

---

---

**Corrosion of metals and alloys —  
Stress corrosion testing —**

Part 9:  
**Preparation and use of pre-cracked  
specimens for tests under rising load  
or rising displacement**

*Corrosion des métaux et alliages — Essais de corrosion sous  
contrainte —*

*Partie 9: Préparation et utilisation des éprouvettes préfissurées pour  
essais sous charge croissante ou sous déplacement croissant*

ISO 7539-9:2021

<https://standards.iteh.ai/catalog/standards/iso/71a2e376-96c6-4c15-85c6-1f5ea1086bfe/iso-7539-9-2021>



**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO 7539-9:2021](https://standards.iteh.ai/catalog/standards/iso/71a2e376-96c6-4c15-85c6-1f5ea1086bfe/iso-7539-9-2021)

<https://standards.iteh.ai/catalog/standards/iso/71a2e376-96c6-4c15-85c6-1f5ea1086bfe/iso-7539-9-2021>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword .....	iv
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Principle .....</b>	<b>2</b>
<b>5 Specimens .....</b>	<b>3</b>
5.1 General .....	3
5.2 Specimen design .....	4
5.3 Stress intensity factor considerations .....	11
5.4 Specimen preparation .....	15
5.5 Specimen identification .....	17
<b>6 Initiation and propagation of fatigue cracks .....</b>	<b>18</b>
<b>7 Procedure .....</b>	<b>19</b>
7.1 General .....	19
7.2 Environmental considerations .....	20
7.3 Environmental chamber .....	20
7.4 Environmental control and monitoring .....	21
7.5 Selection of initial $K$ value prior to dynamic loading .....	22
7.6 Determination of $K_{ISCC}$ .....	22
7.6.1 General .....	22
7.6.2 Determination schedule .....	22
7.6.3 Validation of test results .....	24
7.7 Determination of crack velocity .....	25
<b>8 Test report .....</b>	<b>25</b>
<b>Annex A (informative) Determination of a suitable displacement rate for determining <math>K_{ISCC}</math> from constant displacement rate tests .....</b>	<b>27</b>
<b>Annex B (informative) Determination of crack growth velocity .....</b>	<b>29</b>
<b>Annex C (informative) Information on indirect methods for measuring crack length (see also ISO 21153) .....</b>	<b>30</b>
<b>Bibliography .....</b>	<b>32</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 7539-9:2003), which has been technically revised.

The main change compared to the previous edition is as follows: the formula for K in [Figure 9](#) has been corrected.

A list of all parts in the ISO 7539 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Corrosion of metals and alloys — Stress corrosion testing —

## Part 9:

# Preparation and use of pre-cracked specimens for tests under rising load or rising displacement

## 1 Scope

**1.1** This document specifies procedures for designing, preparing and using pre-cracked specimens for investigating the susceptibility of metal to stress corrosion cracking (SCC) by means of tests conducted under rising load or rising displacement. Tests conducted under constant load or constant displacement are dealt with in ISO 7539-6.

The term “metal” as used in this document includes alloys.

**1.2** Because of the need to confine plasticity at the crack tip, pre-cracked specimens are not suitable for the evaluation of thin products such as sheet or wire and are generally used for thicker products including plate, bar, and forgings. They can also be used for parts joined by welding.

**1.3** Pre-cracked specimens can be stressed quantitatively with equipment for application of a monotonically increasing load or displacement at the loading points.

**1.4** A particular advantage of pre-cracked specimens is that they allow data to be acquired from which critical defect sizes, above which stress corrosion cracking can occur, can be estimated for components of known geometry subjected to known stresses. They also enable rates of stress corrosion crack propagation to be determined.

**1.5** A principal advantage of the test is that it takes account of the potential impact of dynamic straining on the threshold for stress corrosion cracking.

**1.6** At sufficiently low loading rates, the threshold stress intensity factor for susceptibility to stress corrosion cracking,  $K_{ISCC}$ , determined by this method can be less than or equal to that obtained by constant load or displacement methods and can be determined more rapidly.

## 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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7539-6, *Corrosion of metals and alloys — Stress corrosion testing — Part 6: Preparation and use of precracked specimens for tests under constant load or constant displacement*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7539-6 as well as the following apply.