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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 45159.6-2025

**Mechanical vibration and shock - Characterization of the
dynamic mechanical properties of visco-elastic materials - Part
6: Time-temperature superposition**

机械振动与冲击 黏弹性材料动态力学性能的特征 第6部分：时温叠加

(English Translation)

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents"

Drafting.

This document is Part 6 of GB/T 45159 "Characterization of dynamic mechanical properties of viscoelastic materials subject to mechanical vibration and shock".

GB/T 45159 has published the following parts.

- Part 1: Principles and guidelines;
- Part 2: Resonance method;
- Part 3: Cantilever shear beam method;
- Part 4: Dynamic stiffness method;
- Part 5: Poisson's ratio based on comparison of measurement and finite element analysis;
- Part 6: Time-temperature superposition.

This document is equivalent to ISO 18437-6:2017 "Mechanical vibration and shock - Characterization of dynamic mechanical properties of viscoelastic materials - Part 6 Division. Time-temperature superposition.

Introduction

GB/T 45159 provides three methods for measuring the elastic modulus and loss factor of viscoelastic materials, and two methods for measuring Poisson's ratio.

The operating principle, measuring device, measurement and data analysis of the method are presented, thus providing a measurement method for characterizing the dynamic mechanical properties of viscoelastic materials.

It consists of 6 parts.

--- Part 1: Principles and guidance. The purpose is to describe three methods for measuring the elastic modulus and loss factor of viscoelastic materials, and Two methods for measuring Poisson's ratio are presented, along with the test setup, measurement range, and limitations of each method.

--- Part 2: Resonance method. The purpose is to describe the technical requirements for the resonance method to test the dynamic mechanical properties of viscoelastic materials.

--- Part 3: Cantilever shear beam method. The purpose is to describe the cantilever shear beam method for testing the dynamic mechanical properties of viscoelastic materials.

Technical regulations.

--- Part 4: Dynamic stiffness method. The purpose is to describe the technical requirements for the dynamic mechanical properties characterization of viscoelastic materials using the

dynamic stiffness method.

--- Part 5: Poisson's ratio based on comparison of measurement and finite element analysis. The purpose is to describe the Poisson's ratio based on comparison of measurement and finite element analysis.

Poisson's ratio test is a technical provision for characterizing the dynamic mechanical properties of viscoelastic materials.

--- Part 6: Time-temperature superposition. The purpose is to describe the technical requirements for characterizing the dynamic mechanical properties of viscoelastic materials using time-temperature superposition tests.

Mechanical vibration and shock Dynamic mechanics of viscoelastic materials
Characterization of properties Part 6: Time-temperature superposition

1 Scope

This document describes the use of GB/T 45159.1~GB/T 45159.5, ISO 6721-4~ISO 6721-7, and ISO 6721-12.

measurement methods and data collection and analysis methods.

This document applies to viscoelastic materials whose thermorheological properties are simple and for which the equilibrium state has been tested at each temperature.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

ISO 18437-1 Mechanical vibration and shock - Characterization of the dynamic mechanical properties of viscoelastic materials - Part 1: Principles and guidance (Me-Note. GB/T 45159.1-2025 Mechanical vibration and shock - Characterization of dynamic mechanical properties of viscoelastic materials - Part 1: Principles and guidance (ISO 18437-1:2012, IDT)

3 Terms and Definitions

For the purposes of this document, the terms and definitions defined in ISO 18437-1 and the following apply.

dynamic viscoelastic function Basic viscoelastic properties, namely storage modulus and

loss modulus measured in tension, shear and compression, as well as as a function of frequency and temperature loss factor.

Storage modulus storage modulus M' Real part of the complex modulus.

Note 1 to entry. A measure of the energy stored and recovered during cyclic loading.

Note 2: The storage moduli of tension, shear and compression are expressed as E' , G' and K' respectively.

Note 3: The unit is Pascal (Pa).

[Source. ISO 472:2013[1], 2.998] 3.3 Loss modulus M'' Imaginary part of the complex modulus.

Note 1 to entry. A measure of energy lost (dissipated) during cyclic loading.