



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

GB/Z 41107.3-2021

**Destructive tests on welds in metallic materials - Hot cracking
tests for weldments - Arc welding processes - Part 3: Externally
loaded tests**

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Standardization Administration**

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foreword

2021 is consistent with the presentation (see Chapter 4, Chapter 5, 6:3);

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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 of Standardization Documents"

drafted:

This document is part 3 of GB/T (Z) 41107 "Arc Welding Method for Destructive Testing of Welds of Metal Materials for Hot Crack Test"

point: GB/T (Z)41107 has released the following parts:

--- Part 1: General;

--- Part 2: Self-restraint test;

--- Part 3: External load test:

This document uses the redrafted method to modify the use of ISO /T R17641-3:2005 "Hot cracking of weldments for destructive testing of welds in metallic materials"

Pattern Test Arc Welding Methods Part 3: External Load Test:

This document has technical differences compared with ISO /T R17641-3:2005, and the clauses involved in these technical differences have been adopted on the outside

The vertical single line (|) at the margin position is marked, and the corresponding technical differences and their reasons are as follows:

a) ISO 17641-1:2004 (see Chapter 3) is replaced by GB/T 41107:1 modified to adopt international standards;

b) Added the symbol and description of the critical compression displacement "CCD" (see Chapter 4);

- c) Added the symbol and description of bending strain epsilon (see Chapter 4);
- d) The symbols and descriptions of SS and SV are deleted (see Chapter 4);
- e) Changed the description of "Vcrit" from "critical strain to produce the first thermal crack" to "critical tension to produce the first thermal crack" rate" (see Chapter 4);
- f) Added the symbol and description of VPVR (see Chapter 4);
- g) Changed the name of the test, from "flat plate tensile test" to "programmed flat plate tensile test", in accordance with the test method GB/T 41107:1-

2021 is consistent with the presentation (see Chapter 4, Chapter 5, 6:3);

- h) Modified the index for evaluating solidification cracks by hot tensile test in Table 2, from "BTR" to "CCD" (see Chapter 5);
- i) Changed the symbol of the sample length in Figure 1, from "a" to "l" (see 6:1:2);
- j) added a description of the result processing of Method A (see 6:1:5);
- k) The formula and related descriptions of bending strain are added (see 6:2:3);
- l) Added example Figure 4b) about crack inspection results (see 6:2:4):

The following editorial changes have also been made to this document:

- Change "ductility recovery temperature (DTR)" in the description of "BTR" in Table 1 to "ductility recovery temperature (DRT)" (see Chapter 4);
- Change the welding rate symbol from "Ws" to "Vw" to be consistent with the test (see Chapter 4);
- Change the "Rm" unit in Figure 2 from "N/mm²" to "MPa" (see 6:1:5);
- Change the position of the transverse axis of 500/510 from the corresponding 0.5% bending strain to the corresponding 1% bending strain (see 6:2:4);
- Change the symbol from "Vcr" to "Vcrit" (see 6:3:3, 6:3:4);
- Added Appendix A "The Legend of Adjustable Restraint Test Device and Use of Auxiliary Bending Plates" (informative):

Please note that some content of this document may be patented: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

Hot cracks in the heat affected zone of the weld metal and base metal are one of the most common defects in arc welding: Cracks affect the safety of welded parts

Use, in most codes and standards, any type of detectable cracks are not allowed, therefore, countries are working on research and development of thermal

Crack-insensitive welding consumables and base metals, and welding processes designed to reduce or eliminate the risk of hot cracking: At the same time, a variety of

Test methods for thermal crack susceptibility of metallic weldments (including weld consumables, base metals, and welded joints) are also being developed:

GB/T (Z)41107 "Arc Welding Method for Destructive Testing of Welds of Metal Materials for Hot Crack Test" is a guide for hot cracking of weldments in my country:

Basic and generic document for striae testing: GB/T (Z) 41107 aims to establish the terminology, basic principles and tests applicable to hot crack testing

type, which consists of three parts:

--- Part 1: General: A brief introduction to hot crack testing terminology, basic principles, test types, test overview, and test applications

The regulations aim to provide the corresponding basic information for the testing personnel:

--- Part 2: Self-restraint test: Specifications for specimen dimensions, specimen requirements and test procedures for self-restrained thermal crack tests are intended to

Provide inspectors with relevant technical information on thermal crack self-restraint testing:

--- Part 3: External load test: For thermal tensile test, adjustable restraint test and transverse adjustable restraint test, program-controlled flat plate tensile test

Specifications for specimen size, specimen preparation, test procedures and evaluation methods for thermal crack testing under external load

Provides technical information on thermal crack external load testing:

Destructive testing of welds in metallic materials

Arc welding method for hot crack test of weldments

Part 3: External load test

1 Scope

This document specifies external load thermal cracks such as thermal tensile test, adjustable restraint test, transverse adjustable restraint test, and program-controlled flat plate tensile test:

Test specimen dimensions, specimen preparation, test procedures and evaluation methods:

This document applies to the assessment of hot crack susceptibility of austenitic stainless steels, nickel and nickel-based alloys, nickel-copper alloy base metals and welding consumables: If the contract

Both parties have agreed that this document may also be used for reference to other materials such as aluminum alloys and high-strength steels:

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, dated citations

documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to

this document:

GB/T 41107:1 Arc Welding Method for Destructive Test Welds of Metal Materials - Part 1: General Provisions

(GB/T 41107:1-2021, ISO 17641-1:2004, MOD)

3 Terms and Definitions

The terms and definitions defined in GB/T 41107:1 apply to this document:

4 Symbols and Abbreviations

The symbols and abbreviations in Table 1 apply to this document:

Table 1 Symbols and abbreviations and descriptions

Symbol/Abbreviation	Description	Unit
	hot tensile test	
BTR	Brittleness temperature range, the difference between zero strength temperature (NST) and ductile recovery temperature (DRT)	°C
CCD	critical compression displacement, the minimum displacement required to apply controllable compression to ensure no more cracking	mm
DRR	Ductility recovery rate, ratio of area shrinkage difference $[(Z(2)-Z(3))/(Z(1)-Z(3))]\times 100$ (see Figure 2)	%
DRT	ductility recovery temperature, the temperature at which the area shrinkage Z recovers to 5% in the "cooling" tensile test	degrees C