SLOVENSKI STANDARD
SIST EN 3280:2011

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Nadomešča:
SIST EN 3280:2001

Aeronavtika - Ležaji, ležaji letalske šasije, togi ali samoprilagodljivi - Tehnične zahteve

Aerospace series - Bearings, airframe rolling, rigid or self-aligning - Technical specification

Luft- und Raumfahrt - Flugwerklager Wälzlager, Rillenkugellager oder Pendellager - Technische Lieferbedingungen

Série aérospatiale - Roulements pour structure d'aéronefs, rigides ou à rotule - Spécification technique

Ta slovenski standard je istoveten z: **EN 3280:2011**

ICS:

49.035	Sestavni deli za letalsko in vesoljsko gradnjo	Components for aerospace construction

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EUROPEAN STANDARD

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English Version

Aerospace series - Bearings, airframe rolling, rigid or self-aligning - Technical specification

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This European Standard was approved by CEN on 17 March 2011.

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Foreword

This document (EN 3280:2011) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2011, and conflicting national standards shall be withdrawn at the latest by November 2011.

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This document supersedes EN 3280:1994.

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1 Scope

This European Standard specifies the required characteristics, inspection and test methods, qualification and acceptance conditions for rigid or self-aligning airframe rolling bearings.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 2063, *Aerospace series — Airframe rolling bearings — Technical specifications*

EN 3045, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in steel — Diameter series 0 and 2 — Reduced clearance category — Dimensions and loads*

EN 3046, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in steel, cadmium plated — Diameter series 0 and 2 — Reduced clearance category — Dimensions and loads*

EN 3047, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in corrosion resisting steel — Diameter series 0 and 2 — Reduced clearance category — Dimensions and loads*

EN 3053, *Aerospace series — Bearings, airframe rolling — Single row self-aligning roller bearings in steel — Dimensions and loads*

EN 3054, *Aerospace series — Bearings, airframe rolling — Single row self-aligning roller bearings in steel, cadmium plated — Dimensions and loads*

EN 3055, *Aerospace series — Bearings, airframe rolling — Single row self-aligning roller bearings in corrosion resisting steel — Dimensions and loads*

EN 3056, *Aerospace series — Bearings, airframe rolling — Rigid double row ball bearings in steel — Dimensions and loads*

EN 3057, *Aerospace series — Bearings, airframe rolling — Rigid double row ball bearings in steel, cadmium plated — Dimensions and loads*

EN 3058, *Aerospace series — Bearings, airframe rolling — Rigid double row ball bearings in corrosion resisting steel — Dimensions and loads*

EN 3281, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in steel — Diameter series 8 and 9 — Dimensions and loads*

EN 3282, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in steel, cadmium plated — Diameter series 8 and 9 — Dimensions and loads*

EN 3283, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in corrosion resisting steel — Diameter series 8 and 9 — Dimensions and loads*

EN 3284, *Aerospace series — Bearings, airframe rolling – Rigid single row ball bearings in steel — Diameter series 0 and 2 — Normal clearance category — Dimensions and loads*

EN 3285, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in steel, cadmium plated — Diameter series 0 and 2 — Normal clearance category — Dimensions and loads*

EN 3286, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in corrosion resisting steel — Diameter series 0 and 2 — Normal clearance category — Dimensions and loads*

EN 3287, *Aerospace series — Bearings, airframe rolling — Double row self-aligning ball bearings in steel — Diameter series 2 — Dimensions and loads*

EN 3288, *Aerospace series — Bearings, airframe rolling — Double row self-aligning ball bearings in steel cadmium plated — Diameter series 2 — Dimensions and loads*

EN 3289, *Aerospace series — Bearings, airframe rolling — Double row self-aligning ball bearings in corrosion resisting steel — Diameter series 2 — Dimensions and loads*

EN 3290, *Aerospace series — Bearings, airframe rolling — Single row self-aligning roller bearings in steel — Diameter series 3 and 4 — Dimensions and loads*

EN 3291, *Aerospace series — Bearings, airframe rolling — Single row self-aligning roller bearings in steel, cadmium plated — Diameter series 3 and 4 — Dimensions and loads*

EN 3292, *Aerospace series — Bearings, airframe rolling — Single row self-aligning roller bearings in corrosion resisting steel — Diameter series 3 and 4 — Dimensions and loads*

EN 4033, *Aerospace series — Bearings, airframe rolling — Rigid single row ball bearings in corrosion resisting steel — Diameter series 8 and 9, reduced internal radial clearance — Dimensions and loads*

EN 4034, *Aerospace series — Bearings, airframe rolling — Double row self-aligning ball bearings with flanged outer ring in corrosion resisting steel, reduced internal radial clearance — Dimensions and loads*

EN 9100, *Quality Management Systems — Requirements for Aviation, Space and Defence Organizations*

EN 9133, *Aerospace series — Quality management systems — Qualification procedure for aerospace standard parts*

ISO 1132-1:2000, *Rolling bearings — Tolerances — Part 1: Terms and definitions*

3 Terms and definitions

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

3.1
rolling bearings, rigid or self-aligning

3.1.1
general
these bearings have a full complement of balls or rollers

3.1.2
shielded rolling bearing
bearing whose rolling elements and raceways are protected with shields attached to one of the rings and separated from the other by a small space

3.1.3
sealed rolling bearing
bearing whose rolling elements and raceways are completely enclosed by seals attached to one of the rings and rubbing on the other

3.2
surface discontinuities

3.2.1
crack
break in the material which may extend in all directions and be intercrystalline or transcrystalline in character

3.2.2
score, scratch
open surface defect

3.2.3
lap
surface defect where particles of metal or sharp edges are folded over and then rolled or forged into the surface

3.2.4
seam
unwelded fold which appears as an defect in the material

3.3
radial (K_{ia}, K_{ea}) and axial (S_{ia}, S_{ea}) running accuracy
see ISO 1132-1:2000

3.4
internal clearances

3.4.1
radial (G_r)
total value of possible radial displacements of one ring in relation to the other

3.4.2
axial (G_a)
total value of possible axial displacements of one ring in relation to the other

3.4.3
diagonal (G_d)
value of total cant of the inner ring in relation to the outer ring

3.5
starting torque at zero load
maximum torque required to start the rotation of the outer ring with the inner ring held stationary

3.6
delivery batch
batch of bearings with the same identity block, which may come from different production batches

4 Required characteristics, inspection and test methods

See Table 1.

Table 1

Clause	Characteristics	Requirements	Inspection and test methods	Q [a]	A [b]
4.1	**Materials**	In accordance with the product standards or design documentation.	Chemical analysis or certificate issued by semi-finished product manufacturer	X	X
4.2	**Dimensions and tolerances**	In accordance with the product standards or design documentation.	Suitable measuring instruments **Measurement of bore and outer diameter:** - Rings with a width of ≤ 10 mm: in the centre plane. - Rings with a width of > 10 mm: in two planes parallel to the outer faces and at a distance from these faces of twice the maximum value of the ring chamfer. The minimum and maximum diameters shall be determined in each measuring plane. **Measurement of ring width:** - The width of each ring (distance between the two faces) shall be verified at a minimum of four points.	X	X
4.3	**Masses**	In accordance with the product standards or design documentation.	Suitable methods	X	
4.4	**Marking**	In accordance with the product standards or design documentation. It shall be legible and shall not adversely affect the material or the functioning of the bearing.	Visual examination	X	X
4.5	**Surface appearance**	No surface discontinuities liable to have an adverse effect on their characteristics and endurance.		X	X
4.5.1	**Assembled bearings**		Visual inspection using suitable methods		
4.5.2	**Unassembled rings**		Magnetic or dye penetrant inspection		
4.5.3	**Rolling element**	See 4.5.1.	Rolling element must be supplied with certificate of conformity.	X	X
4.6	**Hardness**	In accordance with the product standards or design documentation.	Suitable processes and measuring instruments [c]	X	X
4.7	**Surface roughness**	In accordance with product standards or design documentation.	Suitable measuring instruments or visual-tactile samples [c]	X	X
4.8	**Surface treatment**	In accordance with product standards or design documentation.	- Visual inspection - As per surface treatment standard	X	X
4.9	**Lubrication**	At least 80 % of the free space in the bearing shall be charged with the grease specified in the product standards or design documentation (see Annex G).	Visual inspection after removal of seals or shields	X	
			Visual inspection during manufacture		X
4.10	**Seals** (for sealed bearings) **and shields** (for shielded bearings)				

continued

Table 1 *(concluded)*

Clause	Characteristics	Requirements	Inspection and test methods	Q [a]	A [b]
4.10.1	**Retention**	All bearings: - The seals and shields shall be fitted correctly on the outer ring, in such a way that the functioning of the bearing is not affected. Self-aligning bearings: - After the test, the seals and shields shall not have loosened or become deformed.	Visual inspection See Annex A.	X	X
4.10.2	**Sealing**	The seals shall: rub on the inner ring and retain the grease	Visual inspection after the rings are manually turned in relation to each other.	X	X
		The seals shall: prevent the penetration of foreign bodies. After the test, the running behaviour of the bearings shall conform with 4.13.1.	See Annex B.	X	
4.10.3	**Temperature test**	After the test, the behaviour shall conform with 4.10.1.	See Annex C.	X	
4.11	**Running accuracy:** - radial: K_{ja} K_{ea} - axial: S_{ia} S_{ea}	In accordance with the product standards or design documentation.	See Annex D.	X	X
4.12	**Internal clearances:** - radial: G_r - axial: G_a - diagonal: G_d	In accordance with the product standards or design documentation.	See Annex E.	X	X
4.13	**Behaviour in rotation**				
4.13.1	**At ambient temperature**	No tights spots, e.g. rolling elements catching in the filling slots	See Figures F.2 and F.4.	X	X
4.13.2	**At limit temperatures**	After the test, the mean starting torque shall not exceed 1,5 times the mean of the values recorded before the test.	See Annex C.	X	
		No tight spots	See Figures F.2 and F.4.		
4.14	**Starting torques without load**	In accordance with the product standards or design documentation.	Suitable procedures and measuring instruments	X	X
			- Rotate one of the two ring at least four times to distribute the lubricant uniformity		
			- Measure at least five times the torque gradually applied to the outer ring, with the inner ring held stationary. Just the highest value shall be taken into account		
4.15	**Permissible static loads:** - radial: C_s - axial: F_a max.	In accordance with the product standard or design documentation. After removing the loads, there shall be no permanent deformations.	See Annex F.	X	
4.16	**Ultimate static loads:** - radial - axial	After the removal of the loads, there shall be no cracks or deterioration of the bearing.	See Annex F.	X	

[a] Q: Qualification test.

[b] A: Acceptance test.

[c] This inspection shall be made in the absence of surface treatment, which, for the purpose of qualification, may be removed by a chemical process.

5 Quality assurances

5.1 Product qualification

See EN 9133 and Table 1 and Table 2.

Qualification shall be obtained for each bearing.

However, qualification:

— for a cadmium plated bearing applies to a non cadmium plated bearing with the same dimensions and of the same type, made of the same material;

— is acquired if it has been obtained, for the bearing immediately before and the one immediately after the bearing in question, within the range of bearings indicated in the product standard.

To qualify a bearing of a given range, the manufacturer shall provide:

— nine bearings if this is the first qualification in this range;

— seven bearings for all the other qualifications.

5.2 Acceptance conditions

5.2.1 Inspections and tests to be carried out by the manufacturer

The acceptance of a delivery batch shall be in accordance with Table 2.

5.2.2 User's quality control

The user may, on acceptance of a delivery batch, proceed to inspect it by using the inspections specified in Table 2, in full or in part, to ensure that the items conform to the required quality level, and to determine whether the delivery batch is acceptable.

This inspection can be carried out in the user's factory or by special agreement with the manufacturer, in the latter's factory.

6 Packaging

The bearings shall be packaged either individually or in rolls so that they will not be damaged during transportation.

They shall be protected against moisture, corrosion, dirt and other harmful substance.

The packaging material in contact with the bearing shall provide this protection and be grease-resistant.

The following indications shall be affixed to each individual package:

— manufacturer's name and address;

— quantity (for rolls);

— identity block as defined by the product standards or design documentation;

— packaging date;

— lubrification date.

The following indications at least shall appear on collective packaging:

— manufacturer's name and address;

— number of order;

— quantity;

— identity block as defined by the product standards or design documentation.

7 Certificate of conformity

All the bearings supplied in accordance with this standard shall be accompanied by a certificate of conformity from the manufacturer.

Table 2 — Inspections and tests to be carried out for acceptance

Type of inspection or test [a]	Defined in	Sampling plan [b c]
Materials	4.1	Certificate of conformity of semi- finished products manufacturers
Dimensions and tolerances	4.2	10 % [d]
Marking	4.4	100 %
Surface appearance	4.5.1	10 %: assembled [d]
	4.5.2	100 %: unassembled [e]
Hardness	4.6	1 % per heat treatment batch [d]
Surface roughness	4.7	5 % [d]
Surface treatment (if required)	4.8	5 % per cadmium-plated batch [d]
Lubrication	4.9	100 %
	4.10.2	
Retention of seals and shields	4.10.1	5 % [d]
Running accuracy (K_{ia}, K_{ea}, S_{ia}, S_{ea})	4.11	10 % [d]
Internal clearances (G_r, G_a, G_d)	4.12	5 % [d]
Running behaviour at ambient temperature	4.13.1	100 %
Starting torques at without load	4.14	5 % [d]

[a] The order is left to the initiative of the acceptance authority. These inspections can be carried out at the time of manufacture.

[b] When the sampling is not 100 % any defect found in the course of an inspection or test requires this inspection to be extended to 100 %.

[c] May vary with the approval of the user or authority responsible for acceptance.

[d] Minimum one piece.

[e] This test shall be carried out within the production line. 100 % inspection could be decrease to 10 % if manufacturer is able to demonstrate and to justify by statistical records that the level is less than 0,1 % if any defect are found in samples, the entire lot shall be 100 % inspected.