

Mechanical vibration — Balance quality requirements of rigid rotors

Part 2. Balance errors

ICS 21.120.40

National foreword

This British Standard reproduces verbatim ISO 1940-2 : 1997 and implements it as the UK national standard.

The UK participation in its preparation was entrusted by Technical Committee GME/21, Mechanical vibration and shock, to Subcommittee GME/21/5, Vibration and balancing of machines, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or by using the 'Find' facility of the BSI Standards Electronic Catalogue.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii and iii, a blank page, pages 1 to 16, an inside back cover and a back cover.

Amendments issued since publication

Amd. No.	Date	Text affected

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 October 1997

© BSI 1997

ISBN 0 580 28713 0

INTERNATIONAL STANDARD

ISO
1940-2

First edition
1997-06-15

Mechanical vibration — Balance quality requirements of rigid rotors —

Part 2: Balance errors

*Vibrations mécaniques — Exigences en matière de qualité
dans l'équilibrage des rotors rigides —*

Partie 2: Défauts d'équilibrage



Reference number
ISO 1940-2:1997(E)

AVA Documents
Document Sharing Hub

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.

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.

International Standard ISO 1940-2 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 1, *Balancing, including balancing machines*.

ISO 1940 consists of the following parts, under the general title *Mechanical vibration — Balance quality requirements of rigid rotors*:

- *Part 1: Determination of permissible residual unbalance*
- *Part 2: Balance errors*

Annexes A to C of this part of ISO 1940 are for information only.

Descriptors: vibration, rotors, rigid rotors, balancing, error analysis.

Introduction

The balance quality of a rigid rotor is assessed during the balancing operation in accordance with ISO 1940-1 by the measurement of residual unbalance. This measurement may contain errors which originate from a number of sources. It is therefore necessary to consider the errors involved. Where experience has shown that these are significant they should be taken into account when defining the balance quality of the rotor. ISO 1940-1 does not deal with balance errors in detail, and especially not with the assessment of balance errors, therefore this part of ISO 1940 gives examples of typical errors that can occur and provides recommended procedures for determining them. In addition generalized methods for evaluating the residual unbalance in the presence of balance errors are described.

Mechanical vibration — Balance quality requirements of rigid rotors —

Part 2: Balance errors

1 Scope

This part of ISO 1940 covers the following:

- identification of errors in the balancing process of rigid rotors;
- assessment of errors;
- guidelines for taking errors into account;
- the evaluation of residual unbalance in any two correction planes.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1940. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1940 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1925:1990, *Mechanical vibration — Balancing — Vocabulary*.

ISO 1925:1990/Amd.1:1995, *Amendment 1 to ISO 1925:1990*.

ISO 1940-1:1986, *Mechanical vibration — Balance quality requirements of rigid rotors — Part 1: Determination of permissible residual unbalance*.

ISO 2953:1985, *Balancing machines — Description and evaluation*.

3 Definitions

For the purposes of this part of ISO 1940, the definitions given in ISO 1925 (and its Amendment 1) apply.

4 Sources of balance errors

Balance errors may be classified into one of the following groups:

- a) systematic errors, in which the amount and angle can be evaluated either by calculation or by measurement;
- b) randomly variable errors, in which the amount and angle vary in an unpredictable manner for a number of measurements carried out under the same conditions;
- c) scalar errors, in which the maximum amount can be evaluated or estimated, but the angle is indeterminate.

Depending on the manufacturing processes used, the same error may be placed in one or more of the above categories.

Examples of the sources of errors which may occur are listed in 4.1, 4.2 and 4.3. Some of these errors are discussed in greater detail in annex A.

4.1 Systematic errors

The following are examples of the sources of systematic errors.

- a) Inherent unbalance in the drive shaft of the balancing machine.
- b) Inherent unbalance in the mandrel.
- c) Radial and axial runout in the drive element on the rotor shaft axis.
- d) Radial and axial runout in the rotor fit for components or in the mandrel (see subclause 5.3).
- e) Lack of concentricity between journals and support surfaces used for balancing.
- f) Radial and axial runout of rolling element bearings which are not the service bearings and which are used to support the rotor in the balancing machine.
- g) Radial and axial runout of rotating races (and their tracks) of rolling element service bearings fitted after balancing.
- h) Unbalance from keys and keyways.
- i) Residual magnetism in rotor or mandrel.
- j) Errors caused by re-assembly.
- k) Errors caused by the balancing equipment and instrumentation.
- l) Differences between service shaft and balancing mandrel diameters.
- m) Defect in universal joints.
- n) Permanent bend in a rotor after balancing.