SLOVENSKI STANDARD
SIST EN 2591-403:2001

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Aerospace series - Elements of electrical and optical connection - Test methods - Part 403: Sinusoidal and random vibration

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Luft- und Raumfahrt - Elektrische und optische Verbindungselemente - Prüfverfahren - Teil 403: Sinus- und rauschförmige Schwingungen

Série aérospatiale - Organes de connexion électrique et optique - Méthodes d'essais - Partie 403: Vibrations sinusoidales et aléatoires

Ta slovenski standard je istoveten z: **EN 2591-403:1998**

ICS:

49.060	Letalska in vesoljska elektriļ na oprema in sistemi	Aerospace electric equipment and systems

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This European Standard was approved by CEN on 23 February 1998.

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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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 2591-403:1998 E

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 1999, and conflicting national standards shall be withdrawn at the latest by February 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies a method of determining the ability of elements of connection to withstand sinusoidal or random vibrations of specified severities.

It shall be used together with EN 2591.

2 Normative references

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.

EN 2591	Aerospace series - Elements of electrical and optical connection - Test methods - General
EN 2591-101	Aerospace series - Elements of electrical and optical connection - Test methods - Part 101: Visual examination
EN 2591-201	Aerospace series - Elements of electrical and optical connection - Test methods - Part 201: Contact resistance - Low level
EN 2591-202	Aerospace series - Elements of electrical and optical connection - Test methods - Part 202: Contact resistance at rated current
EN 2591-204	Aerospace series - Elements of electrical and optical connection - Test methods - Part 204: Discontinuity of contacts in the microsecond range
EN 2591-408	Aerospace series - Elements of electrical and optical connection - Test methods - Part 408: Mating and unmating forces [1)]

3 Preparation of specimens

3.1 Specimens shall be prepared according to the technical specification.

3.2 Unless specified in the technical specification, the following details shall be stated:

- mounting method, type of cable and definition of specimen wiring;
- specimens mated or unmated and fitted with protective covers (if applicable);
- number of mating and unmating operations (if applicable);
- type of accessories to be fitted on specimens;
- initial measurements and requirements, (if applicable);
- fixing points of sensors on specimens (if applicable);
- test severity:
  1) sinusoidal or random vibration curve (method A figure 1 or method B figure 2 or 3);
  2) temperature (maximum, minimum and ambient);
  3) duration;
- mating and unmating forces;
- applicable contact resistance test (EN 2591-201 or EN 2591-202);
- final measurements (if applicable).

1) Published as AECMA Prestandard at the date of publication of this standard

4 Apparatus

When the vibration apparatus is loaded with a mass equivalent to that of the specimens, the characteristics required for the test installation shall meet the requirements of methods A or B.

4.1 Sinusoidal vibration

4.1.1 Basic motion

It shall be sinusoidal and such that the fixing points of the specimens are moving substantially in phase, in straight parallel lines.

4.1.2 Transverse motion

The maximum vibration amplitude at the fixing points in any direction perpendicular to the intended direction (including any other motion) shall not exceed 25 % of the specified amplitude.

4.1.3 Distortion

The total harmonic factor at the fixing points of the specimens related to the specified basic driving amplitude shall not exceed 25 %. The value distortion rate shall be noted.

4.1.4 Vibration amplitude tolerances

The amplitude measured at the control point closest to the fixing points in the required direction shall not exceed the specified value by:

- ± 15 % in the frequency range where displacement amplitude is specified;
- ± 10 % in the frequency range where acceleration amplitude is specified.

4.1.5 Frequency tolerances

Measurement of frequency for determination of resonant frequencies shall be carried out with a tolerance of ± 0,5 % or ± 0,5 Hz, whichever is the greater.

4.1.6 Sweep method

The sweep shall be continuous and logarithmic and the sweep rate shall be approximately one octave per minute. For determination of resonant frequencies, the sweep may be temporarily stopped but any dwell time shall be considered in the test duration.

4.2 Random vibration

4.2.1 Power spectral density curves

The output of the vibration apparatus shall be presented graphically as power-spectral density in relation to the frequency. The power spectral density values shall be within the following limits:

- between 40 % and – 30 % (± 1,5 dB) of the specified value from lower-specified frequency up to 1 000 Hz;
- between 100 % and – 50 % (± 3 dB) of the specified value from 1 000 Hz up to the upper specified frequency.

Filter bandwidth shall be a maximum of 1/3 octave or preferably shall have a frequency of 25 Hz.

4.2.2 Distribution curve

A probability density distribution curve may be determined and compared with a Gaussian distribution curve. This test curve shall not differ from the Gaussian curve by more than 10 % of the maximum value.

4.2.3 Vibration measurements

They shall be carried out on the vibration generator and on the installation test. If specified, measurements on the specimens shall be carried out during the test.

4.2.4 Vibration monitoring

The vibration magnitude shall be monitored as near as possible to the specimen fixing points to confirm compliance with the specified vibration curve at all measuring points.

Acceleration in the transverse direction measured at the specimen fixing points shall be limited to 100 % of the applied vibration.

The vibration generator shall produce random excitation that possesses a Gaussian amplitude distribution. The peak value of acceleration shall be limited to three times the r.m.s. value (three-sigma limit).

The specimens shall be vibrated in each of the three axes perpendicular between them, one axis being parallel to the coupling axis.

Unless otherwise specified measurements to EN 2591-204 (Method B) shall be carried out on contacts and (if applicable) the shielding connection.

No discontinuity higher or equal to 1 µs shall be observed. Discontinuities lower than 1 µs are admissible provided their repetition rate does not exceed 1 Hz.

5 Method

5.1 Initial measurements (if applicable)

They shall be carried out as specified.

5.2 Severity

5.2.1 Sinusoidal vibration (method A)

The test severity is given by the combination of four parameters: frequency range, vibration amplitude, test duration and temperature.

5.2.1.1 Frequency range

5 Hz to 3 000 Hz.

5.2.1.2 Vibration amplitude

The values are given in figure 1.

Below certain frequencies known as cross-over frequencies, amplitudes are at constant displacement, whilst above these frequencies amplitudes are at constant acceleration.

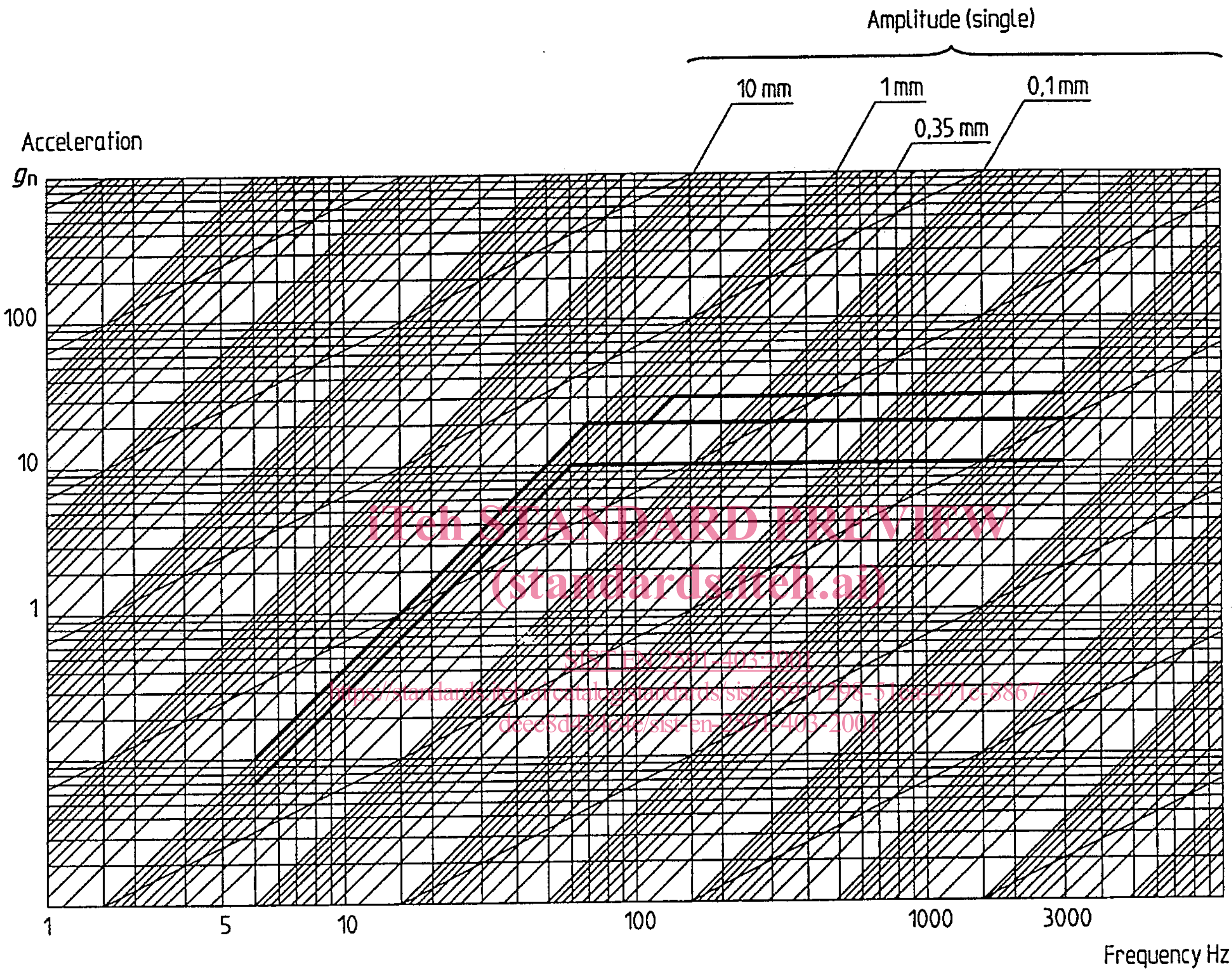

Figure 1: Sinusoidal vibrations

5.2.1.3 Test duration

The entire frequency range of 5 Hz to 3 000 Hz and return to 5 Hz shall be swept in 20 min. This cycle shall be performed 12 times in each of three axes so that test duration shall be approximately 12 h.

5.2.2 Random vibration (method B)

The test severity is given by a combination of spectral shape, spectral density, duration and temperature.

5.2.2.1 Spectral shape and density

See figure 2 and table 1 or figure 3 and table 2.

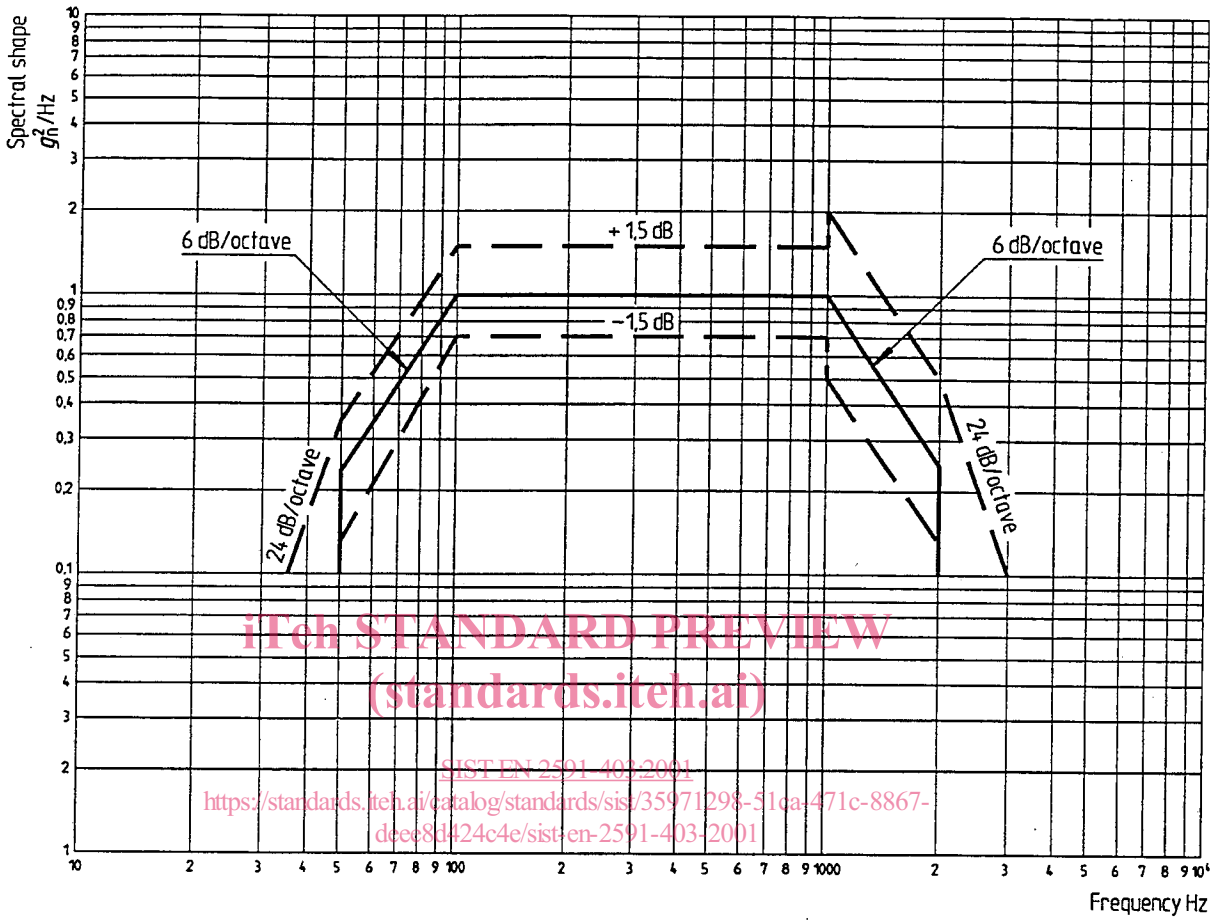

Figure 2: Spectral shape (lower noise r.m.s. values)

Table 1

Characteristics		
Level	Power spectral density	Noise r.m.s. value m/s²
A	0,02	51
B	0,04	72
C	0,06	88
D	0,1	114
E	0,2	161
F	0,3	196
G	0,4	226
H	0,6	278
J	1	359
K	1,5	439