



ISO/TC 123 Strategic Business Plan, Date: 2023-10-12

Version: #14

STRATEGIC BUSINESS PLAN

ISO/TC 123

Plain bearings

EXECUTIVE SUMMARY

The main fields and the overall size of the markets addressed by the committee

Plain bearing is a mechanical component with sliding surfaces by means of which a moving part in relative motion is supported and/or guided with respect to other parts of a mechanism. Because of their inherently simple structure and compact size, plain bearings are used in almost all kinds of machineries as inevitable components and influence largely their performance. Their merits of large load and damping capacity, long life and low noise used under hydrodynamic lubrication are also reasons for many applications. They provide high rigidity when used under hydrostatic lubrication. Plain bearings with special bearing materials, surface structures and/or solid lubricants etc. are used under marginal lubrication or dry friction or maintenance-free conditions. They open new fields of application when used with gas or air as lubricant.

The largest market for plain bearings is doubtlessly automobiles with engine bearings such as main bearings, crankpin bearings, piston pin bushes, etc. and other diverse sliding parts such as kingpin bushes, steering bushes, and shock-absorber bushes, etc. The plain bearings are also used in civil and agricultural machines, ships, railways, aircrafts, spacecrafts, rockets, etc.

Without claiming for completeness, some other typical application should be mentioned: (1) Prime movers and working machines such as steam, gas and hydraulic turbines, Diesel, Otto and gas engines, electric motors and generators, water pumps, compressors, and centrifuges, etc. (2) Machine tools, such as lathes, milling machines, hobbing machines, casting machines, and press and forging machines, etc. (3) Stationery plants, such as water gates, bridges, cranes, offshore structures, buildings with seismic isolation, and astronomical telescopes, etc. (4) Precision machines or the like, such as measurement equipments, business machines,

hard disc-drives, video tape recorder, copy machines, watches, medical equipments, laboratory equipments, and robots, etc. (5) Application in household machines, equipments in buildings and housing, hinges and bushings, and the like.

The benefits already realized and/or expected through the availability of the standards

Though the ISO-standardization of plain bearings began much later than that of rolling bearings and there exist still cases where plain bearings, especially large ones, are designed and produced “piece by piece”, the ISO-standards of plain bearings are becoming more and more often applied and important especially through the globalization of the industries. The standardization gives the benefits of lower cost and applicability of plain bearings worldwide.

The main objectives and priorities in the work of the committee

The objectives of the ISO/TC 123 and its subcommittees are to develop, maintain and update standards for plain bearings in:

Terms and symbols,

Materials, their properties, testing methods and conditions,

Dimensions, tolerances and construction details,

Calculation methods,

Quality analysis and assurance,

Special types of plain bearings

1 INTRODUCTION

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: [ISO](#) (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of [IEC](#) (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of [ITU](#) (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the [International Standard](#).

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its [Technical Committees](#) are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2 BUSINESS ENVIRONMENT OF THE ISO/TC

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

2.1.1 The state of the art and recent technological changes and major innovations

Energy saving, emission and environmental issues are the main driving forces in the sector of plain bearings besides the inland and global competition. Especially in internal combustion engines for road vehicles, where the plain bearings are mostly applied, the demand for energy saving has caused the reduction of bearing width. At the same time, the combustion pressure increased for emission reduction and power enhancement. Hence, the specific bearing load or the bearing load per unit projected bearing area has increased. Together with the reduction of lubricant viscosity for friction loss reduction, the minimum oil film thickness in plain bearings has become less than 1 micro-meter. This caused the operation of plain bearings in mixed lubrication regime, which condition is much more severe than that of traditional hydrodynamic lubrication. This induced the development of new bearing materials, surface structure and treatment.

The demand for energy saving has also caused the mass and size reduction of engine parts, including the walls surrounding and supporting the bearings. The whole engine and plain bearings have become more elastically flexible. The elastic deformation of bearing and oil film pressure supporting the load influence each other. To take these factors into account in bearing design, the Computer Aided Engineering (CAE) is effectively applied using the elasto-hydrodynamic lubrication theory or the thermo-elasto-hydrodynamic lubrication theory.

As will be mentioned in Clause 2.1.3, lead preferred as bearing material component so far may not be used in road vehicles as hazardous substances in near future. The substitute materials have been developed or are now under development. Also the environment and resource issues have caused the change of bearing manufacturing process (plating, for example) or the introduction of recycling.

Due to Mergers and Acquisitions (M & A), the number of the sites for research and development of plain bearings has diminished, especially in Europe and USA, resulting in remarkable decrease of number of experts engaged in standardization activity for plain bearings. This resulted in less participation in the projects and international meetings of plain

bearings in recent years.

At the same time, with increasing industrialization and automobile production in Asia, the production of plain bearings is increasing, especially in China, Republic of Korea, India and Thailand. Therefore, these countries will be more interested in standardization of related subjects.

Though plain bearings are used predominantly in reciprocating internal combustion engines for vehicles at present, it must be kept in mind that the prime mover may change to another one, especially electric type in the long term through technical development caused by resources and environment issues.

2.1.2 Categories of relevant stakeholders

Plain bearings are not end products, but intermediate ones. Besides the manufactures of plain bearings, the relevant stakeholders are, therefore, manufacturers using the plain bearings such as manufacturers of automobiles and so on, mentioned in EXECUTIVE SUMMARY. There are some aftermarkets to be considered by suppliers. There are also so-called rebuilders of plain bearings in some developing countries. They repair the worn-out or damaged bearings for reuse.

2.1.3 Social, safety, health, environmental or cultural issues

Environmental care is becoming increasingly important. With proper measures, the plain bearing industry can contribute to a more sustainable future.

The lead which has been widely used as bearing material due to its superior tribological properties will not be permitted for vehicle use in future because of health and environmental concern. According to [RoHS](#) (DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment) which was enforced on 2006-07-01, hazardous substances including lead shall not exceed limit values in EEE(Electrical and Electronic Equipment) in EU countries.

2.1.4 Other relevant international, regional or national standards or voluntary initiatives

For plain bearings, there exist national or organizational standards as shown in Table 3. They are practically used besides ISO standards and company standards.

2.1.5 Real or potential technical barriers to trade

ISO standards are not yet implemented in all sectors of plain bearings. There are still many cases where plain bearings are designed and produced as order made products or using standards of each manufacturer. This fact may be regarded as some barriers to trade and should be considered.

In case of plain bearings for automobile engines the bearings are usually designed for each type of engines. The bearing size is negotiated between engine and bearing manufacturers, whereas the forms of oil grooves and oil holes are guided by standards.

2.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators express, as typical examples, the business environment in order to provide adequate information to support actions of the ISO/TC:

2.2.1 Sales in the sector of plain bearings in some countries

The approximate figures for the annual sales of plain bearings and/or their materials are given in Table 1.

Table 1 Annual sales of plain bearings and/or their materials in 2016~2020

in million US \$

Country	2016	2017	2018	2019	2020
Austria	724	778	814	960	-
Germany	-	-	-	-	-
Japan	1691	1757	1777	1720	1388
UK	138.07	153.43	166.18	154.44	143.01

2.2.2 Number of companies manufacturing plain bearings and/or their materials in some countries as well as number of employees in 2020

The main manufacturers of plain bearings are situated in the countries: Argentina, Austria, Brazil, China, France, Germany, India, Italy, Japan, Poland, Republic of Korea, Russia, South Africa, Spain, UK and USA. Table 2 gives the number of companies manufacturing plain bearings and/or their materials as well as estimated number of employees engaged in plain bearing sectors in 2020.

Table 2 Number of companies manufacturing plain bearings and/or their materials as well as estimated number of employees in 2020

Country	No. of companies	Estimated no. of employees engaged in plain bearing sectors
Austria	17	6860
Germany	-	-
Japan	37	5038
UK	7	900

2.2.3 Total number of national adoptions of the ISO committee's International Standards in some countries

Table 3 shows the number of national or organizational standards for plain bearings and the number of standards harmonized with ISO in 2020.

Table 3 Number of national or organizational standards for plain bearings and the number of standards harmonized with ISO in 2020

Country	Designation of standards	No. of nat. or organizational standards for plain bearings	No. of standards harmonized with ISO		
			Fully (IDT)	Partially (MOD)	Not (NEQ)
Austria	ÖNORM	18	79	1	(18)
Germany	DIN, DIN ISO	51	43	0	39
Japan	JIS, JASO	23	2	18	3
UK	BSI	46	43	0	3

3 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

Formerly, plain bearings have been often designed and manufactured more or less as order made products or "piece by piece". The standardization for plain bearings began much later than for rolling bearings. However, the ISO standardization of plain bearings is now becoming

more and more important and often applied especially from necessity of globalization of the industries.

Plain bearings are used widely in almost all kinds of machineries as mentioned in EXECUTIVE SUMMARY and the ISO standardization has contributed to cost reduction in designing, manufacturing and maintenance of plain bearings and the end products. Also world-wide supply has been made possible at the most cost-effective price and the same quality guaranteed by ISO standards. This has contributed to remove technical barriers to trade and to open markets. Standardization for the substitute materials for lead developed or under development might be expected in near future. See also Clause 2.1.3.

4 REPRESENTATION AND PARTICIPATION IN THE ISO/TC

4.1 Countries/ISO members bodies that are P and O members of the ISO committee

4.2 Analysis of the participation

ISO/TC 123 and its Subcommittees presently consist of 32 member bodies, where 12 are P-members and 20 are O-members, as shown in Table 4. In Table 4, if a country is a P-member of at least one SC or TC 123, it is listed under P-members. If a country other than P-member is an O-member of at least one SC or TC 123, it is listed under O-members.

As seen in Clause 4.1 or Table 4, the present participation as P-member by developed countries in TC 123 and/or its Subcommittees may be regarded as rather few. Possible reason is mergers and acquisitions (M and A) of plain bearing manufacturers. USA with a large production of plain bearings has withdrawn from O-member of TC 123 in 2014. A reason for this may be found in the fact that they concentrate themselves in production, whereas research and development are conducted in their associated companies in Europe. It is remarkable that many Asian countries have joined in TC 123 and its SCs as P member as seen in Table 4 in recent years. Less participation by developing countries is likely due to the lack of related industries.

Efforts should be made to deepen the recognition of importance of standardization and to improve participation in standardization projects through enlightening activities and encouragement by the present members of TC 123 and its subcommittees. In this respect,

education on standardization in schools and universities are strongly recommended. It is also most important to get the recognition of the company's managers.

Table 4 Members of ISO/TC 123 and its Subcommittees As of 2023-10-01

Region	P-members	O-members
Europe and CIS	Austria, France, Germany, Russian Fed., UK	Belarus, Czech R., Finland, Greece, Hungary, Italy, Poland, Romania, Serbia, Slovakia, Spain, Ukraine
Asia	China, India, Japan, Korea R., Malaysia, Philippines	Indonesia, Iran I.R., Korea D.P.R., Turkey
America	Brazil	Chile, Cuba
Africa		South Africa, Tunisia
Total	12	20

5 OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

5.1 Defined objectives of the ISO/TC

The objectives of the ISO/TC 123 and its subcommittees are to develop, maintain and update standards for plain bearings in:

TC 123: Plain bearings

SC 2: Materials and lubricants, their properties, characteristics, test methods and testing conditions

SC 3: Dimensions, tolerances and construction details

SC 5: Quality analysis and assurance

SC 6: Terms and common items

SC 7: Special types of plain bearings

SC 8: Calculation methods for plain bearings and their applications

5.2 Identified strategies to achieve the ISO/TC's defined objectives

Compared with rolling bearings, plain bearings with their simple structure allow more flexibility in designing and manufacturing. Not all types, sizes and applications are standardized yet.

Even where standards exist, they are not always used because of new different machine designs. The flexibility of designing and manufacturing seems to have been the main reasons

why the standardization began much later for plain bearings.

Engine manufacturers, the largest users of plain bearings at present, expect the newest technologies in materials and bearing structures for the realization of their engine concepts and require sometimes bearing specification beyond standards. This may be the results of technology development where the flexibility of plain bearings is taken into account. However, even in such cases the fundamental design methods and detailed bearing forms are usually guided by standards so that the importance of the standards remains unchanged.

And in the field of some kinds of machineries, especially heavy industrial ones, the design and the related manufacturing systems are already so established, that traditional technologies and experiences of the users and main plain bearing manufacturers are decisive. However, such cases remain in limited parts and limited extents at present.

In spite of the ISO standardization activities so far, there are still items to be standardized due to new demands for energy saving, environment protection, progress of technology and some other reasons.

Also there exist large possibilities for standardization to reconfirm or to fix the existing design methods or to introduce new technologies. As a result, it may be expected that such standardization of plain bearings may offer wider applications.

On the other hand, it should be also mentioned that there are subjects or items unsuitable or impossible for standardization. For example, new materials, structures of sliding surfaces and manufacturing processes, etc. may be the key technologies for product differentiation or competition in the market. Unless the relevant company opens this technology the standardization will not go. On the other hand, subjects important for only a group of stakeholders may not be suitable for standardization.

Taking into account the facts mentioned above, the strategy of standardization for plain bearings is to timely develop useful standards that bring maximum merits to all stakeholders concerned. Appropriate and timely standardization of plain bearings will bring about activation of business related with plain bearings and the end products.

To be more concrete: In order to achieve the defined objectives mentioned in Clause 5.1, ISO/TC 123 has established six subcommittees SC 2, SC 3, SC 5, SC 6, SC 7 and SC 8 on each subject, where each subcommittee will concentrate itself on the achievement of its

objectives and the TC 123 will serve to optimize the activities of all subcommittees.

The projects are carried out and forwarded through international meetings held approximately once a year and usually at a common venue, leading to national meetings to take place several times a year. Not to mention the use of telephone, e-mail, internet, every kind of ISO IT tools. Teleconference and translation in meetings are not used.

5.3 Standards published in 2023

First edition:

ISO/TS 24137:2023 Plain bearings — Surface modification by press fitting solid lubricants combined with micro dimple processing

Second edition:

ISO 3548-3:2023: Plain bearings — Thin-walled half bearings with or without flange — Part 3: Determination of the peripheral length

Third edition:

ISO 12167-1:2023 Plain bearings — Hydrostatic plain journal bearings with drainage grooves under steady-state conditions — Part 1: Calculation of oil-lubricated plain journal bearings with drainage grooves

ISO 12131-2:2023: Plain bearings — Hydrodynamic plain thrust pad bearings under steady-state conditions — Part 2: Functions for the calculation of thrust pad bearings

Fourth edition:

ISO 3547-2:2023: Plain bearings — Wrapped bushes — Part 2: Test data for outside and inside diameters

6 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

In accordance with the last paragraph of the Section 4.2 “Analysis of the participation” of this Business Plan, the numbers of P-members should be increased in order to intensify the standardization activity. All members of TC 123 and its Subcommittees are requested to contribute to this target.

7 STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

This section gives an overview of the ISO/TC's structure, scopes of the ISO/TCs and any existing subcommittees and information on existing and planned standardization projects, publication of the ISO/TC and its subcommittees.

[7.1 Structure of the ISO committee](#)

[7.2 Current projects of the ISO technical committee and its subcommittees](#)

[7.3 Publications of the ISO technical committee and its subcommittees](#)

Reference information

[Glossary of terms and abbreviations used in ISO/TC Business Plans](#)

[General information on the principles of ISO's technical work](#)