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Connectors for electronic equipment - Tests and measurement - Part 25-1: Test 25a - Crosstalk ratio (IEC 60512-25-1:2001)

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Connectors for electronic equipment - Tests and measurements Part 25-1: Test 25a - Crosstalk ratio

(IEC 60512-25-1:2001)

Connecteurs pour équipements électroniques - Essais et mesures Partie 25-1: Essai 25a - Taux de diaphonie (CEI 60512-25-1:2001)

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC
European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 48B/1059/FDIS, future edition 1 of IEC 60512-25-1, prepared by SC 48B, Connectors, of IEC TC 48, Electromechanical components and mechanical structures for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60512-25-1 on 2001-10-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-07-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-10-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex A is normative and annex B is informative.

Endorsement notice

The text of the International Standard IEC 60512-25-1:2001 was approved by CENELEC as a European Standard without any modification.

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Connectors for electronic equipment – Tests and measurements –

Part 25-1:
Test 25a – Crosstalk ratio

International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http://www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONNECTORS FOR ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 25-1: Test 25a – Crosstalk ratio

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60512-25-1 has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

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

FDIS	Report on voting
48B/1059/FDIS	48B/1087/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annex A forms an integral part of this standard.

Annex B is for information only.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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

CONNECTORS FOR ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS–

Part 25-1: Test 25a – Crosstalk ratio

1 General

1.1 Scope and object

This part of IEC 60512 applies to interconnect assemblies, such as electrical connectors, sockets and cable assemblies.

This standard describes test procedures for measuring the magnitude of the electric and magnetic coupling between driven and quiet lines of an interconnect assembly. Both time domain (method A) and frequency domain methods (method B) for single-ended and differential transmission are described. Insertion and reference fixture techniques are also described.

1.2 Definitions

For the purpose of this part of IEC 60512, the following definitions apply.

1.2.1
drive signal
a step waveform (in the time domain) or a sinusoidal waveform (in the frequency domain)

1.2.2
crosstalk ratio
ratio of the signal coupled (induced) into the quiet signal conductor or conductor pair to the magnitude of the signal in the driven conductor or conductor pair. Both signals have the same units of either voltage or current, and the ratio may be expressed in per cent or decibels (dB)

1.2.3
near end crosstalk ratio (NEXT)
crosstalk ratio calculated on the quiet line at or in proximity to the sending (signal source) end of the driven line. This is the ratio of the near end quiet line signal amplitude to the near end driven line signal amplitude

1.2.4
far end crosstalk ratio (FEXT)
crosstalk ratio calculated on the quiet line at or in proximity to the receiving (destination) end of the driven line. This is the ratio of the far end quiet line signal amplitude to the near end driven line signal amplitude

1.2.5
measurement system rise time
rise time measured with fixture in place, without the specimen, and with filtering (or normalization). Rise time is typically measured from 10 % to 90 % levels

1.2.6
specimen environment impedance
impedance presented to the specimen signal conductors by the fixture. This impedance is a result of transmission lines, termination resistors, attached receivers or signal sources, and fixture parasitics

1.2.7
step amplitude
voltage difference between the 0 % and 100 % levels, ignoring overshoot and undershoot, as indicated in figure 1

1.2.8
isolation standard
reference fixture without a test sample and with identical crosstalk characteristics as the test fixture. This fixture may or may not be part of the test board

2 Test resources

2.1 Equipment

2.1.1 Method A, time domain

2.1.1.1 A step generator is used on the driven line and an oscilloscope monitors the quiet line. In a differential application, both shall be able to process differential signals. Typically, this means complementary outputs with provision for amplitude and skew adjustment, and dual inputs with a display of the difference and sum. Filtering or normalization shall be available for varying the rise time. A time domain reflectometer (TDR) is usually used.

NOTE The test professional should be aware of limitations of any mathematical operation(s) performed by an instrument, (e.g. normalization or software filtering).

2.1.1.2 Probes

Probes, when used, shall have suitable rise time performance and circuit loading characteristics (resistance and capacitance).

2.1.2 Method B, frequency domain

A network analyzer is preferred. When greater dynamic range is desired, a signal generator and spectrum analyzer or a vector network analyzer (for measurement with full 2-port calibration) may alternatively be used. If necessary, additional equipment to increase the measurement sensitivity (e.g. broadband output amplifiers or low-noise preamplifiers) may be used. A multi-port network analyzer with appropriate software or baluns may be used for differential measurements.

2.2 Fixture

Unless otherwise specified in the referencing document, the specimen environment impedance shall match the impedance of the test equipment. Typically, this will be 50 Ω for single-ended measurements and 100 Ω for differential.

2.2.1 Specimen conductor assignments

For each measurement, the driven and quiet lines shall be fixtured as indicated in the reference document. In the special case where the drive signal is differential and not balanced, the common mode energy shall be terminated. Adjacent signal lines to these should likewise be terminated if possible (electrically long adjacent signal lines may resonate, adding error to the results). Unless otherwise specified, a 1:1 signal-to-ground ratio (one differential pair to one ground if differential measurements are performed) shall be used with each end having all grounds commoned. For an example, see figure A.4.

2.2.2 Termination

The far end of the driven lines and both ends of the quiet line shall be terminated in the specimen environment impedance specified using one of the methods in figures A.2 and A.3. Care should be taken to minimize the reactances of the resistive terminations over the range of test frequencies.

NOTE The fixture geometry and materials may impact the measurements due to the fixture parasitics. Usually, the product's intended use dictates the most meaningful way to fixture it.

2.2.3 Crosstalk

It is not usually possible to separate fixture crosstalk from that of the specimen. Also, where ground currents are combined in a fixture conductor, common impedance coupling will occur that will add to the actual crosstalk. The reference document should specify the fixture so that its crosstalk contribution is minimized and termination impedances are duplicated. When this is not specified, these contributions should be small compared to the actual specimen crosstalk.

NOTE Since the test board footprint or cable assembly termination technique can significantly impact the crosstalk, it is recommended that an isolation standard (for measuring fixture crosstalk) be included in the fixture.

2.2.4 Insertion technique fixture

The fixture shall be designed to allow measurement of crosstalk with and without the specimen, see figure A.1. If baluns are used for a balanced measurement, or minimum loss pads used for impedance matching, see figures A.2 and A.3, these are included in the fixture.

2.2.5 Reference fixture technique

In this technique, a separate fixture that combines both near end and far end is used for the fixture crosstalk measurement. This fixture shall be a duplicate of the specimen fixture, only without the specimen. Traces, if used, shall include fixture connectors, vias, bends and corners. If baluns are used for a balanced measurement, or minimum loss pads used for impedance matching, see figures A.2 and A.3, these are included in the fixture.