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Temperature verification method applied to dynamic fatigue testing

Méthode de vérification de la température appliquée aux essais de fatigue dynamique

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Foreword

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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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 164, *Mechanical Testing of Metals*, Subcommittee SC 05, *Fatigue, fracture and toughness testing*.

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.

Introduction

It is the aim of this document to provide methodologies to verify the error in indicated measurement relative to the actual temperature of the specimen test piece. Therefore, it is essential to account for all factors, inclusive of environmental effects; not limiting the assessment to, for example, the performance of a recording system and the thermoelectric coefficient of a batch of thermocouple wire.

Certain types of test and advanced simulation rely on accurately controlled and rapidly changing temperature during the test, usually synchronised with control of mechanical loading. Within the scope of this document, that would usually be a thermo-mechanical fatigue test.

Where temperature varies deliberately and rapidly during the test, it is appropriate to verify the degree of time lag in system temperature reading. Without this evaluation (and implicitly a correction) then either the apparent temperature accuracy or the phase accuracy may need to be unnecessarily reduced.

This document has been written with the intention of using congruent language and approach to that used for calibration of extensometers[1] and verification of force measurement[2][3].

Temperature verification method applied to dynamic fatigue testing

1 Scope

This document establishes verification procedures to determine the accuracy, speed of response, and stability of temperature measurement for materials testing equipment. These procedures are specified for the expected use in fatigue tests on metals where these characteristics are important to the fidelity of tests at high or varying temperature.

The principles set out include sufficient provision for both contacting and non-contacting methods of temperature measurement.

This document is for the end-to-end verification of registered value compared with “true” specimen temperature at the point of measurement. It cannot be used to specify the correct method or location of measurement.

NOTE The methodologies could be found applicable to test types beyond mechanical fatigue of metals, but that is outside the remit of this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply .

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
test system
equipment used to perform the (fatigue) test during which this temperature measurement is to be utilised.

Note 1 to entry: This includes the gripping or fixtures, a representative specimen, the heating system (all parts which influence the measurement), measurement conditioning device (e.g. thermocouple conditioning system), data recording device and software.

Note 2 to entry: This verification is expected to take place on a complete test system, but it does not strictly require the presence of the load frame provided that all parts influencing the specimen environment are held in a representative configuration.

Note 3 to entry: The operating environment of the test system should be considered as part of the verification, because changes in temperature of conditioning electronics can affect the measurement, especially if the cold junction of a thermocouple or the detector array of a thermo-optical device is not at constant temperature.

Note 4 to entry: to entry:: Good laboratory conditions would typically be maintained by some form of climate control, but that is not always possible and it does not guarantee to prevent local problems for specific instruments.