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Mechanical vibration — Measurement and evaluation of machine vibration —

Part 3: Industrial machines with operating speeds between 120 r/min and 30 000 r/min

Vibrations mécaniques — Mesurage et évaluation des vibrations de machines —

Partie 3: Machines industrielles avec une vitesse de fonctionnement comprise entre 120 r/min et 30 000 r/min

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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 specified 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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 www.iso.org/iso/foreword.html.

This document 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 of ISO 20816-3 cancels and replaces the first edition (ISO 20816-3:2022), which has been technically revised.

The main changes are as follows:

— title was adjusted to align with expanded scope;

— wording in the Scope was expanded to include machines of Group 3 with a rated power ≤15 kW;

— wording was aligned with ISO 20816-1;

— Figure 4 and Figure 5 were updated;

— wording in 5.2 was adjusted to include machines of Group 3;

— recommendations for TRIP limits were removed in 6.5.3;

— vibration severity zones for machines of Group 3 were added in Table A.3;

— overview of vibration severity zones was added in Table A.4;

— text below Figure B.1 was transformed into Note 1 and Note 2 of the figure;

— Bibliography was updated;

— the entire document was editorially revised.

A list of all parts in the ISO 20816 series and the ISO 10816 series can be found on the ISO website.

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.

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Introduction

This document provides specific guidance for assessing

a) vibration severity measured near bearings, on bearing pedestals or housings of machines when measurements are made in-situ, and

b) the radial shaft vibration severity on coupled machines.

Evaluation criteria, based on previous experience, are given for use as guidelines for assessing the vibratory conditions of such machines. However, note that these criteria do not form the only basis for evaluating vibration severity.

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Mechanical vibration — Measurement and evaluation of machine vibration —

Part 3: Industrial machines with operating speeds between 120 r/min and 30 000 r/min

1 Scope

This document specifies the general requirements for evaluating the vibration of various coupled industrial machine types with operating speeds between 120 r/min and 30 000 r/min when measurements are made in-situ. This document gives guidelines for applying evaluation criteria for measurements taken on non-rotating and rotating parts under normal operating conditions. The guidelines are presented in terms of both steady running vibration values and in terms of changes to vibration values which can occur in these steady values.

This document is applicable to these machine types:

a) steam turbines and generators with outputs ≤40 MW;

b) steam turbines and generators with output power >40 MW and operating speeds other than 1 500 r/min, 1 800 r/min, 3 000 r/min or 3 600 r/min (although generators seldom fall into this category);

c) rotary compressors;

d) industrial gas turbines with output power ≤3 MW;

e) turbofans;

f) electric motors of any type, if the coupling is flexible. When a motor is rigidly coupled to a machine type covered by any other part of the ISO 20816 series, see also that other part;

g) rolls and mills;

h) conveyors;

j) blowers or fans with a rated power greater than 300 kW or which are not flexibly supported, see also ISO 14694.

This document is applicable to machines including a gear unit. ISO 20816-9 contains information for special acceptance tests related to gear units.

This document is applicable to in-situ broad-band vibration measurements taken on the shafts, bearings, bearing pedestals or housings of machines close to bearings under steady-state operating conditions within their operating speed range. The requirements relate to both acceptance tests and operational monitoring. The evaluation criteria apply to both continuous and non-continuous monitoring.

This document is applicable to machines which have gears or rolling bearings but does not address the diagnostic evaluation of the condition of those gears or bearings.

This document is applicable only for the vibration produced by the machine set itself and not for vibration that is transmitted to the machine set from external sources.

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

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

ISO 10817-1, *Rotating shaft vibration measuring systems — Part 1: Relative and absolute sensing of radial vibration*

ISO 20816-1, *Mechanical vibration — Measurement and evaluation of machine vibration — Part 1: General guidelines*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041 and ISO 20816-1 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/

4 Measurement procedures

4.1 General

The measurement procedures that shall be followed and the instrumentation which shall be used are specified in ISO 20816-1, subject to the requirements given in this clause.

The measuring system shall not be influenced by environmental factors such as

a) temperature variations,

b) magnetic fields, including magnetisation of the shaft,

c) sound fields,

d) power source variations,

e) sensor cable length (some designs of shaft vibration probe require matched cable lengths),

f) sensor cable faults, and

g) sensor orientation,

h) data collection by collector (e.g. offline and intermittent using handheld analyser/meter). Coiled cable/other cables movement.

Particular attention shall be paid to ensure that the sensors are correctly mounted and that such mountings can influence the measurements taken.

4.2 Preferred measurement positions and directions

It is common practice to measure vibration on non-rotating parts, or rotating parts (shaft relative vibration), or both. Unless stated otherwise, this document refers to shaft relative vibration when referring

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