First edition
2012-07-01

Metallic materials — Verification of the alignment of fatigue testing machines

Matériaux métalliques — Vérification de l'alignement axial des machines d'essai de fatigue

Reference number
ISO 23788:2012(E)

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
Web www.iso.org

Published in Switzerland

Contents

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 23788 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 5, *Fatigue testing*.

Introduction

Machine alignment in the context of this International Standard means the coincidence of the geometrical (loading) axes of the grips. Any departure from this ideal situation results in an angular and/or lateral offset (or misalignment) in the load train (see Annex A). Misalignment is manifested as an unwanted bending stress/strain field to exist in the test specimen or alignment measuring device (hereinafter “alignment cell”). The bending stress/strain field superimposes on the applied, presumed uniform, stress/strain field. In pure torsion testing, any misalignment results in a biaxial torsion plus bending stress/strain state.

Misalignment in the load train in axial fatigue test systems has been shown to influence significantly the fatigue test results (see References [1], [2] and [3]).

The main causes of bending due to misalignment are invariably a combination of

— poor coincidence of the centrelines of the grips, and

— inherent imperfections in the specimen or alignment cell itself.

The bending contribution due to the test machine ideally remains the same for every test specimen or alignment cell. The bending contribution due to the specimen or alignment cell varies from one device to another.

Recent research (see References [4] and [5]) has shown that no matter how carefully a specimen or an alignment cell device has been manufactured an inherent bending error always exists. Imperfections (i.e. eccentricity and angularity) arise from geometric asymmetry about the axial centreline in the device and other measurement errors relating to the chosen type, positioning and performance of the strain gauges. The device inherent bending error can be significant and sometimes even exceed that due to the machine misalignment.

In this International Standard, errors due to inherent imperfections in the alignment cell itself are eliminated. This is achieved by rotating the alignment device 180° about its longitudinal axis and subtracting its contribution from the overall maximum surface bending strain determined in the measurement. Different devices that are made of the same material and nominal dimensions should reasonably, therefore, produce the same alignment measurement results; see an example in Reference [2], Figure 10.