

JIS

JAPANESE INDUSTRIAL STANDARD

Vibration characteristics of railway
rolling stock--Measuring methods

JIS E 4023-1990

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Translated

by

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Vibration characteristics of railway
rolling stock—Measuring methods

1. Scope

This Japanese industrial standard specifies the measuring methods of vibration characteristics such as vibration acceleration, frequency, etc. in the car body of passenger-carrying cars during operation.

- Remarks
1. The passenger-carrying cars specified in this standard shall be mainly the passenger carrying electric car, passenger-carrying internal combustion railcar and passenger car for ordinary railway as well as the rolling stocks to be used for suspended type railway, straddled type railway and guide rail type railway.
 2. The applicable standard for this standard is shown in the following.
JIS E 4001 glossary of terms for railway rolling stock
 3. The units and numerical values given in brackets { } in this standard are in accordance with the traditional system of units and are appended for informative reference.

2. Definitions

For the purpose of this standard, the following definitions apply. Other terms and definitions are given in JIS E 4001.

- (1) Steady acceleration in lateral direction In the case where the rolling stock runs through a curved section, the component parallel to car body floor of the acceleration in lateral direction generated steadily at the circular curved part. In the case where the inclination angle of the car body is small, it may be represented by formula (1) approximately as shown in Fig. 1.

$$a_H = a_C - g \cdot \phi \dots \dots \dots (1)$$

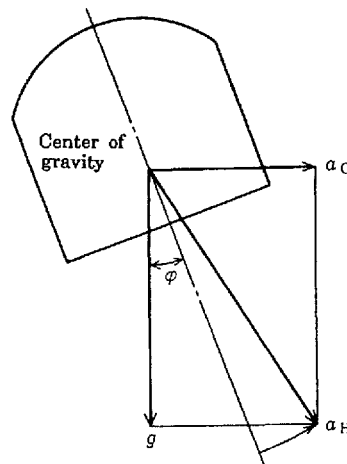
where, a_H : steady acceleration in lateral direction (m/s^2)

a_C : acceleration of centrifugal force (m/s^2)

g : acceleration of gravity (m/s^2)

ϕ : inclination angle of car body (rad)

Fig. 1. Steady acceleration in lateral direction



Remarks: The arrow marks indicate the positive direction.

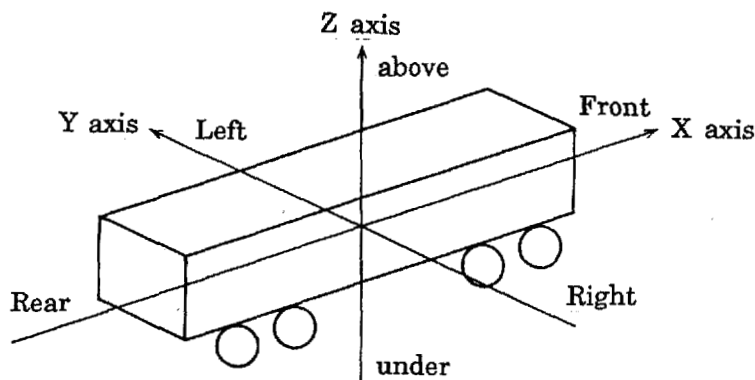
- (2) Vibration in longitudinal direction The linear vibration in the direction of the longitudinal axis⁽¹⁾
- (3) Vibration in lateral direction The linear vibration in the direction of the lateral axis⁽²⁾
- (4) Vibration in vertical direction The linear vibration in the direction of the vertical axis⁽³⁾
- (5) Rolling Rotational vibration around the longitudinal axis⁽¹⁾
- (6) Pitching Rotational vibration around the lateral axis⁽²⁾
- (7) Yawing Rotational vibration around the vertical axis⁽³⁾

Notes ⁽¹⁾ X axis directing to advancing direction of car body and parallel to car body floor surface as shown in Fig. 2.

⁽²⁾ Y axis perpendicular to advancing direction of car body and parallel to car body floor surface as shown in Fig. 2.

⁽³⁾ Z axis vertical to car body floor surface as shown in Fig. 2.

Fig. 2. Coordinate axes



3. Items to be measured

The items to be measured shall be as follows.

- (1) Vibration acceleration of vibration in vertical direction
- (2) Frequency of vibration in vertical direction
- (3) Vibration acceleration of vibration in lateral direction
- (4) Frequency of vibration in lateral direction
- (5) Vibration acceleration of vibration in longitudinal direction
- (6) Frequency of vibration in longitudinal direction
- (7) Steady acceleration in lateral direction
- (8) Frequency of rolling
- (9) Angle of rolling
- (10) Angular velocity of rolling
- (11) Frequency of yawing
- (12) Frequency of pitching

Remarks: The items to be executed with measurement shall be agreed between the parties concerned with delivery.

4. Measuring conditions

The measuring conditions shall be as follows.

- (1) Specimen rolling stock shall be in the state of empty car⁽⁴⁾.

Note⁽⁴⁾ Except for the measuring personnel and measuring apparatus.

- (2) The track shall be in the state maintained ordinarily.
- (3) The running velocity shall be up to the maximum operating velocity determined by taking into consideration the state of permanent way and electric overhead line in section agreed between the parties concerned with delivery and the structure of rolling stock.