UDC 629.113.01:620.178.5

JIS

JAPANESE INDUSTRIAL STANDARD

Vibration testing methods for automobile parts

JIS D 1601--1995

Translated and Published

by

Japanese Standards Association

Printed in Japan

In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

UDC 629. 113. 01: 620. 178. 5

JAPANESE INDUSTRIAL STANDARD J I S

Vibration testing methods for automobile parts

D 1601-1995

1. Scope This Japanese Industrial Standard specifies the vibration testing methods for automobile parts (hereafter referred to as "parts").

2. Classification of tests The tests shall be classified as follows:

(1) Resonance frequency detection test This test is designed to determine the resonance frequency of each part.

(2) Vibration function test This test is designed to check the function of each part under vibrational conditions.

(3) Vibration endurance test This test is designed to determine the durability of each part against the vibration of a constant frequency.

(4) Sweep vibration endurance test This test is designed to determine the durability of each part against vibration, the frequency of which is increased and decreased continuously at a constant rate.

3. Classification of vibrational conditions The vibrational conditions for the vibration function test and the vibration endurance test shall be classified as follows:

(1) The vibrational conditions for the parts shall be classified as follows by type of automobiles to which they are installed:

Type 1 : Those mainly for passenger car parts

Type 2 : Those mainly for bus parts

Type 3 : Those mainly for motortruck parts

Type 4 : Those mainly for motorcycle parts

(2) The vibrational conditions for the parts shall be classified as follows by position of installation:

Class A : Those for the parts to be installed on the body or on the springs of the suspension system, which are subject to a relatively low degree of vibration.

Class B : Those for the parts to be installed on the body or on the springs of the suspension system, which are subject to a relatively high degree of vibration.

Class C : Those for the parts to be installed on the engine structure, which are subject to a relatively low degree of vibration.

Class D : Those for the parts to be installed below the springs of the suspension system or on the engine structure, which are subject to a relatively high degree of vibration.

The examples of the products, to which the classification of vibrational conditions has been applied, are given in Informative reference Table 1.

4. Test conditions

4.1 Order of tests The tests shall be carried out in the order of the resonance frequency detection test, vibration function test, and vibration endurance test or sweep vibration endurance test. However, the resonance frequency detection test and vibration function test may be made simultaneously, or the resonance frequency detection test, vibration function test and sweep vibration endurance test may also be made so.

4.2 Mounting of the parts Each of the parts shall, as a rule, be mounted on the vibration base in a manner that approximates to its actual service.

4.3 Operation of the parts The tests shall be made under the actual operational conditions as a rule.

4.4 Application of vibration Simple harmonic motion shall be applied to the mounted part orthogonally in vertical, transverse and longitudinal directions in the order. However, the relative harmonic content (1) of the simple harmonic motion shall, as a rule, be 25 % or less in terms of vibration acceleration.

Note (1) Calculate the relative harmonic content of the simple harmonic motion as follows:

(1) The vibration acceleration $\pm a$ (m/s^2) caused by sine-wave vibration shall be calculated from the following formula:

$$a = Kf^2A \times 10^{-3}$$

where, $K = 2\pi^2 \fallingdotseq 19.74$

f : frequency (Hz)

A : total amplitude (mm)

(2) The relative harmonic content k (%) of the simple harmonic motion shall be calculated from the following formula:

$$k = \sqrt{\frac{a_2^2 + a_3^2 + a_4^2 \cdots\cdots}{a_1^2}} \times 100$$

where, a_1 : fundamental vibration wave acceleration (m/s^2)

$a_2, a_3, a_4 \cdots$: vibration acceleration of the second, third, fourth, ... vibration waves (m/s^2)

4.5 Detection of vibration acceleration The vibration acceleration of the parts shall, as a rule, be detected at the actual positions of service. However, the measurement may be taken on the vibration base.

5. Testing methods

5.1 Resonance frequency detection test method The resonance frequency of part shall be detected by continuously increasing and decreasing the frequency at a constant rate within the frequency range chosen from Table 1 in accordance with the type of the part to be tested.

Table 1. Frequency range division

Division	Frequency range (2) Hz	Informative reference (4)		
		Period (3) min	Vibration acceleration m/s^2	Total amplitude mm (max.)
50	5 to 50	10	5 to 45	0.4
100	5 to 100			
200	5 to 200			
400	5 to 400			
1000	5 to 1000			
2000	5 to 2000			

Notes (2) The lower limit of frequency may be agreed upon between the parties concerned with delivery.

(3) The period of time required to reciprocate once between the minimum frequency and the maximum frequency.

(4) The numerical values of the period, the vibration acceleration and the total amplitude, when being too great or too small, will make the detection of resonance difficult. These values, therefore, are given here for informative reference only.

5.2 Vibration function test method The frequency of vibration shall be within the same vibration range as that of Table 1 and the function of parts shall be tested at the vibration acceleration of the stage selected from Table 2. However, when deemed necessary, the vibration acceleration may be agreed upon between the parties concerned with delivery.