

This is a preview of "ISO 12107:2012". [Click here to purchase the full version from the ANSI store.](#)

Second edition  
2012-08-15

---

---

## **Metallic materials — Fatigue testing — Statistical planning and analysis of data**

*Matériaux métalliques — Essais de fatigue — Programmation et  
analyse statistique de données*



Reference number  
ISO 12107:2012(E)

© ISO 2012

This is a preview of "ISO 12107:2012". [Click here to purchase the full version from the ANSI store.](#)



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

This is a preview of "ISO 12107:2012". Click here to purchase the full version from the ANSI store.

## Contents

Page

Foreword .....	iv
Introduction .....	v
1 Scope .....	1
1.1 Objectives .....	1
1.2 Fatigue properties to be analysed .....	1
1.3 Limit of application .....	1
2 Normative references .....	1
3 Terms and definitions .....	2
3.1 Terms related to statistics .....	2
3.2 Terms related to fatigue .....	3
4 Statistical distributions in fatigue properties .....	3
4.1 Concept of distributions in fatigue .....	3
4.2 Distribution of fatigue life .....	4
4.3 Distribution of fatigue strength .....	5
5 Statistical planning of fatigue tests .....	5
5.1 Sampling .....	5
5.2 Allocation of specimens for testing .....	6
6 Statistical estimation of fatigue life at a given stress .....	6
6.1 Testing to obtain fatigue life data .....	6
6.2 Plotting data on normal probability paper .....	6
6.3 Estimating distribution parameters .....	7
6.4 Quantitative evaluation of the assumption of normality .....	7
6.5 Estimating the lower limit of the fatigue life .....	7
7 Statistical estimation of fatigue strength at a given fatigue life .....	8
7.1 Testing to obtain fatigue strength data .....	8
7.2 Statistical analysis of test data .....	8
7.3 Estimating the lower limit of the fatigue strength .....	9
7.4 Modified method when standard deviation is known .....	9
8 Statistical estimation of the $S-N$ curve .....	9
8.1 Introduction .....	9
8.2 Estimation of regression parameters .....	13
8.3 Analysis approach .....	15
8.4 Calculation of the lower tolerance limit .....	21
8.5 Experimental plan for the development of $S-N$ curves .....	22
9 Test report .....	22
9.1 Presentation of test results .....	22
9.2 Fatigue strength at a given life .....	22
9.3 $S-N$ curve .....	23
Annex A (informative) Examples of applications .....	24
Annex B (informative) Statistical tables .....	34
Bibliography .....	36

This is a preview of "ISO 12107:2012". [Click here to purchase the full version from the ANSI store.](#)

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 12107 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 5, *Fatigue testing*.

This second edition cancels and replaces the first edition (ISO 12107:2003), which has been technically revised.

This is a preview of "ISO 12107:2012". [Click here to purchase the full version from the ANSI store.](#)

## Introduction

It is known that the results of fatigue tests display significant variations even when the test is controlled very accurately. In part, these variations are attributable to non-uniformity of test specimens. Examples of such non-uniformity include slight differences in chemical composition, heat treatment, surface finish, etc. The remaining part is related to the stochastic process of fatigue failure itself that is intrinsic to metallic engineering materials.

Adequate quantification of this inherent variation is necessary to evaluate the fatigue property of a material for the design of machines and structures. It is also necessary for test laboratories to compare materials in fatigue behaviour, including its variation. Statistical methods are necessary to perform these tasks. This International Standard includes a full methodology for application of the Bastenaire model as well as other more sophisticated relationships. It also addresses the analysis of runout (censored) data.