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Mechanical vibration — Rotor balancing —

Part 11: Procedures and tolerances for rotors with rigid behaviour

Vibrations mécaniques — Équilibrage des rotors —

Partie 11: Modes opératoires et tolérances pour rotors à comportement rigide

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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).

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).

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For an explanation on 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.

The committee responsible for this document is ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 2, *Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures*.

This first edition cancels and replaces ISO 1940-1:2003, which has been technically revised. The main changes are deletion of the terms and definitions which were transferred to ISO 21940-2 and a more pronounced explanation of the application of permissible residual unbalances for the processes of balancing a rotor and verifying its residual unbalance. Information on specification of unbalance tolerances based on vibration limits has been removed.

It also incorporates the Technical Corrigendum ISO 1940-1:2003/Cor 1:2005.

A list of parts in the ISO 21940 series can be found on the ISO website.

Introduction

Rotor balancing is a procedure by which the mass distribution of a rotor (or part or module) is checked and, if necessary, adjusted to ensure the unbalance tolerance is met. This document covers the balancing of rotors with rigid behaviour. A rotor is said to be rigid when the flexure of the rotor caused by its unbalance distribution can be neglected with respect to the agreed unbalance tolerance at any speed up to the maximum service speed. For these rotors, the resultant unbalance, and often moment unbalance, are of interest, which when combined are expressed as a dynamic unbalance of the rotor.

The balancing machines available today enable residual unbalances to be reduced to very low limits. Therefore, it is necessary to specify an unbalance quality requirement for a balancing task, as in most cases it would not be cost-effective to reduce the unbalance to the limits of the balancing machine.

In addition to specifying an unbalance tolerance, it is necessary to consider the errors introduced by the balancing process. This document takes into account the influence of these errors to distinguish clearly between the specified permissible residual unbalance and the reduced residual unbalance values to be achieved during the balancing process.

Mechanical vibration — Rotor balancing —

Part 11: Procedures and tolerances for rotors with rigid behaviour

1 Scope

This document establishes procedures and unbalance tolerances for balancing rotors with rigid behaviour. It specifies

a) the magnitude of the permissible residual unbalance,

b) the necessary number of correction planes,

c) the allocation of the permissible residual unbalance to the tolerance planes, and

d) how to account for errors in the balancing process.

NOTE In ISO 21940-14, the assessment of balancing errors is considered in detail. Fundamentals of rotor balancing are contained in ISO 19499 which gives an introduction to balancing.

This document does not cover the balancing of rotors with flexible behaviour. Procedures and tolerances for rotors with flexible behaviour are dealt with in ISO 21940-12.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21940-2 apply.

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

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

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

4 Pertinent aspects of balancing

4.1 General

Rotor balancing is a procedure by which the mass distribution of a rotor is examined and, if necessary, adjusted to ensure that the residual unbalance or vibration in service is within specified limits. It should be noted that the vibration in service can originate from sources other than unbalance.

Rotor unbalance can be caused by design, material, manufacturing and assembly. Every rotor has an individual unbalance distribution along its length, even in series production.

4.2 Representation of the unbalance

For a rotor with rigid behaviour, different vectorial quantities can be used to represent the same unbalance as shown in Figure 1.