

ICS 77.040.10

CCS H 22



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

GB/T 42914-2023

**Test method for the fracture toughness of aluminium alloy
products**

铝合金产品断裂韧性试验方法

Issued on: August 6, 2023

Implemented on: March 1, 2024

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

1 Scope	1
2 Normative reference documents	1
3 Terms and Definitions	1
4 Method Overview	1
5 Test conditions	2
6 Instruments and Equipment	2
6.1 Testing machine	2
6.2 Fatigue pre-crack equipment	2
6.3 Extensometer	2
6.4 Test fixture	3
6.5 Anti-warping device	5
7 Plane strain fracture toughness test method	5
7.1 Sample	5
7.2 Test Step	15
7.3 Test data processing	18
7.4 Result processing and result presentation	20
8 Plane stress fracture toughness test method	22
8.1 Test method using centrally cracked specimen	22
8.2 Test method using compact tensile specimens	31
8.3 Result processing and result presentation	34
9 Test Report	34
9.1 Plane strain fracture toughness test	34
36 Reference	38

Foreword

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document was drafted by: Southwest Aluminum (Group) Co., Ltd., National Standard (Beijing) Inspection and Certification Co., Ltd., Nonferrous Metal Technology Economic Research Institute Co., Ltd., Chinalco Materials Application Research Institute Co., Ltd., Northeast Light Alloy Co., Ltd., Tianjin Zhongwang Aluminum Co., Ltd. Company, Guangxi Nannan Aluminum Processing Co., Ltd., Youyan Engineering Technology Research Institute Co., Ltd., Shanghai Aviation Materials Structure Testing Co., Ltd., Shandong Nanshan Aluminum Co., Ltd., China Ordnance Equipment Group No.

59 Research Institute Co., Ltd., CRRC Qingdao Sifang Rolling Stock Co., Ltd. Co., Ltd., Central South University, Shanghai Jiao Tong University. The main drafters of this document. Xiao Hong, Wu Lei, Ge Lixin, Chen Jie, Peng Zhujun, Qian Weifeng, Hu Tianlong, Song Zixun, Wei Xiuxun, Yan Lizhen, Liu Jianzhong, Chen Wen, Song Wencheng, Wang Hui, Wang Chou, Deng Yunlai, Xu Jijin. Test method for fracture toughness of aluminum alloy products

1 Scope

China's national test method for the fracture toughness of aluminium alloy products. Fracture toughness is the property that says how large a crack a material will tolerate before it fails suddenly, and for aerospace aluminium it is a design allowable of the same standing as strength. The reason is damage tolerance: an aircraft structure is designed on the assumption that cracks exist, from manufacture or from fatigue, and that they will be found by inspection before they become critical. That approach only works if the critical size is known and is large enough to be detectable, which is exactly what toughness determines. It also runs directly against strength - the heat treatments that raise an aluminium alloy's yield strength generally lower its toughness - so the selection of temper for a wing skin or a fuselage frame is a deliberate compromise, and it needs a measured number rather than a nominal one.

This document describes a test method for the fracture toughness of aluminum alloy products. This document is applicable to the plane strain fracture of aluminum alloy rolled plates, extruded bars, extruded plates, extruded pipes, extruded profiles and forging products. Determination of fracture toughness and plane stress fracture toughness.

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document.

GB/T 8170 Numerical rounding rules and expression and determination of limit values

GB/T 10623 Terminology for mechanical properties testing of metal materials

GB/T 12160-2019 Calibration of extensometer systems for uniaxial testing of metallic materials

GB/T 16825.1-2022 Inspection and calibration of static uniaxial testing machines for metallic materials Part

1. Tensile and/or pressure testing Inspection and Calibration of Inspection Machine Force Measuring System JJG475 electronic universal testing machine JJG556 axial force fatigue testing machine JJG762 extensometer JJG1063 Electro-hydraulic servo universal testing machine

3 Terms and definitions

The terms and definitions defined in GB/T 10623 apply to this document.

4 Method overview

Fatigue cracks were preformed on specimens with machined notches through cyclic loading, and specimens with sharp cracks were subjected to stress perpendicular to the crack plane. When pulling force, the crack tip will undergo a small range of plastic deformation. Usually, the plastic zone of the crack tip of the sample includes the internal plane strain zone and the surface. Plane stress zone. If the thickness of the sample is small enough, the plane strain zone can be ignored, the crack tip is approximately in a plane stress state, and the plane strain can be measured. Surface stress fracture toughness, the proportion of plane strain zone increases with the increase of sample thickness. When the sample thickness increases to a certain extent, the crack tip The end is approximately in a plane strain state, and the plane strain fracture toughness can be measured. Fracture toughness tests are divided into two categories.

---Plane stress fracture toughness test. measured using a central crack specimen or a compact tensile specimen with a width-to-thickness ratio greater than

4 Plane stress fracture toughness (KC), apparent plane stress fracture toughness (Kapp) or crack propagation resistance strength factor of aluminum alloy materials sub(KR);

---Plane strain fracture toughness test. Determination of aluminum alloy materials using compact tensile specimens with a ratio of width to thickness between 2 and 4