

The toaster shall be tested applying the calculated click limit L_q and assessed using the upper quartile method given in 7.4.2.6. The toaster shall be operated for 20 cycles without load at the setting specified in Item a). Each cycle shall comprise an operating period and a rest period, the latter having sufficient duration to ensure that the appliance is cooled to approximately room temperature at the beginning of the next cycle. Forced air cooling may be used.

7.3.4.9.2 Other toasters shall be operated under conditions of adequate heat discharge using the normal load. Each cycle shall consist of an operating period and a rest period, the latter having a duration of 30 s. The click rate N shall be determined at a setting at which the bread becomes golden-brown.

7.3.4.10 Ironing machines (ironing machines for table use, rotating ironing machines, ironing presses): the click rate $N1$ of the control device shall be determined *without* adequate heat transfer, the heating surface being in the open position and the control devices at high temperature setting.

The click rate $N2$ of the motor switch shall be determined under conditions of adequate heat discharge of the heating elements when two damp hand-towels (approximately 1 m × 0,5 m) are ironed per minute.

For fixing the click limit L_q the sum of the two click rates $N = N1 + N2$ has to be applied and the ironing machine shall be tested applying this limit and assessed using the upper quartile method given in 7.4.2.6 on both the control device and the motor switch.

7.3.4.11 Irons shall be operated under conditions of adequate heat discharge, using air, water or oil cooling. The click rate N is defined as the product of the factor 0,66 and the number of switching operations per minute for a duty-cycle of (50 ± 10) % of the control device operated at a high temperature setting.

7.3.4.12 Vacuum packager shall be operated with empty bags once per minute or according to the manufacturer's instruction for use.

7.3.4.13 Flexible electrical heating appliances (warming pads, electric blankets, bedwarmers, heating mattresses) shall be spread between two flexible covers (e.g. non-conducting mats), extending beyond the heating surface by at least 0,1 m. The thickness and the heat conductivity shall be selected in such a way that the click rate N can be determined for a duty-cycle of (50 ± 10) % of the control device.

7.3.4.14 Room heaters (fan heaters, convectors, fluid-filled heaters as well as oil and gas burners and similar) shall be operated under adequate heat transfer.

The click rate N shall be determined for a duty-cycle of (50 ± 10) % of the control device or the maximum operating rate stated by the manufacturer.

The amplitude and duration of the disturbance shall be measured for the lowest position of the power range switch, if any.

For appliances having their thermostats and acceleration resistor connected to the mains, the same measurements shall be performed in addition with the switch in zero position.

When, in practice, the thermostat may be used together with inductive loads (e.g. relay, contactor) all measurements shall be performed using such a device, having the highest coil inductance used in practice.

In order to obtain a satisfactory measurement, it is essential that the contacts shall be operated for a sufficient number of times with a suitable load to ensure that the levels of disturbance are representative of those encountered in normal operation.

NOTE See also 7.2.4 for room heating equipment intended to be used stationary.

7.3.5 Automatic goods-dispensing machines, entertainment machines and similar appliances

As far as continuous disturbance occurs no special operating conditions are to be observed; the appliance is to be operated according to the manufacturer's instruction for use.

In case of automatic machines, where individual switching processes are (directly or indirectly) manually operated, and whereby no more than two clicks per sales, dispensing or similar processes are produced, 4.2.3.1 is applicable.

7.3.5.1 Automatic dispensing machines

Three dispensing operations are to be carried out, each subsequent operation being initiated once the machine has returned to a quiescent rest state. If the number of clicks produced by each of the dispensing operations is the same then the click rate N is numerically equal to one-sixth of the number of clicks produced in a single dispensing operation. If the number of clicks varies from operation to operation, a further seven dispensing operations are to be carried out and the click rate N shall be determined from at least 40 clicks on the assumption that the rest period between each dispensing operation was such that the 10 operations were uniformly distributed over a period of one hour. The rest period is to be included in the minimum observation time.

7.3.5.2 Juke boxes

An operating cycle is carried out by inserting the largest number of coins with the minimum value necessary to start the machine, followed by the selection and playing of the corresponding number of pieces of music. This operating cycle is to be repeated as often as necessary to produce a minimum of 40 clicks. The click rate N is determined as being half the number of clicks per minute.

NOTE Due to the normal frequency of use and combination of coins, the number of clicks is taken as half that during the test observed.

7.3.5.3 Automatic entertaining machines incorporating a winnings-payout mechanism

Electromechanical devices incorporated in the machine for storing and paying out winnings are to be disconnected where possible from the operating system to allow the entertainment function to be operated independently.

The entertainment cycle is initiated by inserting the largest number of coins with the minimum value necessary to start the machine. The entertainment cycle is to be repeated as often as necessary to produce a minimum of 40 clicks. The click rate $N1$ is determined as being half the number of clicks per minute.

NOTE Due to the normal frequency of use and combination of coins, the number of clicks is taken as half that during the test observed.

The average frequency and value of the winnings-payout is to be supplied by the manufacturer. The click rate, $N2$, of the devices for storing and paying-out winnings are assessed by simulation of a win of the average value supplied by the manufacturer rounded off to nearest payout value. The simulation of this win is to be repeated as often as necessary to produce a minimum of 40 clicks. The winnings-payout mechanism click rate, $N2$, is thus determined.

To allow for the frequency of paying-out, the number of entertainment cycles used to determine $N1$ is multiplied by the average frequency of paying-out. This number of paying-outs per entertainment cycle is multiplied by $N2$ to produce an effective winnings paying-out mechanism click rate, $N3$.

The click rate for the machine is the sum of the two click rates, i.e. $N1 + N3$.

7.3.5.4 Automatic entertainment machines with no winnings-payout mechanism

7.3.5.4.1 Pinball machines

The machine shall be operated by a reasonable player (one with at least 30 min experience of operating this or similar machines). The largest number of coins with the minimum value necessary to start the machine are used. The operating cycle is to be repeated as often as necessary to produce a minimum of 40 clicks.

7.3.5.4.2 Video machines and all other similar appliances

These machines and appliances shall be operated in accordance with the manufacturer's instruction for use. The operating cycle shall be the programme obtained after inserting the largest number of coins with the minimum value necessary to start the machine. In the case of machines with several programmes, the programme giving the maximum click rate shall be selected. Should the duration of the programme be less than 1 min, the following programme is not to be started within one minute off the start of the previous programme so as to reflect normal use. This rest period is to be included in the minimum observation time. The programme shall be repeated as often as necessary to produce a minimum of 40 clicks.

NOTE This subclause will be deleted when provisions for video machines and similar appliances are taken into account in CISPR 13.

7.3.6 Electric toys running on tracks

7.3.6.1 Electric toy systems

7.3.6.1.1 An electric toy system includes both the moving component, the control device and the track, sold as a package.

7.3.6.1.2 The system shall be assembled to the instructions given in the sales package. The layout of the track shall be such as to maximize the area. Other components shall be arranged as indicated in figure 7.

7.3.6.1.3 Each moving component shall be tested separately while running on the track, all components in the sales package shall be tested, and the system shall also be tested with all moving components being operated simultaneously.

7.3.6.1.4 If a number of electric toy systems are made up of identical moving components, control devices and track and differ only in the numbers of components then only the electric toy system, which in one sales package contains the greatest number of moving components, shall be tested. The track shall cover the greatest area. If this electric toy system meets the requirements of 7.3.6.3, the other electric toy systems shall be deemed to meet the requirements without further testing.

7.3.6.1.5 The testing shall be carried out as described in 7.3.6.3.

7.3.6.2 Individual components

7.3.6.2.1 Individual components of a toy system which have been approved as part of a system, even when sold separately, shall require no further testing.

7.3.6.2.2 Individual moving components, for example locomotives and cars

Individual moving components, not approved already as part of a system, shall be tested on an oval track measuring 2 m × 1 m. The necessary track, leads and control device are to be supplied by the manufacturer of the individual moving component. If such auxiliary equipment is not supplied, tests shall be carried out on such auxiliary equipment as is convenient for the testing organization to use.

The track, leads and control devices are to be arranged as shown in figure 7. The tests are to be carried out as described in 7.3.6.3. The test report shall contain a description of the auxiliary equipment used.

7.3.6.2.3 Controllers are under consideration.

7.3.6.3 Method of measurement

7.3.6.3.1 Terminal voltages 148,5 kHz to 30 MHz: earthed and non-earthed equipment

The electric toy system shall be arranged in accordance with 7.3.6.1 or 7.3.6.2, whichever applies. The electric toy system shall be tested at a height of 0,4 m above a metal earth plate or above the metal floor of a screened room. The metal plate will extend at least 0,4 m beyond the edge of the electric toy system.

The power supply lead from the transformer to the track shall be of 0,4 m length or, if longer, folded back and forth parallel to the lead to form a horizontal bundle with a length of between 0,3 m and 0,4 m. Measurements shall be made on the power side of the transformer/controller device using the artificial mains V-network (see 5.1.2). The limits set out in table 1 columns 2 and 3 shall apply.

Measurements shall also be made at the terminals for the low voltage supply and control-leads on the track side of the transformer/controller, using a voltage probe as described in 5.1.3 in series with the input of the measuring receiver. For the principal measuring arrangement see figure 5. The limits specified in table 1, columns 4 and 5 apply.

7.3.6.3.2 Disturbance power 30 MHz to 300 MHz

The electric toy system shall be arranged in accordance with 7.3.6.1 and 7.3.6.2 whichever applies, except that the maximized track area shall not exceed 2 m × 1 m (see figure 7). The disturbance power measurements shall be made only on the track side of the transformer/controller using the absorbing clamp, the low voltage supply lead being extended as far as is needed. Any suppression devices fitted at the interconnection of the low voltage supply and the track shall be removed in order to allow a valid assessment of the disturbance radiated from the track itself.

All self-propelled vehicles contained in the electric toy system shall be running simultaneously but all other vehicles shall not be on the track. The limits set out in table 2, columns 2 and 3 shall apply.

7.3.7 Miscellaneous equipment and appliances

NOTE Disturbance power limits in the frequency range 30 MHz to 300 MHz are not applicable to the devices quoted in 7.3.7.1 to 7.3.7.3, causing discontinuous disturbance solely (see 4.2.1).

7.3.7.1 Time switches not incorporated in equipment or appliances

The switch is adjusted to maximize the value of n_2 (the number of switching operations – see 7.4.2.3). The load current shall be 0,1 of the maximum rated value, and unless otherwise specified by the manufacturer, the load shall consist of incandescent lamps.

If the conditions in 4.2.3.3 "instantaneous switching" are satisfied, there is no limit on the amplitudes of the clicks produced.

For switches employing a manually operated "on" and automatic "off", the average "on" time (t_1 seconds) shall be determined from three successive operations while the switch is adjusted to maximize the value of n_2 . A rest period of 30 s shall be allowed. The time for a complete cycle is $(t_1 + 30)$ s, thus the click rate $N = 120/(t_1 + 30)$.

7.3.7.2 Electric fence supply units

When measuring the disturbance voltage at the fence terminals of the electric fence energizer, the fence wire shall be simulated by a series RC circuit comprising a 10 nF capacitor (surge voltage at least equal to the no-load output voltage of the electric fence energizer) and a 250 Ω resistor (the 50 Ω in parallel with 50 μ H incorporated in the artificial mains V-network provides the balance of the required 300 Ω load resistance) connected as shown in figure 6.

The limits for electric fence supply units apply to the mains terminals and to the output terminal of the supply unit. A correction factor of 16 dB shall be added to the measured values on the output terminals according to the voltage division resulting from the use of the fence equivalent circuit from the 250 Ω resistor in series with the 50 Ω impedance of the artificial mains V-network (see also item 5 of the legend of figure 6).

The leakage resistance of the fence wire is represented by a resistor of 500 Ω placed in parallel to the series circuit.

When measuring, the appliance shall be operated in the normal position with a maximum inclination of 15° from the vertical position.

The controls accessible without tools shall be set to the position of maximum disturbance.

Electric fences designed to be operated with a.c. or d.c. shall be tested with both kinds of supply.

The earth terminal of the fence circuit shall be connected to the earth terminal of the artificial mains V-network. If the terminals of the fence circuit are not clearly marked, they shall be earthed in turn.

NOTE In order to avoid damage to the r.f. input of the measuring receiver by the high energy pulses of the electric fence unit, it may be necessary to insert an attenuator before the r.f. input.

7.3.7.3 Electronic gas igniters

The disturbance caused by manually operated single spark on demand electronic gas igniters, which operate only when a switch included for the purpose of mains connection or disconnection operates, is to be disregarded according to 4.2.3.1 (for instance central heating boilers and gas fires are excluded, but not cooking equipment).

Other equipment incorporating electronic gas igniters shall be tested without gas being applied to the equipment as follows:

7.3.7.3.1 Single spark on demand igniters for cooking equipment

Determine whether disturbance is continuous or discontinuous as follows:

Produce 10 single sparks with not less than 2 s between sparks. If any click exceeds 200 ms, the continuous disturbance limits of tables 1 and 2 apply. When the conditions of the click duration in 4.2.3.3 "instantaneous switching" are fulfilled, it is assumed that the click rate is not more than five and there is no limit on the amplitude of the click produced.

Otherwise, the click limit L_q shall be collated as in 4.2.2.2 using an empirical click rate $N = 2$. This click rate is an assumed practical value, which gives a click limit L_q 24 dB above the continuous disturbance limit L .

The igniter shall be tested for 40 sparks with a minimum of 2 s between each spark, applying the calculated click limit L_q and assessed by the upper quartile method (see 7.4.2.6).

7.3.7.3.2 Repetitive igniters for cooking equipment

Determine whether the disturbance is continuous or discontinuous as follows:

Operate the igniter to produce 10 sparks.

If either,

- a) any disturbance exceeds 200 ms, or
- b) any disturbance is not separated from a subsequent disturbance or click by at least 200 ms, the continuous disturbance limit of tables 1 and 2 applies.

If

all clicks are less than 10 ms, it is assumed that the click rate N is not more than five and in accordance with 4.2.3.3, there is no limit on the amplitude of the clicks produced.

NOTE If one of the 10 clicks has a duration more than 10 ms but less than 20 ms for the application of the exception in 4.2.3.3, the duration of at least 40 clicks has to be evaluated.

If

the exception in 4.2.3.3 cannot be applied, the click limit L_q shall be calculated as in 4.2.2.2 using an empirical rate $N = 2$. This click rate is an assumed practical value which gives a click limit L_q of 24 dB above the continuous disturbance limit L .

The igniter shall be tested for 40 sparks applying the calculated click limit L_q and assessed by the upper quartile method (see 7.4.2.6).

7.3.7.4 Insect killers: A resistive load of 2 k Ω shall be placed across the discharge path

NOTE Normally only continuous disturbance can be observed.

7.3.7.5 Radiating equipment for personal care as appliances incorporating gas-discharge lamps, e.g. for therapeutic purposes, like ultra-violet and ozone lamps, see CISPR 15.

7.3.7.6 Electrostatic air cleaners shall be operated under normal working conditions, surrounded by a sufficient volume of air.

7.3.7.7 Battery chargers

NOTE Disturbance power limits in the frequency range 30 MHz to 300 MHz are not applicable to these devices (see 4.1.2.4).

Battery chargers not incorporated in another appliance or equipment shall be measured in a manner similar to 5.2.4 with the mains supply terminals connected to an artificial mains V-network.

The load terminals shall be connected to a variable resistive load designed to ensure that the maximum specified current and/or voltage of the device under test can be obtained. See also 4.1.1.2. In cases when the load terminals are not accessible while loading, no measurement at the load terminals need to be made.

When a fully charged battery is required for correct operation of the device, the battery shall be connected in parallel with the variable load.

Battery chargers which would not operate as intended when connected to a resistive load or a fully charged battery shall be tested after being connected to a battery which is partially charged.

The load shall be varied until the maximum and minimum values of the voltage or current to be controlled have been reached; the maximum level of disturbance at the input and at the load terminals shall be recorded.

NOTE The terminals to be connected to the battery are considered as additional terminals; the limits of table 1, columns 4 and 5 apply.

7.3.7.8 Rectifiers

NOTE Disturbance power limits in the frequency range 30 MHz to 300 MHz are not applicable to these devices (see 4.1.2.4).

Rectifiers not incorporated in another appliance or equipment shall be measured in a manner similar to 5.2.4 with the mains supply terminals connected to an artificial mains V-network and the load terminals to a variable resistive load designed to ensure that the maximum specified current and/or voltage of the device under test can be attained.

The load shall be varied until the maximum and minimum values of the voltage or current to be controlled have been reached; the maximum level of disturbance at the input and at the load terminals shall be recorded.

7.3.7.9 Convertors

NOTE Disturbance power limits in the frequency range 30 MHz to 300 MHz are not applicable to these devices (see 4.1.2.4).

Convertors not incorporated in appliances or equipment that can be connected to the mains supply shall be measured in a manner similar to 5.2.4 with the mains supply terminals connected to an artificial mains V-network and the load terminals to a variable load. Unless specified otherwise by the manufacturer, a resistive load shall be applied.

The load shall be varied until the maximum and minimum values of the voltage or current to be controlled have been reached; the maximum level of disturbance at the input and at the load terminals shall be recorded.

In the case of battery-operated convertors, the supply terminals have to be connected directly to the battery and the disturbance voltage at the battery side is measured as specified in 7.2.2 by means of the voltage probe as described in 5.1.3, limits given in 4.1.1.4, last paragraph.

7.3.7.10 Lifting devices (electric hoists)

To be operated in intermittent action without load.

The click rate N shall be determined with 18 working cycles per hour; each cycle shall comprise:

- a) on hoists having only operating speed: lift; pause; lower; pause;
- b) on hoists having two operating speeds with both the following cycles, alternating:
 - Cycle 1: fine lift (creep speed); lift (full speed); fine lift; pause; fine lower; lower (full speed); fine lower; pause;
 - Cycle 2: fine lift; pause; fine lower; pause.

NOTE For shortening the time to be used for testing the cycles may be accelerated, but the click rate is calculated on the basis of 18 cycles per hour; care should be taken not to damage the motor by exceeding duty cycle.

For any traction drive a similar test shall be made.

Lifting and traction shall be measured and evaluated separately.

7.4 Interpretation of results

7.4.1 Continuous disturbance

7.4.1.1 The reading on the measuring receiver is observed for about 15 s for each measurement; the highest readings shall be recorded with the exception of any isolated spike which shall be ignored.

7.4.1.2 If the general level of the disturbance is not steady, but shows a continuing rise or fall of more than 2 dB in the 15 s period, then the disturbance measurement shall be performed in accordance with the conditions of normal use of the appliances, as follows:

- a) If the appliance is one which may be switched on or off frequently, for instance an electric drill or a sewing-machine motor, then at each frequency of measurement the appliance shall be switched on just before each measurement, and switched off just after each measurement; the maximum level obtained during the first minute at each frequency of measurement shall be recorded;

- b) if the appliance is one which in use normally runs for longer periods, for instance a hair-dryer, then it shall remain switched on for the period of the complete measurement, and at each frequency the level of disturbance shall be recorded only after a steady reading (subject to the provision of 7.4.1.1) has been obtained.

7.4.1.3 The disturbance voltage limits apply throughout the frequency range 148,5 kHz to 30 MHz and therefore the disturbance characteristics shall be assessed throughout this frequency range.

An initial survey or scanning of the complete range shall be made. In the case of quasi-peak detector measurement, the registered values shall be given at least at the following frequencies and at all frequencies at which there is a maximum:

160 kHz, 240 kHz, 550 kHz, 1 MHz, 1,4 MHz, 2 MHz, 3,5 MHz, 6 MHz, 10 MHz, 22 MHz, 30 MHz.

These frequencies are to be subject to a tolerance of $\pm 10\%$.

7.4.1.4 The disturbance power limits apply throughout the frequency range 30 MHz to 300 MHz and therefore the disturbance characteristics shall be assessed throughout this frequency range.

An initial survey or scanning of the complete range shall be made. In the case of quasi-peak detector measurement, the registered values shall be given at least at the following frequencies and at all frequencies at which there is a maximum:

30 MHz, 45 MHz, 65 MHz, 90 MHz, 150 MHz, 180 MHz, 220 MHz, 300 MHz.

These frequencies are to be subject to a tolerance of ± 5 MHz.

7.4.1.5 If in the frequency range 30 MHz to 300 MHz measurements are made on a single appliance, the measurements are to be repeated on at least one frequency in the vicinity of each of the following frequencies:

45 MHz, 90 MHz, 220 MHz.

If the observed differences between the levels for the respective frequencies during the first and second measurement are 2 dB or less, the first results are retained. If these differences are greater than 2 dB, the measurements of the complete spectrum shall be repeated and the highest level of all measurements at each frequency shall be taken.

NOTE Further restriction to the relevant critical frequency is permitted for tests on running production.

7.4.1.6 In the case of average detector measurement on disturbances caused by electronic devices, such as microprocessors, isolated spectral lines may occur, constituted by the fundamental frequency and higher harmonics of the disturbance source.

The values registered with the average detector shall be given at least at all isolated spectral lines.

7.4.1.7 When an equipment contains only a commutator motor as source of disturbance, average detector measurement need not be carried out.

7.4.2 Discontinuous disturbance

7.4.2.1 The minimum observation time T is obtained at both measuring frequencies (see 7.4.2.2) in the following way:

For appliances which do not stop automatically, the shorter time of either:

- 1) the time to register 40 clicks, or, where relevant, 40 switching operations, or
- 2) 120 min.

For appliances which stop automatically, the duration of the minimum number of complete programmes necessary to produce 40 clicks or, where relevant, 40 switching operations. When, 120 min after the beginning of the test, 40 clicks have not been produced, the test is stopped at the end of the programme in progress.

The interval between the end of one programme and the start of the next programme shall be excluded from the minimum observation time, except for those appliances for which an immediate re-start is inhibited. For these appliances, the minimum time required to re-start the programme shall be included in the minimum observation time.

7.4.2.2 The click rate N shall be determined under the operating conditions specified in 7.2 and 7.3 or, when not specified, under the most onerous conditions of typical use (maximum click rate) at 150 kHz for the frequency range 148,5 kHz to 500 kHz and at 500 kHz for the frequency range 500 kHz to 30 MHz.

The receiver attenuator is to be set such that an input signal equal in amplitude to the relevant limit L for continuous disturbance produces a mid-scale deflection on the meter.

NOTE See clause 5 of CISPR 16-2 for more details.

7.4.2.3 The click rate N is obtained in the following way:

In general N is the number of clicks per minute determined from the formula $N = n_1/T$, n_1 is the number of clicks during the observation time T minutes.

For certain appliances (see annex A) the click rate N is determined from the formula $N = n_2 \times f/T$ where n_2 is the number of switching operations (see 3.3) during the observation time T and f is a factor given in annex A, table A.2.

7.4.2.4 The relevant click limit L_q for discontinuous disturbance is determined in accordance with the formula given in 4.2.2.2.

7.4.2.5 The measurement of disturbance generated by switching operations shall be performed with the same programme as has been chosen when determining the click rate N at the following restricted number of frequencies:

150 kHz, 500 kHz, 1,4 MHz and 30 MHz.

7.4.2.6 The appliance is assessed for compliance with the higher limit L_q in accordance with the upper quartile method, the appliance being tested for a time not less than the minimum observation time T .

If the click rate N is determined from the number of clicks, the appliance under test shall be deemed to comply with the limit if not more than a quarter of the number of clicks registered during the observation time T exceeds the click limit L_q .

If the click rate N is determined from the number of switching operations, the appliance under test shall be deemed to comply with the limit if not more than a quarter of the number of switching operations registered during the observation time T produce clicks exceeding the click limit L_q .

NOTE 1 An example of the use of the upper quartile method is given in annex B.

NOTE 2 See annex C for guidance on the measurement of discontinuous disturbance.

8 Interpretation of CISPR radio disturbance limit

8.1 Significance of a CISPR limit

8.1.1 A CISPR limit is a limit which is recommended to national authorities for incorporation in national standards, relevant legal regulations and official specifications. It is also recommended that international organizations use these limits.

8.1.2 The significance of the limits for type approved appliances shall be that on a statistical basis at least 80 % of the mass-produced appliances comply with the limits with at least 80 % confidence.

In the case of discontinuous disturbance when the shortened procedure described in 8.2.2.3 is applied, compliance with the limits on the 80 % – 80 % basis is not guaranteed.

8.2 Type tests

Type tests shall be made:

8.2.1 For appliances producing continuous disturbance:

8.2.1.1 Either on a sample of appliances of the type using the statistical method of evaluation in accordance with 8.3.

8.2.1.2 Or, for simplicity's sake, on one appliance only (see 8.2.1.3).

8.2.1.3 Subsequent tests are necessary from time to time on appliances taken at random from the production, especially in the case indicated in 8.2.1.2.

8.2.2 For appliances producing discontinuous disturbance:

8.2.2.1 On one item only.

8.2.2.2 Subsequent tests are necessary from time to time on an appliance taken at random from the production.

8.2.2.3 In the case of controversy with regard to a type approval test, the following shortened procedure is applied:

If the first appliance is measured and fails, three additional appliances shall be measured at the same frequency or frequencies at which the first appliance failed.

The three additional appliances are judged according to the same requirements as applied to the first appliance.

If all three additional appliances comply with the relevant requirements, the type is approved.

If one or more additional appliances do not comply, the type is rejected.

8.3 Compliance with limits for appliances in large-scale production

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

8.3.1 Test based on the non-central t-distribution

This test should be performed on a sample of not less than five items of the type, but if, in exceptional circumstances, five items are not available, then a sample of four or three shall be used. Compliance is judged from the following relationship:

$$\bar{x} + ks_n \leq L$$

where

\bar{x} is the arithmetic mean of the measured value of n items in the sample

s_n is the standard deviation of the sample

$$s_n^2 = \sum(x_n - \bar{x})^2 / (n - 1)$$

where

x_n is the value of the individual item

L is the appropriate limit

k is the factor derived from tables of the non-central t -distribution which ensures with 80 % confidence that 80 % of the type is below the limit; the value of k depends on the sample size n and is stated below.

The quantities x_n , \bar{x} , s_n^2 and L are expressed logarithmically (dB(μ V), dB(μ V/m) or dB(pW)).

| | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|
| n | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| k | 2,04 | 1,69 | 1,52 | 1,42 | 1,35 | 1,30 | 1,27 | 1,24 | 1,21 | 1,20 |

8.3.2 Test based on the binomial distribution

This test should be performed on a sample of not less than seven items.

Compliance is judged from the condition that the number of appliances with an interference level above the appropriate limit may not exceed c in a sample of size n .

| | | | | | |
|-----|---|----|----|----|----|
| n | 7 | 14 | 20 | 26 | 32 |
| c | 0 | 1 | 2 | 3 | 4 |

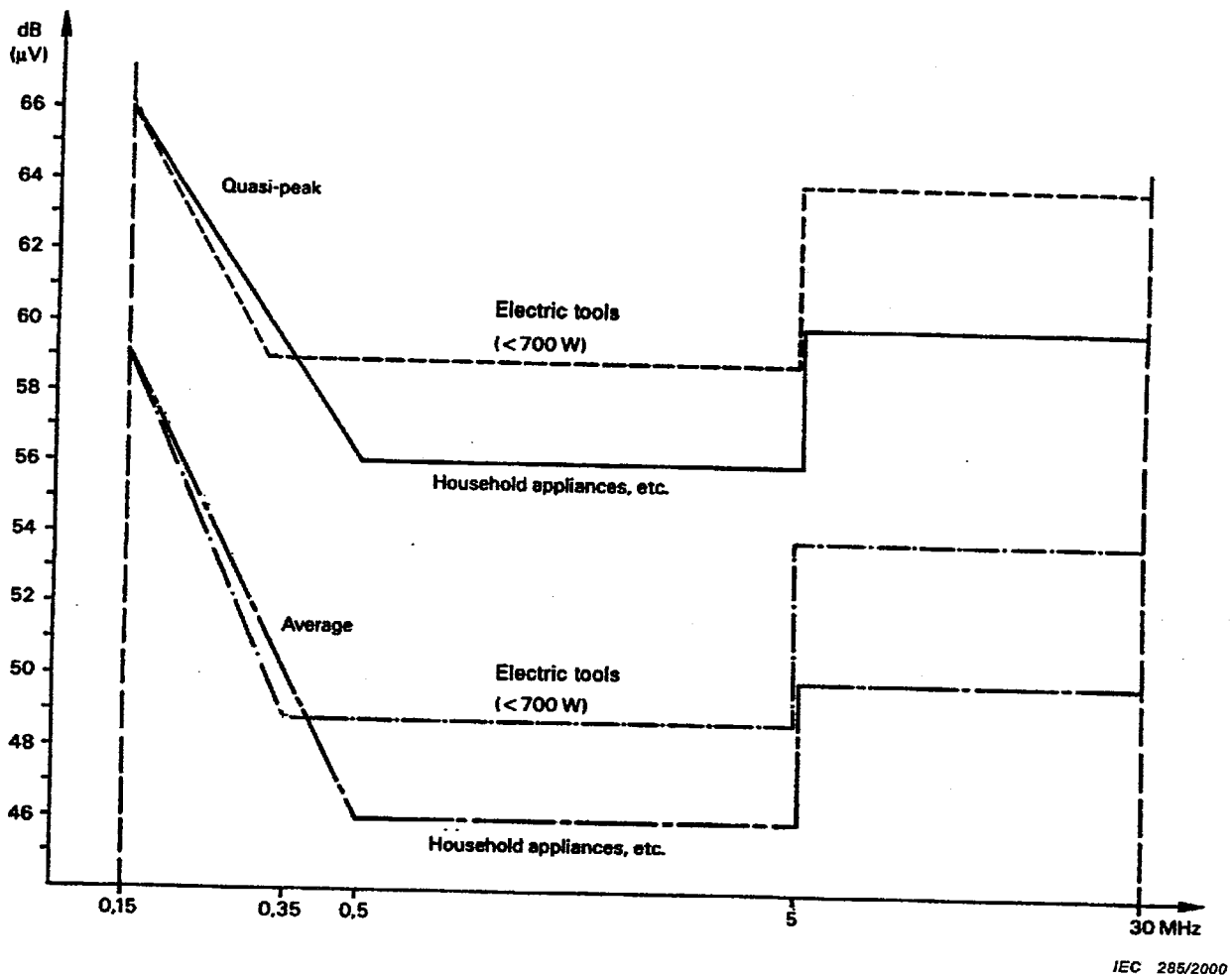
8.3.3 Should the test on the sample result in non-compliance with the requirements in 8.2.1 or 8.2.2, then a second sample may be tested and the results combined with those from the first sample and compliance checked for the larger sample.

NOTE For general information see CISPR 16, Section nine: Statistical considerations in the determination of limits of radio interference.

8.4 The banning of sales

The banning of sales or withdrawal of a type approval, as result of a dispute shall be considered only after tests have been carried out using the statistical method of evaluation. Statistical assessment of compliance with requirements shall be made in accordance with 8.2.2.3 for discontinuous disturbance and in accordance with 8.3.1 for continuous disturbance.

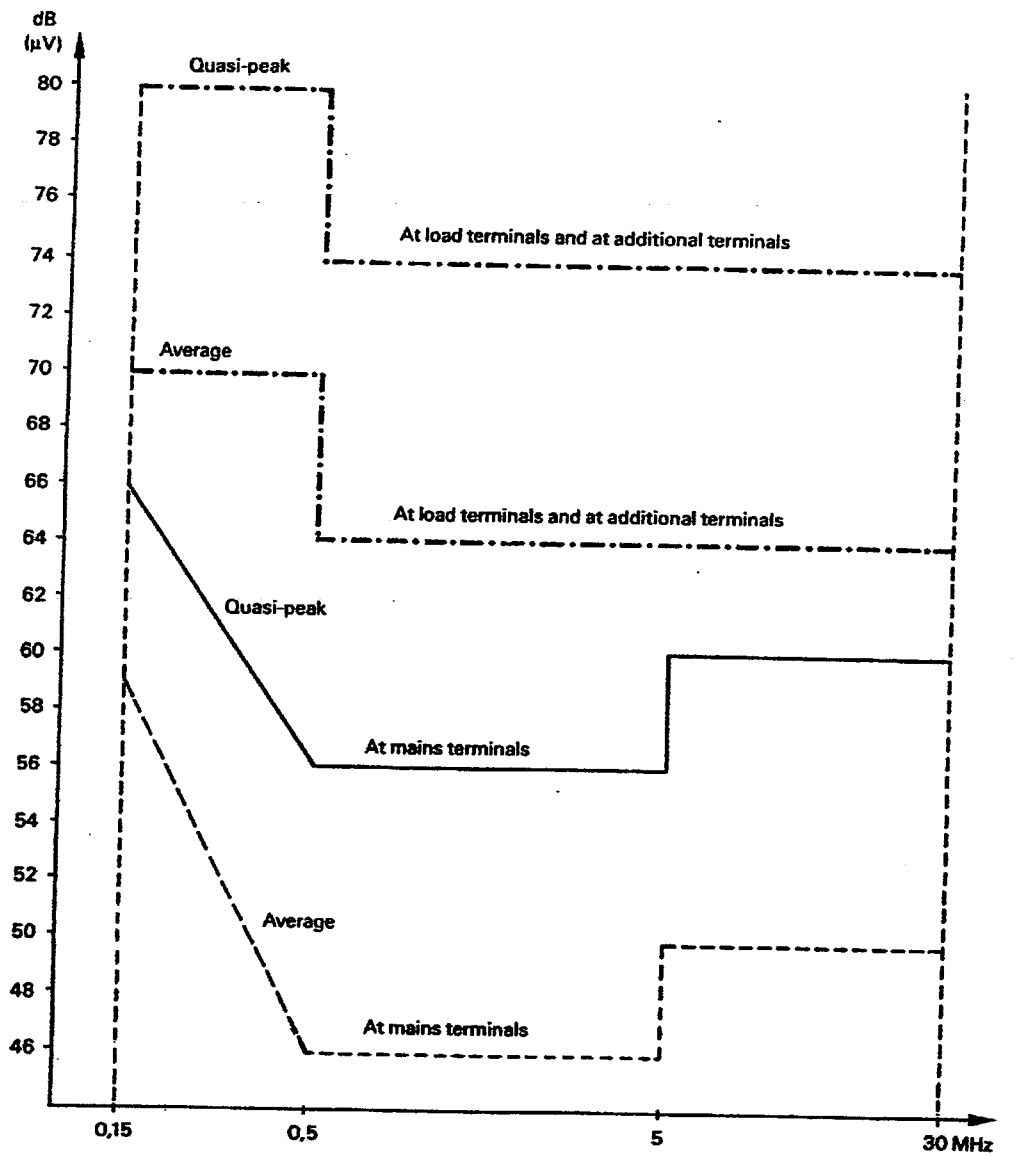
Household appliances and electric tools



* For electric tools:
700 W to 1 000 W: +4 dB
>1 000 W: +10 dB

Figure 1 – Graphical representation of the limits (see 4.1.1)

Regulating control



IEC 286/2000

Figure 2 – Graphical representation of the limits (see 4.1.1)

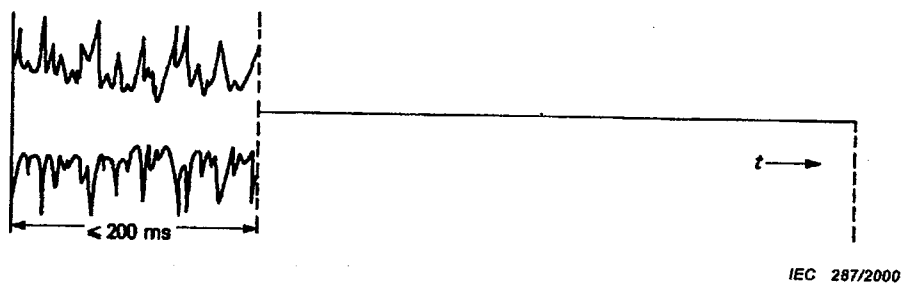


Figure 3a

One click

Disturbance not longer than 200 ms, consisting of a continuous series of impulses and observed at the intermediate frequency output of the measuring receiver.

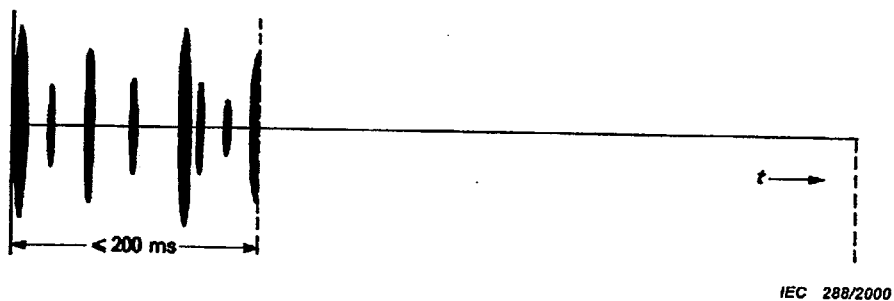


Figure 3b

One click

Individual impulses shorter than 200 ms, spaced closer than 200 ms not continuing for more than 200 ms and observed at the intermediate frequency output of the measuring receiver.

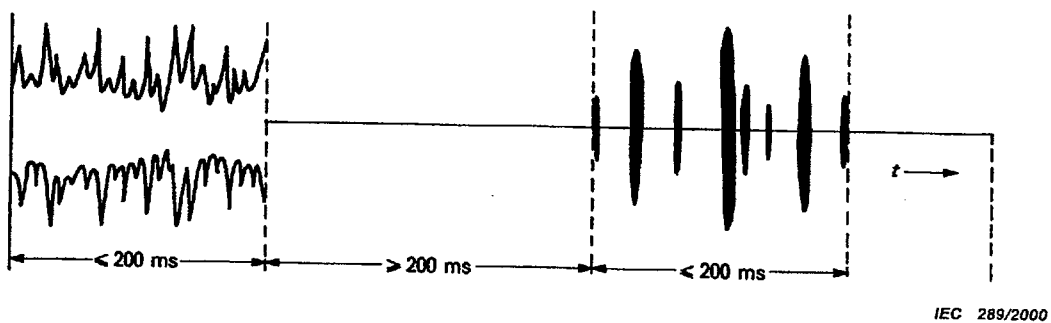


Figure 3c

Two clicks

Two disturbances neither exceeding 200 ms, spaced by a minimum of 200 ms and observed at the intermediate frequency output of the measuring receiver.

Figure 3 – Examples of discontinuous disturbances classified as clicks (see 3.2)

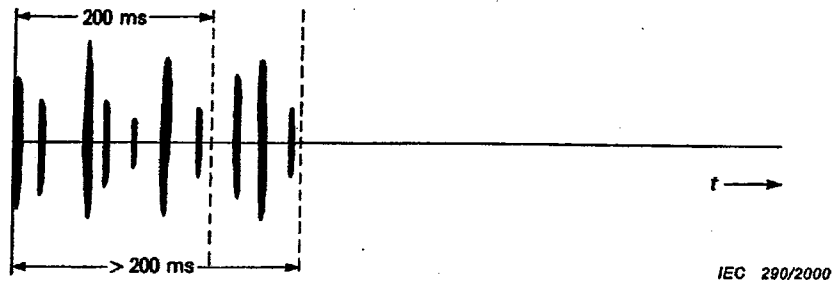


Figure 4a

Individual impulses shorter than 200 ms, spaced closer than 200 ms continuing for more than 200 ms and observed at the intermediate frequency output of the measuring receiver.

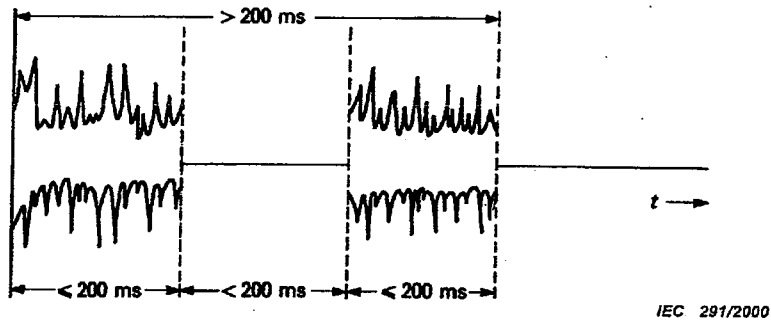
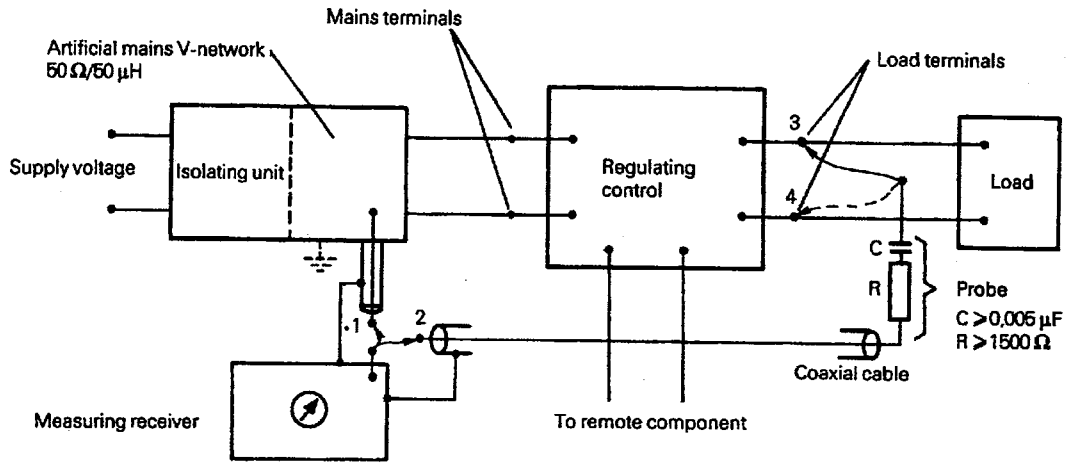


Figure 4b

Two disturbances spaced by less than 200 ms, and having a total duration of more than 200 ms and observed at the intermediate frequency output of the measurement receiver.

Figure 4 – Examples of discontinuous disturbance for which the limits of continuous disturbance apply (see 4.2.2.1).

For some exceptions from this rule see 4.2.3.2 and 4.2.3.4.



IEC 292/2000

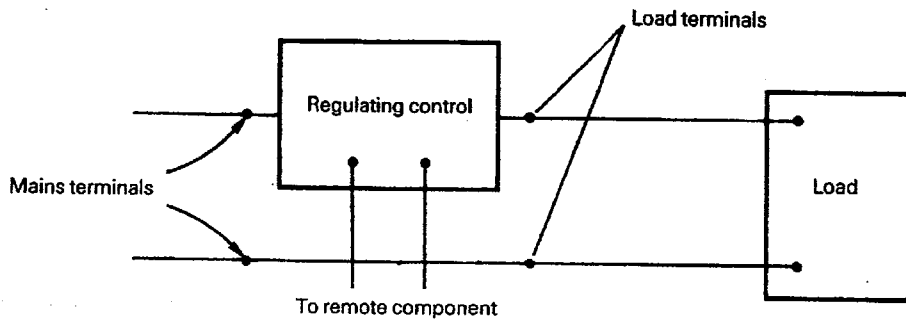
- 1 Switch position for mains measurements
- 2 Switch position for load measurements
- 3 and 4 Successive connections during load measurements

NOTE 1 The length of the coaxial cable of the probe shall not exceed 2 m.

NOTE 2 When the switch is in position 2, the output of the artificial mains V-network at terminal 1 shall be terminated by an impedance equivalent to that of the CISPR measuring receiver.

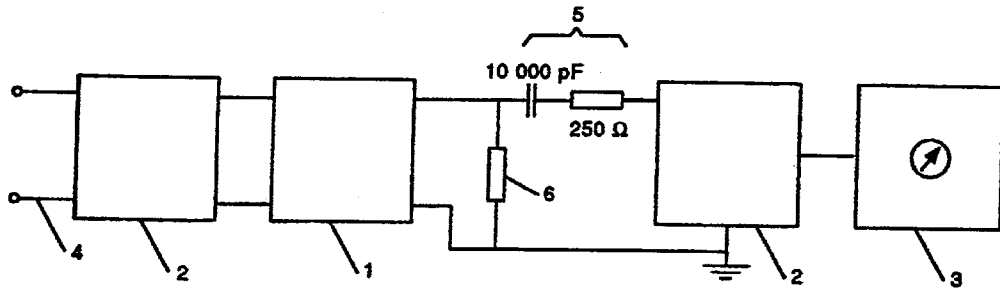
NOTE 3 Where a two-terminal regulation control is inserted in one lead only of the supply, measurements shall be made by connecting the second supply lead as indicated in figure 5a.

Figure 5 – Measuring arrangement for regulating controls (see 5.2.4)



IEC 293/2000

Figure 5a – Measurement arrangement for two-terminal regulating controls

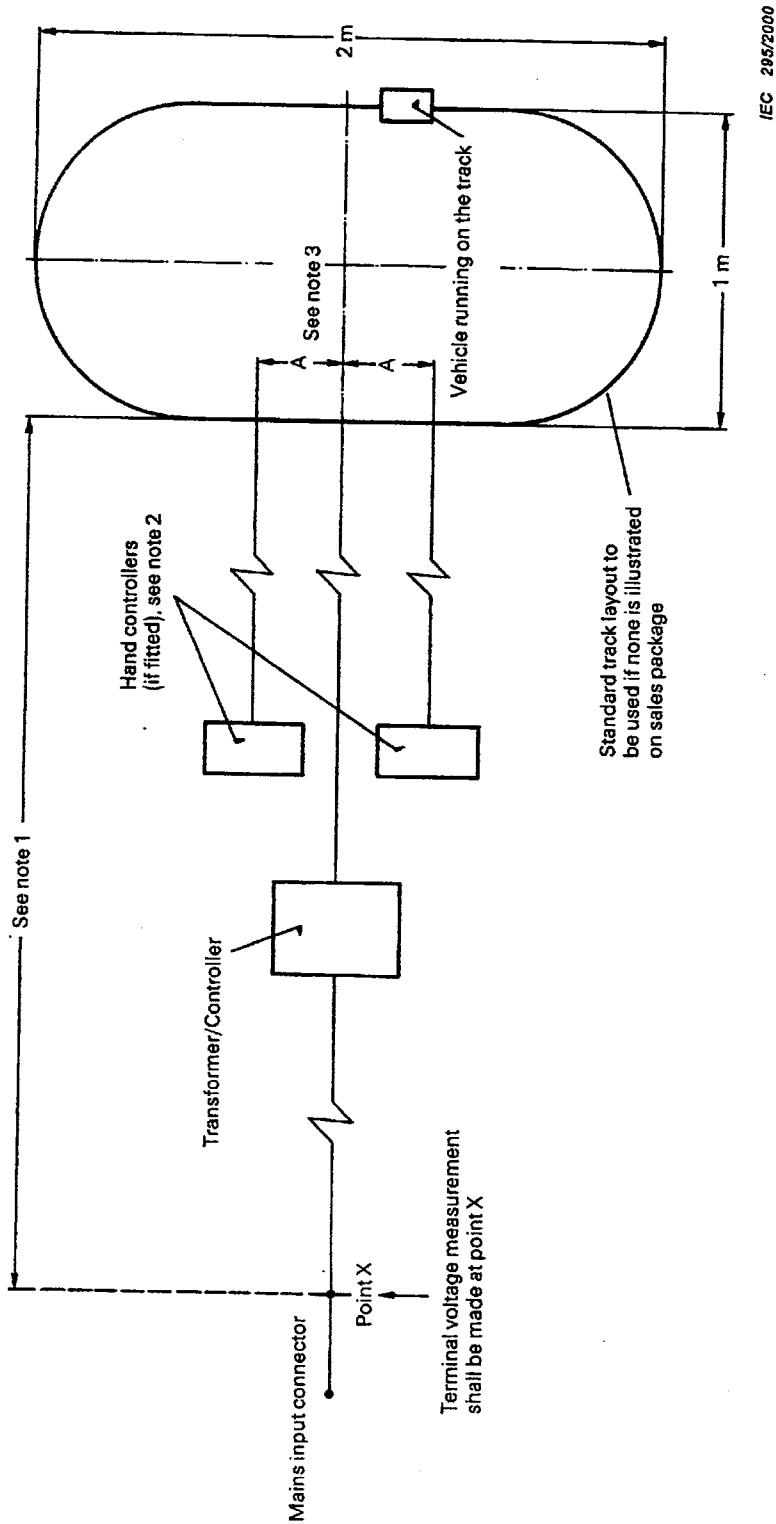


IEC 294/2000

- 1 Supply unit of electric fence
- 2 Artificial mains V-network (see 5.1.2)
- 3 CISPR receiver conforming to CISPR 16
- 4 Mains lead, or battery lead
- 5 Elements of the equivalent circuit to replace the fence (the specified load resistance of 300 Ω is provided by the 250 Ω resistor in series with the 50 Ω impedance of the artificial mains V-network)
- 6 Resistor of 500 Ω to simulate leakage (to be added to the equivalent circuit of item 5)

NOTE The left V-network is not necessary when the EUT is battery-operated. The right V-network may protect the meter against pulses in the dummy fences.

Figure 6 – Arrangement for measurement of disturbance voltage produced at the fence terminal of electric fence energizers (see 7.3.7.2)



NOTE 1 For terminal voltage measurements (0,15 MHz to 30 MHz), the nearest part of the track should not be further than 1 m from point X.

NOTE 2 For power measurements (30 MHz to 300 MHz) the distance from the transformer/controller to the nearest part of the track must be extended (to 6 m) to accommodate the use of the absorbing clamp.

NOTE 3 Distance A shall be adjusted to 0,1 m where possible.

Figure 7 – Measuring arrangement for toys running on tracks

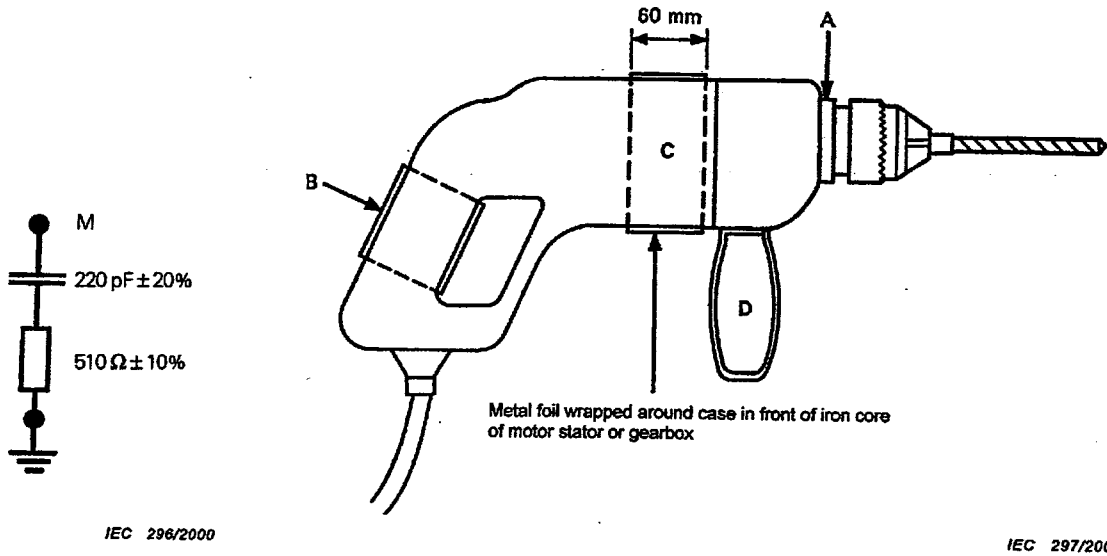


Figure 8a – RC element

Figure 8b – Portable electric drill

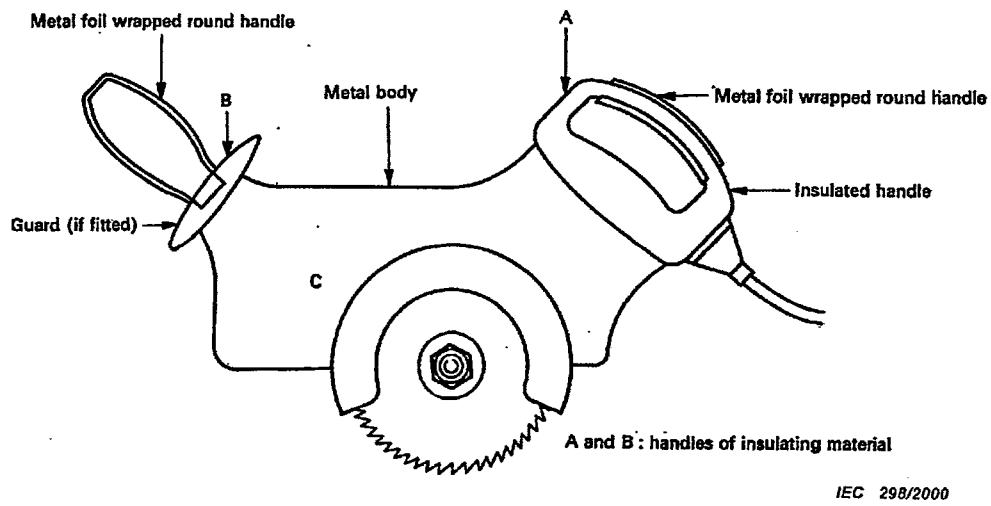
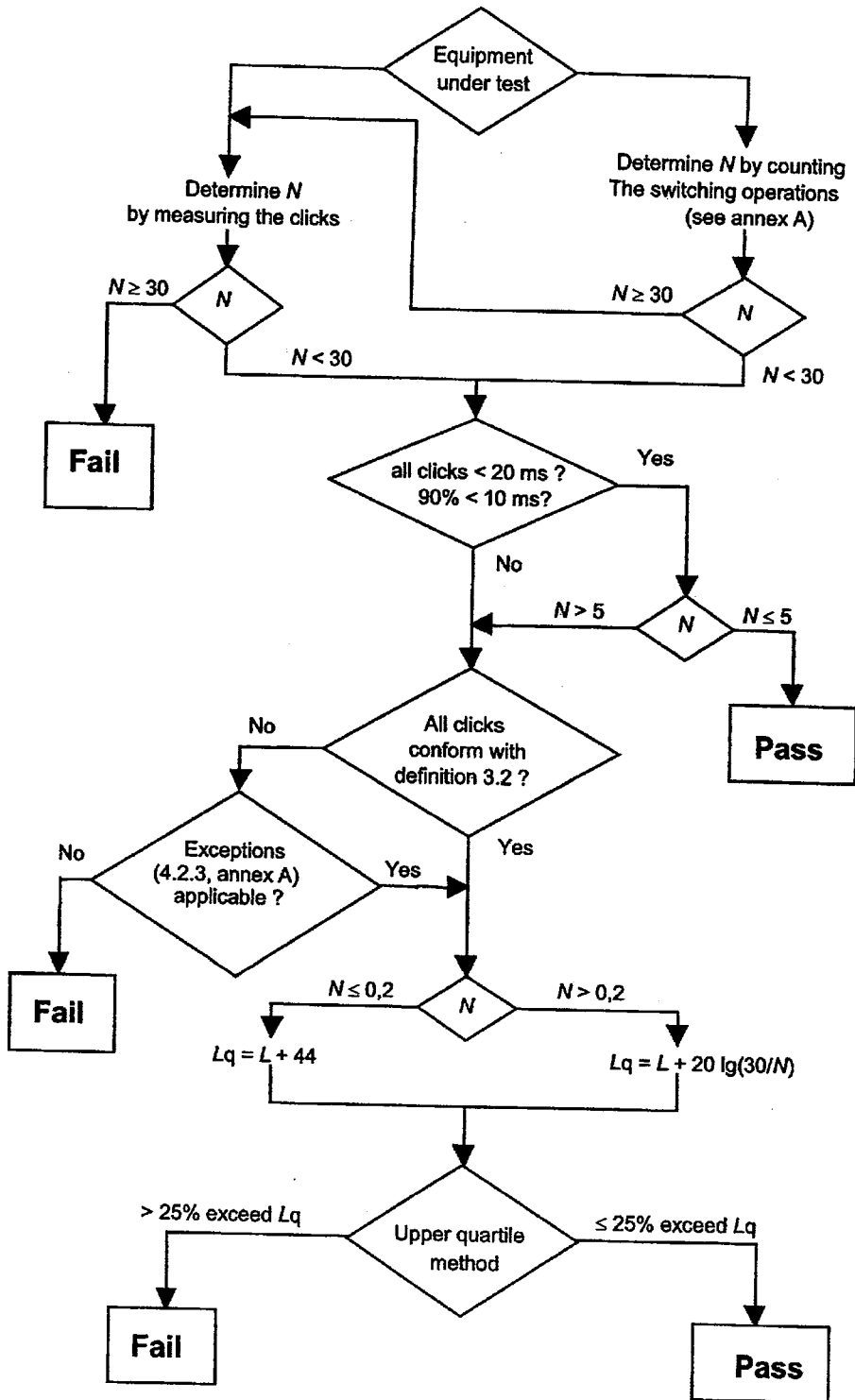


Figure 8c – Portable electric saw

Figure 8 – Application of the artificial hand (5.1.4 and 5.2.2.2)



IEC 299/2000

Figure 9 – Flow diagram for measurements of discontinuous disturbance (see annex C)

Annex A
(normative)

**Limits of disturbance caused by the switching operations
of specific appliances when the formula $20 \lg 30/N$ is applicable**

Relaxations for classes of equipment with specific disturbance characteristics.

Thermostatically controlled three-phase switches

For thermostatically controlled three-phase switches, the three disturbances caused sequentially in each of the three phases and the neutral shall, independent of their spacing and subject to the following conditions, be evaluated as three clicks and not as continuous disturbance if:

- a) the switch operates not more than once in any 15 min, period and the three disturbances are neither preceded nor followed within 2 s by any other disturbance;
- b) the duration of the disturbance caused by the opening or closing of any one of the contacts shall be 20 ms or less and not more than a quarter of the number of the clicks caused by switching operations registered during the observation time is allowed to exceed the level 44 dB above the relevant limit L for continuous disturbance.

Table A.1 – Examples of appliances and application of limits according to 4.2.2 and 4.2.3 for which the click rate N is derived from the number of clicks

| Type of appliance | Operating conditions subclause | Type of appliance | Operating conditions subclause |
|---|--------------------------------|--|--------------------------------|
| Bed warmers | 7.3.4.13 | Ironing presses | 7.3.4.10 |
| Blankets | 7.3.4.13 | Kettles | 7.3.4.3 |
| Boilers | 7.3.4.3 | Milk boilers | 7.3.4.3 |
| Coffee percolators | 7.3.4.3 | Roasters, table-type | 7.3.4.2 |
| Convectors* | 7.3.4.14 | Room heaters* | 7.3.4.14 |
| Cooking ovens | 7.3.4.8 | Steam generators | 7.3.4.6 |
| Cooking pans | 7.3.4.2 | Sterilizers | 7.3.4.3 |
| Deep-fat fryers | 7.3.4.2 | Stewing pans | 7.3.4.2 |
| Dish-washing machines | 7.3.1.11 | Storage water heaters, thermal and non-thermal | 7.3.4.5 |
| Electric fences | 7.3.7.2 | Thermostats, separate for control of room or water heaters, oil and gas burners* | 7.2.4 |
| Fan heaters* | 7.3.4.14 | Toasters | 7.3.4.9 |
| Feeding bottle heaters | 7.3.4.3 | Waffle grills | 7.3.4.8 |
| Fluid-filled heaters* | 7.3.4.14 | Waffle irons | 7.3.4.8 |
| Frying pans | 7.3.4.2 | Warming pads | 7.3.4.13 |
| Glue pots | 7.3.4.3 | Warming plates | 7.3.4.7 |
| Grills | 7.3.4.8 | Washing machines | 7.3.1.10 |
| Hair-dryers | 7.3.1.8 | Water heaters, instant* | 7.3.4.4 |
| Heating mattresses | 7.3.4.13 | | |
| Immersion heaters | 7.3.4.3 | | |
| Ironing machines, rotating | 7.3.4.10 | | |
| Ironing machines, table and free standing | 7.3.4.10 | | |

In the frequency range 148,5 kHz to 30 kHz, the limits as given in table 1, column 2 – for the measurement with the quasi-peak detector on household and similar equipment – apply enlarged with

$$20 \lg \frac{30}{N} \text{ dB } (\mu\text{V}) \text{ for } 0,2 \leq N < 30$$

$$N = n_1 / T \text{ (see 7.4.2.3)}$$

* For thermostats for, or integrated in, room heating equipment intended to be used stationary, see 7.2.4 and table A.2.

Table A.2 – Examples of appliances and application of limits for which the click rate N is derived from the number of switching operations and the factor f as mentioned in the relevant operating conditions

| Type of appliance | Operating conditions subclause | Factor f |
|---|--------------------------------|------------|
| Thermostats for portable or removable room heating equipment* | 7.2.4 | 1 |
| Refrigerators, freezers | 7.3.1.9 | 0,5 |
| Cooking ranges with automatic plates | 7.3.4.1 | 0,5 |
| Appliances with one or more boiling plates controlled by thermostats or energy regulators | 7.3.4.1 | 0,5 |
| Irons | 7.3.4.11 | 0,66 |
| Sewing machine speed controls and starter switches | 7.2.3.1 | 1 |
| Dental drill speed control and starter switches | 7.2.3.1 | 1 |
| Electro-mechanical office machines | 7.2.3.2 | 1 |
| Slide projector picture change devices | 7.2.3.3 | 1 |

In the frequency range 148,5 kHz to 30 kHz, the limits as given in table 1, column 2 – for the measurement with the quasi-peak detector on household and similar equipment – apply enlarged with

$$20 \lg \frac{30}{N} \text{ dB } (\mu\text{V}) \text{ for } 0,2 \leq N < 30$$

$$N = n_2 \times f / T \text{ (see 7.4.2.3)}$$

* See 4.2.3.1.

Annex B
(informative)

Example of the use of the upper quartile method to determine compliance with disturbance limits (see 7.4.2.6)

Example: (Tumble-dryer)

The appliance has a program which stops automatically; therefore the observation time is defined and contains more than 40 clicks.

Frequency: 500 kHz

Limit for continuous disturbance level: 56 dB (µV)

First test run

| | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|
| Disturbance No.: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | * | * | * | - | * | - | * | * | - | * |
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | * | * | * | * | * | * | * | * | * | * |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | * | * | * | * | * | * | * | * | * | * |
| * is the click | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| - is the discontinuous disturbance (not exceeding the limit for continuous disturbance) | * | - | * | * | - | * | * | * | * | * |
| | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| | * | * | - | * | * | * | * | * | * | - |
| | 51 | 52 | 53 | 54 | 55 | 56 | | | | |
| | - | * | * | * | - | * | | | | |

- total time of run (T) = 35 min
- total number of clicks (n₁) = 47

$$N = \frac{47}{35} = 1,3$$

$$20 \lg \frac{30}{N} = 20 \lg \frac{30}{1,3} = 27,5 \text{ dB}$$

Click limit L_q for 500 kHz = 56 + 27,5 = 83,5 dB (µV)

The number of clicks allowed above the click limit L_q :

$$\frac{47}{4} = 11,75, \text{ which means that only 11 such clicks are allowed}$$

A second test run is made to determine how many clicks exceed the click limit L_q . The time for this second run is the same as the time taken for the first run.

Frequency: 500 kHz

Click limit L_q : 83,5 dB (μ V)

Second test run

| | | | | | | | | | | |
|--|----|----|----|----|----|----|----|----|----|----|
| Disturbance No.: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | * | - | * | - | - | * | * | - | - | * |
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | - | - | - | - | - | - | - | * | * | * |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | - | * | - | * | - | - | - | - | - | - |
| | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| | - | - | - | - | - | * | - | * | - | - |
| * are the clicks above click limit L_q | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| - are the clicks not exceeding click limit L_q | * | * | - | - | - | - | - | - | - | - |
| | 51 | 52 | 53 | 54 | 55 | 56 | | | | |
| | - | - | - | - | - | - | | | | |

- total time of run (T) = 35 min (identical to first run)
- number of clicks greater than click limit L_q = 14
- allowed number of clicks = 11, therefore *the appliance is not accepted.*

Annex C (informative)

Guidance notes for the measurement of discontinuous disturbance (clicks)

C.1 General

These guidance notes do not purport to interpret the provisions of this standard, but are intended to guide the user through the rather complex procedure, which will be explained in part C.4 in the order as shown in the flow diagram (figure 9) with references to the clauses of this standard containing the corresponding normative determinations.

Discontinuous disturbance as described in the definition for a click (see 3.2) is presupposed to be less disturbing than continuous disturbance and therefore this standard contains a number of relaxations on the limits for this kind of disturbance.

Clicks normally are produced by switching operations and are broadband disturbances with the maximum of the spectral characteristic below 2 MHz. For this reason it is sufficient to carry out the measurements only on a restricted number of frequencies. The influence of the disturbance depends not only on the amplitude but also on the duration, the spacing and the repetition rate of the clicks. Therefore the clicks have to be evaluated not only over the frequency range but also over the time interval. Since the amplitude and the duration of a single click are not constant, the necessary reproducibility of the test results requires the application of statistical methods. For this purpose the upper quartile method is applied.

C.2 Measuring apparatus

C.2.1 Artificial mains network

The artificial mains network is required to provide a defined impedance at the terminals of the equipment under test (EUT), to isolate the test circuit from unwanted radio-frequency signals and to couple the disturbance voltage to the measuring devices (see 5.1.2).

A V-network according to CISPR 16-1, clause 11 shall be used.

C.2.2 Measuring receiver

For the measurement of the amplitudes of the clicks a measuring receiver with quasi-peak detector according to CISPR 16-1, clause 2 shall be used.

The i.f. output of the measuring receiver is needed for the evaluation of duration and spacing of the clicks.

C.2.3 Disturbance analyzer

The recommended method for the assessment of discontinuous disturbance is the use of a special disturbance analyzer according to CISPR 16-1, clause 14. Usually a quasi-peak measuring receiver is already integrated in the disturbance analyzer.

It should be considered that not all exceptions given in CISPR 14-1 are included in CISPR 16-1. Therefore the disturbance analyzer may not be able to supervise the applicability of all exceptions. In this case in addition a storage oscilloscope shall be used, if the existence of configurations of discontinuous disturbance is observed which are not in line with the definition of a click (3.2).

C.2.4 Oscilloscope

The use of an oscilloscope may be necessary for the duration measurements. Clicks are transient events, therefore a storage oscilloscope is required.

The cut-off frequency of the oscilloscope shall be not lower than the intermediate frequency of the measuring receiver.

C.3 Measurement of the basic parameters of a discontinuous disturbance

C.3.1 Amplitude

The amplitude of the discontinuous disturbance is the quasi-peak reading of the measuring receiver or the disturbance analyzer as specified in C.2.

In case of close succession bursts of discontinuous disturbances the indication on the output of the quasi-peak detector may exceed the limit for continuous disturbance during the whole time interval. For this time interval all registered disturbances have to be taken into account, which exceed the i.f. reference level (see 3.3).

C.3.2 Duration and spacing

The duration and spacing of the disturbance is measured on the i.f. output either manually with a storage oscilloscope or automatically with a disturbance analyzer.

For a manual measurement the triggering of the oscilloscope shall be adjusted to the i.f. reference level of the measuring receiver, that means to the corresponding value on the i.f. output of the measuring receiver of an unmodulated sinusoidal input signal which produces a quasi-peak indication equal to the limit for continuous disturbance (see 3.3).

NOTE Other calibration sources may be used (for instance 100 Hz pulses). Using pulsed calibration sources the weighting factor given in CISPR 16-1, pulse response curve for band B, shall be taken into account. Furthermore, regarding impulse area and spectrum, the pulses shall conform with the requirements of annex B in CISPR 16-1.

During the manual measurement with a storage oscilloscope it shall be considered that the indication of a single pulse after the weighting by the quasi-peak detector is more than 20 dB lower than the indication of a sinusoidal signal or 100 Hz pulses with the same amplitude. Not all registered disturbances on the oscilloscope, which is adjusted to the i.f. reference level, shall be taken into account but only those which exceed the limit for continuous disturbance. Therefore the indication of the quasi-peak detector or the display of the disturbance analyzer shall be observed simultaneously. It shall be noted that after a single pulse the maximum of the quasi-peak indication occurs approximately 400 ms later.

NOTE Duration and spacing of the clicks can be measured also on the output of the envelope detector. Duration measurements after the quasi-peak detector are impossible due to the defined discharge time of 160 ms in this detector.

Figure 3 and 4 show examples of different kinds of discontinuous disturbances.

Special precautions have to be taken when discontinuous disturbance has to be measured in the presence of continuous disturbance. In such circumstances it may be necessary to adjust the triggering of the oscilloscope not to the i.f. reference level but to an appropriate higher level for the purpose of excluding the influence of the continuous disturbance.

Care shall be taken to use the correct writing speed, otherwise the peaks of the pulses may not be completely displayed.

The following time bases are recommended to be used for duration measurements with an oscilloscope:

- for disturbances with duration shorter than 10 ms:
time base 1 ms/cm to 5 ms/cm;
- for disturbances with duration between 10 ms and 200 ms:
time base 20 ms/cm to 100 ms/cm
- for disturbances at intervals of about 200 ms:
time base 100 ms/cm

NOTE Such time bases make possible visual evaluation to an accuracy of approximately 5 %, which allgns with the 5 % accuracy specified for the disturbance analyzer in CISPR 16-1, clause 14.

Duration measurements may also be performed on the mains supply current circuit of the EUT by connecting the oscilloscope to the artificial mains V-network, provided rise and fall-off time of the registered disturbances are very short in comparison with the duration of the disturbance. (The edges of the registered pulses on the oscilloscope are very steep.)

In case of doubt the duration measurements have to be executed on the i.f. output of a measuring receiver as specified in C.2.2.

NOTE Owing to the limited bandwidth of the measuring receiver the shape and possibly the duration of the discontinuous disturbances may be changed. It is therefore recommended that the simple oscilloscope / artificial mains V-network combination be used only when the exception 4.2.3.3 "Instantaneous switching" applies, that means when the amplitude of the clicks have not to be measured. In all other cases the use of a measuring receiver is recommended.

C.4 Measuring procedure of discontinuous disturbances, following the flow diagram (figure 9)

C.4.1 Determination of the click rate

The click rate is the average number of clicks per minute (see 3.6). Dependent on the type of the EUT there are two methods for determining the click rate:

- by measuring the number of clicks or
- by counting the number of switching operations.

Generally it is allowed for each EUT to determine the click rate by measuring the clicks, that means it is allowed to take each EUT as a "black box" (for thermostats special methods apply, see 7.2.4). For both methods the minimum observation time shall be observed (see 3.5 and 7.4.2.1).

The measurements of the number of clicks for determining the click rate shall be carried out only on two frequencies: 150 kHz and 500 kHz (see 7.4.2.1).

The appliance shall be operated under the conditions as given in clause 7.2 or 7.3. For some kinds of appliances these subclauses contain additional rules for determining the click rate.

When not specified, the EUT shall be operated under the most onerous conditions of typical use, that means under the conditions with the highest click rate (see 7.4.2.2). It shall be taken into account that the click rate on different mains terminals (e.g. phase or neutral) may be different.

The input attenuator of the measuring receiver shall be adjusted to the limit L of continuous disturbance.

The click rate is determined from the formula: $N = n_1 / T$,

where n_1 is the number of measured clicks during the minimum observation time T in minutes (see 7.4.2.3).

With a click rate $N \geq 30$ the limits for continuous disturbance apply (see 4.2.2.1). Since the measurements already showed that there are discontinuous disturbances exceeding these limits (see the definition of a click in 3.2), it is clear that the EUT failed the test.

For certain appliances, mentioned in annex A, table A.2, the click rate can be determined by counting the number of switching operations.

In this case the click rate can be obtained from the formula: $N = n_2 \times f / T$,

where n_2 is the number of the counted switching operations during the minimum observation time T in minutes and f is a factor given in annex A, table A.2 (see 7.4.2.3).

If the click rate, obtained by counting the switching operations, is higher or equal than 30 the EUT has not failed the test yet, but there still remains the possibility of determining the click rate by measuring the clicks, that means the possibility to measure how many of the counted switching operations in fact are causing disturbances with amplitudes higher than the limit for continuous disturbance.

C.4.2 Application of the exceptions

After determining the click rate it is recommended to prove the applicability of the exception rule 4.2.3.3 instantaneous switching. If the therein given conditions apply (duration of all clicks <20 ms, 90 % of them with a duration <10 ms, click rate $N < 5$), the procedure can be stopped. A measurement of the amplitudes of the clicks in this case is not necessary, the EUT passed the test.

Furthermore it shall be investigated whether duration and spacing of all discontinuous disturbances show conformity with the definition of a click (see 3.2), because only in this case the relaxed limits for discontinuous disturbance can be used.

If configurations of discontinuous disturbances are observed that do not correspond to the definition of a click (see 3.2), the applicability of the other exceptions, mentioned in 4.2.3 or in annex A, shall be checked.

For example, if the separation between two disturbances is less than 200 ms and the click rate is less than 5 often the exception 4.2.3.4 applies. A disturbance analyzer, which is not able to supervise all exceptions, in this case automatically indicates the existence of continuous disturbance, that means the result "fail".

If none of the exceptions apply to the observed configurations of discontinuous disturbance which do not conform with the definition of a click (see 3.2), the EUT failed the test.

C.4.3 Upper quartile method

If the measurements of the click rate, duration and spacing of the clicks established that the relaxed limits for discontinuous disturbance can be applied, the amplitude of the clicks shall be evaluated by using the upper quartile method (see 3.8 and 7.4.2.6)

Corresponding to the click rate N shall be calculated the amount ΔL by which the limits L for continuous disturbance shall be increased (see 4.2.2.2):

$$\begin{aligned} \Delta L &= 44 \text{ dB} && \text{for } N < 0,2 \\ \Delta L &= [20 \log(30/N)] \text{ dB} && \text{for } 0,2 \leq N < 30 \end{aligned}$$

The click limit L_q is determined from the formula:

$$L_q = L + \Delta L$$

The amplitude of the clicks shall be evaluated only at the following restricted number of frequencies: 150 kHz; 500 kHz; 1,4 MHz and 30 MHz (see 7.4.2.5).

The input attenuator of the measuring receiver shall be adjusted to the relaxed limit L_q for discontinuous disturbance.

These measurements shall be performed under the same operating conditions and with the same observation time as has been chosen when determining the click rate (see 7.4.2.5).

The appliance under test is deemed to comply with the limits for discontinuous disturbance if not more than a quarter of the number of clicks registered during the observation time T exceeds the click limit L_q (see 7.4.2.6). That means the number n of clicks exceeding L_q has to be compared with the number n_1 or n_2 , obtained during the determination of the click rate (see C.4.1 and 7.4.2.3). The requirements of this standard are fulfilled when the following conditions apply:

$$n \leq n_1 \times 0,25 \quad \text{or} \quad n \leq n_2 \times 0,25$$

Annex B gives an example of the use of the upper quartile method.

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|-------------------------|-------------|--|---------------|-------------|
| IEC 60050-161 | 1990 | International Electrotechnical Vocabulary (IEV) - Chapter 161: Electromagnetic compatibility | - | - |
| IEC 60335-2-76 (mod) | 1997 | Safety of household and similar electrical appliances Part 2-76: Particular requirements for electric fence energizers | EN 60335-2-76 | 1999 |
| CISPR 16-1 | 1993 | Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus | - | - |
| A1 | 1997 | | - | - |
| CISPR 16-2 | 1996 | Part 2: Methods of measurement of disturbances and immunity | - | - |
| A1 | 1999 | | - | - |