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**Mechanical vibration of non-reciprocating
machines — Measurements on rotating
shafts and evaluation criteria —**

Part 1:
General guidelines

*Vibrations mécaniques des machines non alternatives — Mesurages sur
les arbres tournants et critères d'évaluation —*

Partie 1: Directives générales



Reference number
ISO 7919-1:1996(E)

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 7919-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 2, *Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures*.

This second edition of ISO 7919-1 cancels and replaces the first edition (ISO 7919-1:1986), which has been technically revised.

ISO 7919 consists of the following parts, under the general title *Mechanical vibration of non-reciprocating machines — Measurements on rotating shafts and evaluation criteria*:

- Part 1: *General guidelines*
- Part 2: *Large land-based steam turbine generator sets*
- Part 3: *Coupled industrial machines*
- Part 4: *Gas turbine sets*
- Part 5: *Machine sets in hydraulic power generating and pumping plants*

Annex A forms an integral part of this part of ISO 7919. Annexes B, C, D and E are for information only.

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Introduction

Machines are now being operated at increasingly high speeds and loads, and under increasingly severe operating conditions. This has become possible, to a large extent, by the more efficient use of materials, although this has sometimes resulted in there being less margin for design and application errors.

At present, it is not uncommon for continuous operation to be expected and required for 2 or 3 years between maintenance operations. Consequently, more restrictive requirements are being specified for operating vibration values of rotating machinery, in order to ensure continued safe and reliable operation.

ISO 10816-1 establishes a basis for the evaluation of mechanical vibration of machines by measuring the vibration response on non-rotating, structural members only. There are many types of machine, however, for which measurements on structural members, such as the bearing housings, may not adequately characterize the running condition of the machine, although such measurements are useful. Such machines generally contain flexible rotor shaft systems and changes in the vibration condition may be detected more decisively and more sensitively by measurements on the rotating elements. Machines having relatively stiff and/or heavy casings in comparison to rotor mass are typical of those classes of machines for which shaft vibration measurements are frequently to be preferred.

For machines such as steam turbines, gas turbines and turbo-compressors, all of which may have several modes of vibration in the service speed range, measurements on non-rotating parts may not be totally adequate. In such cases, it may be necessary to monitor the machine using measurements on the rotating and non-rotating parts, or on the rotating parts alone.

The guidelines presented in this part of ISO 7919 are complemented by those given in ISO 10816-1. If the procedures of both standards are applied, the one which is more restrictive generally applies.

Shaft vibration measurements are used for a number of purposes, ranging from routine operational monitoring and acceptance tests to advanced experimental testing, as well as diagnostic and analytical investigations. These various measurement objectives lead to many differences in methods of interpretation and evaluation. To limit the number of these differences, this part of ISO 7919 is designed to provide guidelines primarily for operational monitoring and acceptance tests.

During the preparation of this part of ISO 7919, it was recognized that there was a need to establish quantitative criteria for the evaluation of machinery shaft vibration. However, there is a significant lack of data on this subject at present and, consequently, this part of ISO 7919 has been structured to allow such data to be incorporated as it becomes available.

Specific criteria for different classes and types of machinery will be given in the relevant parts of ISO 7919 as they are developed.

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Mechanical vibration of non-reciprocating machines — Measurements on rotating shafts and evaluation criteria —

Part 1: General guidelines

1 Scope

This part of ISO 7919 sets out general guidelines for measuring and evaluating machinery vibration by means of measurements made directly on rotating shafts for the purpose of determining shaft vibration with regard to

- a) changes in vibrational behaviour;
- b) excessive kinetic load;
- c) the monitoring of radial clearances.

It is applicable to measurements of both absolute and relative radial shaft vibration, but excludes torsional and axial shaft vibration. The procedures are applicable for both operational monitoring of machines and to acceptance testing on a test stand and after installation. Guidelines are also presented for setting operational limits.

NOTES

1 Evaluation criteria for different classes of machinery will be included in other parts of ISO 7919 when they become available. In the meantime, guidelines are given in annex A.

2 The term "shaft vibration" is used throughout ISO 7919 because, in most cases, measurements will be made on machine shafts; however, ISO 7919 is also applicable to measurements made on other rotating elements if such el-

ements are found to be more suitable, provided that the guidelines are respected.

For the purposes of ISO 7919, operational monitoring is considered to be those vibration measurements made during the normal operation of a machine. ISO 7919 permits the use of several different measurement quantities and methods, provided that they are well defined and their limitations are set out, so that the interpretation of the measurements will be well understood.

This part of ISO 7919 does not apply to reciprocating machines.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 7919. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7919 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 10816-1:1995, *Mechanical vibration — Evaluation of machine vibration by measurements on non-rotating parts — Part 1: General guidelines.*