test, having no intentional differences, carried out with different test systems under conditions of measurement intended to be the same in each case

NOTE 1 The test system and test conditions are assumed to fulfil all normative requirements in the applicable standards.

NOTE 2 In the context of this Standard, the meaning of the terms can be summarized as follows :

Term	Meaning
Repeatability	Same equipment under test (EUT), same test system, same test conditions, repeated tests
Reproducibility	Same equipment under test (EUT), different but normative test systems, different but normative test conditions
Variability	Different equipments under test (EUTs) of the same type, having no intentional differences, different but normative test systems, different but normative test conditions

3.18

variable speed drive, VSD

equipment, based on power electronics, which enables the speed and/or torque of a motor to be continuously controlled

3.19

lighting control gear

device connected between the supply and one or more lamps, enabling the lamp(s) to operate as intended

NOTE 1 The lighting control gear can consist of one or more separate components. It can include means for dimming, correcting the power factor and suppressing radio interference, and further control functions.

NOTE 2 The lighting control gear can be partly or totally integrated in some lamps, such as in the case of self-ballasted lamps. Any references to lighting control gear include any such integrated lamps.

NOTE 3 Examples of lighting control gear are ballasts or electronic control gear for discharge lamps, step-down converters for incandescent lamps, and drivers for solid state lighting modules.

NOTE 4 For the purposes of this Standard, independent phase control dimmers as defined in **3.24A** are not considered to be lighting control gear.

NOTE 5 For the purposes of this Standard, mechanical switches and relays, and other simple devices providing on/off control only, do not produce distorted currents and are not considered to be lighting control gear.

3.20

digital load side transmission lighting control device, DLT control device

device to control lighting parameters of electronic lighting equipment, such as light level and light colour, using data transmission over its load side mains wiring in accordance with **IEC 62756-1**

NOTE A DLT control device is wired like a conventional phase control dimmer, but does not directly make the supply power delivered to the connected dedicated lighting equipment vary. It transmits digital signals over the power cable on the load side to the dedicated lighting equipment, which contains means for receiving and interpreting control signals as well as built-in means for dimming, colour variation, etc.

3.21

dimmer

device to control the light output level of lighting equipment

3.22

built-in dimmer

dimmer which is either contained within the enclosure of a lighting equipment or mounted in its supply cable

3.23

independent dimmer

dimmer other than a built-in dimmer

3.24

phase control dimmer

electronic switch producing a leading edge (forward phase) or a trailing edge (reverse phase) AC waveform

NOTE This AC waveform is supplied to one or more loads and its conduction angle is adjustable.

3.24A

independent phase control dimmer

phase control dimmer other than a built-in dimmer

NOTE Add-on booster used in combination with independent phase control dimmer has the same function as that of the dimmer and therefore is included in this definition.

3.25

universal phase control dimmer

phase control dimmer which is capable of switching, automatically or manually, between producing a leading edge or a trailing edge AC waveform

3.26

professional luminaire for stage lighting and studios

luminaire (outdoor or indoor) for stage lighting or for television, film or photographic studios within the scope of IEC 60598-2-17 and which is professional equipment

3.26A

public electricity supply system

electric power system owned by an electric utility including an electrically connected wiring used to deliver electric energy to consumers and a plug socket

4 General

The objective of this Standard is to set limits for harmonic emissions of equipment within its scope, so that, with due allowance for the emissions from other equipment, compliance with the limits ensures that harmonic disturbance levels do not exceed the harmonic environmental target level.

NOTE For the public electricity supply system, an appropriate target level of a harmonic environment is considered to be a total voltage distortion factor of 5 % for the 6.6 kV distribution system and of 3 % for the extra high tension system [according to a report issued by the electric power infrastructure reinforcement council, a private advisory panel to the Commissioner of the Agency for Natural Resources and Energy of the Ministry of International Trade and Industry (the present Ministry of Economy, Trade and Industry), issued in June 1987].

5 Classification of equipment

5.1 General

For the purpose of harmonic current limitation, equipment is classified as follows:

Class A :

Equipment not specified as belonging to Class B, C or D shall be considered as Class A equipment.

Some examples of Class A equipment are :

- balanced three-phase equipment;
- household appliances, excluding those specified as belonging to Class B, C or D;

- vacuum cleaners;
- high pressure cleaners;
- tools, excluding portable tools;
- independent phase control dimmer;
- audio equipment;
- professional luminaires for stage lighting and studios.

NOTE 1 Equipment that can be shown to have a significant effect on the public electricity supply system might be reclassified in a future edition of this Standard, taking into account the following factors :

- number of pieces of equipment in use;
- duration of use;
- simultaneity of use;
- power consumption;
- harmonic spectrum, including phase.

Class B :

- portable tools;
- arc welding equipment which is not professional equipment.

Class C :

- lighting equipment.

Class D : Equipment having a specified active input power according to **6.3.2**, less than or equal to 600 W, of the following types :

- personal computers and personal computer monitors;
- television receivers;
- refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

NOTE 2 Class D limits are reserved for equipment that, by virtue of the factors listed in NOTE 1, can be shown to have a pronounced effect on the public electricity supply system.

5.2 Description of lighting equipment

In this Standard, lighting equipment as defined in **3.13** includes :

- lamps and luminaires;
- the lighting part of multi-function equipment where one of the primary functions of this is illumination;
- independent lighting control gear;
- ultraviolet (UV) and infrared (IR) radiation equipment;

- illuminated advertising signs;
- independent dimmers, other than phase control types, for lighting equipment;
- DLT control devices.

In this Standard, lighting equipment as defined in **3.13** excludes :

- lighting devices built in equipment with another primary purpose, such as photocopiers, overhead projectors and slide projectors, or employed for scale illumination or indication purposes;
- household appliances whose primary function is not for generating and/or regulating and/or distributing optical radiation but which contain one or more lamps with or without a separate switch (e.g. a range hood with a built-in lamp);
- independent phase control dimmers;
- professional luminaires for stage lighting and studios;
- emergency luminaires that emit light only during emergency mode.

6 General requirements

6.1 General

The restrictions specified in **6.2** also apply to the categories of equipment listed in **7.1** for which no harmonic current limits apply.

The requirements and limits specified in this clause are applicable to the power input terminals of equipment intended to be connected to public electricity supply systems operating at 50 Hz or 60 Hz.

A simplified test method is permitted for equipment that undergoes minor changes or updates, provided that, in previous full compliance tests, it has been shown to have current emissions below 60 % of the applicable limits and the *THD* of the supply current is less than 15 %. The simplified test method consists of verifying that the equipment, which has gone through minor changes or updates, has an active input power within ± 20 % of that of the originally tested product, and that the *THD* of the supply current is less than 15 %. Products that fulfil these requirements are deemed to comply with the applicable limits, but in case of doubt, the result of a full compliance test according to **6.2** to **6.4** and Clause **7** takes precedence over the result of this simplified method.

6.2 Control methods

Asymmetrical controls according to **JIS C 60050-161**, **161-07-12**, and half-wave rectification may only be used in the following circumstances :

- a) where they are the only practical solution permitting the detection of unsafe conditions, or
- b) where the controlled active input power is less than or equal to 100 W, or

- c) where the controlled appliance is a piece of portable equipment fitted with a two-core flexible cord and is intended for use for a short period of time, i.e. for a few minutes only.

If one of three conditions in **a)** to **c)** is fulfilled, half-wave rectification may be used for any purpose, whereas asymmetrical controls may only be used for the control of motors.

NOTE 1 Such equipment includes, but is not limited to, hair dryers, electrical kitchen appliances and portable tools.

Symmetrical control methods which can produce harmonics up to the 40th order in the input current may be used for the control of the power supplied to heating elements provided that the input power is less than or equal to 200 W, or that the limits of Table 3 are not exceeded.

Such symmetrical control methods are also allowed for professional equipment provided that either

- a) one of the conditions of **a)**, **b)** or **c)** given above is fulfilled, or
- b) the relevant emission limits according to Clause 7 are not exceeded when tested at the supply input terminals and in addition both the following conditions are fulfilled:
- 1) it is necessary to control precisely the temperature of a heater whose thermal time constant is less than 2 s, and
 - 2) there is no other technique economically available than symmetrical control methods.

Professional equipment whose primary purpose, considered as a whole, is not for heating, shall be tested against the relevant emission limits according to Clause 7.

NOTE 2 An example of a product whose primary purpose is not heating is a photocopier, whereas a cooker is considered to have heating as its primary purpose.

Household appliances with symmetrical control used for a short time (for example hair dryers) shall be tested under Class A.

Even though asymmetrical controls and half-wave rectification are permitted under the conditions of **a)**, **b)** or **c)** given above, the equipment shall still comply with the requirements for harmonic current specified in this Standard.

NOTE 3 When using asymmetrical controls or half-wave rectification under the conditions of **a)**, **b)** or **c)** given above, the input current has a DC component that can disturb certain types of protection devices in case of an earth fault. See **IEC/TR 60755**.

6.3 Harmonic current measurement

6.3.1 Test configuration

Harmonic components shall be measured in accordance with the requirements given in Annex A for the test circuit and the supply source.

Specific test conditions for the measurement of harmonic currents associated with some types of equipment are given in Annex B.

For equipment not mentioned in Annex B, emission tests shall be conducted with the user's operation controls or automatic programs set to the mode expected to produce the maximum *THC* under normal operating conditions. This defines the equipment set-up during emission tests and not a requirement to measure *THC* or to conduct searches for worst-case emissions.

The harmonic current limits specified in Clause 7 apply to line currents and not to currents in the neutral conductor.

The equipment shall be tested as presented by, and in accordance with information provided by, the manufacturer. Preliminary operation of motor drives can be performed by the manufacturer before the tests to ensure that results correspond with normal use.

6.3.2 Measurement procedure

The test shall be conducted according to the general requirements given in 6.3.3. The test duration shall be as defined in 6.3.4.

The measurement of harmonic currents shall be performed as follows :

- for each harmonic order, measure the RMS harmonic current smoothed using a digital equivalent of a first-order low-pass filter with a time constant of 1.5 s in each discrete Fourier transform (DFT) time window as defined in IEC 61000-4-7;
- calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period as defined in 6.3.4.

The value of the input power to be used for the calculation of limits shall be determined as follows :

- measure the active input power smoothed using a digital equivalent of a first-order low-pass filter with a time constant of 1.5 s in each DFT time window;
- determine the maximum of the measured values of power from the DFT time windows over the entire duration of the test.

NOTE The active input power supplied to the smoothing section of the measuring instrument as defined in IEC 61000-4-7 is the active input power in each DFT time window.

The harmonic currents and the active input power shall be measured under the same test conditions but need not be measured simultaneously.

The manufacturer may specify any value of power which is within $\pm 10\%$ of the actual measured value and use it for determining the limits for the original manufacturer's conformity assessment test. The measured and specified values of power, as defined in 6.3.2, shall be documented in the test report.