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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 28278.1-2012

Plain bearings -- Hydrostatic plain journal bearings without drainage grooves under steady-state conditions -- Part 1: Calculation of oil-lubricated plain journal bearings without drainage grooves

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Foreword

GB/T 28278 "Sliding bearings without steady-state under the conditions of non-return sump fluid hydrostatic radial bearing" consists of the following two parts.

- Part 1. Calculation of lubricating radial plain bearings without oil return;

- Part 2. Characteristic values calculated by lubricating radial plain bearings without oil return.

This part is part 1 of GB/T 28278.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This part uses the translation method equivalent to ISO 12168-1..2001 "Sliding bearings without steady-state conditions without return tank Hydrostatic radial

Plain bearings - Part 1. Calculation of lubricating radial plain bearings without oil return.

And the normative reference in this part of the international standards are consistent with the relationship between China's standards are as follows.

Industrial fluid lubricants ISO viscosity classification (egvISO 3448..1992) GB/T 3141-1994.

This part is made by the China Machinery Industry Federation.

This part is headed by the National Standardization Technical Committee for Plain Bearings (SAC/TC236).

This part is responsible for drafting units. China Machine Productivity Promotion Center.

This part participates in the drafting unit. Xi'an Jiaotong University, Zhejiang Zhuji Shenfa Bearing Co., Ltd., Shenke sliding bearing Co., Ltd.,

Zhejiang Dongfang Sliding Bearing Co., Ltd., Dongfang Steam Turbine Co., Ltd., Dongfang Motor Co., Ltd., Lin'an Orient Bearing Co., Ltd.

Introduction

The working principle of the hydrostatic bearing is that the supporting force of the lubrication is caused by the external lubricating oil pressure. The characteristic of static pressure lubrication is wear

Small size, low noise, wide working speed range and high stiffness and high impedance. These properties determine the hydrostatic plain bearings in many cases, such as

The special importance of the application in machine tools.

The basic principle of this part of GB/T 28278 is applicable to the different number of oil chambers, similar to the geometric shape of the oil cavity,

Pressure bearing. This part of GB/T 28278 is only for hydrostatic radial plain bearings without oil return between oil chambers. With a return oil

Slot bearings compared to this type of bearing in the same stiffness characteristics required under the required power is smaller.

The lubricating oil is pressurized by a constant linear pressure pump (system pressure pen = constant) through a preloaded linear restrictor, such as a capillary restrictor.

The calculation procedure listed in this part of GB/T 28278 can be used to calculate and evaluate hydrostatic bearings with a given design parameter, or

For the design of some parameters of variable hydrostatic bearings. In addition, this part of GB/T 28278 also contains the design of the required lubrication system,

Including the calculation of throttle parameters.

Sliding bearings do not return to the tank under steady state conditions

Pressure radial plain bearings - Part 1. Without return sumps

Calculation of oil lubricated radial plain bearings

1 Scope

This part of GB/T 28278 is suitable for static pressure radial plain bearings under steady state conditions.

This part of GB/T 28278 is only for lubrication between the oil chambers without the oil return.

2 normative reference documents

The following documents are indispensable for the application of this document. For dated references, only the dated version is used in this article

Pieces. For undated references, the latest edition (including all modifications) applies to this document.

GB/T 28278.2-2012 Plain bearings without return sumps under steady state conditions Hydrostatic radial bearings - Part 2. No

(ISO 12168-2..2001, IDT) for lubricating radial plain bearings

ISO 3448..1992 Industrial liquid lubricants ISO viscosity classification (Industrialliquidlubricants-ISO viscosity)

classification

3 Calculate the basic principles and boundary conditions

The purpose of this part of the calculation is to determine the bearing operating conditions, geometry and lubricating oil and other related hydrostatic bearing operating parameters,

That is to determine the bearing eccentricity, carrying capacity, oil film stiffness, oil pressure, oil flow, friction power, pump power and temperature rise. except

Considering the static pressure of the bearing, the hydrodynamic effect of the bearing is also approximated.

The Reynolds equation provides a theoretical basis for the calculation of hydrostatic bearings. However, in most practical applications, it can be reached by approximate calculation

To the desired precision.

The approximation used in this section is to use two integral equations to describe the state of the oil flowing through the bearing and journal surface gaps.

These two integral equations can be derived from the Reynolds equation using specific boundary conditions. The Haagen-Burtonian law describes the parallel surface gap

The pressure flow, the Kurt formula describes the shear flow generated by the journal rotation in the bearing clearance. The theoretical basis of the computational process is given in Appendix A.

A detailed description of the.

The following important assumptions are used in the calculation process given in this section.

a) The flow of the lubricating oil is laminar flow.

b) The lubricating oil is completely adhered to the lubricated surface.

c) Lubricants are incompressible Newtonian fluids.

d) The lubricating oil in the entire lubrication gap and in the front restrictor is of equal viscosity.

e) The lubrication gap is completely filled with lubricating oil.

f) The pressure gradient in the film thickness direction is zero.

g) The journal and bearing surfaces that make up the lubrication gap are rigid.

h) The radius of curvature of the relative moving surface is much greater than the thickness of the lubricating film.

i) The thickness of the lubricating film is set in the axial direction (z-axis direction).