

Translated English of Chinese Standard: GB/T41739-2022  
[www.ChineseStandard.net](http://www.ChineseStandard.net) → Buy True-PDF → Auto-delivery.  
[Sales@ChineseStandard.net](mailto:Sales@ChineseStandard.net)

**GB**

NATIONAL STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA

ICS 77.040.99

CCS Y 80

**GB/T 41739-2022**

---

**Test method for dimensional stability of metal matrix  
composites - Thermal-cold cycling method**

金属基复合材料尺寸稳定性检测方法 冷热循环法

**Issued on: October 12, 2022**

**Implemented on: February 01, 2023**

---

**Issued by: State Administration for Market Regulation;  
Standardization Administration of the People's Republic of China.**

## Table of Contents

|                                        |   |
|----------------------------------------|---|
| Foreword .....                         | 3 |
| 1 Scope .....                          | 4 |
| 2 Normative references .....           | 4 |
| 3 Test principle.....                  | 4 |
| 4 Samples .....                        | 4 |
| 5 Test devices and test procedure..... | 5 |
| 6 Test results .....                   | 7 |
| 7 Test report.....                     | 8 |

# Test method for dimensional stability of metal matrix composites - Thermal-cold cycling method

## 1 Scope

This document specifies the test principle, samples, test devices and test procedure, test results, and test report for real-time detection of the dimensional stability of metal matrix composites using the thermal-cold cycle.

This document applies to the determination for dimensional stability of aluminum matrix composites (thermal-cold cycling temperature range: 20 °C ~ 150 °C), magnesium matrix composites (thermal-cold cycling temperature range: 20 °C ~ 150 °C) and iron matrix composites (thermal-cold cycling temperature range: 20 °C ~ 490 °C).

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 4339, Test methods for thermal expansion characteristic parameters of metallic materials

JC/T 2250, Fused silica

## 3 Test principle

This document uses a single-push-rod or double-push-rod thermal dilatometer, with the help of a quartz differential component of the same stable material, to measure the length variation of the metal matrix composite at 20 °C before the first cycle and after each thermal-cold cycle (among 15 thermal-cold cycles in total). The push rod transmits the variation in sample length to the sensor, and the shape and size of the push rod shall ensure that the load is applied to the sample.

## 4 Samples

### 4.1 Sample cutting and processing

Samples shall be cut mechanically at room temperature (15 °C ~ 25 °C).

The requirements for the measuring device for length variation are as follows:

- a) The measurement range of length variation shall be 0 mm ~ 2.5 mm, and the resolution shall not be lower than  $10^{-6}$  mm;
- b) Use a constant temperature water bath to keep the temperature of the measuring device for length variation stable; the temperature variation shall not be greater than  $\pm 0.5$  °C.

### **5.1.3 Heating and cooling device**

The requirements for the heating and cooling device are as follows:

- a) No matter which heating or cooling method is used, the temperature shall be controlled;
- b) Either the heating device or the cooling device shall have a uniform temperature zone greater than the sample length, and the maximum temperature difference in the uniform temperature zone shall not be greater than 2 °C;
- c) The heating and cooling rate of the sample shall be 5 °C/min.

### **5.1.4 Temperature measuring device**

The temperature measurement accuracy of the thermocouple is  $\pm 0.2$  °C.

### **5.1.5 Control system**

The control system shall be able to set different temperature programs during the test and be able to perform automatic control. The control system shall be able to detect the shielding gas flow of the test system in real time. When the requirements of the test system cannot be met, the control system shall be able to automatically cut off the power.

### **5.1.6 Data collecting and processing system**

The data collecting and processing system shall be able to continuously and automatically collect the data of the test temperature and length variation in the whole process, and be able to perform data analysis, calculation, drawing and correction.

## **5.2 Device calibration**

The device has to be calibrated and then re-calibrated every six months.

High-purity fused silica standard samples are used for device calibration. The test conditions and procedures used for device calibration, such as temperature history, ambient atmosphere, shall be the same as those used for testing samples. The obtained length variation shall be used as the baseline value, which is used to correct the experimental results during data analysis.

**This is an excerpt of the PDF (Some pages are marked off intentionally)**

**Full-copy PDF can be purchased from 1 of 2 websites:**

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, [Sales@ChineseStandard.net](mailto:Sales@ChineseStandard.net)

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

**----- The End -----**