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

## Part 7: Rotodynamic pumps for industrial applications, including measurements on rotating shafts

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

*Partie 7: Pompes rotodynamiques pour applications industrielles, y compris mesurages sur les arbres tournants*

Reference number
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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 10816-7 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*, in collaboration with ISO/TC 115 *Pumps*.

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

Vibration measurements on rotodynamic pumps can be useful for many purposes, e.g. for the operational monitoring, acceptance test and for diagnostic or analytic investigation (condition monitoring).

General descriptions of the principles to be applied for the measurement and assessment of vibration on coupled industrial machines are given for vibration on non-rotating parts in ISO 10816-1 and for shaft vibration in ISO 7919-1.

This part of ISO 10816 is based on vibration data gathered from a survey of about 1 500 pumps operating both *in situ* and at various test facilities. This survey included pumps of different types, speed and power, operating over a wide range of flows. Due to the large number of vibration measurements, these data are considered to be representative of pumps that are operating satisfactorily, though there is a lack of information about the mean time between failure and operating conditions for the measured values.

Statistical evaluation of these data has been made for the preferred operating region, i.e. 70 % to 120 % of the best efficiency point (BEP), as well as evaluations of the flow and power dependency.

This vibration survey showed no significant differences between rigid and flexible supports, or between horizontal and vertical orientations of the pumps when measured at the positions defined in this part of ISO 10816. This is in contrast to other standards dealing with vibration measurements (e.g. ISO 10816-1, ISO 10816-3 and ISO 13709[10]) which do make these distinctions.

The statistical analysis showed a slight dependency of the vibration values with the power consumption of a pump. Consequently, this part of ISO 10816 distinguishes between pumps up to and above 200 kW.