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

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**

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

*Partie 2: Turbines à vapeur et alternateurs excédant 50 MW pour
applications terrestres, avec des vitesses normales de fonctionnement
de 1 500 r/min, 1 800 r/min, 3 000 r/min et 3 600 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.

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 10816-2 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 third edition cancels and replaces the second edition (ISO 10816-2:2001), of which it constitutes a technical revision. It also incorporates the Technical Corrigendum ISO 10816-2:2001/Cor.1:2004. The main changes are:

- emphasis on acceptance specifications always being agreed on between the supplier and the purchaser of the steam turbine and generator prior to installation;
- recommendation for setting the ALARM limit for steady-state operation of new machines at the zone B/C boundary when no established baseline data are available;
- introduction of a new annex providing cautionary notes about the use of constant vibration velocity criteria at low frequencies;
- closer alignment of this part of ISO 10816 with ISO 7919-2, ISO 7919-4 and ISO 10816-4.

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 part of ISO 10816 giving 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 gives specific provisions for assessing the severity of vibration measured on the bearing housings or pedestals of large steam turbines and generators. Measurements at these locations characterize the state of vibration reasonably well. Evaluation criteria, based on previous experience, are presented. These can be used for assessing the vibratory condition of such machines.

Two criteria are provided for assessing the machine vibration when operating under steady-state conditions. One criterion considers the magnitude of the observed vibration; the second considers changes in the magnitude. In addition, different criteria are provided for transient operating conditions. However, vibration on non-rotating parts does not form the only basis for judging the severity of vibration. For large steam turbines and generators, it is also common to judge the vibration based on measurements taken on the rotating shafts. For shaft vibration measurement requirements, see ISO 7919-1 and ISO 7919-2.

The evaluation procedures presented in this part of ISO 10816 are based on broad-band measurements. However, because of advances in technology, the use of narrow-band measurements or spectral analysis has become increasingly widespread, particularly for the purposes of vibration evaluation, condition monitoring and diagnostics. The specification of criteria for such measurements is beyond the scope of this part of ISO 10816. They are dealt with in greater detail in ISO 13373 (all parts), which establish provisions for the vibration condition monitoring of machines.

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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

1 Scope

This part of ISO 10816 establishes provisions for evaluating the severity of *in-situ*, broad-band vibration measured radial (i.e. transverse) to the shaft axis on all main bearing housings or pedestals and in the axial direction on thrust bearings. These are in terms of:

- vibration under normal steady-state operating conditions;
- vibration during other (non-steady-state) conditions when transient changes are taking place, including run up or run down, initial loading and load changes;
- changes in vibration which can occur during normal steady-state operation.

This part of ISO 10816 is applicable to land-based steam turbines and generators with power outputs greater than 50 MW and a normal operating speed of 1 500 r/min, 1 800 r/min, 3 000 r/min or 3 600 r/min. It is also applicable to steam turbines and/or generators which are directly coupled to a gas turbine (such as for combined-cycle applications). In such cases, the criteria of this part of ISO 10816 apply only to the steam turbine and the generator (including synchronizing clutches). ISO 7919-4 and ISO 10816-4 are applicable to the evaluation of the gas turbine vibration.

The evaluation criteria in this part of ISO 10816 are not applicable to the electromagnetic excited vibration with twice line frequency at the generator stator core and housing.

The numerical values specified are not intended to serve as the only basis for judging the severity of vibration. For large steam turbines and generators, it is also common to judge the vibration based on measurements taken on the rotating shafts. For such vibration measurement requirements, see ISO 7919-1 and ISO 7919-2.

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 7919-2, *Mechanical vibration — Evaluation of machine vibration by measurements on rotating shafts — 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*

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