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Plain bearings — Terms, definitions, classification and symbols —

Part 3: Lubrication

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Partie 3: Lubrification

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Foreword

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This document was prepared by Technical Committee ISO/TC 123 *Plain bearings*, Subcommittee SC 6, *Terms and common items.*

This fourth edition cancels and replaces the third edition (ISO 4378-3:2017), which has been technically revised.

The main changes are as follows:

— editorial revision of the document: instead of referring to the parts in the figure by subclause number, the part numbers have been used and the names in the key have been shown.

— addition of alphabetical index.

A list of all parts in the ISO 4378 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

As there is a large number of multiple designations in the domain of plain bearings, there is a considerable risk of error in the interpretation of standards and technical literature.

This document is an attempt to establish a uniform basic system of designations of lubrication.

in addition, this document is specifically intended for the field of plain bearings the content can be adopted in general to the field of tribology and being adopted to other machinery elements.

Plain bearings — Terms, definitions, classification and symbols —

Part 3: Lubrication

1 Scope

This document specifies the most commonly used terms relating to lubrication of plain bearings with their definitions and classification.

For some terms and word combinations, their short forms are given, which can be used where they are unambiguous.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General terms

3.1.1
lubrication
technique to reduce friction force, wear and deterioration of the surfaces of two bodies in contact and in relative motion due to the action and effect of lubricant

3.1.2
method of lubrication
method of supplying lubricant into the space between two bodies in contact and in relative motion

3.2 Terms related to the types of lubrication and classification

3.2.1 Classification according to physical state of the lubricant

3.2.1.1
gas-film lubrication
lubrication (3.1.1) in which the interacting surfaces in relative motion are separated by a gaseous lubricant

3.2.1.2
liquid-film lubrication
lubrication (3.1.1) in which the interacting surfaces in relative motion are separated by a liquid lubricant

3.2.1.3
fluid-film lubrication
lubrication (3.1.1) in which the interacting surfaces in relative motion are separated by a fluid lubricant (gas or liquid)

3.2.1.4
solid-film lubrication
lubrication (3.1.1) in which the interacting surfaces in relative motion are separated by a *solid lubricant* (3.4.1.4)

3.2.2 Classification according to the mechanism of separation of the interacting surfaces by a lubricant film

3.2.2.1
hydrodynamic lubrication
lubrication (3.1.1) in which the interacting surfaces in relative motion are completely separated by the pressure generated in the fluid film between these surfaces due to their relative motion and the *viscosity* (3.5.1) of the fluid

3.2.2.2
hydrostatic lubrication
lubrication (3.1.1) in which the interacting surfaces, either in relative motion or in a state of rest, are completely separated by supplying high-pressure fluid between the interacting surfaces from the outside

3.2.2.3
aerodynamic lubrication
lubrication (3.1.1) in which the interacting surfaces in relative motion are completely separated by the pressure generated in the gas film between these surfaces due to their relative motion and the *viscosity* (3.5.1) of the gas

3.2.2.4
aerostatic lubrication
lubrication (3.1.1) in which the interacting surfaces, either in relative motion or in a state of rest, are completely separated by supplying high-pressure gas between the interacting surfaces from the outside

3.2.2.5
boundary lubrication
lubrication (3.1.1) in which friction between, and wear of, two surfaces in relative motion are governed by the properties of the surface and by the properties of the lubricant other than bulk *viscosity* (3.5.1)

3.2.2.6
mixed-film lubrication
mixed lubrication
partial-film lubrication
lubrication (3.1.1) in which there is *fluid-film lubrication* (3.2.1.3) and *boundary lubrication* (3.2.2.5)

3.2.2.7
laminar flow lubrication
lubricating condition in which the molecules of the lubricant fluid move steadily and regularly, forming smooth streamlines

Note 1 to entry: This condition appears in a flow in which the viscous force prevails over the inertia force, or where the Reynolds number is relatively small and the Taylor number is less than a critical value.

3.2.2.8
non-laminar flow lubrication
lubricating condition for which the flow is not laminar and which includes transition and *turbulent flow lubrication* (3.2.2.10)

3.2.2.9
transition flow lubrication
Taylor flow lubrication
lubricating condition in which the stream lines are not smooth, but the turbulence is not fully developed

Note 1 to entry: Depending on the operating conditions, the Taylor vortexes can occur or not.

3.2.2.10
turbulent flow lubrication
lubricating condition in which the molecules of the lubricant move in an unsteady and irregular manner in time and space or in a turbulent manner

Note 1 to entry: This condition appears in a flow in which the inertia force prevails over viscous force or where the Reynolds number is large and the Taylor number is greater than a critical value.

3.2.2.11
starved lubrication
lubricating condition in which lubricant is insufficiently supplied between surfaces to be lubricated

3.2.2.12
non-lubrication
condition of relative motion without *lubrication* (3.1.1)

3.2.2.13
oil-free lubrication
lubricating condition in which interacting surfaces in relative motion are not lubricated by oil

3.2.2.14
grease lubrication
lubrication (3.1.1) in which *grease* (3.4.1.3) is used as lubricant

3.2.2.15
water lubrication
lubrication (3.1.1) in which water or sea water is used as lubricant

3.2.3 Calculation model for the EHD and THD lubrication condition

3.2.3.1
elasto-hydrodynamic lubrication
EHL
EHD
lubrication (3.1.1) in which the pressure, the friction force and the lubricant film thickness between the interacting surfaces in relative motion are governed by the elastic properties of the materials of contacting bodies, as well as the rheological properties of the lubricant, especially the pressure dependence of *viscosity* (3.5.1)

3.2.3.1.1
hard EHL
elasto-hydrodynamic lubrication (3.2.3.1) in which the effect of elastic deformation of interacting surfaces in relative motion, and the exponential increase in *viscosity* (3.5.1) of lubricant due to high pressure, prevail

3.2.3.1.2
soft EHL
elasto-hydrodynamic lubrication (3.2.3.1) in which the interacting surfaces have low elastic modulus and there is no increase in the *viscosity* (3.5.1) of the lubricant due to high pressure

3.2.3.1.3
micro EHL
lubrication (3.1.1) in which micro-asperities of the interacting surfaces in relative motion are lubricated under *EHL* (3.2.3.1) conditions

3.2.3.2
thermo-hydrodynamic lubrication
THL
THD
fluid-film lubrication (3.2.1.3) in which the lubricating conditions between two surfaces in relative motion are governed by the heat balance in the lubricant film, including heat generation due to shear, the heat transfer and the temperature-dependence of the lubricant *viscosity* (3.5.1)

3.2.3.3
thermo-elastohydrodynamic lubrication
TEHL
TEHD
fluid-film lubrication (3.2.1.3) in which the lubricating conditions between two surfaces in relative motion are governed by the heat balance in the lubricant film, including heat generation due to shear, the heat transfer, the elastic properties of friction surfaces and the rheological properties of the lubricant, especially, *viscosity's* (3.5.1) dependence on temperature and pressure

3.3 Terms related to methods of lubrication and classification

3.3.1 Classification according to periodicity of application of lubricant

3.3.1.1
continuous lubrication
method of lubrication (3.1.2) in which the lubricant is continuously supplied to the interacting surfaces in relative motion

3.3.1.2
periodical lubrication
method of lubrication (3.1.2) in which the lubricant is periodically supplied to the interacting surfaces in relative motion

3.3.2 Classification according to the methods of renewing the lubricant

3.3.2.1
recirculating lubrication
method of lubrication (3.1.2) in which the lubricant, having passed the interacting surfaces in relative motion, is mechanically recirculated to them

3.3.2.2
life-time prelubrication
method of lubrication (3.1.2) in which the lubricant is supplied only before the system is put into operation

3.3.2.3
once-through lubrication
method of lubrication (3.1.2) in which the lubricant is periodically or continuously supplied to the interacting surfaces in relative motion, without returning to the lubricating system

3.3.3 Classification according to the method of application of the lubricant to the friction surface

3.3.3.1
force-feed lubrication
method of lubrication (3.1.2) in which the lubricant is supplied between the interacting surfaces in relative motion by external force

Note 1 to entry: See Figure 1.