GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 29.280
S 35

GB/T 21563-2008 / IEC 61373:1999

Railway applications - Rolling stock equipment - Shock and vibration tests

(IEC 61373:1999, IDT)

轨道交通 机车车辆设备

冲击和振动试验

Issued on: March 24, 2008 **Implemented on: November 1, 2008**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine;

Standardization Administration Committee.

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Foreword

This Standard is identical with IEC 61373:1999 *Railway applications - Rolling stock equipment - Shock and vibration tests*.

This Standard is an equivalent translation of IEC 61373:1999.

For ease of use, this Standard makes the following editorial changes:

- Modified “this international standard” to “this Standard”;
- Used decimal point “.” to replace the comma “,” that acts as decimal point;
- Deleted the foreword of the international standard.

Annex A, Annex B, Annex C and Annex D of this Standard are informative.

This Standard was proposed by and shall be under the jurisdiction of National Technical Committee on Electric Traction Equipment And Systems of Standardization Administration of China.

The drafting organizations of this Standard: Zhuzhou CSR Times Electric Co., Ltd., CSR Sifang Locomotive Co., Ltd..

Main drafters of this Standard: Mao Yuanqi, Yan Wu, He Danlu.

Railway applications - Rolling stock equipment - Shock and vibration tests

1 Scope

This Standard specifies the requirements for testing items of equipment intended for use on railway vehicles which are subsequently subjected to vibrations and shock owing to the nature of railway operational environment. To gain assurance that the quality of the equipment is acceptable, it has to withstand tests of reasonable duration that simulate the service conditions seen throughout its expected life.

Simulated long-life testing can be achieved in a number of ways each having their associated advantages and disadvantages, the following being the most common:

a) amplification: where the amplitudes are increased and the time base decreased;

b) time compression: where the amplitude history is retained and the time base is decreased (increase of the frequency);

c) decimation: where time slices of the historical data are removed when the amplitudes are below a specified threshold value.

The amplification method as stated in a) above, is used in this Standard and together with the publications referred to in Clause 2; it defines the default test procedure to be followed when vibration testing items for use on railway vehicles. However, other standards exist and may be used with prior agreement between the manufacturer and the customer. In such cases test certification against this Standard will not apply. Where service information is available tests can be performed using the method outlined in Annex A. If the levels are lower than those quoted in this Standard, equipment is partially certified against this Standard (only for service conditions giving functional test values lower than or equal to those specified in the test report).

Whilst this Standard is primarily concerned with railway vehicles on fixed rail systems, its wider use is not precluded. For systems operating on pneumatic tyres, or other transportation systems such as trolleybuses, where the level of shock and vibration clearly differ from those obtained on fixed rail systems, the supplier and customer can agree on the test levels at the tender stage. It is

Annex B

(Informative)

Guidance for export of design level from random vibration test data

B.1 Introduction

During the design process, it is necessary to take measure to prevent equipment / part failure in vibration test or later normal operation. This Annex provides the calculation formula of vibration excitation amplitude for design calculation. It also provides guidance on how to select random input value in accordance with this Standard. An working example is listed in the end. Finally, the basic formula is given in general form. An approximate formula is derived based on Single Degree of Freedom (SDOF) system in this Annex.

Therefore, the design engineer has responsibility to choose a critical vibration mode (SDOF system) to evaluate mechanical integrity of the design.

The calculation process described in this Annex is only for reference, not as requirement of contract.

Suppliers and buyers shall be fully aware that evaluation on mechanical integrity requires a certain degree of engineering judgment.

The Annex does not exclude the need of design or additional experimental research, so as to comply with special contract or environmental requirements.

B.2 Purpose

Equipment is likely to be in shock during operation. Therefore, information related to vibration degree is essential when calculating mechanical strength. When there is no such information, this guidance shall provide replacement method of deriving designed vibration excitation data in accordance with this Standard. Thus, the design engineer shall be able to calculate stress, force or acceleration response, so as to determine the fatigue damage. However, this Standard does not involve special design method.

Although this Annex does not discuss shock calculation, it is recommended that the design engineer can consider the shock excitation level of this Standard.

B.3 Definition

Peak factor: ratio of peak vibration on time domain to r.m.s. value.

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