



SLOVENSKI STANDARD

SIST EN 3280:2001

01-januar-2001

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

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

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

Série aérospatiale - Roulements pour structures d'aéronefs, rigides ou a rotule - Spécification technique

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ICS:

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

EN 3280

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 1994

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Descriptors: Aeronautical industry, airframe rolling bearings, specification

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 1994-02-04. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36, B-1050 Brussels

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Foreword

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 PRESENTED BY MEMBER ORGANIZATIONS

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

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

This standard was submitted for Formal Vote, and the result was positive.

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 August 1994, and conflicting national standards shall be withdrawn at the latest by August 1994.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Scope

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

It is applicable whenever referenced.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- ISO 1132 Rolling bearings - Tolerances - Definitions
- EN 3042 Aerospace series - Quality assurance - EN aerospace products - Qualification procedure
- 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

3 Definitions

For the use of this standard, the following definitions apply :

3.1 Rolling bearings, rigid or self-aligning

These bearings have a full complement of balls or rollers.

3.1.1 Shielded rolling bearing

A 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.

3.1.2 Sealed rolling bearing

A 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 open defect in the material.

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3.3 Radial (K_{ia} , K_{ea}) and axial (S_{ia} , S_{ea}) running accuracy

See ISO 1132.

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

This consist 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 1)	A 2)
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 <u>Measurement of bore and outer diameter :</u> <ul style="list-style-type: none"> - 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. <u>Measurement of ring width :</u> <ul style="list-style-type: none"> - 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 and balls		Magnetic or dye penetrant inspection		
4.6	Hardness	In accordance with the product standards or design documentation	Suitable processes and measuring instruments ³⁾	X	X

(continued)

Table 1 (continued)

Clause	Characteristics	Requirements	Inspection and test methods	Q 1)	A 2)
4.7	Surface roughness	In accordance with product standards or design documentation	Suitable measuring instruments or visual-tactile samples 3)	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 annexe 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)				
4.10.1	Retention	<p><u>All bearings :</u></p> <ul style="list-style-type: none"> - 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. <p><u>Self-aligning bearings :</u></p> <ul style="list-style-type: none"> - After the test, the seals and shields shall not have loosened or become deformed. 	<p>Visual inspection</p> <p>See annexe A</p>	X	X
4.10.2	Sealing	<p>The seals shall :</p> <ul style="list-style-type: none"> - rub on the inner ring and retain the grease. - prevent the penetration of foreign bodies. <p>After the test, the running behaviour of the bearings shall conform with 4.13.1.</p>	Visual inspection after the rings are manually turned in relation to each other.	X	X
			See annexe B.	X	
4.10.3	Temperature test	After the test, the behaviour shall conform with 4.10.1.	See annexe C.	X	

(continued)

Table 1 (concluded)

Clause	Characteristics	Requirements	Inspection and test methods	Q	A
				1)	2)
4.11	Running accuracy : - radial : K_{iB} , K_{eB} - axial : S_{iB} , S_{eB}	In accordance with the product standards or design documentation	See annexe 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 annexe E.	X	X
4.13	Behaviour in rotation				
4.13.1	At ambient temperature	No tight 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. - No tight spots	See annexe C. See figures F 2 and F 4.	X	
4.14	Starting torques at zero load	In accordance with the product standards or design documentation	Suitable procedures and measuring instruments. - Rotate one of the two rings at least four times to distribute the lubricant uniformly. - 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.	X	X
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 annexe 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 annexe F.	X	

1) Q = Qualification test
2) A = Acceptance test
3) 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 assurance

5.1 Product qualification

See EN 3042 and tables 2 and 3.

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 4.

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 4, 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.

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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 ;
- lubrication 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 - Non-destructive inspections and tests to be carried out for qualification

Types of inspections and tests ¹⁾	Defined in clause	Serial No. of samples								
		1	2	3	4	5	6	7	8	9
Materials	4.1	X	X	X	X	X	X	X	X	X
Dimensions and tolerances	4.2	X	X	X	X	X	X	X		
Masses	4.3	X	X	X	X	X	X	X		
Marking	4.4	X	X	X	X	X	X	X	X	X
Surface appearance	4.5.1	X	X	X	X	X	X	X	X	X
Surface treatment (if required)	4.8	X	X	X	X	X	X	X	X	X
Retention of seals and shields	4.10.1						X	X		
Running accuracy (K_{1a} , K_{e2} , S_{1a} , S_{e2})	4.11	X	X	X	X	X	X	X		
Internal clearances (G_r , G_a , G_d)	4.12	X	X	X	X	X	X			
Running behaviour at ambient temperature	4.13.1	X	X	X	X	X	X	X	X	X
Starting torques at zero load	4.14	X	X	X	X	X	X	X	X	X

1) The order is left to the initiative of the qualification authority.

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Table 3 - Destructive inspections and tests to be carried out for qualification

Types of inspections and tests ¹⁾ https://standards.iteh.ai/catalog/standards/sist/d8e3bec26846ed-ab9d-3e7cca08040a/sist-en-3280-2001			Defined in clause	Serial No. of samples								
				1	2	3	4	5	6	7	8	9
Surface appearance ²⁾			4.5.2						X	X		
Hardness ³⁾			4.6							X		
Surface roughness ²⁾			4.7						X	X		
Lubrication ²⁾			4.9 4.10.2						X	X		
Sand and dust test ²⁾ ⁴⁾			4.10.2									X
Running behaviour and behaviour of bearings, seals and shields at extreme temperatures ⁴⁾			4.10.3 4.13.2								X	
Test under static load	radial	permissible (C_s)	4.15	X	X	X						
		ultimate	4.16	X	X	X						
	axial	permissible (F_a max.)	4.15				X	X				
		ultimate	4.16				X	X				

1) The order is left to the initiative of the qualification authority.
2) These tests are destructive because bearings disassembly is required.
3) A minimum of three rolling elements shall be inspected.
4) These tests shall be carried out only on the first bearing of each range submitted for qualification (see 5.1).