

INTERNATIONAL STANDARD

ISO
10792-3

First edition
1995-07-15

Aerospace — Airframe spherical plain bearings in corrosion-resisting steel with self-lubricating liner —

Part 3: Technical specification

*Aéronautique — Rotules en acier résistant à la corrosion, à garniture
autolubrifiante, utilisées dans la structure des avions —*

Partie 3: Spécifications techniques



Reference number
ISO 10792-3 1995(E)
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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.

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.

International Standard ISO 10792-3 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 15, *Airframe bearings*.

ISO 10792 consists of the following parts, under the general title *Aerospace — Airframe spherical plain bearings in corrosion-resisting steel with self-lubrication liner*:

- *Part 1: Metric series*
- *Part 2: Inch series*
- *Part 3: Technical specification*

Annexes A to D form an integral part of this part of ISO 10792.

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International Organization for Standardization

Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Aerospace — Airframe spherical plain bearings in corrosion-resisting steel with self-lubricating liner —

Part 3:

Technical specification

1 Scope

This part of ISO 10792 gives a technical specification (required characteristics, the methods for checks and tests, the quality assurance, and the qualification, reception and delivery conditions) for spherical plain bearings in corrosion-resisting steel, with self-lubricating liner, designed to be subjected under load to slow rotations and low-strain oscillatory motion only.

It is applicable to spherical plain bearings consisting of two concentric rings between which is interposed a self-lubricating liner which is bonded to the spherical surface of the outer ring, when reference is made to it in the relevant product standards or in a defining document.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 10792. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 10792 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6811:1983, *Spherical plain bearings — Vocabulary*.

ISO 10792-1:1995, *Aerospace — Airframe spherical plain bearings in corrosion-resisting steel with self-lubricating liner — Part 1: Metric series*.

ISO 10792-2:1995, *Aerospace — Airframe spherical plain bearings in corrosion-resisting steel with self-lubricating liner — Part 2: Inch series*.

ISO 11078:1994, *Aerospace — Aircraft de-icing/anti-icing non-Newtonian fluids, ISO type II*.

3 Definitions

For the purposes of this part of ISO 10792, the definitions given in ISO 6811 and ISO 10792-1 and the following definitions apply.

3.1 crack: Break in the material which may extend in all directions and be intercrystalline or transcrystalline in character.

3.2 score, scratch: Open surface defect resulting from a tearing of the metal.

3.3 lap: Surface defect where particles of metal or sharp edges are folded over and then rolled or forged into the surface.

3.4 seam: Unwelded fold which appears as an open defect in the material.

3.5 void: Area where the adhesive bond is broken or non-existent leaving a smooth, clean space at the interface between the metallic surface and the liner.

3.6 delivery lot: Lot of spherical plain bearings packaged for delivery having the same identity block although they may originate from different production lots.

4 Required characteristics, inspection and test methods

The required characteristics and the inspection and test methods for qualification and acceptance tests shall be as defined in 4.1 to 4.18.

No.	Characteristics	Requirements	Inspection and test methods	Q ¹⁾	A ¹⁾
4.1	Materials	Materials shall conform to product standard or design documents	Chemical analysis or analysis based on the manufacturer's certificate of conformity of the semi-finished product	X	X
4.2	Configuration	The width of the inner ring shall be greater than the width of the outer ring, so that a tilting movement is possible in addition to rotation movement. The outer ring shall have no filling (assembly) slots The outer ring may have face grooves for mechanical swaging		X	X
4.3	Dimensions and tolerances	Dimensions and tolerances shall conform to product standard or design documents	Appropriate measuring tools Measurement of bore and of outer diameter: a) Rings having a width of ≤ 10 mm in the centre plane parallel to the outer faces b) Rings having a width of > 10 mm. in two planes parallel to the outer faces and placed at a distance from these faces twice the maximum value of the ring chamfer. Determine the minimum and maximum diameters in each plane Measurement of ring width: Check on the width of each ring (distance between the two faces) at a minimum of four points. Check on the symmetry of the rings Repeat after rotation of the outer ring through 180°	X	X
4.4	Masses	Masses shall conform to product standard or design documents	Appropriate methods.	X	
4.5	Marking	Marking shall conform to product standard or design documents Marking shall be legible and shall not have a detrimental effect on the material nor adversely affect the working of the spherical plain bearing.	Visual inspection	X	X

No.	Characteristics	Requirements	Inspection and test methods	Q ¹⁾	A ¹⁾
4.6	Surface appearance	The bearings shall be free of surface discontinuities (see 3 1, 3 2, 3 3 and 3 4) liable to have an adverse affect on their characteristics and endurance The liner shall not contain contaminant products and shall not show any breaks, tears or voids Lubrication is not permitted		X	X
4.6.1	Assembled rings		Visual inspection using suitable methods		
4.6.2	Unassembled rings		Magnetic-particle or dye-penetrant inspection.		
4.7	Hardness	Hardness shall conform to product standard or design documents	Appropriate measurement procedures and instruments	X	X
4.8	Surface roughness	Surface roughness shall conform to product standard or design documents	Appropriate measurement instruments or visual and manual samples	X	X
4.9	Surface treatment	Surface treatment shall conform to product standard or design documents.	Visual check In accordance with surface treatment standard	X	X
4.10	Behaviour during rotation and tilting movements	The spherical plain bearing shall be able to move freely within the limits fixed for angles of tilt in the product standard or design documents	Manual check	X	X
4.11	Starting torques with zero load				
4.11.1	At ambient temperature	Starting torques shall conform to product standard or design documents.	Appropriate measurement procedures and instruments. Precede this measurement with a few manual rotations and tilting movements With zero load, measure the torque, gradually applied to the inner ring, in both directions, maintaining the outer ring fixed Note the maximum value required for the inner ring to be set in motion	X	X
4.11.2	At low temperature	Starting torques shall be equal to or less than twice those indicated in the product standard or design documents.	Expose the spherical plain bearing for 4 h to the minimum temperature $\pm 5^{\circ}\text{C}$ Immediately after wards, measure the torque as indicated in 4 11.1	X	
4.11.3	Following a cycle of extreme temperatures	Starting torques shall conform to requirements specified in the product standard or design documents	Expose the spherical plain bearing for 1 h to the minimum temperature $\pm 2^{\circ}\text{C}$, followed by 1 h at the maximum temperature $\pm 2^{\circ}\text{C}$ Repeat this cycle 10 times in succession Four hours after this set of cycles, measure the torque, at ambient temperature, in accordance with in 4 11 1	X	

No.	Characteristics	Requirements	Inspection and test methods	Q ¹⁾	A ¹⁾
4.12	Compliance of spherical surfaces				
4.12.1	Fabric-type liners	No difference between measurements obtained on spherical surfaces shall exceed 0,08 mm	Clad the bearing in plastic material identical to that used for metallurgical mounts. Section the bearing on a diameter and normal to the race side face. Grind and polish the exposed surface. Measure the thickness, t , checked at a minimum of five points uniformly spaced around the spherical diameter with the aid of, for example, an optical dial indicator	X	
4.12.2	Moulded liners	The maximum liner thickness shall occur at the midpoint and shall comply with the requirements of table 1.	Proceed as described in 4.12.1. Measurements shall be made at the midpoint, at the points situated at $C/10$ from each edge of the outer ring and at least two other equally spaced points (see figure 1). NOTE — The dimension C is defined in ISO 10792-1 and ISO 10792-2	X	
4.13	Permissible static loads				
4.13.1	Radial, C_s	The permissible radial static load shall conform to product standard or design documents. With this load, the inner ring shall be able to take any position within the limit of the angle of tilt indicated in the product standard or design documents, and there shall be no maximum total deformations greater than those indicated in table 2. After suppression of the load, there shall be no residual deformations greater than those indicated in table 2.	See A 1.1	X	
4.13.2	Axial, C_a	The permissible axial static load shall conform to product standard or design documents. After suppression of the load, there shall be no residual deformations greater than those indicated in table 2.	See A 2 1.	X	
4.14	Ultimate loads	After suppression of the radial and axial loads, there shall not be no rupture, nor crack, nor expulsion of the inner ring	See A.1 2 and A 2 2.	X	

No.	Characteristics	Requirements	Inspection and test methods	Q ¹⁾	A ¹⁾
4.15	Permissible dynamic radial loads, C_{25}	Permissible dynamic radial loads at ambient temperature, at low temperature and at high temperature shall conform to product standard or design documents After suppression of the loads: a) there shall be no metal-to-metal contact between the inner and the outer rings, b) wear and tear of the liner shall not exceed the values indicated in table 3, c) resistance to peeling and adhesion of the liner shall meet the requirements specified in 4.17 and 4.18; d) the starting torque at zero load determined in accordance with 4.11 shall not exceed the value specified in table 4	See annex B	X	
4.16	Compatibility between liner and fluids	At the end of the dynamic load test, the requirements specified in 4.15 shall be satisfied	Use one spherical plain bearing per fluid Turn the inner ring so that it is perpendicular to the outer ring In this position, immerse the spherical plain bearings, for 24 h, in the fluids defined in annex C which shall be brought to the following temperatures a) $+ 70\text{ °C} \pm 3\text{ °C}$ for those defined in C 3, b) $+ 45\text{ °C} \pm 3\text{ °C}$ for those defined in C 1 and C 2, c) ambient temperature for that defined in C 4 30 min after removing the bearings from the fluids, test in accordance with annex B, under the conditions for testing at ambient temperature following immersion.	X	
4.17	Resistance of the liner to peeling	These requirements and this test shall only be applied if there is an indication from the manufacturer that the liner is susceptible to peeling. It shall present a mean peeling resistance of greater than 0,35 N per millimetre of width of the outer ring reduced by 2 mm to eliminate the effects of edges and chamfers 75 % of the recording curve shall lie above 0,35 N/mm	See annex D	X	X ²⁾

No.	Characteristics	Requirements	Inspection and test methods	Q ¹⁾	A ¹⁾
4.18	Bond integrity	The liner shall not contain any contaminating substances and shall firmly adhere to the outer ring over at least 90 % of the contact area. No voids are allowed which cannot be circumscribed within a circle of diameter equal to a) 25 % of the outer ring width, or b) 6 mm, whichever is less	After the test to determine resistance to peeling, evaluate the location and size of any voids If the liner is non-peelable, divide bearings which have been subjected to radial dynamic loads into sections and determine the bond integrity by chipping, scraping, abrasion or other appropriate means.	X	X
1) Q = Qualification test A = Acceptance test 2) For acceptance testing, the resistance to peeling shall be measured immediately after assembly and polymerization					

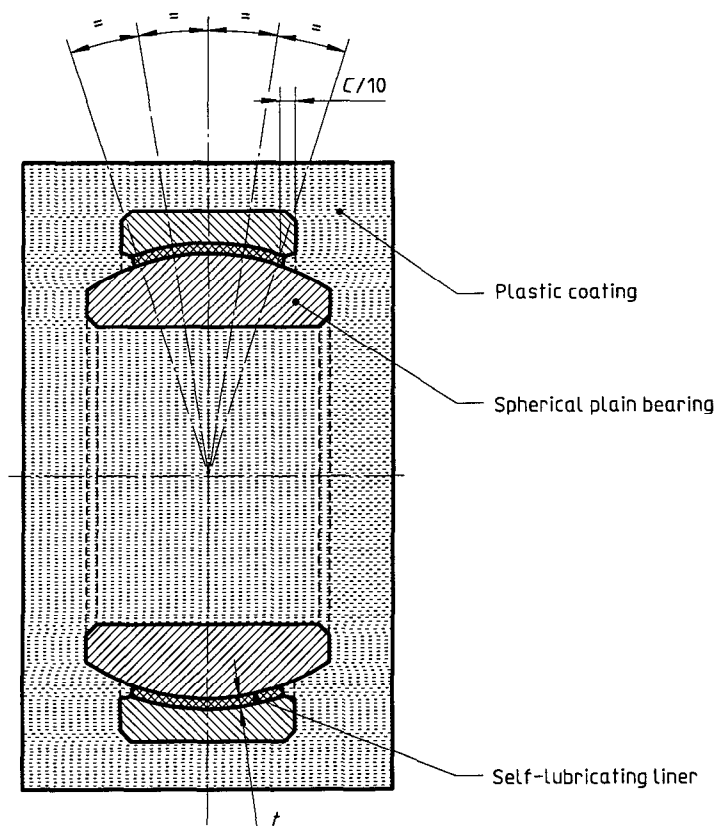


Figure 1