

Basic environmental testing procedures —

Part 2.1 Tests

Test Fd — Random vibration — wide band general requirements

(This part should be read in conjunction with Part 1.1 General and it is recommended that reference be made to Part 2.1Fda, Part 2.1Fdb or Part 2.1Fdc as required)

UDC [621.37/.39.001.4]:620.169.1:620.178.53:539.433

© BSI 03-1999
Draft for comment 69/23643

ISBN 0 580 07507 9

Amendments issued since publication

Amd. No.	Date	Comments
	June 1984	Indicated by a sideline in the margin

Contents

	Page
Foreword	ii
1 Object	1
2 Mounting and control	1
2.1 Mounting of specimen	1
2.2 Reference and control points	1
3 Severities	1
3.1 Frequency ranges	1
3.2 Acceleration spectral density spectrum levels	2
3.3 Duration of conditioning	2
4 Degrees of reproducibility	2
4.1 Tolerances characterizing the degrees of reproducibility	2
4.2 Choice of reproducibility	2
5 Sinusoidal vibration	3
5.1 Frequency response measurement	3
5.2 Resonance search	3
6 Initial measurements	3
7 Conditioning	3
8 Final measurements	4
9 Information required in the relevant specification	4
Appendix A Considerations upon which the test is based	8
Figure 1 — Acceleration spectral density spectrum and tolerance limits	7
Table 1 — Frequency ranges	2
Table 2 — Tolerance limits for true acceleration spectral density and true total r.m.s. acceleration	3
Table 3 — Acceleration spectral density and related sinusoidal amplitude	3
Table 4 — Total r.m.s. acceleration values	5

Foreword

This British Standard, incorporating Amendment No. 1 published in 1977 and Amendment No. 2 published in 1984, is technically equivalent to IEC Publication 68-2-34:1973 “*Basic environmental testing procedures, Part 2: Tests — Test Fd: Random vibration wide band — General requirements*”, published by the International Electrotechnical Commission (IEC).

Random vibration testing is a complicated matter and the total volume of the specification is, therefore, considerable. The layout of the test methods and the testing philosophy upon which they are based are therefore given in this foreword.

Layout of the test methods

In order to facilitate its use, the material is split up into four sections, each being a separate publication in the BS 2011 series, as follows.

BS 2011-2.1, *Test Fd Random vibration: wide band, general requirements.*

BS 2011-2.1, *Test Fda Random vibration: wide band, reproducibility high.*

BS 2011-2.1, *Test Fdb Random vibration: wide band, reproducibility medium.*

BS 2011-2.1, *Test Fdc Random vibration: wide band, reproducibility low.*

Each of the last three publications forms a complete test method with recommended confirmation procedures contained in its appendices.

All the information required by the relevant specification writer is therefore contained in Test Fd General, whilst that needed by the test engineer is contained in Tests Fda, Fdb and Fdc, whichever is specified. (See also Appendix A).

Whilst the relevant specification writer need only read Test Fd General requirements and the test engineer the specified Test Fda, Fdb or Fdc, it is strongly recommended that all users read BS 2011-2.1Fd and that part of BS 2011 Test Fd containing the reproducibility required.

Testing philosophy

A certain degree of reproducibility is required of British Standard test methods, especially for tests included in qualification or acceptance procedures and intended to be used on the same types of specimens by different authorities, such as a supplier or purchaser of electronic components.

The word Reproducibility, as used in this document, does not mean a reproducibility relationship between the test and the real environment: it is intended to describe the achievement of similar results when the test is run at different locations by different people.

The great difference in effort required to meet the different tolerance values in the severity level and to confirm the validity of the test has resulted in the introduction of the three degrees of Reproducibility (see Clause 4). Within each degree of Reproducibility a choice of confirmation method may be made, taking into consideration both the dynamic characteristics of the test specimen and the availability of test equipment.

The relevant specification shall state the Reproducibility appropriate to the particular need, leaving the choice of confirmation method to the testing laboratory. The tolerances have been so chosen that for a particular Reproducibility each confirmation method should produce approximately equivalent results.

The demand for reproducibility requires control of the vibration level within narrow frequency bands. Although narrow band equalization will be found to give better reproducibility than broad band systems, it permits the specimen little opportunity to react with the test environment. Broad-band equalization, however, allows resonance within the specimen to modify the test level so that peaks and notches can occur. In service, the real environment will generally contain peaks and notches due to the reaction of the specimen with its environment. It is unlikely, however, that these will coincide with the peaks and notches occurring in the test laboratory.

The relevant specification may prescribe, for information purposes, a narrow band analysis to succeed a test of Reproducibility Low which otherwise conforms to this procedure.

Only considerable experience of random vibration testing can enable the test engineer to make the best use of the test equipment available and it cannot be stressed too strongly that if random vibration testing is to achieve the degree of realism that justifies its introduction, engineering judgment must be allowed in its application. This applies to such things as the choice of confirmation method and fixture design, as well as to the general interpretation of results.

It should be noted that two terms of particular importance to the subject of random vibration testing are referred to frequently throughout the text of this publication. They are defined here to ensure that the text is made as clear as possible to the reader.

Acceleration spectral density (hereinafter abbreviated to A.S.D.) is the spectral density of an acceleration variable and is given in units of acceleration squared per unit frequency.

A.S.D. spectrum defines the way the A.S.D. varies within the frequency range.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 9 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.