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प्लेन बियरिंग्स — नियम, परिभाषाएँ, वर्गीकरण और प्रतीक — भाग 1: डिज़ाइन, बियरिंग सामग्री और उनके गुण

[IS 10260 (भाग 1) *का दूसरा पुनरीक्षण*]

Draft Indian Standard

Plain Bearings — Terms, Definitions, Classification and Symbols — Part 1 Design, Bearing Materials and Their Properties

[*Second Revision of* IS 10260 (Part 1)]

ICS 21.100.10; 01.040.21

Bearings Sectional Committee, PGD 13	**Last date of Comment:** 2 months from the date of wide circulation

FOREWORD

This Indian Standard (Second Revision) will be adopted by the Bureau of Indian Standards on the recommendation of the Bearings Sectional Committee and approval of the Production and General Engineering Division Council.

This standard was originally published in 1982 and subsequently revised in 2017. This second revision has been brought out to align the standard with the latest technological developments and international practices.

The major changes in this revision are as follows:

a) Clause for Normative references (**2)** has been added;
b) Addition of Figure 3, 4, 5, 6, 7, 8, 9, 18, 19, 36, 37, 40, 44 and 49 and technical revision of the other Figures; and
c) Definitions in clause **3.6.3**, **3.6.4** and **3.6.7** are updated.

This standard is published in five parts. Other parts in this series are:

Part 2 Friction and Wear
Part 3 Lubrication
Part 4 Basic symbols
Part 5 Application of symbols

In formulation of this standard, considerable assistance has been derived from ISO 4378-1 : 2024 'Plain bearings — Terms, definitions, classification and symbols Part 1 : Design, bearing materials and their properties', issued by International Organization for Standardization (ISO).

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 uncertainty leads to the continuous addition of supplementary designations, which only serves to increase the misunderstanding.

This standard is an attempt to establish a uniform basic system of designations of design, bearing materials and their properties.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (second revision).’

Indian Standard

PLAIN BEARINGS — TERMS, DEFINITIONS, CLASSIFICATION AND SYMBOLS PART 1 DESIGN, BEARING MATERIALS AND THEIR PROPERTIES

(*Second Revision*)

1 SCOPE

This standard specifies the most commonly used terms relating to design, bearing materials and their properties 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. Self-explanatory terms are given without definitions.

2 NORMATIVE REFERENCES

There are no normative references in this standard.

3 TERMINOLOGY

For the purposes of this standard, the following terms and definitions apply.

3.1 General Terms

3.1.1 *Bearing*

Mechanical component by means of which a part in relative motion is supported and/or guided with respect to other parts of a mechanism.

3.1.2 *Plain Bearing, Sliding Bearing*

Bearing (**3.1.1**) in which the type of relative motion is sliding.

3.1.3 *Plain Bearing Unit*

Mechanical component of a tribological system including a plain bearing (**3.1.2**), its supporting part (for example, a housing), a shaft and a lubricating system.

3.2 Types of Plain Bearings and Classification

3.2.1 *Classification According to the Type of Load*

3.2.1.1 *Statically loaded plain bearing* — Plain bearing (**3.1.2**) operating under a load constant in magnitude and direction.

3.2.1.2 *Dynamically loaded plain bearing* — Plain bearing (**3.1.2**) operating under a load changing in magnitude and/or direction

3.2.2 *Classification According to the Direction of the Acting Load*

3.2.2.1 *Plain journal bearing, journal bearing* — Plain bearing (**3.1.2**) in which the load acts radially to the axis of the rotating shaft.

NOTE — *See* Fig. 1 and 3.

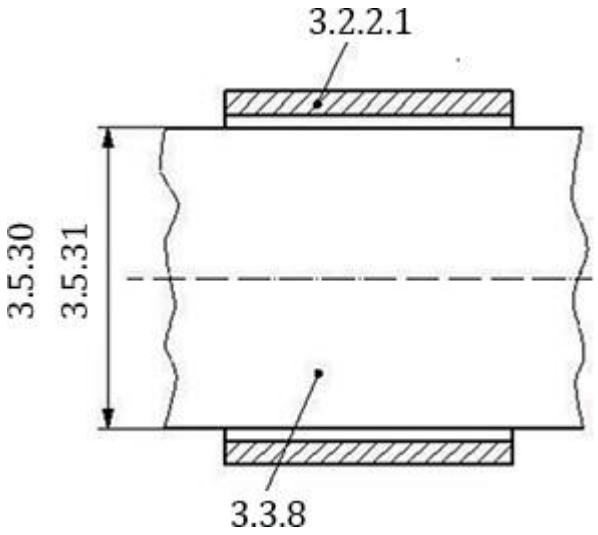


FIG. 1 PLAIN JOURNAL BEARING

3.2.2.2 *Plain thrust bearing, thrust bearing* — Plain bearing (**3.1.2**) in which the load acts along the axis of the rotating shaft.

NOTE — *See* Fig. 2.

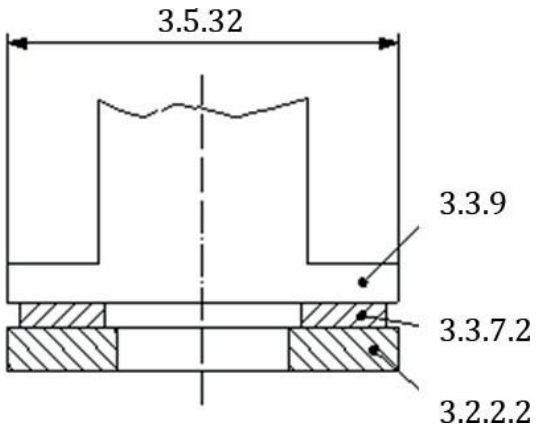


FIG. 2 PLAIN THRUST BEARING

3.2.2.3 *Journal thrust bearing flanged bearing* — Plain bearing (**3.1.2**) capable of supporting a load in both the axial and radial directions.

3.2.3 *Classification According to the Type of Lubrication*

3.2.3.1 *Hydrodynamic bearing* — Plain bearing (**3.1.2**) operating under conditions of hydrodynamic lubrication.

NOTE — *See* Fig. 3.

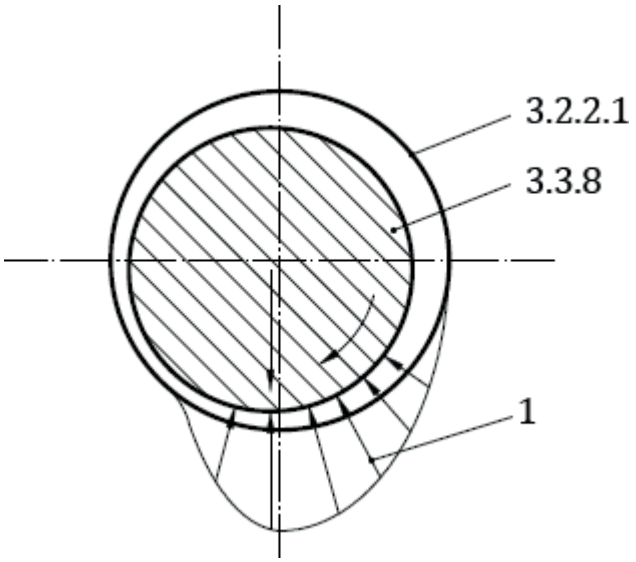


FIG. 3 HYDRODYNAMIC DEARING

3.2.3.2 *Hydrostatic bearing, externally pressurized bearing* — Plain bearing (**3.1.2**) operating under conditions of hydrostatic lubrication.

NOTE — *See* Fig. 4.

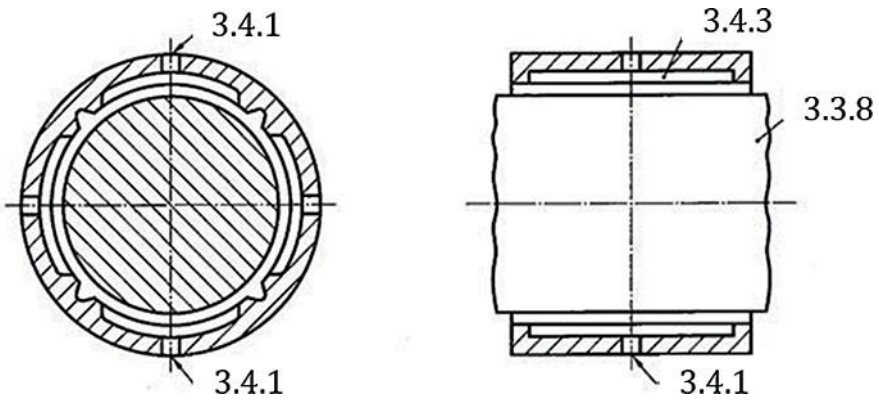


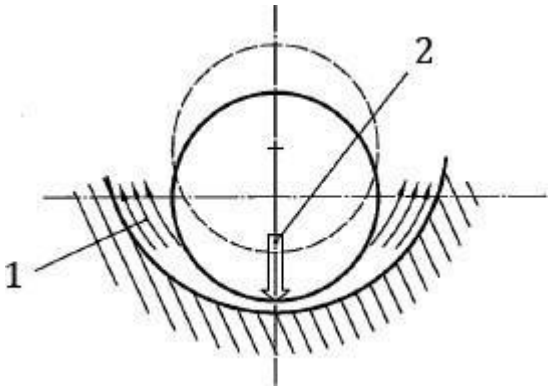
FIG. 4 HYDROSTATIC BEARING

3.2.3.3 *Hydrodynamic gas bearing hydrodynamic air bearing* — Plain bearing (**3.1.2**) operating under conditions of hydrodynamic gas/air lubrication.

3.2.3.4 *Hydrostatic gas bearing hydrostatic air bearing* — Plain bearing (**3.1.2**) operating under conditions of hydrostatic gas/air lubrication.

3.2.3.5 *Squeeze film bearing* — Plain bearing (**3.1.2**) in which complete separation of sliding surfaces is caused by the pressure developed in the lubricant film as a result of their approach in the direction normal to the surface.

NOTE — *See* Fig. 5.



Key

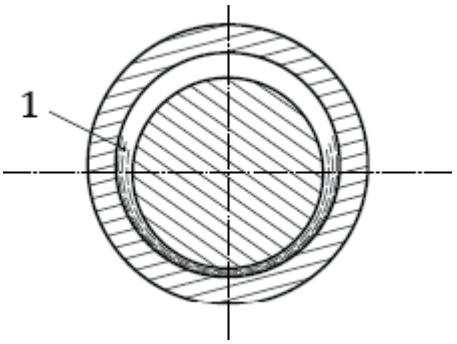
1 Lubricant
2 Load

FIG. 5 SQUEEZE FILM BEARING

3.2.3.6 *Hybrid bearing* — Plain bearing (**3.1.2**) operating under conditions of both hydrostatic and hydrodynamic lubrication.

3.2.3.7 *Solid-film lubricated bearing* — Plain bearing (**3.1.2**) operating with a solid lubricant.

NOTE — *See* Fig. 6.



Key

1 Solid lubricant

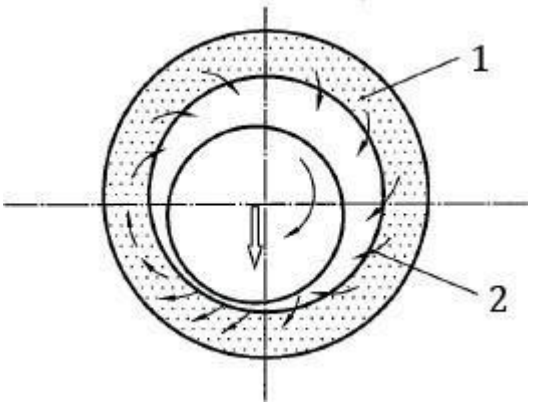
FIG. 6 SOLID FILM LUBRICATED BEARING

3.2.3.8 *Unlubricated bearing* — Plain bearing (**3.1.2**) operating without a lubricant.

3.2.3.9 *Self-lubricating bearing* — Plain bearing (**3.1.2**) lubricated by the bearing material (**3.6.1**), by the material components or by solid lubricant overlays.

3.2.3.10 *Porous self-lubricating bearing, sintered bearing, oil-impregnated sintered bearing* — Bearing (**3.1.1**), the sliding part of which consists of material having communicating pores filled with lubricant.

NOTE — *See* Fig. 7.



Key

1 Porous bearing
2 Oil flow

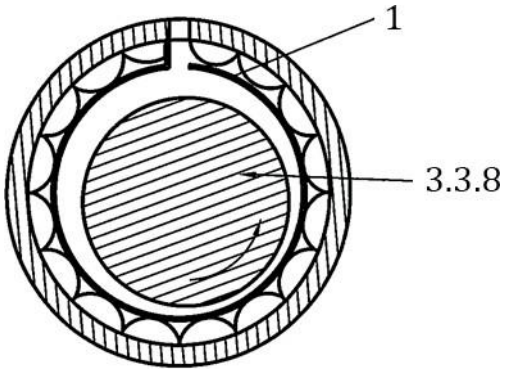
FIG. 7 POROUS SELF-LUBRICATING BEARING

3.2.3.11 S*elf-contained plain bearing assembly* — Bearing assembly with a lubricant reservoir and means of circulating the lubricant to the bearing surface.

NOTE — See plain bearing assembly (3.2.4.9).

3.2.3.12 *Foil bearing* — Hydrodynamic bearing (**3.2.3.1**) consisting of a thin solid material (**3.6.2**) with low bending stiffness, which supports a load while allowing deflection of the thin solid material.

NOTE — *See* Fig. 8.



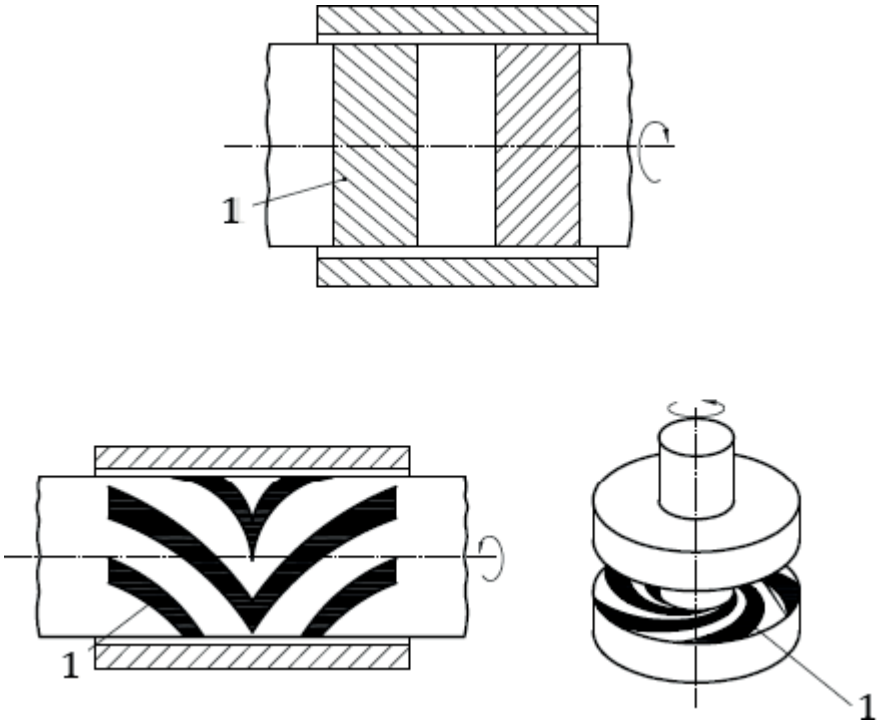
Key

1 Foil

FIG. 8 FOIL BEARING

3.2.3.13 *Spiral groove bearing* — Hydrodynamic bearing (**3.2.3.1**) system with many shallow spiral grooves on the surface of the bearing or the shaft.

NOTE — *See* Fig. 9.



Key
1 Grooves

FIG. 9 SPIRAL GROOVE BEARING

3.2.4 *Classification According to the Design*

3.2.4.1 *Circular cylindrical bearing* — Plain journal bearing (**3.2.2.1**), every cross-section of the inside surface of which is a circle of the same diameter.

NOTE — *See* Fig. 10.

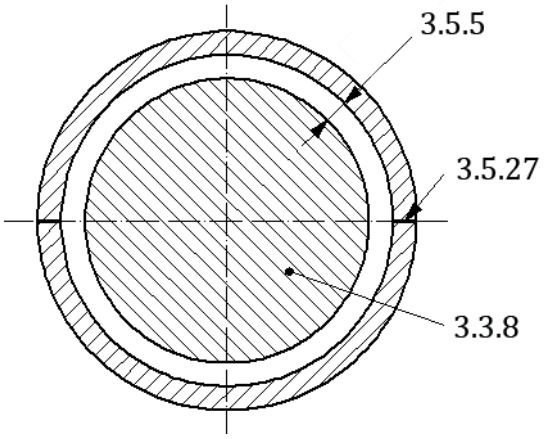


FIG. 10 CIRCULAR CYLINDRICAL BEARING

3.2.4.2 *Profile bore bearing* — Plain journal bearing (**3.2.2.1**) in which no cross-section of the inside surface is a circle.

NOTE — *See* Fig. 11.

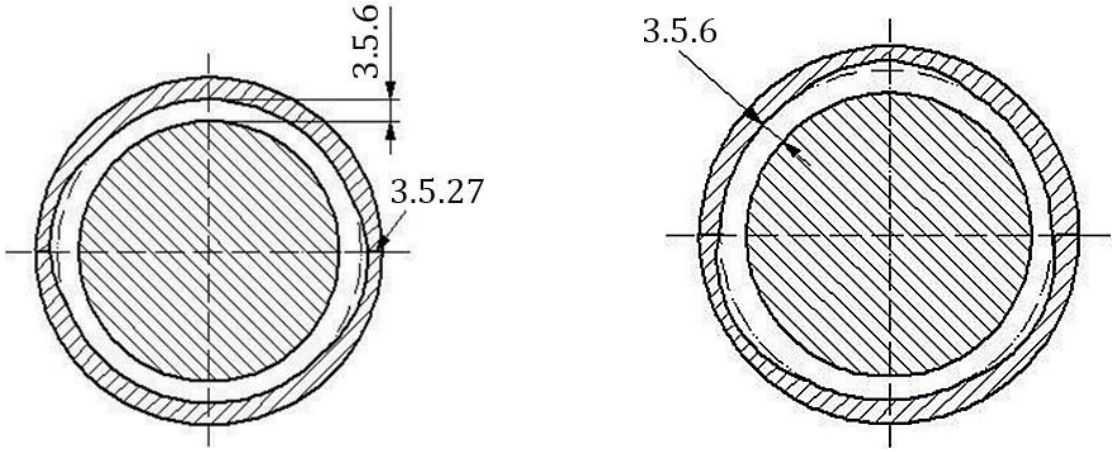


FIG. 11 PROFILE BORE BEARING

3.2.4.3 *Lobed bearing* — Plain journal bearing (**3.2.2.1**) having more than one cylindrical surface so arranged that two or more lubricant wedges develop around the bearing circumference.

NOTE — *See* Fig. 11.

3.2.4.4 *Pad thrust bearing* — Plain thrust bearing (**3.2.2.2**), the sliding surface of which consists of fixed pads (**3.3.7**).

NOTE — *See* Fig. 12.

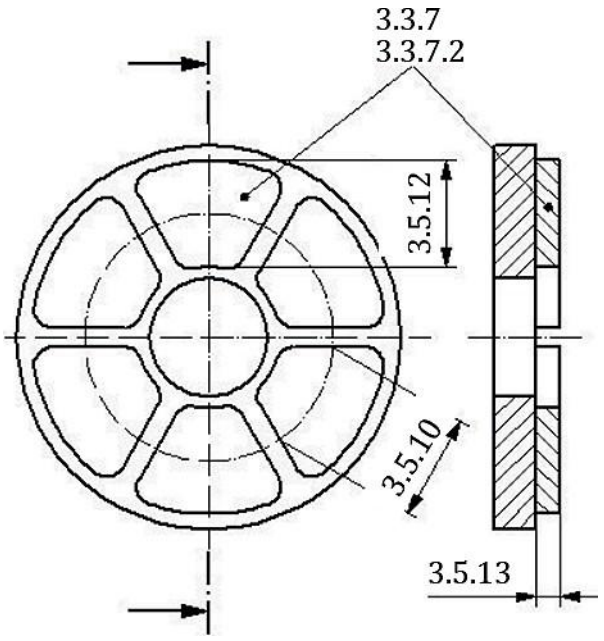


FIG. 12 PAD THRUST BEARING

3.2.4.5 *Taper-land thrust bearing* — Plain bearing (**3.1.2**) in which one side of the sliding surfaces is tapered.

NOTE — *See* Fig. 13.

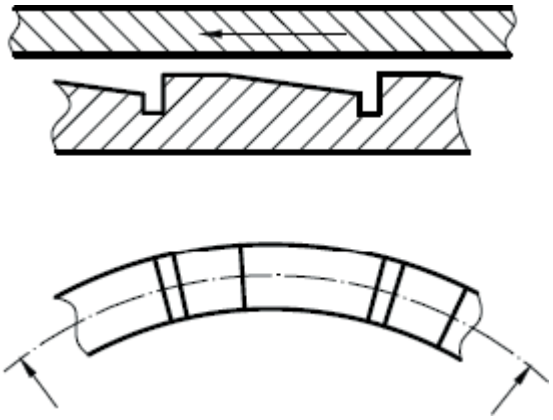


FIG. 13 TAPER-LAND THRUST BEARING

3.2.4.6 *Tilting pad journal bearing* — Self-tilting plain journal bearing (**3.2.2.1**), the sliding surface of which consists of pads (**3.3.7**) free to align with respect to the journal under the hydrodynamic action of the lubricant film.

NOTE — *See* Fig. 14.

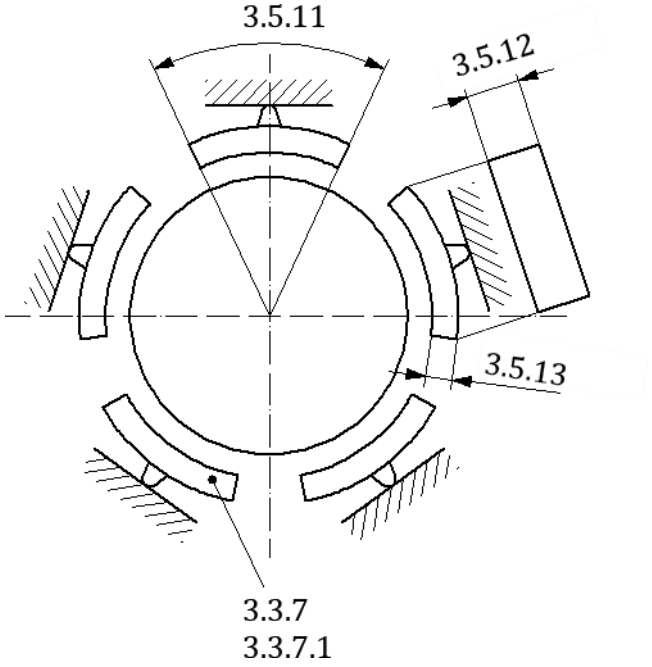


FIG. 14 TILTING PAD JOURNAL BEARING

3.2.4.7 *Tilting pad thrust bearing* — Self-tilting plain thrust bearing (**3.2.2.2**), the sliding surface of which consists of pads (**3.3.7**) free to tilt to make a convergent lubricant film with the thrust collar sliding surface under the hydrodynamic action of the lubricant film.

NOTE — *See* Fig. 15.

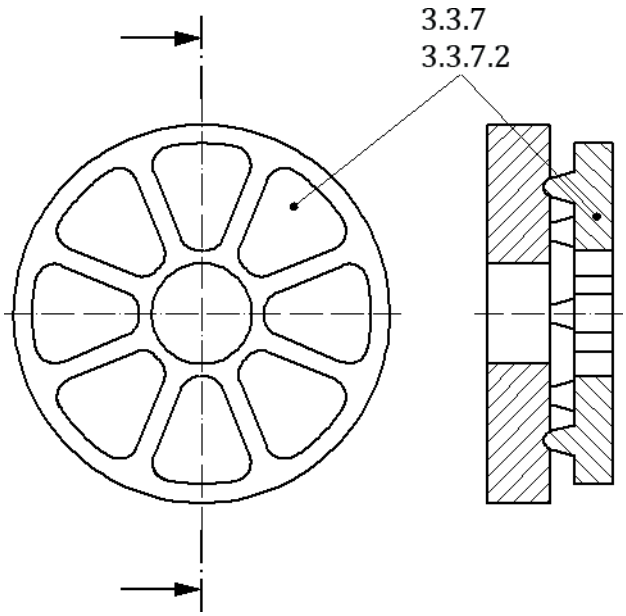


FIG. 15 TILTING PAD THRUST BEARING

3.2.4.8 *Floating bush bearing* — Plain bearing (**3.1.2**) designed as a bush (**3.3.2**), being able to slide and rotate on the shaft and in the housing bore.

NOTE — *See* Fig. 16.

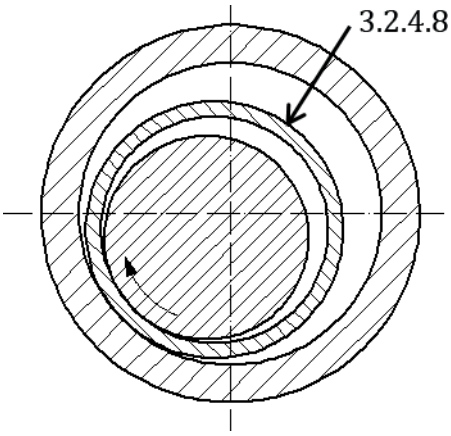


FIG. 16 FLOATING BUSH BEARING

3.2.4.9 *Plain bearing assembly* — Bearing assembly consisting of a plain bearing fitted in a pedestal or flanged housing.

NOTES
1 See self-contained plain bearing assembly (3.2.3.11).
2 *See* Fig. 17.

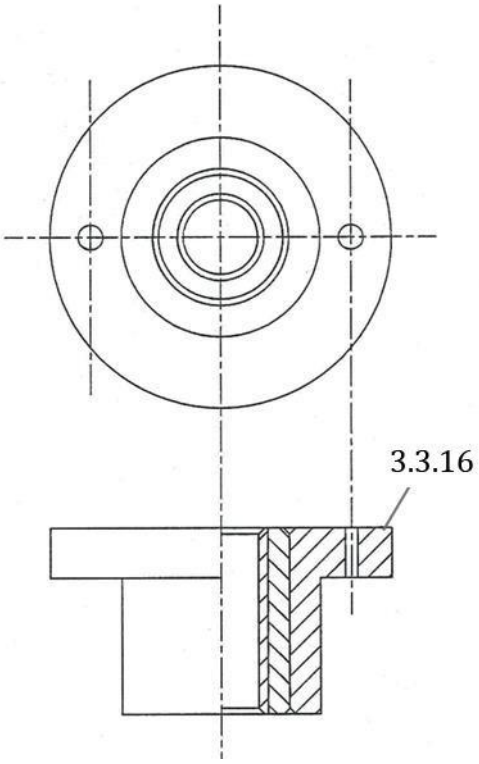


FIG. 17 PLAIN BEARING ASSEMBLY

3.2.4.9.1 *Pedestal plain bearing assembly, pillow block bearing assembly* — Plain bearing assembly (**3.2.4.9**) secured by fixing elements perpendicular or parallel to the shaft axis.

3.2.4.9.2 *Flanged plain bearing assembly* — plain bearing assembly (**3.2.4.9**) secured by fixing elements parallel and/or perpendicular to the shaft axis.

NOTE — *See* Fig. 17.

3.2.4.10 *Self-aligning bearing* — Plain bearing (**3.1.2**) designed with the ability to self-align, with respect to the opposing surface.

NOTE — *See* Fig. 18.

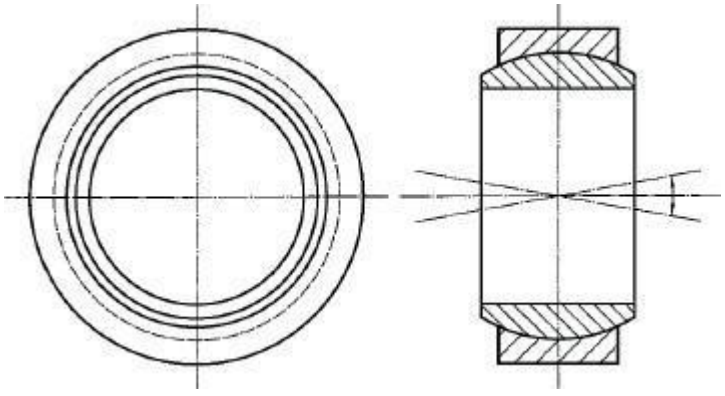


FIG. 18 SELF-ALIGNING BEARING

3.2.4.11 *Offset bearing* — Pair of plain bearings (**3.1.2**) assembled by shifting radially by a certain distance smaller than the radius clearance.

NOTE — *See* Fig. 19.

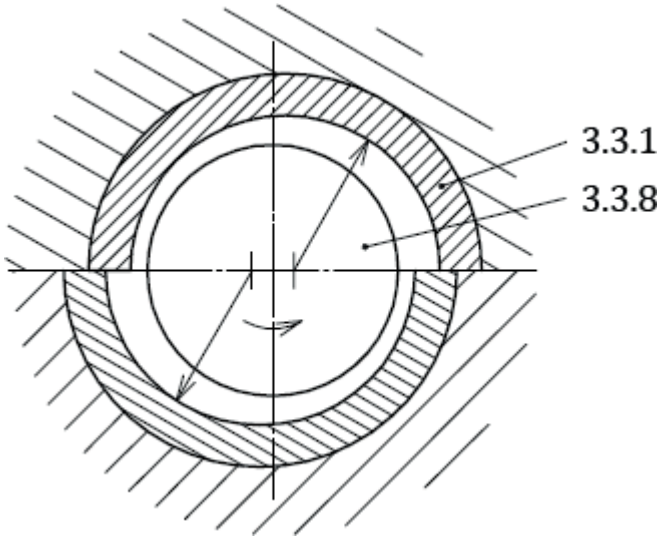


FIG. 19 OFFSET BEARING

3.3 Structural Elements of Plain Bearing Assembly

3.3.1 *Half-Bearing*

Plain journal bearing (**3.2.2.1**) with a sliding surface of 180° of the shaft circumference.

NOTE — *See* Fig. 20.

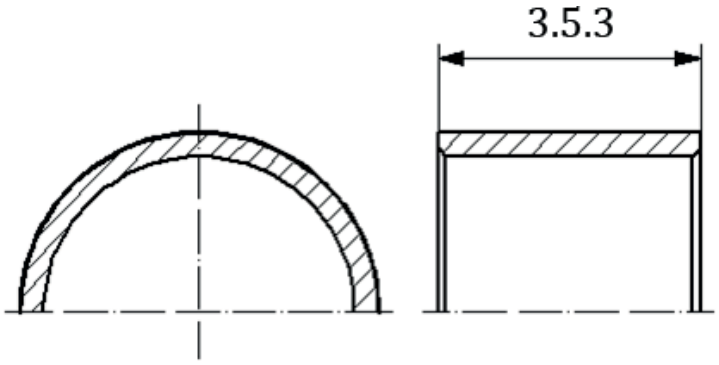


FIG. 20 HALF-BEARING

3.3.1.1 *Thin wall half-bearing* — Half-bearing (**3.3.1**) of sufficiently small wall thickness that the bearing geometry will be influenced by housing bore geometrical imperfections.

NOTE — *See* Fig. 46.

3.3.1.2 *Thick wall half-bearing* — Half-bearing (**3.3.1**) of sufficiently large wall thickness that the bearing geometry will not be influenced by housing bore geometrical imperfections.

3.3.1.3 *Bearing back* — Surface of bearing backing (**3.3.1.4**) opposite the slide surface.

NOTE — *See* Fig. 24.

3.3.1.4 *Bearing backing, backing* — Part of a multilayer bearing applied for giving a bearing the required strength and/or stiffness.

NOTE — *See* Fig. 24.

3.3.2 *Plain Bearing Bush, Bearing Bush, Bush*

Replaceable tubular bearing element, the inner and/or outer surface of which is the sliding surface of a plain bearing (**3.1.2**).

NOTE — *See* Fig. 21.

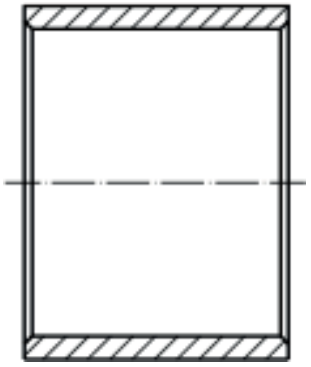


FIG. 21 PLAIN BEARING BUSH

3.3.2.1 *Plain bearing wrapped bush, bearing wrapped bush, wrapped bush* — Bush (**3.3.2**) made from a wrapped strip of a single-layer or multilayer bearing material (**3.6.1**).

NOTE — *See* Fig. 22.

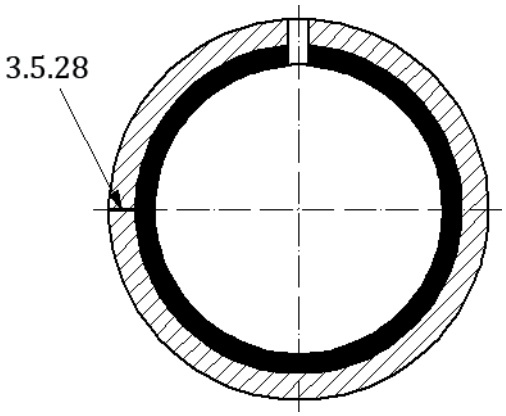


FIG. 22 PLAIN BEARING WRAPPED BUSH

3.3.3 *Flanged Half-Bearing Flanged Bush*

Half-bearing (**3.3.1**)/bush (**3.3.2**) with a flange at one or both ends.

NOTE — *See* Fig. 23.

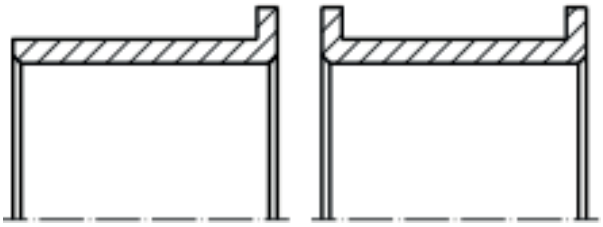


FIG. 23 FLANGED HALF-BEARING

3.3.4 *Solid Half-Bearing, Solid Bush*

Half-bearing (**3.3.1**)/bush (**3.3.2**) made of a single material.

3.3.5 *Multilayer Half-Bearing, Multilayer Bush*

Half-bearing (**3.3.1**)/bush (**3.3.2**) made of layers of different materials.

NOTE — *See* Fig. 24.

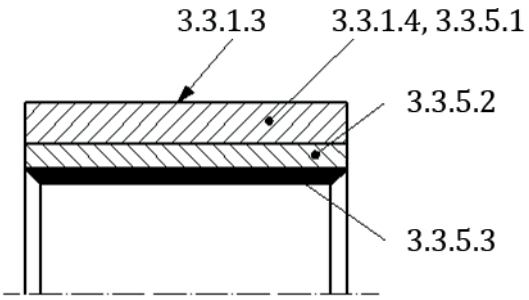


FIG. 24 MULTILAYER HALF-BEARING

3.3.5.1 *Half-bearing backing, bush backing, backing* — Part of a multilayer half-bearing/bush (**3.3.5**) which gives the required strength and/or stiffness to the bearing (**3.1.1**).

NOTE — *See* Fig. 24.

3.3.5.2 *Bearing material layer, bearing layer, lining* — Layer of a bearing material (**3.6.1**) as part of a multilayer half-bearing (**3.3.5**).

NOTES
1 The layer thickness is usually greater than 0,2 mm.
2 *See* Fig. 24.

3.3.5.3 *Plain bearing running-in layer, running-in layer, overlay* — Additional layer of material applied to the bearing material (**3.6.1**) to improve running-in ability (**3.6.11**), conformability (**3.6.10**), embeddability (**3.6.12**) and, in some cases, corrosion resistance (**3.6.16**).

NOTE
1 The layer thickness is usually from 0,01 mm to 0,05 mm.
2 *See* Fig. 24.

3.3.5.4 *Interlayer, bonding layer, nickel dam* — Thin layer between the overlay (**3.3.5.3**) and the lining (**3.3.5.2**) to strengthen the bond and reduce diffusion.

NOTE — The layer thickness is usually between 0,001 mm and 0,002 mm.

3.3.5.5 *Protective layer, flash* — Very thin layer on bearing surface or backing to provide corrosion protection in storage.

NOTE — The layer thickness is usually between 0,000 5 mm and 0,001 mm.

3.3.6 *Thrust Washer*

Annular plate used to support an axial load in conjunction with a plain journal bearing (**3.2.2.1**).

NOTE — *See* Fig. 25.

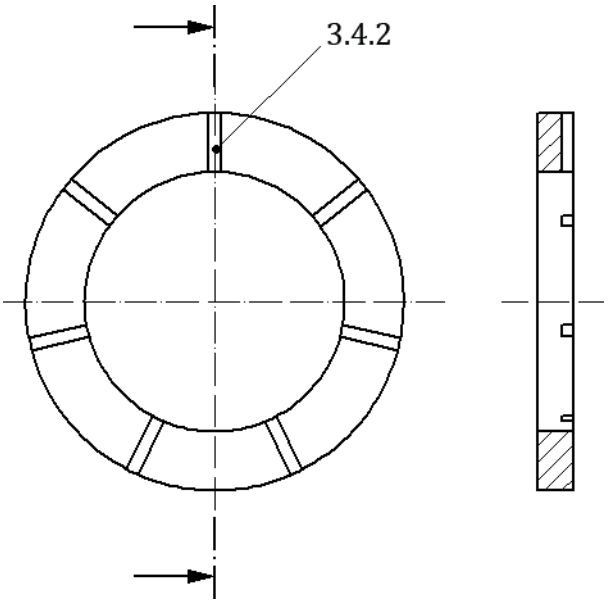


FIG. 25 THRUST WASHER

3.3.6.1 *Thrust half-washer* — Part of an annular plate which, on its own, or combined with another similar part, forms a thrust bearing (**3.2.2.2**).

NOTE — *See* Fig. 26.

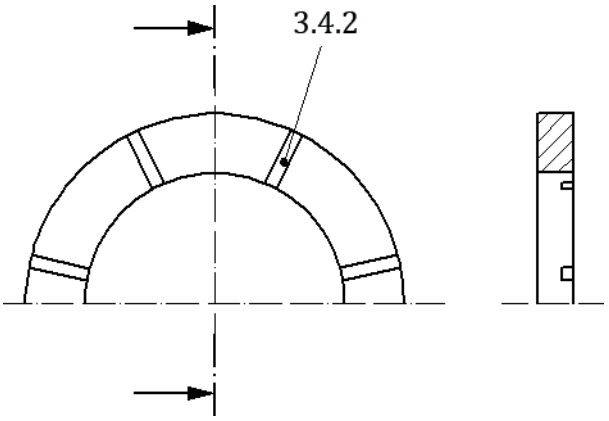


FIG. 26 THRUST HALF-WASHER

3.3.7 *Pad*

Part of a pad bearing that carries the load.

NOTE — *See* Fig. 12, 14 and 15.

3.3.7.1 *Journal pad* — Part of a plain journal pad bearing.

NOTE — *See* Fig. 14.

3.3.7.2 *Thrust pad* — Part of a plain thrust pad bearing.

NOTE — *See* Fig. 2, 4 and 15.

3.3.8 *Journal*

Part of a shaft or of an axle supported by a plain journal bearing (**3.2.2.1**).

NOTE — *See* Fig. 1, 3, 4, 8 and 10.

3.3.9 *Thrust Collar*

Annular part of a shaft supported by a plain thrust bearing (**3.2.2.2**).

NOTE — *See* Fig. 2.

3.3.10 *Oil Ring (Loose), Oil Disc (Secured)*

Annular element loosely supported by, or secured to, the shaft to transfer lubricant to the bearing (**3.1.1**).

NOTE — *See* Fig. 27.

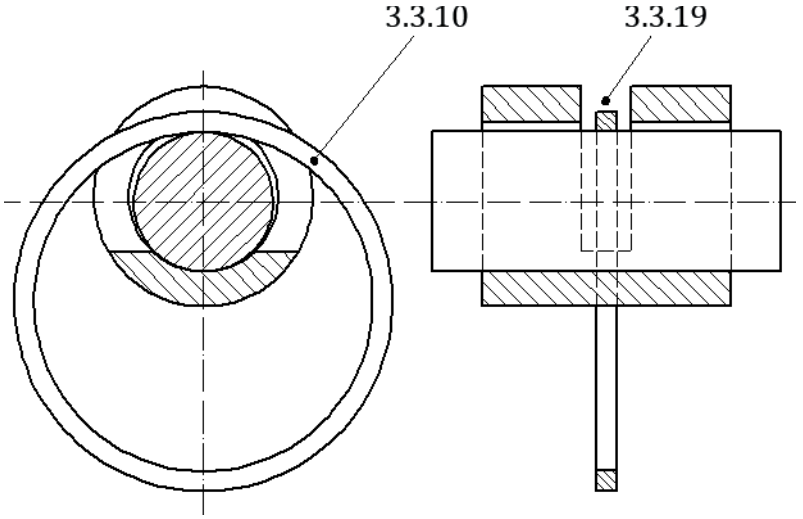


FIG. 27 OIL RING

3.3.11 *Plain Bearing Housing*

Housing into which a plain bearing (**3.1.2**) is fitted.

3.3.12 *Plain Bearing Housing, Block Bearing Block, Pillow Block*

Part of the housing that supports the bearing (**3.1.1**).

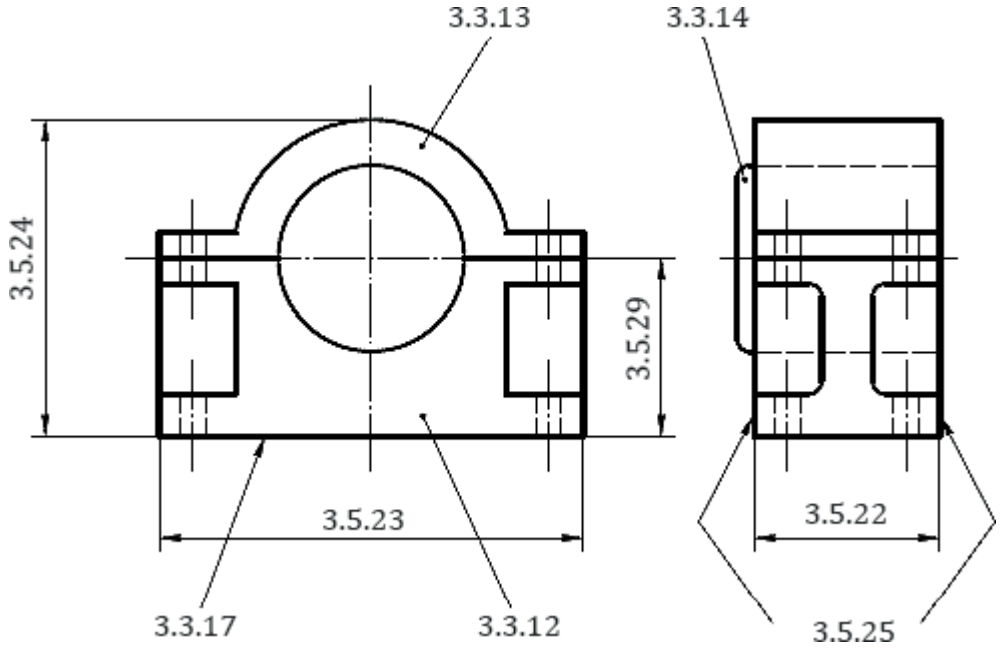


FIG. 28 PLAIN BEARING HOUSING BLOCK

3.3.13 *Plain Bearing Housing Cap, Bearing Cap*

Part of the housing that retains the bearing in the block.

NOTE — *See* Fig. 28.

3.3.14 *Plain Bearing Housing Cover Plate, Cover Plate*

Plate for closing the housing face (**3.5.25**) in axial direction.

NOTE — *See* Fig. 28.

3.3.15 *Plain Bearing Assembly Gasket, Bearing Gasket*

Element used for sealing the bearing housing against lubricant leakage and ingress of dirt.

3.3.16 *Bearing Housing Flange*

Part of the flanged bearing housing for connection to the machine in an axial direction and/or perpendicular to the axis.

NOTE — *See* Fig. 17.

3.3.17 *Bearing Housing Base*

Part of the pedestal bearing housing for perpendicular or parallel connection to the machine casing or machine foundation.

3.3.18 *Bearing Insulation*

Electrical insulation between plain bearing (**3.1.2**) and housing or between housing and housing support.

NOTE — This is sometimes used to prevent the bearing (3.1.1) from electro erosive wear.

3.3.19 *Oil Ring Slot*

Recess in the plain bearing (**3.1.2**) for location of an oil ring.

NOTE — *See* Fig. 27.

3.3.20 *Oil Filler Hole, Lubricant Filler Hole, Lubricant Supply Hole*

Capped hole for charging the bearing housing with oil.

3.3.21 *Oil Drain Hole Lubricant Drain Hole*

Plugged hole for draining the lubricant charge from the bearing housing.

3.3.22 *Plain Bearing Housing Bore*

Cylindrical bore of the housing for fixing the bearing bush (**3.3.2**) or a pair of half-bearings (**3.3.1**), which is a spherical bore in the case of the spherical plain bearing.

3.4 Structural Elements of Plain Bearing

3.4.1 *Oil Hole Lubrication Hole*

Hole through backing and sliding surface of a plain bearing (**3.1.2**) to supply and distribute lubricant.

NOTE — *See* Fig. 4, 29 and 30.

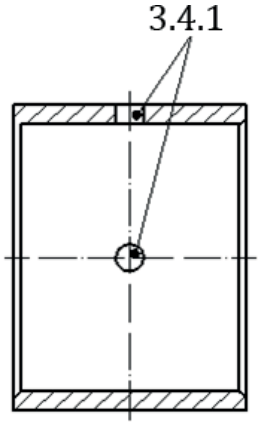


FIG. 29 OIL HOLE

3.4.2 *Oil Groove Lubrication Groove*

Groove on the sliding surface to supply and distribute lubricant on the sliding surface.

NOTE — *See* Fig. 26, 27, 31 and 32.

3.4.2.1 *Outer oil groove, outer lubrication groove* — Groove on the bearing back (**3.3.1.3**) to supply lubricant to the oil hole (**3.4.1**).

NOTE — *See* Fig. 30.

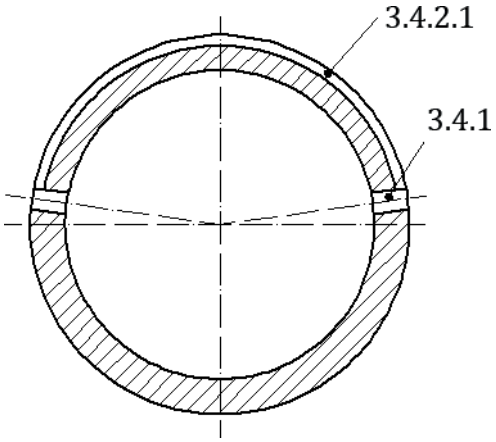


FIG. 30 OUTER OIL GROOVE

3.4.2.2 *Longitudinal groove, axial groove* — Lubrication groove (**3.4.2**) parallel to the axis in a plain journal bearing (**3.2.2.1**).

NOTE — *See* Fig. 31.

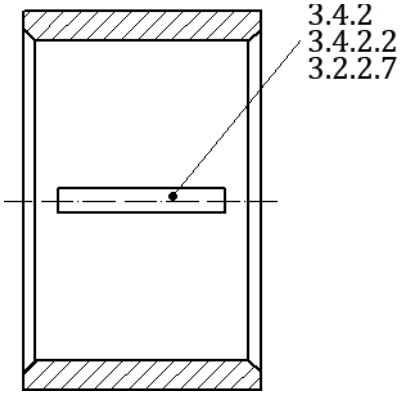


FIG. 31 LONGITUDINAL GROOVE

3.4.2.3 *Circumferential groove* — Lubrication groove (**3.4.2**) in annular or partially annular form.

NOTE — *See* Fig. 32.

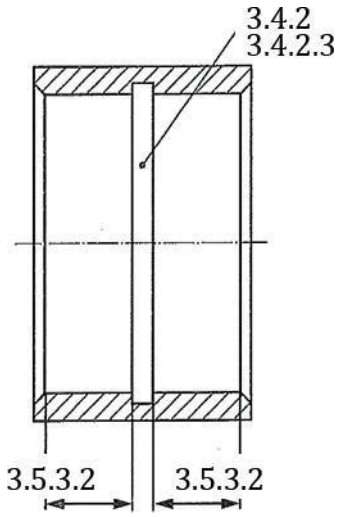


FIG. 32 CIRCUMFERENTIAL GROOVE

3.4.2.4 *Partially circumferential groove* — partially circumferential lubrication groove (**3.4.2**) provided on a part of a plain journal bearing (**3.2.2.1**).

3.4.2.5 *Helical groove, spiral groove* — Helically cut lubrication groove (**3.4.2**).

NOTE — *See* Fig. 33.

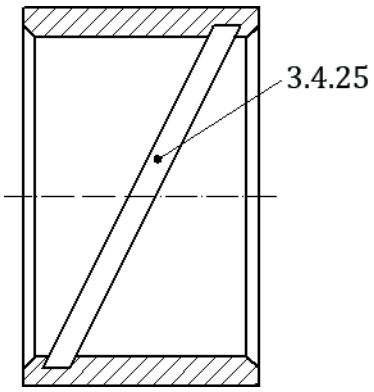


FIG. 33 HELICAL GROOVE

3.4.2.6 *Open groove* — axial lubrication groove (**3.4.2**) extending over the full bearing width.

NOTE — *See* Fig. 34.

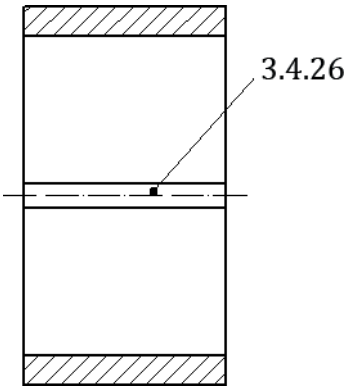


FIG. 34 OPEN GROOVE

3.4.2.7 *Stopped-off groove* — Oil groove (**3.4.2**) that does not reach the bearing end face or faces.

NOTE — *See* Fig. 31.

3.4.2.8 *Gutterway* — Axial oil groove (**3.4.2**) adjacent to or spanning an axial joint in a bearing (**3.1.1**).

NOTE — *See* Fig. 35.

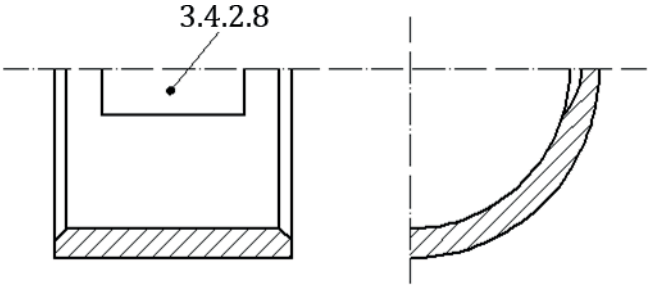


FIG. 35 GUTTERWAY

3.4.2.9 *Chevron groove* — Oil groove (**3.4.2**) that has a line or pattern in the shape of a V

NOTE — *See* Fig. 36.

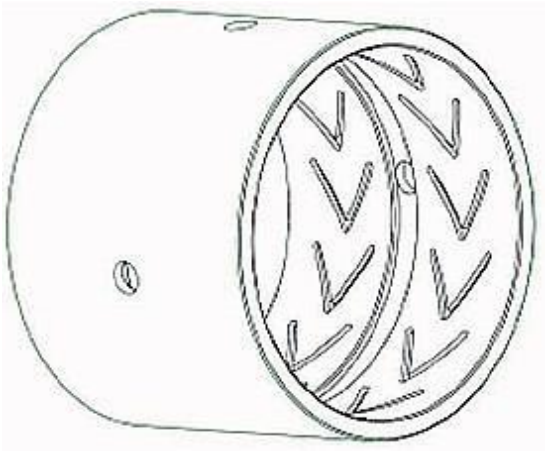


FIG. 36 CHEVRON GROOVE

3.4.2.10 *Herringbone groove* — oil grooves (**3.4.2**) having twist angles in opposite directions from both ends of the bearing surface.

NOTE — *See* Fig. 37.

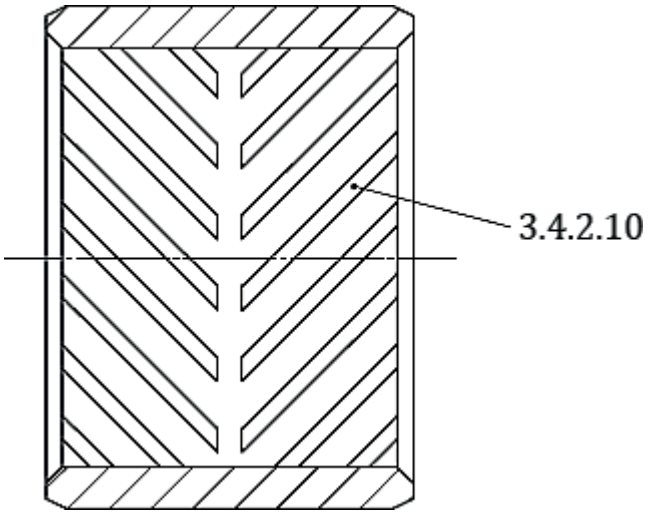


FIG. 37 HERRINGBONE GROOVE

3.4.3 *Oil Pocket, Lubrication Indentation*

Recess on the sliding surface to accumulate and to distribute lubricant.

NOTE — *See* Fig. 4 and 38.

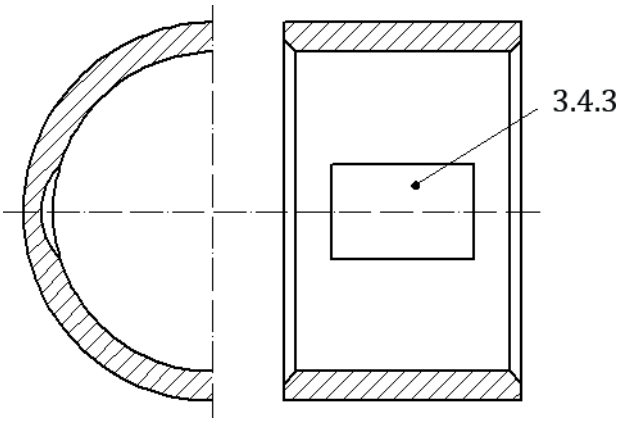


FIG. 38 OIL POCKET

3.4.4 *Locating Feature*

Notch, nick, recess, groove, lug or hole to locate a bearing (**3.1.1**) in a housing.

NOTE — *See* Fig. 39.

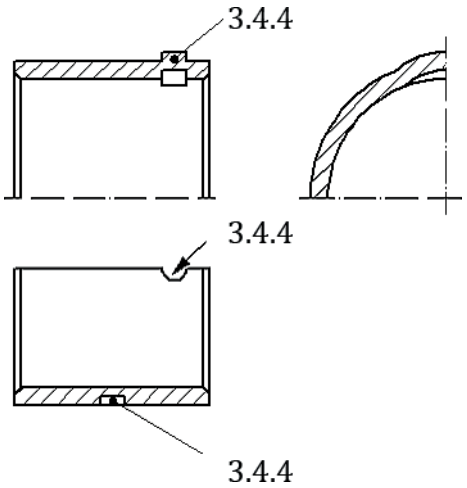


FIG. 39 LOCATING FEATURE

NOTE — *See* ISO 12301:2007, Fig. 21 to 26.

3.4.5 Clinch

Shapes of joint faces (**3.5.27**) in order to close the split of wrapped bushes (**3.3.2.1**) by engaging mutually.

NOTE — *See* Fig. 40.

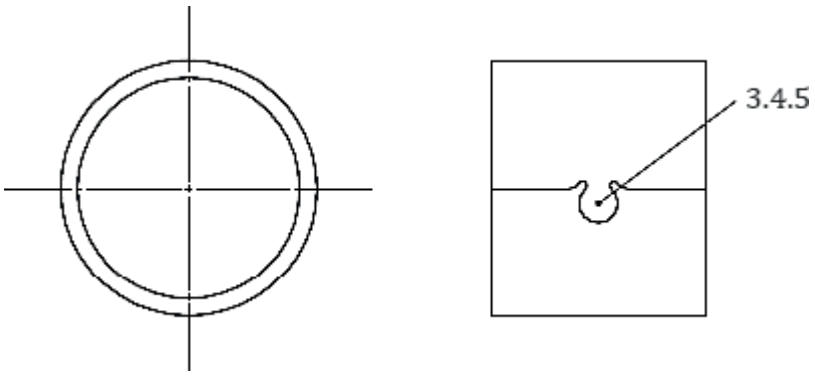


FIG. 40 CLINCH

3.5 Dimensional Characteristics of Plain Bearing

3.5.1 *Journal Bearing Bore Diameter, Bore, Inside Bearing Diameter, ID*

Internal diameter of the section perpendicular to the axis of a circular cylindrical journal bearing.

NOTE — *See* Fig. 41.

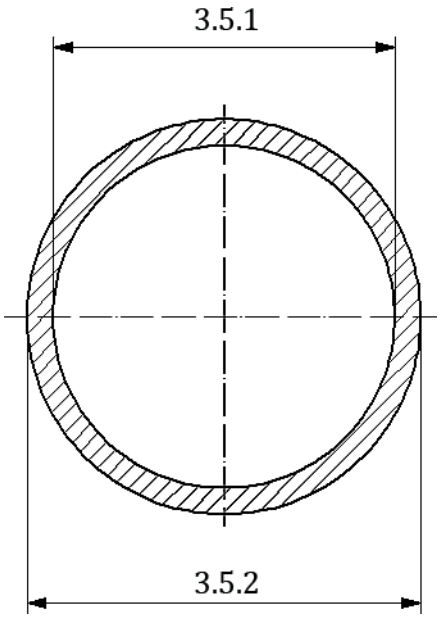


FIG. 41 JOURNAL BEARING DIAMETER

3.5.2 *Plain Journal Bearing Outside Diameter, Outside Bearing Diameter, OD*

Diameter of the back of the bearing (**3.1.1**).

NOTE — *See* Fig. 41.

3.5.3 *Bearing Width*

Dimension of a plain bearing (**3.1.2**) measured perpendicular to the direction of the sliding motion.

NOTE — *See* Fig. 20 and 42.

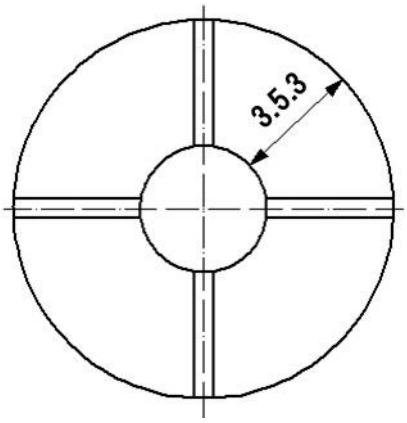


FIG. 42 BEARING WIDTH

3.5.3.1 *Effective bearing width* — Bearing (**3.1.1**) or bush (**3.3.2**) width excluding the central groove and chamfers.

3.5.3.2 *Bearing land width* — Dimension of a circumferentially grooved journal bearing from the edge of the groove to the edge of the bearing (**3.1.1**) in the axial direction, excluding chamfers.

NOTE — *See* Fig. 32.

3.5.3.3 *Land* — Effective sliding surface in a plain bearing (**3.1.2**).

3.5.4 *Diametral Clearance of a Plain Journal Bearing, Journal Bearing Clearance, Bearing Clearance*

Difference between the diameter of the bearing bore and the diameter of the journal.

3.5.5 *Radial Clearance of a Circular Cylindrical Bearing*

Difference between the radius of the bearing bore and the radius of the journal.

NOTE — *See* Fig. 10.

3.5.6 *Minimum Radial Clearance of a Non-Circular Cylindrical Bearing*

Minimum distance between the sliding surfaces of the centred shaft and bearing (**3.1.1**).

NOTE — *See* Fig. 11.

3.5.7 *Relative Clearance of a Bearing*

Ratio of the radial clearance to the radius of journal or the ratio of the diametral clearance to the diameter of journal in a circular cylindrical bearing (**3.2.4.1**).

3.5.8 *Journal Bearing Wall Thickness, Bush Wall Thickness*

Distance between the outer surface of the backing and the sliding surfaces of a half-bearing (**3.3.1**) or bush (**3.3.2**) in a given radial direction.

NOTE — *See* Fig. 43.

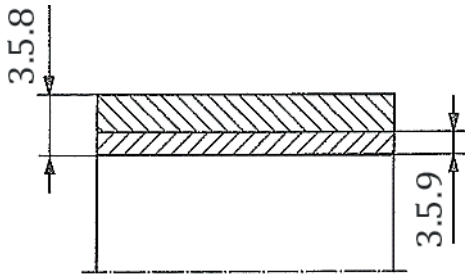


FIG. 43 JOURNAL BEARING WALL THICKNESS

3.5.9 *Bearing Material Layer Thickness, Lining Thickness*

Thickness of bearing material (**3.6.1**) applied to the backing.

NOTE — *See* Fig. 43.

3.5.10 *Pad Length of Pad Thrust Bearing*

Linear dimension of a pad (**3.3.7**) measured in the direction of sliding along the mean diameter.

NOTE — *See* Fig. 12.

3.5.11 *Pad Angle of Pad Journal Bearing*

Angle to indicate the circumferential dimension of a pad (**3.3.7**) forming part of a pad journal bearing.

NOTE — *See* Fig. 14.

3.5.12 *Pad Width*

Linear dimension of a pad (**3.3.7**) measured perpendicular to the direction of the sliding motion.

NOTE — *See* Fig. 12 and 14.

3.5.13 *pad thickness*

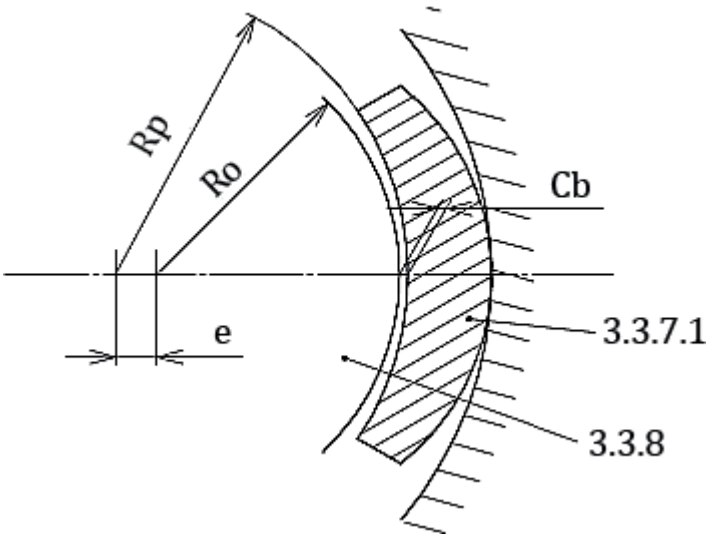
Linear dimension of a pad (**3.3.7**) measured in the axial direction or in the radial direction.

NOTE — For axial direction (thrust pad), *see* Fig. 12 and for radial direction (journal pad), *see* Fig. 14.

3.5.14 *Preload Factor*

Dimensionless value (m) determined by dividing the difference between the manufactured radial clearance (Cp) and the assembled radial clearance (Cb) by the manufactured radial clearance (Cp) (*See* Fig. 44) in a multi-lobe bearing or a tilting pad journal bearing.

NOTES
1 Expressed as (Cp − Cb) / Cp.
2 By making the assembled radial clearance (Cb) smaller than the manufactured radial clearance (Cp), the bearing oil film stiffness and damping property are influenced.



where
Preload factor 'm' = e / (e + Cb) = (Cp − Cb) / Cp ; and
Cp = e + Cb = Rp − Ro

FIG. 44 PRELOAD FACTOR

3.5.14.1 *Manufactured radial clearance, Cp* — Difference between the radius of the bearing bore and the radius of the journal

NOTE — In case of a circular cylindrical bearing (3.2.4.1), the radial clearance (3.5.5) has to be used and in case of a non- circular cylindrical bearing, the minimum radial clearance (3.5.6) has to be used.

3.5.14.2 *Assembled radial clearance, Cb* — Actual minimum distance between the sliding surfaces of journal and bearing (3.1.1) after assembled, which is not same in value with the manufactured radial clearance (3.5.14.1) because of the gap between the centers of journal and bearing.

3.5.15 *Load on Pad*

Load on a tilting pad journal bearing (**3.2.4.6**) in the direction of the pad pivot.

3.5.16 *Load Between Pads*

Load on a tilting pad journal bearing (**3.2.4.6**) directed towards the space between two adjacent pads (3.3.7) facing each other

3.5.17 *Crush Relief, Oil Relief, Bore Relief*

Tapering off of half-bearing (**3.3.1**) wall thickness at the joint face (**3.5.27**).

NOTE — *See* Fig. 45.

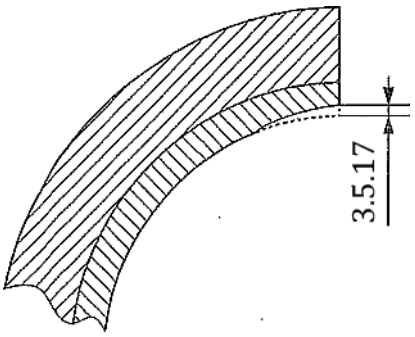


FIG. 45 CRUSH RELIEF

3.5.18 *Nip, Crush, Crush Height*

Distance by which a half-bearing (**3.3.1**) fitted under a predetermined test load into a checking block exceeds the defined semi-circular length of the checking block bore.

NOTE — *See* Fig. 46.

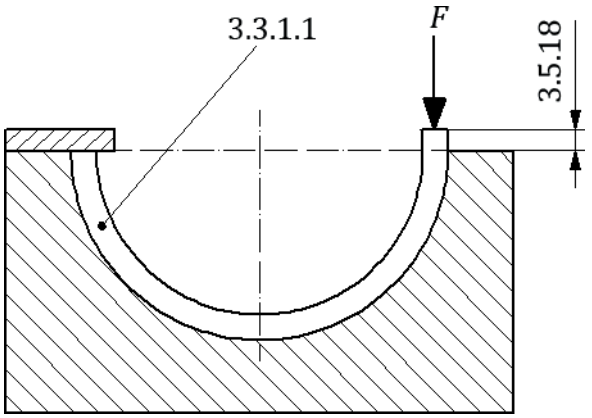


FIG. 46 CRUSH

3.5.19 *Interference*

Difference between the journal bearing (**3.2.2.1**) outside diameter and the housing bore diameter when the former is larger than the latter.

NOTE — *See* Fig. 47.

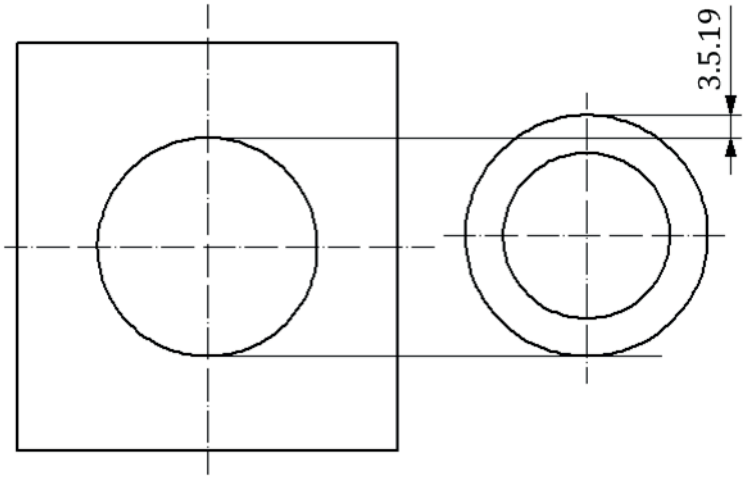


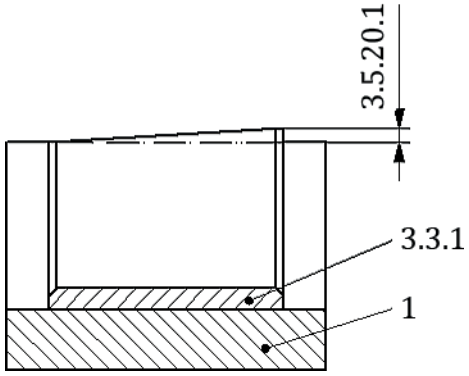
FIG. 47 INTERFERENCE

3.5.20 *Bearing Joint Inclination*

Deviation from parallelism of half-bearing (**3.3.1**) joint faces.

3.5.20.1 *Axial bearing joint inclination* — Deviation from parallelism of half-bearing (**3.3.1**) joint faces relative to the axis of rotation of the checking block bore.

NOTE — *See* Fig. 48, where the deviation is indicated by “3.5.20.1”.



Key

1 Checking block

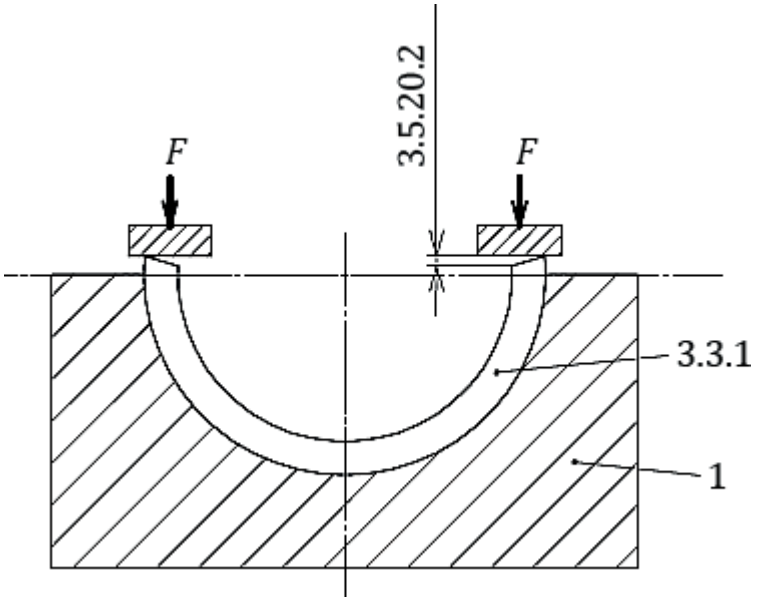
FIG. 48 AXIAL BEARING JOINT INCLINATION

3.5.20.2 *Radial bearing joint inclination* — Deviation from parallelism toward the radial direction of half- bearing (**3.3.1**) joint faces relative to the datum plane of the checking block.

NOTES

1 It is more relevant in larger bearings and can be checked qualitatively by the degree of blue transfer from loading.
Blocks to bearing joint surfaces during peripheral length checking, or in extreme cases, by the insertion of gauge strip into the gap created between the bearing joint and the loading block, shown at the inner diameter in the sketch.

2 *See* Fig. 49, where the deviation is indicated by “3.5.20.2”.



Key

1 Checking block

FIG. 49 RADIAL BEARING JOINT INCLINATION

3.5.21 *Free Spread*

Difference between the outside diameter of a half-bearing (**3.3.1**) measured across the joints in a free state and that of the checking block bore.

NOTE — *See* Fig. 50, where half of the free spread is indicated by “3.5.21”.

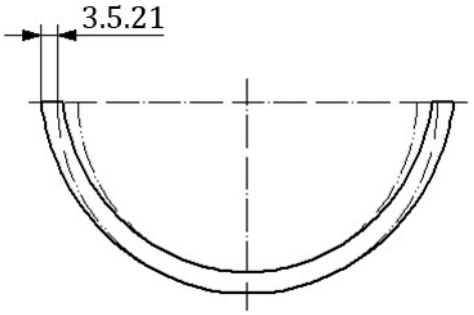


FIG. 50 FREE SPREAD

3.5.22 *Housing Width*

Maximum dimension of the bearing housing measured in the axial direction.

NOTE — *See* Fig. 28.

3.5.23 *Housing Length*

Maximum dimension of the bearing housing measured horizontally and perpendicular to the bearing axis.

NOTE — *See* Fig. 28.

3.5.24 *Housing Height*

Maximum dimension of the bearing housing measured perpendicular to the bearing axis.

NOTE — *See* Fig. 28.

3.5.25 *Housing Face*

Outer surface of the bearing housing perpendicular to the axial direction.

NOTE — *See* Fig. 28.

3.5.26 *Cooling Fins*

Extension of the outer surface of the bearing housing to improve heat dissipation.

3.5.27 *Joint Face*

Surface of facing ends of the half-bearing (**3.3.1**) or bearing housing.

NOTE — *See* Fig. 10 and 11.

3.5.28 *Joint Split*

Split area of a wrapped bush (**3.3.2.1**) that is shrunk to fit to the bush housing

NOTES
1 Wrapped bushes can be closed by an interlocked split [a clinch (3.4.5)].
2 *See* Fig. 22.

3.5.29 *Centre Height of a Pedestal Plain Bearing*

Distance between bearing housing bottom and the shaft axis.

NOTE — *See* Fig. 28.

3.5.30 *Journal Diameter*

Diameter of rotating shaft at the axial position supported by the plain journal bearing (**3.2.2.1**).

NOTE — *See* Fig. 1 and 51.

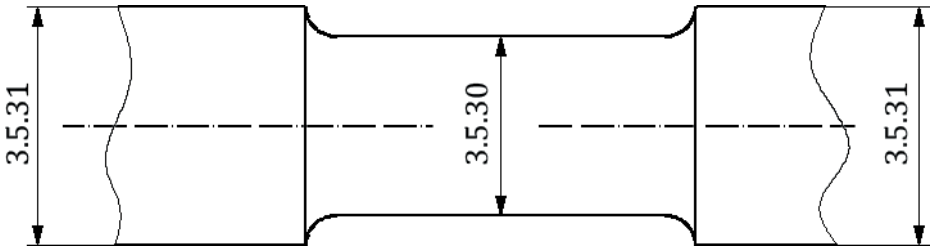


FIG. 51 JOURNAL DIAMETER

3.5.31 *Shaft Diameter*

Diameter of rotating shaft.

NOTE — *See* Fig. 1 and 51.

3.5.32 *Collar Diameter*

Thrust collar diameter or outside diameter of thrust collar (disc integral to the shaft).

NOTE — *See* Fig. 2.

3.6 Materials and Their Properties

3.6.1 *Bearing Material, Lining Material*

Material possessing a set of properties appropriate for use in plain bearings (**3.1.2**).

3.6.2 *Solid Material*

Bearing material (**3.6.1**) consisting of one uncoated material.

3.6.3 *Metallic Material*

Bearing materials characterised by high thermal and electrical conductivity, malleability, ductility and high reflectivity of light. Combination of different metals is called alloys.

Example:

Aluminium alloy, copper alloy, white metal, etc.

3.6.4 *Polymer*

Bearing materials made of very large carbon-based molecules called macromolecule. These materials are composed of large number of subunits.

3.6.5 *Multilayer Material*

Bearing material (**3.6.1**) consisting of two or more layers of different materials including backing material (**3.6.6**).

3.6.6 *Backing Material*

Material of which the bearing backing (**3.3.1.4**) is made.

3.6.7 *Composite Material*

Bearing materials are made of two or more different constituent materials. The constituent materials have notably different physical or chemical properties. These composites are merged to create a material with completely different properties.

3.6.8 *Sintered Bearing Material, Sintered Material*

Material formed from compressed and sintered powder.

3.6.9 *Tribological Compatibility*

Ability of a bearing material (**3.6.1**) to ensure optimal tribological behaviour in the tribological system.

3.6.10 *Conformability*

Ability of a bearing material (**3.6.1**) to adjust to the mating surface by elastic and plastic deformation.

3.6.11 *Running-In Ability*

Ability of a bearing material (**3.6.1**) to ensure acceptably low friction and high wear and seizure resistance (**3.6.14**) after initial running-in against a specified shaft material.

3.6.12 *Embeddability*

Ability of a bearing material (**3.6.1**) to embed hard particle contaminants.

3.6.13 *Bonding*

Ability of a bearing lining material (**3.6.1**) to form an acceptably strong bond with a specified bearing backing (**3.3.1.4**) material.

3.6.14 *Seizure Resistance*

Ability of a bearing material (**3.6.1**) in the tribological system to resist seizure

3.6.15 *Wear Resistance*

Ability of a bearing material (**3.6.1**) in the tribological system to resist wear, expressed as a reciprocal of the wear rate or the wear intensity.

3.6.16 *Corrosion Resistance*

Ability of a bearing material (**3.6.1**) to withstand corrosion.

3.6.17 *Relative Wear Resistance*

Ratio of wear resistance (**3.6.15**) of a bearing material (**3.6.1**) to that of reference material under similar wear conditions.

3.6.18 *Temperature Stability*

Ability of a bearing material (**3.6.1**) to retain the required performance properties over a wide temperature range.

3.6.19 *Fatigue Resistance*

Ability of a bearing material (**3.6.1**) to resist fatigue.