

Status of EN/IEC61000-3-2/3 and 61000-311/12 Harmonics & Flicker Standards And associated IEC61000-4-7 & IEC61000-4-15 measurement standards

EN/IEC61000-3-2 Edition 2 plus Amendment 2 (2004) – harmonic current emissions < 16 amp

Basically Edition 2 plus the amendments is equivalent to IEC/EN61000-3-2 edition 3 (2005) – in force since 2006, and to be updated in 2009.

IEC61000-3-2 refers to IEC61000-4-7 for measurement techniques, and edition 2 of that standard is in effect. IEC61000-4-7 Ed. 2 (2002) will be updated soon (FDIS is circulating) but the new version does not contain dramatic changes. The key difference vs. Edition 1, is the measurement window (200 ms) and the harmonic grouping technique. IEC61000-4-7 consolidated the changes that were made in amendment A14 to EN61000-3-2 which is commonly known as CENELEC A-14 or – within the IEC working group – it is known as the “Millennium Amendment” – as the compromise was reached during the IEC/SC77A/WG1 meeting in Rome in the year 2000.

Several amendments to IEC61000-3-2 have been issued in the last two years while other minor changes are underway. In edition 3, a new provision for Class-A equipment permits products to have harmonic emissions up to 200 % of the limit, provided they don't exceed 150 % for > 10 % of the time, and the average emissions are below 90 % of the limit. Prior to Ed. 3, there was just one evaluation criterion, in that the maximum permitted excursions are 150 % provided that the average emission level is < 100 %.

New amendments underway include an approved interpretation for self ballasted lamp testing (< 25 Watt) that properly defines the conditions for measuring conduction angles. Also, detailed test conditions for PC's, IT equipment and notebook computers (generally Class-D limits) will be included, as well as a change in the clause specifying harmonic measurement tolerances and repeatability. Changes are also being worked out for products using multi-cycle-symmetrical control as a means to control power. These MCSC methods have been used in some cooking and water heating appliances for years, but cause inter-harmonic components, which may exceed lower order even harmonics, when grouping per IEC61000-4-7 is applied.

Edition 3 of IEC61000-3-2 is available from the IEC Web store.

<http://webstore.iec.ch/webstore/webstore.nsf/artnum/035281?opendocument> (price is CHF 131)

IEC61000-4-7 specifies the measurement methods for harmonics compliance testing. The 320 ms evaluation period, used in older harmonic analyzers, is no longer permitted with the release of the upcoming version (in FDIS status). The upcoming version permits inter-harmonics analysis to be used at the discretion of the testing authority. If-and when- IEC61000-3-2 and 61000-3-12 are amended to properly cover MCSC equipment, the grouping will always be used. In addition to many editorial changes and clarifications, the upcoming version of IEC61000-4-7 includes a definition for phase angle measurements (of harmonics) and measurement provisions for equipment > 16 amp/phase (for emission measurements per IEC61000-3-12). The FDIS for the new version also includes the definition of the artificial network impedance and evaluation method for measurements in the range from 2 -9 kHz.

The existing Edition 2 is still available at the IEC Web store, while the new revision should be published in early 2008.

<http://webstore.iec.ch/webstore/webstore.nsf/artnum/029073?opendocument> (price is CHF 155)

EN/IEC61000-3-12 (Harmonics current emissions from 16 to 75 Amp per phase)

Edition 1 of IEC61000-3-12 was published in November 2004, and it is currently undergoing work in the context of the maintenance cycle. Measurement methods for IEC61000-3-12 are given in IEC61000-4-7 Ed. 2 (see above). The standard provides in essence for 3 different test classes, the most important of which is balanced 3 phase equipment. Limits are proportional to the rated current of the product, and products with a high $R_{s_{ce}}$ are permitted to have higher emissions than products with lower $R_{s_{ce}}$ values. Basically this means that the higher the short circuit current rating at the connection point is, the higher

the permitted harmonic levels are. The standard also provides limits for non-balanced 3 phase equipment, and has provisions that permit certain products to have higher harmonic emissions if the product in question exhibits a 5th harmonic with a phase angle that more or less compensates the 5th harmonic emissions from PC's and TV's.

Work is underway to amend IEC61000-3-12 in various areas. The most relevant is review of MCSC methods, and specific test conditions for certain products. In particular, it is likely that the grouping will not be done for the 2nd harmonic. It is also anticipated that test conditions for an increasing series of products will be added to IEC61000-3-12 as the standard is applied for the purpose of CE declarations of more and more products. Having EN/IEC61000-3-12 available as a method to declare conformance is in the interest of the product manufacturers, as is clearly evidenced by the manufacturers of ASD/VFD motor controls and air conditioners that are already using IEC61000-3-12.

Because of the higher power levels, bigger power sources are needed for compliance testing per IEC61000-3-12. The voltage distortion requirements are considerably more relaxed than those for tests per IEC61000-3-2 tests. The power source requirements for 61000-3-12 are also added to the upcoming IEC61000-4-7 edition.

IEC61000-3-3 Edition 1.2 (2005) and IEC61000-4-15 Edition 1.1 (2003)

This Edition 1.2 (2005) of EN61000-3-3 is a consolidation of 61000-3-3 Edition 1 plus A1:2001 and A2: 2005. The changes between the superseded version and Amendment 1 are: "dc" limit change from 3.0 to 3.3 %; "dmax" limit change for certain (hand held) equipment to 6 or 7 %, and a new evaluation method for d_{max} , that requires 24 values to be measured, delete high/low and average the remaining 22; "dt" is permitted (during start-up) to be up to 500 ms > 3.3 % vs. the older 300 ms > 3.0 % ; "rms current < 20 Amp" as an alternative measurement method for certain equipment to pass.

Measurement methods for Flicker are specified in IEC61000-4-15 edition 1.1, which supersedes IEC60868 and Amendment-1 thereto (in effect since May 1, 2004). IEC61000-4-15 will be amended soon, as the modulation/calibration tables are being corrected/updated. Although not very big, the ~ 2 % difference for some values is substantial enough to warrant a complete update. Also, the conditions under which the so called "steady state condition" exists are being defined, as this is not properly specified in the existing Edition 1.1. Other additions concerns the test for phase jumps and specific voltage change patterns for Flicker meters that are used to monitor power quality per contractual requirements between electricity suppliers and individual customers.

The consolidated IEC61000-3-3 Ed. 1.2 is available at the IEC Webstore and costs 154.00 CHF

<http://webstore.iec.ch/webstore/webstore.nsf/Standards/IEC%2061000-3-3?openDocument>

EN/IEC61000-3-11 (2000-08)

This standard has been in effect since 2003. it applies to equipment up to 75 Amp per phase. It uses the same limits as IEC61000-3-3 (and measurement per 61000-4-15) but permits the manufacturer to specify the conditions (stiff 230 V supply) under which the equipment will meet the Flicker limits of 61000-3-3.

Thus, the standard is used for compliance testing on equipment with > 16 amp/phase, but may also be used by manufacturers who's <16 amp/phase are unable to meet IEC61000-3-3. In the latter case, the manufacturer must specify under which conditions the product will meet the limits given in IEC61000-3-3, which is basically the same process that applies to higher power products. The customer must then assure that the required conditions exist at the intended location for the product.

The principal difference between IEC61000-3-11 and IEC61000-3-3 is that the standard for tests up to 75 amp per phase employs a different impedance value, called Z_{test} , as opposed to the IEC60725 Reference Impedance as used for IEC61000-3-3. The standard is available via the IEC web store.

<https://domino.iec.ch/webstore/webstore.nsf/artnum/026385> (cost is CHF 78)

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