

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Classification of environmental conditions –
Part 2-9: Environmental conditions appearing in nature – Measured shock and
vibration data – Storage, transportation and in-use**

**Classification des conditions d'environnement –
Partie 2-9: Conditions d'environnement présentes dans la nature – Données de
chocs et de vibrations mesurées – Stockage, transport et utilisation**



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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope and object.....	6
2 Normative references	6
3 General	6
3.1 Introductory remarks	6
3.2 Storage	7
3.3 Transportation	7
3.3.1 Road	7
3.3.2 Rail.....	7
3.3.3 Air	8
3.3.4 Sea.....	8
3.4 In-use	8
4 Shock and vibration data	9
5 Description of the methods	9
5.1 General.....	9
5.2 ASD envelope method	9
5.3 Normal tolerance limit method.....	10
5.4 Product axis.....	11
5.4.1 Known axis	11
5.4.2 Unknown axis	12
5.5 Factoring for variables and unknowns	12
Annex A (informative) Worked example	13
A.1 Envelope curve	13
A.2 NTL curve calculation	13
A.3 Processing of the envelope curve and NTL curve.....	13
Annex B (informative) Method to smooth and envelop an environmental description spectrum.....	15
B.1 Original data	15
B.2 Octave averaging.....	15
B.3 Averaging method.....	15
B.4 Standard slope curves	16
B.5 Comparison of envelope and NTL curves.....	17
Bibliography.....	19
Figure A.1 – Comparison of curves 1 to 5 and the envelope curve 7 and 95/50 NTL curve 6	14
Figure B.1 – 95/50 NTL envelope of data.....	15
Figure B.2 – 95/50 NTL envelope of data.....	16
Figure B.3 – 1/3 octave averaged with standard slopes	17
Figure B.4 – Comparison of curves with increasing normal tolerance factors C	18
Table 1 – Normal tolerance factors, C.....	11
Table A.1 – Example of five hypothetical curves for random vibration	13
Table A.2 – Calculation for the five hypothetical curves	14

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –**Part 2-9: Environmental conditions appearing in nature –
Measured shock and vibration data –
Storage, transportation and in-use**

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International Standard IEC 60721-2-9 has been prepared by IEC technical committee 104: Classification of environmental conditions.

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

FDIS	Report on voting
104/630/FDIS	104/632/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 2.

A list of all parts in the IEC 60721 series, published under the general title *Classification of environmental conditions*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

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INTRODUCTION

This part of IEC 60721 is intended as part of the strategy for defining an environmental description from measured data acquired at multiple locations whilst a product is either in storage, being transported or in-use at weather or non-weather protected locations. This measured data is normally in the form of acceleration versus time records. This, in turn, will then allow appropriate severities to be chosen from the IEC 60068-2 series [1]¹ of shock and vibration test methods. Environmental levels given in IEC 60721-3 [2] should then be applied, having been updated based upon the strategy described in this standard.

More detailed information may be obtained from specialist documentation, some of which is given in the bibliography.

¹ Numbers in square brackets refer to the Bibliography.

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –

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1 Scope and object

This part of IEC 60721 is intended to be used to define the strategy for arriving at an environmental description from measured data when related to a product's life cycle.

Its object is to define fundamental properties and quantities for characterization of storage, transportation and in-use shock and vibration data as background material for the severities to which products are liable to be exposed during those phases of their lifecycle.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

None.

3 General

3.1 Introductory remarks

Shock and vibrations measured in storage, transportation platforms and in-use locations can vary considerably from a basic sinusoidal character to pure random, which itself may or may not be normally distributed. If it is the latter, it can be reasonably assumed that the process is a sum of normally distributed random waves of differing amplitudes mixed in a complex manner.

Rarely can a real world environment be classified purely as a sinusoidal vibration and is normally associated with a discrete excitation mechanism such as rotating machinery, aero engines, propellers and is normally mixed with an associated random vibration process. It is then necessary for the specification writer to decide whether to conduct a random vibration test only or to perform one of the mixed mode tests.

Associated with the vibration environment for each life-cycle stage is, potentially, a shock environment which may produce much higher acceleration levels in certain circumstances. Generally speaking, the frequency content for these shocks is contained within the 0 Hz to 200 Hz bandwidth for, say, transportation, assuming that the packaged product is firmly secured to the transport platform base and is not therefore 'bouncing around'. However, much higher frequencies, maybe in the kHz range, may be present in the in-use stage, again dependent upon the real world scenario.

The process described below is for a random vibration environment, since it is probably the most common form of test conducted. Any statement made therefore about the random process should be interpreted as applying to the alternative process. However, it can equally be applied to the shock environment by calculating the shock response spectrum and conducting the same process on this spectrum as for an acceleration spectral density (ASD)