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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 9239.31-2023

Replacing GB/T 19874-2005

**Mechanical vibration - Rotor balancing - Part 31: Susceptibility
and sensitivity of machines to unbalance**

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foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules for Standardization Documents"

drafting:

This document is part 31 of GB/T 9239 "Rotor Balance for Mechanical Vibration": GB/T 9239 has issued the following parts:

- Part 12: Balance methods and tolerances for rotors with flexible characteristics;
- Part 13: Criteria and safety protection for on-site balancing of large and medium-sized rotors;
- Part 14: Evaluation procedures for balance errors;
- Part 21: Description and evaluation of balancing machines;
- Part 31: Machine unbalance variability and unbalance sensitivity;
- Part 32: Key criteria for shaft and mating balance:

This document replaces GB/T 19874-2005 "Mechanical Vibration Machine Unbalance Sensitivity and Unbalance Sensitivity", and

Compared with GB/T 19874-2005, except for structural adjustment and editorial changes, the main technical changes are as follows:

- Increased machine variability correction factor (see 4:5);
- Increased mode shape sensitivity value (see 5:4);
- Increased the working speed (see 5:5);
- Increased transient speed (see 5:6);

--- Deleted Figure 1 (see Figure 1 of the:2005 edition);

--- Deleted the accelerated rotation of the rotor (see 5:3 of the:2005 edition):

This document is equivalent to ISO 21940-31:2013 "Mechanical Vibration Rotor Balance Part 31: Machine Unbalance Variability and Unevenness

Balancing Sensitivity":

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

Vibration caused by rotor unbalance is one of the most critical issues in the design and maintenance of rotating machinery: The dynamic forces it generates will have an impact on the machine and

adverse effects on human health and safety:

Balancing is the process of checking the mass distribution of a rotor and, if necessary, correcting it so that the remaining unbalance, or

Vibration, or the process in which the forces on a bearing are within specified limits:

GB/T 9239 "Mechanical Vibration Rotor Balance" explains balance in a general way, uses specific terms and definitions, and helps users choose

Choose the appropriate balancing method and provide guidance for the application of balancing techniques: Contains most of the standards in the field of balance, grouped into five main areas:

Introduction, vocabulary, balancing methods and tolerances, balancing machines, and mechanical design for balancing, are intended to consist of the following parts:

--- Part 1: Introduction: The purpose is to give the general background of the use of balancing technology in the GB/T 9239 series of documents, and to guide

The user understands the corresponding part of the series, including vocabulary, balancing methods and tolerances, balancing machines and mechanical design for balancing:

--- Part 2: Vocabulary: The purpose is to define the vocabulary used for balancing, giving an alphabetical index of the balancing vocabulary and a diagram of the balancing machine term

solution guide:

--- Part 11: Balance methods and tolerances for rotors with rigid characteristics: The aim is to give a balancing method for rigid rotors and

Tolerance: It specifies the allowable value of residual unbalance, the necessary number of correction surfaces, the allocation of residual unbalance tolerances of correction surfaces and how

How to account for errors in the balancing process:

--- Part 12: Balance methods and tolerances for rotors with flexible characteristics: The purpose is to give a balancing method for flexible rotors and

Tolerance: The typical structural forms of flexible rotors are given, the balance requirements according to their own characteristics are specified, and the balance methods are listed:

method, provides a method for assessing the final state of equilibrium and gives guidance on tolerances for unbalance:

--- Part 13: Criteria and safety protection for on-site balancing of large and medium-sized rotors: The purpose is to give large and medium-sized rotors in their own bearings

The procedure for in-field balancing: Describes the conditions suitable for on-site balancing, the required instruments, the contents of safety measures, reports and

Requirements for maintaining records:

--- Part 14: Evaluation procedures for balance errors: The purpose is to give a procedure for evaluating the balance error and to specify the rotor

Requirements for the identification of errors during balance measurements, the evaluation of identified errors and the consideration of errors in the determination of residual unbalance:

--- Part 21: Description and evaluation of balancing machines: The purpose is to give the requirements for the performance evaluation of the balancing machine:

--- Part 23: Balancing machine guards and other protective measures for measuring stations: The purpose is to give balancing machine shields and other protection

Requirements for protective measures, define the different levels of protection provided by protective covers and other protective measures, and give the application of each level of protection

scope:

--- Part 31: Machine unbalance variability and unbalance sensitivity: The purpose is to give the determination of machine vibration sensitive to unbalance

It provides a method for evaluating vibration sensitivity considering that the resonant speed is close to the operating speed:

--- Part 32: Key criteria for shaft and mating balance: The purpose is to give a keyed rotor assembly when the individual components are balanced

the only criterion:

Mechanical Vibration Rotor Balancing Part 31:

Machine imbalance variability and imbalance sensitivity

1 Scope

This document describes a method for determining the sensitivity of a machine to vibration to unbalance, and for this sensitivity (which is the relation between resonant speed and operating speed)

function of speed proximity), providing evaluation guidelines: This document focuses only on fundamental frequency vibrations caused by unbalance and shows how to convert sensitive

Degree values are recommended for use in some special cases:

This document includes a classification system for classifying machines according to their unbalanced variability: Divide machines into three categories by variability

Type, divided into five ranges according to sensitivity: This sensitivity value is intended for simple mechanical systems, where the rotor is preferably only

There is a resonant speed: These sensitivity values can also be used for machines with multiple resonant speeds in the operating speed range, but these resonant speeds are required

The speeds are far apart from each other (for example, more than 20% apart):

These sensitivity values given are not intended to be used as acceptance criteria for any type of machine, but rather as an indication of how to avoid oversized defects or avoid

Guidelines for avoiding excessive, unattainable requirements: It can also be used as the basis for more related investigations, for example, in some specific cases it may be necessary to

To determine the sensitivity more accurately: If due consideration is given to the sensitivity values given, the machine is expected to perform satisfactorily in most cases

run:

Considering only the sensitivity value does not guarantee that the vibration will not exceed the given vibration limit during operation, many other vibration sources may also cause vibration:

activities, but these are beyond the scope of this document: