

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

BASIC EMC PUBLICATION

PUBLICATION FONDAMENTALE EN CEM

AMENDMENT 1

AMENDEMENT 1 **iTeh STANDARD PREVIEW**

(standards.iteh.ai)

**Electromagnetic compatibility (EMC) –**

**Part 4-13: Testing and measurement techniques – Harmonics and  
interharmonics including mains signalling at a.c. power port, low frequency  
immunity tests**

**Compatibilité électromagnétique (CEM) –**

**Partie 4-13: Techniques d'essai et de mesure – Essais d'immunité basse  
fréquence aux harmoniques et inter-harmoniques incluant les signaux transmis  
sur le réseau électrique alternatif**





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## FOREWORD

This amendment has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

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

Enquiry draft	Report on voting
77A/668/CDV	77A/684/RVC

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- withdrawn,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.

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### 5.2 Test levels for interharmonics and mains signalling

[IEC 61000-4-13:2002/AMD1:2009](http://webstore.iec.ch/IEC%2061000-4-13%202002%20AMD1%202009)

Replace the last paragraph of this subclause, the paragraph below Table 4b, by the following:  
[1b2478b2f034/iec-61000-4-13-2002-amd1-2009](http://webstore.iec.ch/1b2478b2f034/iec-61000-4-13-2002-amd1-2009)

Immunity test levels for interharmonics above 100 Hz are based on the mains signalling levels or by the Meister curve levels defined in 8.2.4 depending on the class of equipment being tested. Mains signalling levels are in the range of 2 % to 6 % of  $U_1$ . Discrete interharmonic frequencies have a level of about 0,5 % of the fundamental frequency voltage  $U_1$  (in absence of resonance). In class 3 for industrial networks, these levels can be considerably higher.

### Figure 1 Test flowcharts

Replace Figures 1a and 1b by the following:

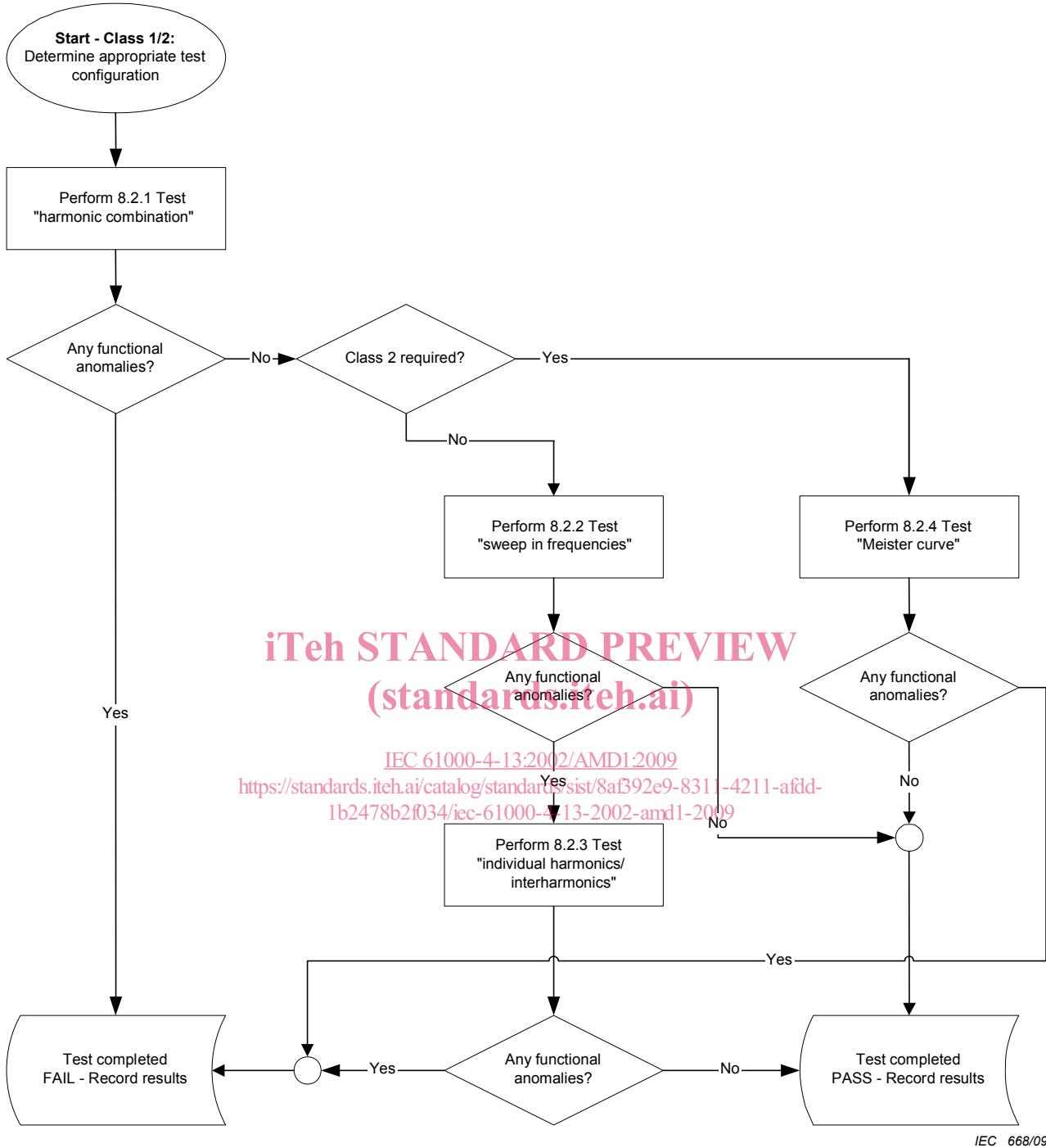


Figure 1a – Test flowchart class 1 and class 2

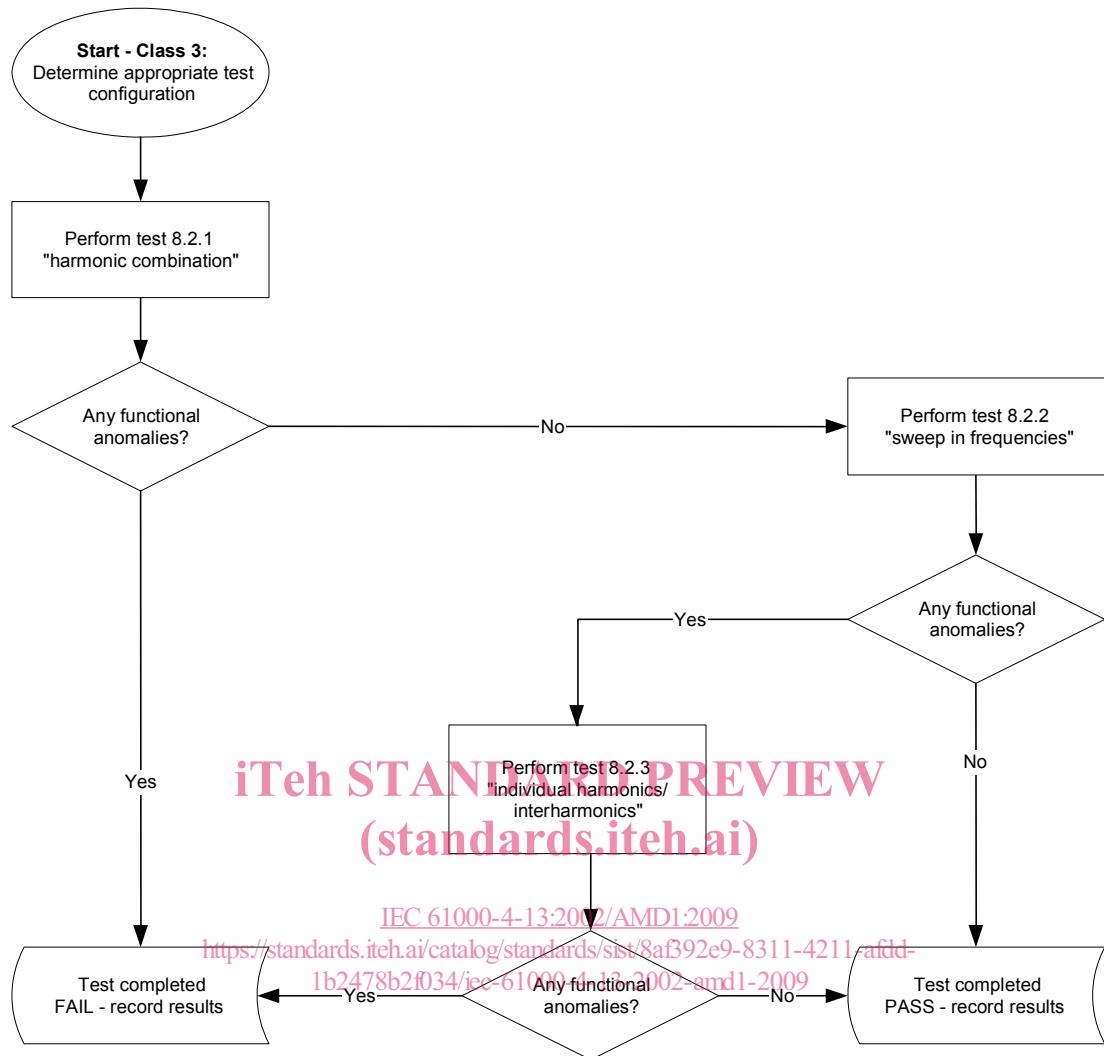


Figure 1b – Test flowchart class 3

Figure 1 – Test flowcharts

### 8.2.1 Harmonic combination test flat curve and over swing

Replace the entire subclause by the following:

The two harmonic combination tests to be carried out are flat curve and over swing. The EUT shall be tested for each harmonic combination, according to Tables 7 and 8 for 2 min. The time-domain waveforms are shown in Figures 6 and 7 for the flat curve and over swing tests respectively.

Flat curve: the voltage follows a time related function in which each half-wave consists of three parts. See Figure 6.

- Part 1 starts from zero, it follows a pure sine function up to 95% of the peak value for Class 1, 90 % of the peak value for Class 2 and up to 80 % for Class 3.
- Part 2 is a constant voltage.
- Part 3 is equivalent to Part 1 (following a pure sine function).

The r.m.s. value of the resultant waveform shall be maintained at nominal voltage during the application of this test. This means that the sinusoidal part of the waveform has to be increased in amplitude by the factor  $K_y$  shown in Table 7.

**Table 7 – Time related function, "flat curve"**

Function (Parts 1 and 3)	Voltage Ratio $K_y$	Voltage (Parts 1 and 3)	Function (Part 2)	Voltage (Part 2)	Class
$0 \leq  \sin(\omega t)  \leq 0,95$	1,013 3	$u = U_1 \times K_1 \times \sqrt{2} \times \sin(\omega t)$	$0,95 \leq  \sin(\omega t)  \leq 1$	$u = \pm 0,95 \times U_1 \times K_1 \times \sqrt{2}$	1
$0 \leq  \sin(\omega t)  \leq 0,9$	1,037 9	$u = U_1 \times K_2 \times \sqrt{2} \times \sin(\omega t)$	$0,9 \leq  \sin(\omega t)  \leq 1$	$u = \pm 0,9 \times U_1 \times K_2 \times \sqrt{2}$	2
$0 \leq  \sin(\omega t)  \leq 0,8$	1,111 7	$u = U_1 \times K_3 \times \sqrt{2} \times \sin(\omega t)$	$0,8 \leq  \sin(\omega t)  \leq 1$	$u = \pm 0,8 \times U_1 \times K_3 \times \sqrt{2}$	3
$0 \leq  \sin(\omega t)  \leq X$	X	$u = U_1 \times K_x \times \sqrt{2} \times \sin(\omega t)$	$X \leq  \sin(\omega t)  \leq 1$	$u = \pm X \times U_1 \times K_x \times \sqrt{2}$	X

NOTE 1 Classes 1, 2, and 3 are defined in Annex C.

NOTE 2 The levels given for class X are open. The level must be defined by the product committees. However, for equipment for use in public supply systems the values must not be lower than those of class 2.

NOTE 3 Maximum deviation:  $\Delta u = \pm(0,01 \times U_1 \times \sqrt{2} + 0,005 \times u)$ .

Over swing: Over swing is generated by adding a discrete value of the 3<sup>rd</sup> harmonic and also of the 5<sup>th</sup> harmonic both with a corresponding phase relationship.

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**Table 8 – Harmonic combination, "over swing"  
(standards.iteh.ai)**

h	3	5	Class
% of $U_1$	4 % / 180°	002/AMD1:30% / 0°	1
% of $U_1$	6 % / 180°	4 % / 0°	2
% of $U_1$	8 % / 180°	5 % / 0°	3
% of $U_1$	X / 180°	X / 0°	X

NOTE 1 Classes 1, 2, and 3 are defined in Annex C.

NOTE 2 The levels given for class X are open. The level has to be defined by the product committees. However, for equipment for use in public supply systems, the values must not be lower than those of class 2.

### 8.2.2 Test method “Sweep in frequencies”

Replace the entire text of this subclause by the following new text. Table 9 at the end of this subclause remains unchanged.

The equipment set-up for sweep frequency tests are shown in Figures 2 and 3. The amplitude of the sweep frequencies depends on the frequency range (see Table 9 and Figure 5). The sweep (analogue) or step rate (digital) should be such that the time taken per decade is no less than 5 min, as shown in Figure 5. The frequency sweep will dwell at frequencies where performance anomalies are detected. At each dwell point, the test time should be at least 120 s.

NOTE Anomalies can also be caused by resonances. Further details are described in Annex B.

### 8.2.4 Application of the Meister curve

Delete the first paragraph.

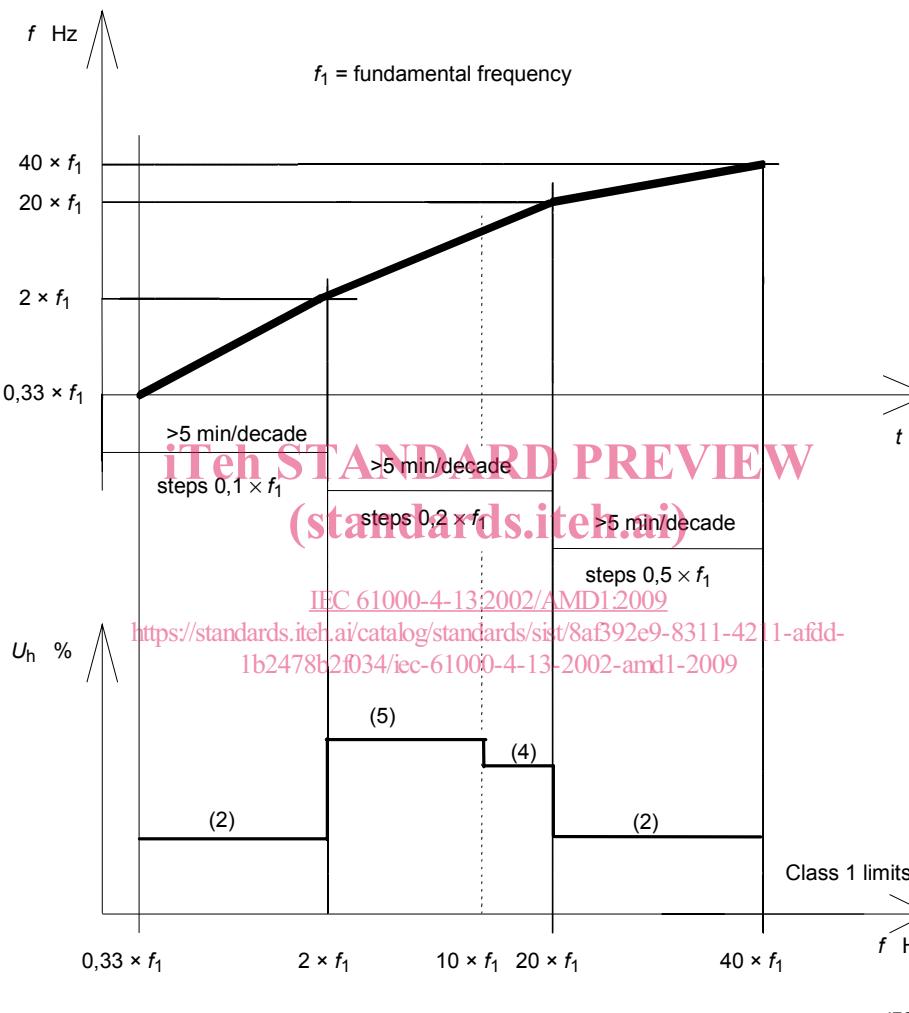
Replace the second paragraph by the following new text:

The Meister curve test is applied to Class 2 products. During this test, the sweep (analog) or step rate (digital) should be such that the time taken per decade is no less than 5 min, as shown in Figure 5.

*Delete the fourth and the fifth paragraphs (the two paragraphs below Table 11).*

**Figure 5 An example of the sweep in frequency test**

*Replace existing Figure 5 by the following new Figure:*

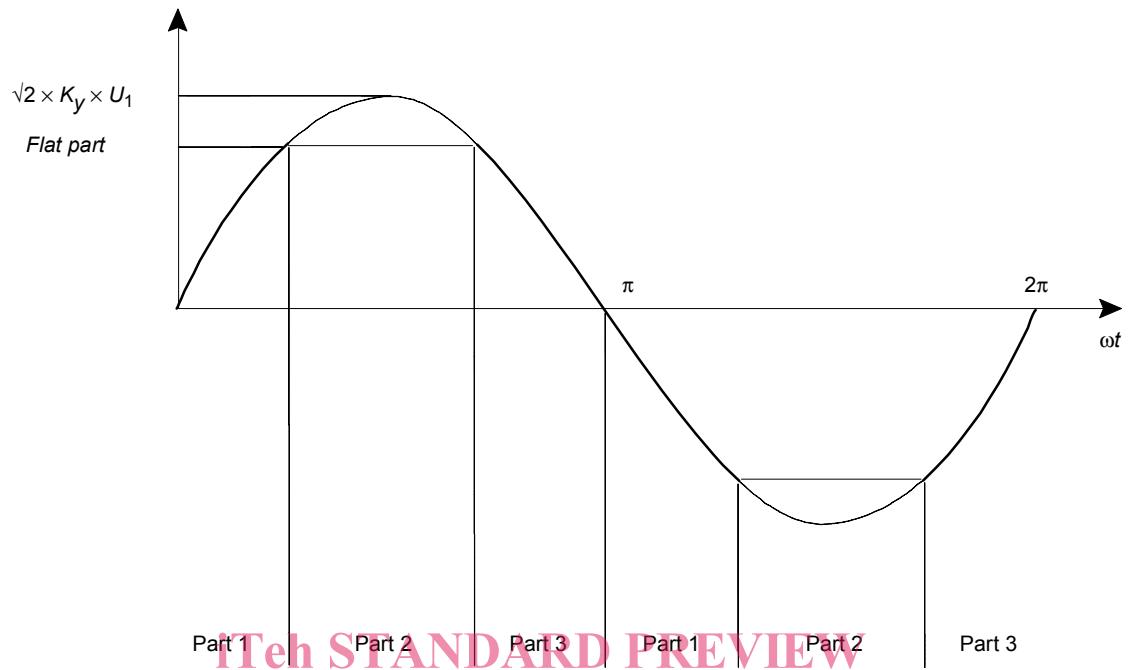


NOTE  $U_h$  = value of superimposed harmonics in %.

**Figure 5 – An example of the sweep in frequency test  
(for example class 1 equipment from Table 9)**

**Figure 6 Flat curve waveshape**

Replace the existing Figure 6 by the following new Figure:



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IEC 822/02

Examples with  $U_1 = 230$  V:

For class 1:  $K_1 = 1,013$  3

[IEC 61000-4-13:2002/AMD1:2009](https://standards.iteh.ai/catalog/standards/sist/8af392e9-8311-4211-afdd-1b2478b2f04/iec-61000-4-13-2002-amd1-2009)

<https://standards.iteh.ai/catalog/standards/sist/8af392e9-8311-4211-afdd-1b2478b2f04/iec-61000-4-13-2002-amd1-2009>

Peak voltage:  $U_1 \times K_1 \times \sqrt{2} = 329,6$  V

Voltage of flat part:  $0,95 \times U_1 \times K_1 \times \sqrt{2} = 313,1$  V

For class 2:  $K_2 = 1,037$  9

Peak voltage:  $U_1 \times K_2 \times \sqrt{2} = 337,6$  V

Voltage of flat part:  $0,9 \times U_1 \times K_2 \times \sqrt{2} = 303,8$  V

For class 3:  $K_3 = 1,111$  7

Peak voltage:  $U_1 \times K_3 \times \sqrt{2} = 361,6$  V

Voltage of flat part:  $0,8 \times U_1 \times K_3 \times \sqrt{2} = 289,3$  V

**Figure 6 – Flat curve waveshape**

## Annex B Resonance point

Replace the first and second paragraphs by the following new text. The example remains unchanged.

A resonance point for example may be assumed, if the harmonic or interharmonic current at a constant harmonic voltage amplitude reaches a maximum value at a frequency  $f_{res}$ , and the current decreases by 3 dB in the frequency range  $f_{res}$  to  $1,5 f_{res}$ . A resonance frequency can cause significant thermal disturbances. Thermal effects are not considered in this standard.

In practice, resonances appear especially at higher frequencies.