

INTERNATIONAL STANDARD

NORME INTERNATIONALE

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

AMENDMENT 1
AMENDEMENT 1

**Electromagnetic compatibility – Requirements for household appliances,
electric tools and similar apparatus –
Part 1: Emission**

**Compatibilité électromagnétique – Exigences pour les appareils
électrodomestiques, outillages électriques et appareils analogues –
Partie 1: Emission**



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FOREWORD

This amendment has been prepared by CISPR subcommittee F: Interference relating to household appliances tools, lighting equipment and similar apparatus.

The text of this amendment is based on the following documents:

FDIS	Report on voting
CISPR/F/491/FDIS	CISPR/F/502/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

CONTENTS

Replace the existing title of subclause 8.4 by the following:

8.4 Non-compliance

Add the titles of Clauses 9 and 10 as follows:

9 Methods of measurement of radiated emission (30 MHz to 1 000 MHz)

10 Measurement uncertainty

Add the following new Tables 4, 5, and 6 :

Table 4 – General margin to the limit for statistical evaluation

Table 5 – Factor k for the application of the non-central t -distribution

Table 6 – Application of the binomial distribution

Foreword

Delete the following sentence: “This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.”

1 Scope

1.1 *Add, to the second paragraph, the following sentence:*

Both mains powered appliances and battery powered appliances are included.

Insert, at the end of NOTE 1, the following new item:

- arc welding equipment: CISPR 11.

2 Normative references

Add the following new references:

IEC 61000-4-20:2003, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

CISPR 16-1-4:2007, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances*
Amendment 1 (2007)

CISPR 16-2-3:2006, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-4-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements*

3 Definitions

3.13

battery box

Replace the existing definition with the following:

compartment which is separate from the toy or appliance and in which the batteries are placed

Add the following new definitions after definition 3.23

3.24

clock frequency

the fundamental frequency of any signal used in the device excluding those which are solely used inside integrated circuits (IC).

NOTE High frequencies are often generated inside of integrated circuits (IC) by phase-locked-loop (PLL) circuits from lower clock oscillator frequencies outside the IC.

3.25

battery-operated appliance

appliance which is operated only from batteries and has no provision for performing its intended function when connected to the mains, either directly or via a power supply.

NOTE 1 Toys are not considered to be appliances.

NOTE 2 An appliance which has provision for charging but cannot perform its intended function during charging is considered to be a battery-operated appliance.

3.26

mains-operated appliance

all appliances which are not battery-operated appliances

NOTE Toys are not considered to be appliances.

4 Limits of disturbance

Replace the text immediately preceding subclause 4.1 with the following new text:

Radio disturbance measurements below 148,5 kHz and above 1 000 MHz do not need to be carried out.

4.1 Continuous disturbance

Replace subclauses 4.1.2 and 4.1.3 by the following:

4.1.2 Frequency range 30 MHz to 1 000 MHz

4.1.2.1 Disturbance power measurement in the frequency range 30 MHz to 300 MHz

The limits of the disturbance power are given in Table 2a. Disturbance power is measured in accordance with Clause 6, at all terminals.

Table 2a – Disturbance power limits for the frequency range 30 MHz to 300 MHz

1	Household and similar appliances		Tools					
	2	3	4	5	6	7	8	9
Frequency range			Rated motor power not exceeding 700 W		Rated motor power above 700 W and not exceeding 1 000 W		Rated motor power above 1 000 W	
(MHz)	dB (pW) Quasi-peak	dB (pW) Average ^a	dB (pW) Quasi-peak	dB (pW) Average ^a	dB (pW) Quasi-peak	dB (pW) Average ^a	dB (pW) Quasi-peak	dB (pW) Average ^a
30 to 300	45 to 55	35 to 45	45 to 55	35 to 45	49 to 59	39 to 49	55 to 65	45 to 55
Increasing linearly with the frequency from:								
^a If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.								

Table 2b – Margin when performing disturbance power measurement in the frequency range 30 MHz to 300 MHz

1	Household and similar appliances		Tools					
	2	3	4	5	6	7	8	9
Frequency range			Rated motor power not exceeding 700 W		Rated motor power above 700 W and not exceeding 1 000 W		Rated motor power above 1 000 W	
(MHz)	dB (pW) Quasi-peak	dB (pW) Average	dB (pW) Quasi-peak	dB (pW) Average	dB (pW) Quasi-peak	dB (pW) Average	dB (pW) Quasi-peak	dB (pW) Average
Increasing linearly with the frequency from:								
200 to 300	0 to 10 dB	-	0 to 10 dB	-	0 to 10 dB	-	0 to 10 dB	-

NOTE 1 This table only applies if specified in 4.1.2.3.2.

NOTE 2 The measured result at a particular frequency shall be less than the relevant limit minus the corresponding margin (at that frequency).

4.1.2.2 Radiated disturbances measurement in the frequency range 30 MHz to 1 000 MHz

The limits of radiated disturbances are given in Table 3. Radiated disturbances are measured in accordance with the standards and testing methods given in Table 3.

Table 3 – Radiated disturbance limits and testing methods for the frequency range 30 MHz to 1 000 MHz

Testing method	Standard	Frequency range MHz	Limit dB μ V/m Quasi-peak	Remark
OATS ^a or SAC ^{b,d}	CISPR 16-2-3	30 – 230	30	Measurement distance 10 m
		230 – 300	37	
		300 – 1 000	37	
FAR ^e	CISPR 16-2-3	30 – 230	42 to 35 ^f	Measurement distance 3 m
		230 – 1 000	42	
TEM-Waveguide ^c	IEC 61000-4-20	30 – 230	30	-
		230 – 1 000	37	

NOTE The lower limit is applicable at the transition frequency.

^a OATS = open area test site

^b SAC = semi-anechoic chamber

^c The TEM-waveguide is limited to devices without cables attached and with a maximum size according to subclause 6.1 of IEC 61000-4-20 (The largest dimension of the enclosure at 1 GHz measuring frequency is one wavelength, 300 mm at 1 GHz)

^d Measurements may be made at closer distance, down to 3 m. An inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

^e FAR = fully anechoic room. All equipment, including floor-standing equipment, shall be measured within the test volume as described in Figure 6 of CISPR 16-2-3.

^f Decreasing linearly with the logarithm of the frequency.

In any situation where it is necessary to verify the original measurement, the measuring method and measuring distance originally chosen shall be used in order to ensure consistency of the results.

4.1.2.3 Application of the limits

4.1.2.3.1 General

This subclause describes application of the limits for all appliances (see Figure 10).

Regulating controls which incorporate semiconductor devices, electric fence energizers, rectifiers, battery chargers and converters, which do not contain any clock frequency higher than 9 kHz, are not subject to the requirements in the frequency range 30 MHz to 1 000 MHz.

4.1.2.3.2 Mains operated appliances

The equipment under test shall be evaluated for emissions in the 30 MHz to 1 000 MHz range by testing in accordance with either method a) or b), see also Figure 10.

- a) The limits in columns 2 and 3 of Table 2a for the frequency range from 30 MHz to 300 MHz shall be met by all appliances except for electric tools. For electric tools the particular limits given in columns 4 to 9 of Table 2a apply according to the rated power of the motor, excluding the power of any heating device (for instance heating power in a blower for plastic welding).

Appliances are deemed to comply in the frequency range from 300 MHz to 1 000 MHz if both of the following conditions (1) and 2)) are fulfilled:

- 1) all emission readings from the equipment under test shall be lower than the applicable limits (Table 2a) reduced by the margin (Table 2b);
- 2) the maximum clock frequency shall be less than 30 MHz.

If either of condition 1) or 2) is not fulfilled, radiated measurements in the frequency range from 300 MHz to 1 000 MHz shall be conducted and the limits of Table 3 for that range applied. In any case the limits of Table 2a in the frequency range 30 MHz to 300 MHz shall be met.

- b) The limits in Table 3 shall be met. Any of the measurement methods mentioned in Table 3 can be selected by the manufacturer except that the TEM-waveguide shall be used only for battery powered appliances not intended to have external cables attached (see also Note c in Table 3).

The test report shall state which method was used and which limits were applied.

4.1.2.3.3 Battery operated appliances

For all battery operated appliances the limits in Table 3 apply for the frequency range from 30 MHz to 1 000 MHz (See also Figure 11). Any of the measurement methods mentioned in Table 3 can be selected by the manufacturer except that the TEM-waveguide shall be used only for battery powered appliances not intended to have external cables attached.

The test report shall state which method was used and which limits were applied. Battery operated appliances which do not contain active electronic circuits or motors shall not be measured. These appliances are considered to comply without testing.

NOTE Examples of active electronic circuits include circuits containing transistors, thyristors and relays. A LED connected to a battery via a manual switch is not an active electronic circuit if the current is limited only by a resistor or a transistor operating linearly, but it is an active switching circuit if the current is pulsed using a transistor.

4.2.1 Replace the existing text by the following:

The limits for discontinuous disturbance depend mainly on the character of the disturbance and on the click rate N as given in detail in 4.2.2 and 4.2.3.

No discontinuous disturbance limits apply in the frequency range 30 MHz to 1 000 MHz.

NOTE The level of disturbances below 30 MHz is interpreted as an indication for the level above 30 MHz.

6.2.1

Replace the text of this subclause as follows:

6.2.1 The distance between the clamp test set-up (the appliance, the lead to be measured and the absorbing clamp) and any other conductive objects (including persons, walls and ceiling, but excluding the floor) shall be at least 0,8 m. The appliance to be tested shall be placed on a non-metallic support table parallel to the floor. The height of the table shall be 0,1 m \pm 0,025 m for appliances primarily intended to be positioned on the floor in normal use, and 0,8 m \pm 0,05 m for other appliances.

The lead to be measured is placed in a straight line for a distance sufficient to accommodate the absorbing clamp, and to permit the necessary measuring adjustment of position for tuning. The clamp is placed around the lead.

7.1.5 *Replace the existing second paragraph by the following:*

Apparatus which incorporate electronic regulating controls shall have the controls adjusted for maximum disturbance in accordance with the procedure outlined in 7.2.6.1, in both frequency ranges 148,5 kHz to 30 MHz and 30 MHz to 1 000 MHz.

7.2.2 Battery operated equipment

Replace the existing title and text of this subclause with the following:

7.2.2 Battery operated appliances

The appliance shall be tested operating in each permitted mode and in accordance with the operating conditions given in 7.3.

7.2.6 Regulating controls incorporating semiconductor devices

Delete the existing note preceding subclause 7.2.6.1.

7.3.1.3

Add to this subclause the following title:

7.3.1.3 Coffee grinders and coffee makers

Add the following new subclauses:

7.3.1.3.1 Coffee grinders

Coffee grinders with a timer shall be operated without load for the maximum duration allowed by the timer.

Coffee grinders without a timer shall be operated without load for the duration taken to grind the maximum quantity of roasted coffee beans stated in the instructions.

If it is not possible to operate the grinder without load, the grinder shall be operated using the maximum quantity of roasted coffee beans stated in the instructions.

7.3.1.3.2 Coffee makers and espresso makers with integrated grinder

Coffee makers and espresso makers with integrated grinder shall be tested according to 7.2.1. The grinder function shall be tested according to 7.3.1.3.1.

If the operation time of the coffee grinder can be set by the user, it should be set to maximum duration.

7.3.1.3.3 Fully automatic coffee makers

Fully automatic coffee makers shall be tested according to 7.2.1. The different functions shall be tested sequentially so that all possible disturbance sources are covered.

The test conditions shall reflect the normal operation of the appliance, as stated in the instructions for use. Where these are not specified, the following separate modes of operation shall be tested:

- keep warm mode for fully automated coffee makers;
- pre-heating for espresso coffee makers;
- 1 cup of coffee (approximately 125 ml) per minute;
- 200 ml hot water, followed by 30 s pause;
- 20 s steam consumption per minute.

7.3.1.12

Replace the third paragraph of this subclause by the following:

Separate tumble dryers are operated with half the maximum dry weight of cotton textile material recommended in the manufacturer's instruction for use. The material shall be soaked with water having a temperature of $25\text{ °C} \pm 5\text{ °C}$ and a mass of 60 % of that of the textile material.

7.3.2.10

Delete the existing subclause.

After Subclause 7.3.4.14, add the following new subclause:

7.3.4.15 Rice cookers shall be tested with the rated capacity of tap water and with the lid closed. If there is no indication of the rated capacity, the cooker shall be filled with 80 % water of the maximum capacity of the inner pot.

If the cooker automatically enters a “keep warm”-mode at the end of the cooking process, the cooking mode should be ended manually and the click measurement shall be started at the time of the first operation of the thermostat, which controls the “keep warm” temperature.

7.3.6.1 Classification

Replace, in the dashed item under Category B, the reference to “4.1.3” by “4.1.2.2”.

Replace the second paragraph under Category C, including its dashed items, by the following sentence:

Toys of category C shall comply with the limits from 30 MHz to 1 000 MHz.

Replace, in the second dashed item under Category D, the reference to “4.1.2 (disturbance power)” by the following:

- 4.1.2.1 (disturbance power) and 4.1.2.2 (radiated disturbances)

Replace, in the second dashed item under Category E, the reference to “4.1.3” by “4.1.2.2”.

7.3.7 Miscellaneous equipment and appliances

Replace the existing note by the following:

NOTE Limits in the frequency range 30 MHz to 1 000 MHz are not applicable to the devices quoted in 7.3.7.1 to 7.3.7.3, causing only discontinuous disturbance (see 4.2.1).

Add the following new subclause 7.4.1.6:

7.4.1.6 The radiated emission limits apply throughout the frequency range from 30 MHz to 1 000 MHz.

Renumber existing subclause 7.4.1.6 to 7.4.1.7.

Renumber existing subclause 7.4.1.7 to 7.4.1.8.

8.3 Compliance with limits for appliances in large-scale production

Replace the existing text of this subclause by the following:

Statistically assessed compliance with the limits shall be made according to one of the three tests described below or to some other test which ensures compliance with the requirements of 8.1.2 above.

The test according to 8.3.1 or 8.3.2 should be performed on a sample of not less than 5 items of the type, but if, in exceptional circumstances, 5 items are not available, then a sample of 3 or 4 shall be used.

The test according to 8.3.3 should be performed on a sample of not less than 7 items.

NOTE It is recommended to start the evaluation with the method described in 8.3.1 and only in case the test has not been passed to continue with the more extensive methods described in 8.3.2 and 8.3.3.

8.3.1 Test based on a general margin to the limit

Compliance is given when the measured values from all items of the sample are under the limit and the margin to the limit is not shorter than the general margin, given in Table 4 below.

Table 4 – General margin to the limit for statistical evaluation

Sample size (<i>n</i>)	3	4	5	6
General margin to the limit (dB)	3,8	2,5	1,5	0,7

This method shall not be used to consider a product as non-compliant.

NOTE The newly introduced method in this subclause is based on CISPR 16-4-3.

Compliance is given, when

$$x_{\max} + k_E \sigma_{\max} < L$$

where

- x_{\max} is the highest (worse) value of all items in the sample;
- k_E is the coefficient from the Table below, depending on the sample size;
- σ_{\max} is a conservative value for the standard deviation in a product group;
- L is the limit.

Sample size (<i>n</i>)	3	4	5	6
Coefficient k_E	0,63	0,41	0,24	0,12

CISPR 16-4-3 recommends a value $\sigma_{\max} = 6,0$ dB for both the terminal voltage and the disturbance power. For radiated disturbances, measured on appliances in the scope of this standard, the same value for σ_{\max} has been assumed. The values for the general margin to the limit in the Table 4 above are a simple multiplication of this 6,0 dB with the coefficient k_E . In Table 4 values are given only for a sample size up to $n = 6$ because for $n = 7$ or higher the method given in 8.3.3 can be applied, where the binomial distribution without an additional margin is used.

8.3.2 Test based on the non-central *t*-distribution

Compliance is judged from the following relationship:

$$\bar{x} + kS_n \leq 0$$

where

- \bar{x} is the arithmetic mean of the values x_n of n items in the sample;
- k is the factor, derived from tables of the non-central *t*-distribution which ensures with 80 % confidence that 80 % or more of the type is below the limit;
- the value of k depends on the sample size n and is stated in Table 5 below.

Table 5 – Factor *k* for the application of the non-central *t*-distribution

<i>n</i>	3	4	5	6	7	8	9	10	11	12
<i>k</i>	2,04	1,69	1,52	1,42	1,35	1,3	1,27	1,24	1,21	1,2

where

S_n^2 is equals to $\sum (x_n - \bar{x})^2 / (n - 1)$;

S_n is the standard deviation of the sample;