



SLOVENSKI STANDARD

SIST EN 2063:2001

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Aerospace series - Airframe rolling bearings - Technical specifications

Aerospace series - Airframe rolling bearings - Technical specifications

Luft- und Raumfahrt - Flugwerklager - Technische Spezifikation

Série aérospatiale - Roulements pour structures d'aéronefs - Spécification technique

Ta slovenski standard je istoveten z: **EN 2063:1992**

[SIST EN 2063:2001](https://standards.iteh.ai/catalog/standards/sist/687fe418-4ebf-4071-a49-37c9d1f1266b/sist-en-2063-2001)

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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 2063:1992

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 1992

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Descriptors: Aircraft industry, airframe bearings, specifications, characteristics, inspection, tests

English version

**Aerospace series - Airframe rolling bearings -
Technical specification**Série aérospatiale - Roulements pour structures
d'aéronefs - Spécification techniqueLuft- und Raumfahrt - Flugwerklager -
Technische Spezifikation**iTeh STANDARD PREVIEW
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This European Standard was approved by CEN on 1992-05-11. 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.

This European Standard exists 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.

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

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

Foreword

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.

According to the Common CEN/CENELEC Rules, 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 and United Kingdom.

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Contents

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1	Scope
2	Field of application
3	Normative References
4	Definitions and symbols
5	Materials and protection
6	Required characteristics
7	Inspections and tests
8	Qualification conditions
9	Acceptance conditions
10	Marking, packing and certificate of conformity
	Annex A (normative) Table of tests and inspections to be carried out for qualification of a bearing.

1 Scope

This standard specifies bearings designed to be subjected under load to slow rotations or oscillations only.

2 Field of application

These bearings are intended for use in fixed and moving components of the aircraft structure such as control surfaces, flaps, doors, etc., and their control mechanisms. They are designed for use under temperature conditions specified in the dimensional standards listed below in clause 3.

The requirements of this standard may also be applied to other bearings, not listed in clause 3, provided that they are conditions of procurement of such bearings.

3 Normative References

- EN 2009 Bearings, airframe rolling - Rigid single row ball bearings, in steel - Diameter series 8 and 9 - Dimensions and loads - Aerospace series
- EN 2010 Bearings, airframe rolling - Rigid single row ball bearings, in steel cadmium plated - Diameter series 8 and 9 - Dimensions and loads - Aerospace series ¹⁾
- EN 2011 Bearings, airframe rolling - Rigid single row ball bearings, in corrosion resisting steel - Diameter series 8 and 9 - Dimensions and loads - Aerospace series
- EN 2012 Bearings, airframe rolling - Rigid single row ball bearings, in steel - Diameter series 0 and 2 - Dimensions and loads - Aerospace series
- EN 2013 Bearings, airframe rolling - Rigid single row ball bearings, in steel cadmium plated - Diameter series 0 and 2 - Dimensions and loads - Aerospace series ¹⁾
- EN 2014 Bearings, airframe rolling - Rigid single row ball bearings, in corrosion resisting steel - Diameter series 0 and 2 - Dimensions and loads - Aerospace series
- EN 2015 Bearings, airframe rolling - Double row self aligning ball bearings, in steel - Diameter series 2 - Dimensions and loads - Aerospace series
- EN 2016 Bearings, airframe rolling - Double row self aligning ball bearings, in steel cadmium plated - Diameter series 2 - Dimensions and loads - Aerospace series ¹⁾
- EN 2017 Bearings, airframe rolling - Double row self aligning ball bearings, in corrosion resisting steel - Diameter series 2 - Dimensions and loads - Aerospace series
- EN 2018 Bearings, airframe rolling - Single row self aligning ball bearings, in steel - Diameter series 3 and 4 - Dimensions and loads - Aerospace series
- EN 2019 Bearings, airframe rolling - Single row self aligning ball bearings, in steel cadmium plated - Diameter series 3 and 4 - Dimensions and loads - Aerospace series ¹⁾
- EN 2020 Bearings, airframe rolling - Single row self aligning roller bearings, in corrosion resisting steel - Diameter series 3 and 4 - Dimensions and loads - Aerospace series
- EN 2030 Steel FE-PM43 - Hardened and tempered - Bars $D \leq 150$ mm - Aerospace series ¹⁾
- EN 2031 Steel FE PL31 - Hardened and tempered - Bars - Aerospace series ¹⁾.

1) Published as AECMA standard at the date of publication of this standard.

4 Definitions and symbols

4.1 Definitions

The airframe bearings are practically filled with balls or rollers. They generally have a projecting inner ring and are all constructed with shields or seals and are charged with grease specified in the dimensional standards.

A bearing with shields is a bearing in which the rolling elements and raceways are protected by shields secured to one of the rings and separated from the other by a small space.

A bearing with seals is a bearing in which the rolling elements and raceways are completely enclosed by flexible seals secured to one of the rings and rubbing on the other.

4.2 Symbols

C_o	=	basic static load rating
F_r	=	static radial load
C_s	=	permissible static radial load
F_a	=	static axial load
$F_a \text{ max.}$	=	permissible static axial load (maximum load)
P_a	=	equivalent static load
α	=	nominal contact angle formed by the line of action of the load on the ball and a plane perpendicular to the rolling axis
R	=	radial load factor
A	=	axial load factor
Y_s	=	coefficient of axial load $\frac{R}{A}$

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4.3 Basic static load rating C_o

The basic static load rating is defined as the static radial load which causes a total permanent deformation of 0,0001 of the rolling element diameter at the point of contact of the most highly loaded rolling element and raceway.

Table 1 - Basic static load rating

Bore d (mm)	C_o kN			
	Standard number			
	EN 2009 EN 2010 EN 2011	EN 2012 EN 2013 EN 2014	EN 2015 EN 2016 EN 2017	EN 2018 EN 2019 EN 2020
05	—	1,220	0,470	—
06	—	1,720	0,710	—
08	—	2,110	1,140	7,350
10	1,900	3,040	1,760	10,780
12	2,200	3,480	2,010	12,050
15	2,890	4,160	2,350	13,920
17	3,140	4,800	3,040	18,910
20	3,100	7,350	4,070	22,640
25	3,840	8,330	—	32,340
30	4,375	11,170	—	43,120
35	5,080	—	—	—
40	5,680	—	—	—
50	7,690	—	—	—
60	12,500	—	—	—

4.4 Permissible static loads

The permissible static radial load C_s is given by :

$$C_s = C_o \times R$$

The permissible static axial load F_a max. is given by :

$$F_a \text{ max.} = C_o \times A$$

$$F_a \text{ max.} = \frac{C_s}{Y_s}$$

The values normally used for factors R and A are given in table 2.

The value of coefficient Y_s is specified in each dimensional standard.

4.5 Combined radial and axial loads

For rigid bearings defined by standards EN 2009 to EN 2014, the permissible radial and axial loads may be applied simultaneously.

For the self aligning bearings defined by standards EN 2015 to EN 2020, in the case of simultaneous radial and axial loads, these loads shall comply with the following formula :

$$P_s = F_r + Y_s \times F_a$$

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This formula shall meet the following requirement <https://standards.iteh.ai/catalog/standards/sist/687fe418-4ebf-4071-af49-37c9d1f1266b/sist-en-2063-2001>

$$P_s \leq C_s$$

For a more accurate evaluation of the loads, as far as double row self aligning ball bearings are concerned, as specified by standards EN 2015, EN 2016, EN 2017, the following formula applies :

$$P_s = F_r + 0,44 \cot. \alpha \times F_a$$

Table 2 - Load factors

Standard number	Radial load factor R	Axial load factor A
EN 2009 - EN 2010 - EN 2011 EN 2012 - EN 2013 - EN 2014	5,6	2,5
EN 2015 - EN 2016 - EN 2017	8	2,5 1)
EN 2018 - EN 2019 - EN 2020	5	1,5 2)

1) Safe values based on a small contact angle. If a more accurate evaluation of the permissible axial load is required, it can be obtained by application of the formula for combined loads where F_r (radial load) = 0.

2) If movement occurs , permissible load F_a may be less than $1,5 C_o$, but no general rule can be given for this limitation.

5 Materials and protection

5.1 Materials

The prescribed materials are specified in the dimensional standards.

5.2 Protection

The bearings defined by standards EN 2010, EN 2013, EN 2016, EN 2019 are protected by passivated cadmium plating of all external surfaces of the rings, with the exception of the bore and raceways. The cadmium plating thickness shall be 5 μm to 12 μm .

6 Required characteristics

6.1 Hardness

The rings and rolling elements shall be of the following hardness :

- for bearing steel defined by standard EN 2031, the Rockwell hardness shall be 60 to 66 HRC ;
- for corrosion resisting bearing steel defined by standard EN 2030, the Rockwell hardness shall be ≥ 58 HRC.

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6.2 Surface roughness

The arithmetic mean deviation of surface roughness shall be :

- R_a : 0,2 μm for the raceway and rolling elements;
- R_a : 0,8 μm for the bore, side faces and cylindrical outer surface.

6.3 Lubrication

The bearings shall be charged to at least 80 % of the voids with a grease, specified in the dimensional standards, which shall retain its characteristics within the prescribed temperature range.

6.4 Sealing

The seals shall be designed so as not to affect functioning of the bearing within the prescribed temperature range. They shall retain the lubricant in the bearing and prevent ingress of foreign bodies.

6.5 Geometrical characteristics

6.5.1 Dimensions - Tolerances - Mass

These shall conform to the values specified in the dimensional standards.

6.5.2 Form tolerances

On the inner ring :

- raceway radial runout shall be $\leq 25 \mu\text{m}$;
- raceway runout with reference side shall be $\leq 40 \mu\text{m}$.

On the outer ring :

- raceway radial runout shall be $\leq 40 \mu\text{m}$;
- raceway runout with reference side shall be $\leq 40 \mu\text{m}$ (the runout is not applicable to self aligning bearings).

6.5.3 Internal radial clearances

The internal radial clearances shall conform to the values specified in the dimensional standards.

6.6 Mechanical characteristics

6.6.1 Running behaviour

The bearings shall be suitable for normal functioning in the prescribed temperature range.

They shall be easily turned by hand, not exhibit frequent and regular hard spots such as those which may be due to the balls fouling the filling slots.

6.6.2 Permissible static loads

The bearings shall withstand the permissible static loads given in the dimensional standards for one continuous minute without causing unacceptable permanent deformations on the raceways, affecting the behaviour in running and oscillation when the load is removed.

6.6.3 Rupture static loads

[SIST EN 2063:2001](https://standards.iteh.ai/catalog/standards/sist/687fe418-4ebf-4071-af49-3521c823d10c/sist-en-2063-2001)

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The rupture static loads are maximum static radial or axial loads which the bearings shall withstand for one continuous minute without jamming, cracks or fractures being observed when the load is removed.

The rupture static load shall not be less than 1,5 times the value of the permissible static load.

7 Inspections and tests

7.1 Visual inspection

The bearings shall be subjected to a visual inspection to check the external condition and to ascertain :

- compliance of marking with the provisions of subclause 10.1 ;
- correct attachment of the seals or protection shields.

7.2 Material, protection and lubrication inspection

7.2.1 Material inspection

The chemical analysis shall be in compliance with that specified in the material standards.