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Plain bearings — Handling of plain bearings

Paliers lisses — Manipulation des paliers lisses

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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*.

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.

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Introduction

The purpose of this document is to give appropriate methods of handling plain bearings. Alternative practises may be adopted as agreed between bearing suppliers and their customers.

Inappropriate handling can cause premature damage to bearings and should be avoided.

This document provides four clauses for the handling of plain bearings:

— storage and transportation;

— installation (fitting);

— operation (running);

— replacement (exchange of bearing).

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Plain bearings — Handling of plain bearings

1 Scope

This document specifies requirements and guidance on the storage, transportation, handling, installation, operation and replacement of plain bearings and related parts.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4378-1, *Plain bearings — Terms, definitions, classification and symbols — Part 1: Design, bearing materials and their properties*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4378-1 apply.

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 http://www.electropedia.org/

4 Storage and transportation

4.1 General

The plain bearings are stored and transported after manufacture until installation into machines. In this period, they shall be protected from damage, deterioration, deformation and contamination by foreign matter.

4.2 Storage and transportation by packing

4.2.1 General

The plain bearings are stored and transported by using sheets, bags or boxes. The environment shall be taken into consideration and respected when packing materials are manufactured, e.g. by implementing an environmental management system such as ISO 14001.

4.2.2 Purpose of packing

Plain bearings are protected against damage by impact load during storage and transportation and against rust and contaminants such as dust and moisture by using packing materials with a rust-preventive function.

On the outside of the package, the contents should be indicated (type, name, part number, size, number of pieces, production lot number, etc.) in order to identify the contents without removing the protective packaging.

Packaging should be robust enough to withstand long-term storage without damage to the contents.

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When bearings of the same type and size are packed in groups, indication of the contents should be the same as when individually packed. However, the number of packed plain bearings should also be indicated clearly on each pack.

4.2.3 Packing method

Plain bearings should be packed so that they can be easily unpacked at the receiving inspection by the users or before their installation. However, the packing shall remain intact whilst transported and during storage so that the product is unaffected by vibration and environmental changes.

4.2.4 Packing material

Packing material shall be suitable for the purpose of packing as given in 4.2.2.

Materials that produce fibrous waste, paper dust and the like, which could adhere to plain bearings and impair their function, shall not be used.

Examples of packing materials are: rust inhibitor paper sheet, oil-impregnated paper sheet (see 4.4), polyethylene-coated paper (laminated paper), polyethylene sheet, foamed polystyrene, foamed polyurethane sheet (buffer material).

Deoxygenating agents may be utilized in conjunction with oil-less/oil-free packing.

4.2.5 Unpacking

At the time of unpacking, damage to the plain bearings by knives, scissors or sharp tools used to open packaging should be prevented.

In order to prevent damage to the plain bearings and misuse, they should be unpacked just before the receiving inspection or just before they are installed.

4.3 Storage and transportation in containers

4.3.1 General

Examples of types of containers are: cardboard boxes, corrugated boxes, plastic containers and metal containers.

4.3.2 Purpose of storage and transportation in containers

Containers are used to store and transport multiple plain bearings of the same type. Sometimes, individually packed plain bearings are stored in a container.

The container storage aims:

— to prevent plain bearings from becoming lost or getting scattered during transportation or storage,

— to prevent plain bearings from being deformed and damaged by vibration and shock during transportation,

— to prevent plain bearings from being damaged when bearings are badly stacked during warehouse storage,

— to prevent contamination of plain bearings.

The materials and design of containers used in automated assembly shall be agreed by the suppliers and customers.

Containers shall be suitable for the purpose of packing as given in 4.2.2.

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4.3.3 Points to notice at storage and transportation

When multiple plain bearings are stored and transported together, impingement between bearings caused by product movement during transportation should be prevented. Such impingement can be avoided by partitioning the container.

4.3.4 Other methods of storage and transportation

Large and heavy plain bearings should be packed in a water-resistant, corrugated-cardboard box or a wooden box. For plain bearings with a special shape, a purpose-built container should be used for storage and transportation.

4.3.5 Attachment of test and quality certificate

A test certificate or quality certificate for the plain bearings should be attached to the container if necessary, as agreed between the plain bearing supplier and the customer.

4.4 Selection of rust inhibitors and cleaning agents

Specification of the rust inhibitors and cleaning agents used during bearing assembly and receiving inspection operations and their method of use should be agreed between the suppliers and their customers.

When plain bearings are cleaned before receiving inspection and/or installation of the bearings, rust inhibitors or lubricants of the prescribed type shall be applied immediately afterwards in order to protect the bearings from rusting.

4.5 Storage environment

4.5.1 Warehouse or storage room

Direct or reflected sunlight should be prevented from heating plain bearings stored in a warehouse or storage room.

Storage facilities should be clean, dry and dust-free.

The storage facility should be kept tidy and in good order to facilitate the transfer of plain bearings into and out of store.

4.5.2 Ambient temperature of storage room

Bearings should not be stored at excessively high ambient temperatures in order to prevent creep deformation or stress relaxation deformation in polymer sliding bearings due to residual stress.

The lubricant should be prevented from leaking out of oil-impregnated bearings under high temperature. When oil-impregnated plain bearings are stored for a long time, they sometimes need to be impregnated again with lubricant prior to their installation and use.

4.5.3 Environmental humidity for storage room

Plain bearings containing ferrous materials should be stored in a dry room, as they can rust in a high humidity environment.

Plain polymer bearings should be stored in a room with controlled humidity as some types can experience size and shape change through moisture absorption.

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4.5.4 First-in first-out

Plain bearings of oldest manufacturing date should be used first to minimize the risk of any reduction of material quality during storage.

4.6 Handling

Clean gloves should be worn whilst handling bearings during packing, inspection and installation to avoid contamination or marking of the bearings by fingerprints.

Attention should be paid to prevent plain bearings from touching each other and damaging by vibration and shock during transportation as referred to in 4.2.3.

4.7 Documentation

Documents related to storage, transportation and handling instructions, if required, should be attached to packaging as agreed between supplier and customer.

5 Method of installation of plain bearings

5.1 Points to consider during plain bearings installation

5.1.1 Plain bearings

Plain bearings should be checked to ensure they are free of contamination and surface damage. If present on the surface of plain bearings, contaminants should be removed using a clean, soft rag or cleaning fluids, taking care not to cause mechanical damage to the bearing surfaces.

Once bearings have been cleaned, lubricant should be applied immediately to prevent rust. Cleaning fluids should not be used on oil- impregnated plain bearings to avoid removing lubricant from the bearing structure.

Cleaning fluids should be used with caution, particularly on polymer bearings, as chemical constituents can cause deterioration of the bearing materials.

Plain bearings with damage sufficient to affect their performance shall not be used. Plain bearings with minor damage may be used after appropriate repair by consultation and agreement with the bearing manufacturer.

Plain bearings should be installed in the correct orientation with due consideration to the shaft direction of motion.

5.1.2 Housing

Housings should be checked to ensure that chamfers are applied to facilitate the installation of plain bearings, and to ensure that they are free of contaminants and mechanical damages on their inner surface where the plain bearings will be installed.

If contamination is present on the inner surface of housings, it shall be removed.

Damage present on the inner surface of the housing that can affect the performance of the plain bearing assembly shall be repaired.

5.1.3 Press-fit method

Appropriate tools (arbour, guide, press) should be used to prevent damage when press-fitting plain bearings into a housing.

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Installation of plain bearings using a hammer shall be avoided, as it can cause damage or deformation of the bearing assembly components.

Appropriate chamfers or radii at the outer edges of the plain bearing and at the inner edges of the housing shall be used.

5.1.4 Screw –fixing method

Deformation of the inner surface of plain bearings should be prevented when a fastener is inserted axially between the outer surface of the plain bearing and the inner surface of the housing.

The tip of a fastener should be prevented from protruding beyond the inner surface of the bearing when it is inserted radially through the housing into a groove or hole in the bearing outer surface.

The dimensions of a fastener securing a bearing flange should be sufficient to prevent rotation of the bearing within its housing during operation.

5.1.5 Keyed joint method

Keyways are formed on the plain bearing outer surface and the housing inner surface and a key is inserted axially to prevent relative rotation between the bearing and its housing.

Sufficient interference should be provided between the housing and bearing to prevent fretting corrosion of mating surfaces in the bearing assembly.

When using a tapered key, excessive interference should not be used in order to prevent deformation of the plain bearing.

5.1.6 Retaining ring fixing method

A circlip is commonly used.

A circumferential groove is formed on the inner surface of the housing and a retaining ring is fitted into the groove after the plain bearing is inserted, preventing axial movement of the plain bearing in its housing.

NOTE Rotational movement of the plain bearing cannot be prevented by this method.

5.1.7 Shrink fitting by cooling

The outside diameter of a relatively large plain bearing is reduced by cooling using a refrigerant such as dry ice or liquid nitrogen, to produce a temporary clearance fit and permit insertion of the plain bearing into its housing.

The plain bearing installation shall be done quickly before the bearing warms up and expands.

Delayed installation causes moisture in the atmosphere to condense on the bearing surface and hamper the installation operation. Moisture and/or condensed water shall be removed to avoid rust or dilution of lubricant.

5.1.8 Shrink fitting by heating

The inside diameter of the bearing housing is increased by heating to produce a temporary clearance fit and permit insertion of the plain bearing into its housing. Oil bath, hot cabinet, heating plate or electric induction heater can be used for the heating method.

NOTE Excessively high housing temperatures can adversely affect the bearing material structure when it is fitted and change the housing geometry through stress relaxation.

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5.1.9 Points to notice during installation of plain bearings

When the lubricant is to be supplied from a hole in the housing into a hole in the plain bearing, both holes should be fully aligned to prevent oil starvation of the bearing.

Safety shall be maintained in all work.

5.1.10 Points to notice after installation of plain bearings

If there is a delay between assembling the bearing into its housing and final assembly of the machine, the vicinity of the plain bearing should be covered with a protective sheet to prevent contamination of the bearing assembly.

5.2 Mating shaft and assembly inspection

5.2.1 Mating shaft

Chamfers or radii should be applied to the insertion end of the mating shaft to prevent damage to the bearing surface during assembly and the component surfaces should be checked for cleanliness.

Contaminants should be removed using a clean, soft rag or cleaning fluids, taking care not to cause mechanical damage to the surfaces.

Once the mating shaft has been cleaned, lubricant should be applied immediately to prevent rust.

Mating shafts with damage sufficient to affect their performance shall not be used. Mating shafts with minor damage may be used after appropriate repair by consultation and agreement with the shaft and bearing manufacturers.

5.2.2 Installation of shaft

When shafts are installed into plain bearings, damage should be prevented by applying lubricant to the shaft and plain bearing running surfaces.

5.2.3 Check of operation

Mating shafts should be manually rotated after installation to ensure they are free to move smoothly.

Difficulty with rotational or axial movement can indicate an uneven contact or eccentricity between the bearing and shaft surfaces.

In such instances, the root cause should be identified and addressed before rechecking for free movement.

6 Operation

6.1 Cleaning (flushing) of lubrication system

Contaminants adhering to bearing surfaces and remaining in the lubricating system (including pumps, filters, pipes, valves and reservoirs) should be removed or cleaned by the use of flushing fluids or lubricant before running the machine.

6.2 Running-in

Operation under light load for a defined period of running time, known as “running-in”, should be performed before normal machine operation is started.

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