INTERNATIONAL STANDARD

ISO 12168-1

First edition
2001-12-15

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

Paliers lisses — Paliers lisses radiaux hydrostatiques sans rainure d'écoulement fonctionnant en régime stationnaire —

Partie 1: Calcul pour la lubrification des paliers lisses radiaux sans rainure d'écoulement

Reference number
ISO 12168-1:2001(E)

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Printed in Switzerland

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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 3.

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 part of ISO 12168 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12168-1 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 4, *Methods of calculation of plain bearings*.

ISO 12168 consists of the following parts, under the general title *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*

— *Part 2: Characteristic values for the calculation of oil-lubricated plain journal bearings without drainage grooves*

Annexes A and B form a normative part of this part of ISO 12168.

Introduction

The functioning of hydrostatic bearings is characterized by the fact that the supporting pressure of the bearing is generated by external lubrication. The special advantages of hydrostatic bearings are lack of wear, quiet running, wide useable speed range as well as high stiffness and damping capacity. These properties are also the reason for the special importance of hydrostatic bearing units in different fields of application such as e.g. machine tools.

The bases of calculation described in this part of ISO 12168 apply to bearings with different numbers of recesses and different width/diameter ratios for identical recess geometry. In this part of ISO 12168 only bearings without oil drainage grooves between the recesses are taken into account. As compared to bearings with oil drainage grooves, this type needs less power with the same stiffness behaviour.

The oil is fed to each bearing recess by means of a common pump with constant pump pressure (system p_{en} = constant) and via preceding linear restrictors (e.g. in the form of capillaries).

The calculation procedures listed in this part of ISO 12168 enable the user to calculate and assess a given bearing design as well as to design a bearing as a function of some optional parameters. Furthermore, this part of ISO 12168 contains the design of the required lubrication system including the calculation of the restrictor data.

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

1 Scope

This part of ISO 12168 applies to hydrostatic plain journal bearings under steady-state conditions.

In this part of ISO 12168 only bearings without oil drainage grooves between the recesses are taken into account.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 12168. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 12168 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3448:1992, *Industrial liquid lubricants — ISO viscosity classification*

ISO 12168-2:2001, *Plain bearings — Hydrostatic plain journal bearings without drainage grooves under steady-state conditions — Part 2: Characteristic values for the calculation of oil-lubricated plain journal bearings without drainage grooves*

3 Bases of calculation and boundary conditions

Calculation within the meaning of this part of ISO 12168 is the mathematical determination of the operational parameters of hydrostatic plain journal bearings as a function of operating conditions, bearing geometry and lubrication data. This means the determination of eccentricities, load-carrying capacity, stiffness, required feed pressure, oil flow rate, frictional and pumping power, and temperature rise. Besides the hydrostatic pressure build-up, the influence of hydrodynamic effects is also approximated.

Reynolds' differential equation furnishes the theoretical bases for the calculation of hydrostatic bearings. In most practical cases of application it is, however, possible to arrive at sufficiently exact results by approximation.

The approximation used in this part of ISO 12168 is based on two basic equations for describing the flow via the bearing lands, which can be derived from Reynolds' differential equation when special boundary conditions are observed. The Hagen-Poiseuille law describes the pressure flow in a parallel clearance gap and the Couette equation the drag flow in the bearing clearance gap caused by shaft rotation. A detailed presentation of the theoretical background of the calculation procedure is included in annex A.