
**Mechanical vibration — Evaluation of
machine vibration by measurements on
non-rotating parts —**

Part 3:

**Industrial machines with nominal power
above 15 kW and nominal speeds
between 120 r/min and 15 000 r/min when
measured *in situ***

*Vibrations mécaniques — Évaluation des vibrations des machines par
mesurages sur les parties non tournantes —*

*Partie 3: Machines industrielles de puissance nominale supérieure à
15 kW et de vitesse nominale de fonctionnement entre 120 r/min et
15 000 r/min, lorsqu'elles sont mesurées in situ*



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2009

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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

Page

Foreword	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	2
3 Measurement procedures and operational conditions	2
4 Machine classification	5
5 Evaluation.....	6
Annex A (normative) Evaluation zone boundaries.....	10
Bibliography.....	12

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 10816-3 was prepared by Technical Committee 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 second edition cancels and replaces the first edition (ISO 10816-3:1998). The main change is the deletion of pumps from the scope, which now are dealt with in ISO 10816-7.

ISO 10816 consists of the following parts, under the general title *Mechanical vibration — Evaluation of machine vibration by measurements on non-rotating parts*:

- *Part 1: General guidelines*
- *Part 2: Land-based steam turbines and generators in excess of 50 MW with normal operating speeds of 1 500 r/min, 1 800 r/min, 3 000 r/min and 3 600 r/min*
- *Part 3: Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15 000 r/min when measured in situ*
- *Part 4: Gas turbine sets with fluid-film bearings*
- *Part 5: Machine sets in hydraulic power generating and pumping plants*
- *Part 6: Reciprocating machines with power ratings above 100 kW*
- *Part 7: Rotodynamic pumps for industrial applications, including measurements on rotating shafts*

Introduction

ISO 10816-1 is the basic document describing the general requirements for evaluating the vibration of various machine types when the vibration measurements are made on non-rotating parts. This part of ISO 10816 provides specific guidance for assessing the severity of vibration measured on bearings, bearing pedestals, or housings of industrial machines when measurements are made *in situ*.

Two criteria are provided for assessing the machine vibration. One criterion considers the magnitude of the observed vibration; the second considers the changes in the magnitude. It must be recognized, however, that these criteria do not form the only basis for judging the severity of vibration. For some machine types, it is also common to judge the vibration based on measurements taken on the rotating shafts. Shaft vibration measurement requirements and criteria are addressed in separate documents, namely ISO 7919-1^[1] and ISO 7919-3^[2].

This document is a preview generated by EVS

This document is a preview generated by EVS

Mechanical vibration — Evaluation of machine vibration by measurements on non-rotating parts —

Part 3:

Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15 000 r/min when measured *in situ*

1 Scope

This part of ISO 10816 gives criteria for assessing vibration levels when measurements are made *in situ*. The criteria specified apply to machine sets having a power above 15 kW and operating speeds between 120 r/min and 15 000 r/min.

The machine sets covered by this part of ISO 10816 include:

- steam turbines with power up to 50 MW;
- steam turbine sets with power greater than 50 MW and speeds below 1 500 r/min or above 3 600 r/min (not included in ISO 10816-2);
- rotary compressors;
- industrial gas turbines with power up to 3 MW;
- generators;
- electrical motors of any type;
- blowers or fans.

NOTE However, the vibration criteria presented in this part of ISO 10816 are generally only applicable to fans with power ratings greater than 300 kW or fans which are not flexibly supported. As and when circumstances permit, recommendations for other types of fans, including those with lightweight sheet metal construction, will be prepared. Until such time, classifications can be agreed between the manufacturer and the customer, using results of previous operational experience, see also ISO 14694^[4].

The following are excluded from this part of ISO 10816:

- land-based steam turbine generator sets with power greater than 50 MW and speeds of 1 500 r/min, 1 800 r/min, 3 000 r/min or 3 600 r/min (see ISO 10816-2);
- gas turbine sets with power greater than 3 MW (see ISO 10816-4);
- machine sets in hydraulic power generating and pumping plants (see ISO 10816-5);
- machines coupled to reciprocating machines (see ISO 10816-6);

- rotodynamic pumps including integrated electric motors, i.e. where the impeller is mounted directly on the motor shaft or is rigidly attached to it (see ISO 10816-7);
- rotary positive displacement compressors (e. g. screw compressors);
- reciprocating compressors;
- reciprocating pumps;
- submerged motor-pumps;
- wind turbines.

The criteria of this part of ISO 10816 apply to *in situ* broad-band vibration measurements taken on the bearings, bearing pedestals, or housing of machines under steady-state operating conditions within the nominal operating speed range. They relate to both acceptance testing and operational monitoring. The evaluation criteria of this part of ISO 10816 are designed to apply to both continuous and non-continuous monitoring situations.

This part of ISO 10816 encompasses machines which may have gears or rolling element bearings, but does not address the diagnostic evaluation of the condition of those gears or bearings.

The criteria are applicable only for the vibration produced by the machine set itself and not for vibration which is transmitted to the machine set from external sources.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 496, *Driving and driven machines — Shaft heights*

ISO 2954, *Mechanical vibration of rotating and reciprocating machinery — Requirements for instruments for measuring vibration severity*

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

3 Measurement procedures and operational conditions

3.1 General

The general measurement procedures are in accordance with ISO 10816-1, subject to the recommendations specified below.

3.2 Measurement equipment

The measurement equipment shall be capable of measuring broad-band root-mean-square (r.m.s.) vibration with flat response over a frequency range of at least 10 Hz to 1 000 Hz in accordance with the requirements of ISO 2954. Depending on the vibration criteria, this may require measurements of displacement or velocity or combinations of these (see ISO 10816-1). However, for machines with speeds approaching or below 600 r/min, the lower limit of the flat response frequency range shall not be greater than 2 Hz.

NOTE If the measurement equipment is also to be used for diagnostic purposes, an upper frequency limit higher than 1 000 Hz may be necessary.