BS EN 3280:2011

BSI Standards Publication

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

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National foreword

This British Standard is the UK implementation of EN 3280:2011. It supersedes BS EN 3280:1994, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ACE/12, Aerospace fasteners and fastening systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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

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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of an identical text or by endorsement, at the latest by November 2011, and conflicting national standards shall be withdrawn at the latest by November 2011.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.

Annex A
(normative)

Retention test for self-aligning bearing seals and shields

A.1 Principle

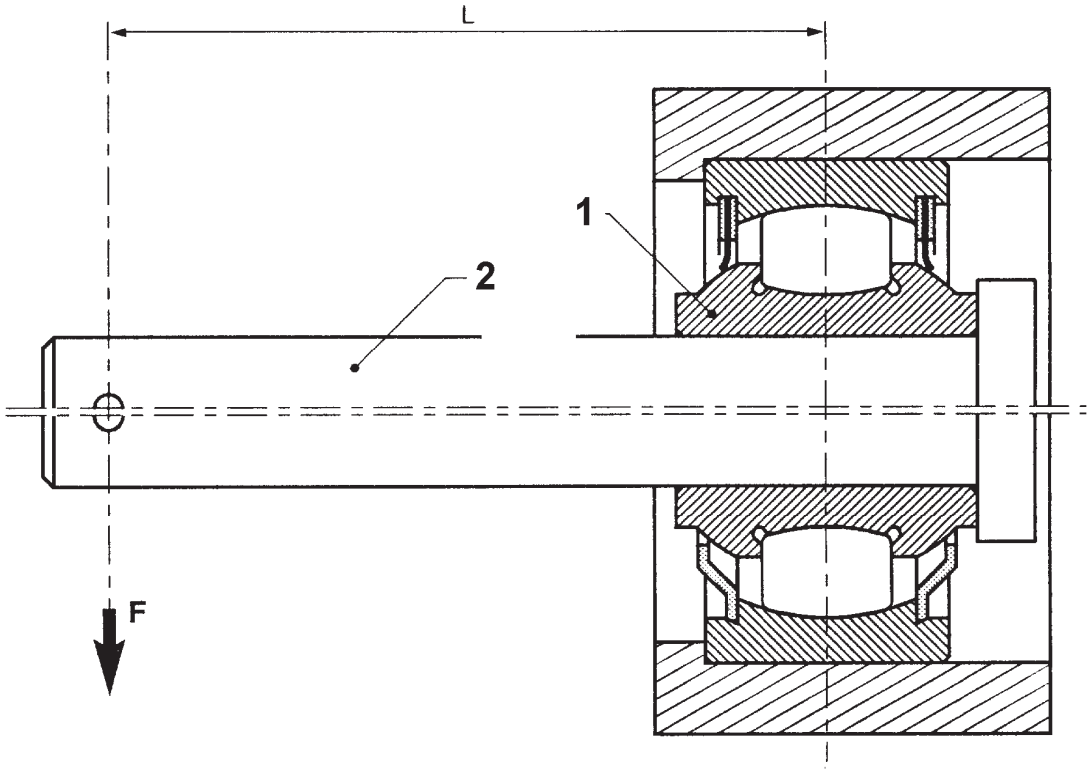
See Figure A.1 as an example.

A.2 Method

— Apply a force F to the end of a lever arm L.

This force shall produce the torque specified in Table A.1.

— Carry out the test at ambient temperature, in two directions 90° from each other.



Key

1 self-aligning bearing
2 shaft
F force applied
L lever arm

Figure A.1

Table A.1

Nominal diameter mm	**Min. torque** N.m		
	EN 3053 to EN 3056	EN 3287 to EN 3289	EN 3290 to EN 3292
5		0,40	
6	1,50		
8	2,00	0,50	1,50
10	2,50	0,70	2,50
12	3,50	0,80	3,00
15	4,00	1,00	3,70
17	4,50	1,20	4,00
20		1,40	4,50
25			5,50
30			6,00

Annex B
(normative)

Sand and dust test

B.1 Principle

The apparatus comprises:

a) a test chamber;

b) accessories to regulate:

   1) dust and sand concentration;

   2) air flow rate;

   3) temperature;

   4) humidity of the dusty and sandy air.

The contaminated air shall be introduced into the space reserved for the test in such a way that its flow becomes approximately laminar before reaching the bearing to be tested.

B.2 Conditions imposed for the sand and dust

Abrasives having angular structures so that by mass:

a) 100 % shall pass through a sieve with a 150 µm mesh width;

b) 98 % shall pass through a sieve with a 100 µm mesh width;

c) 90 % shall pass through a sieve with a 75 µm mesh width;

d) 75 % shall pass through a sieve with a 45 µm mesh width.

The mixture shall contain between 97 % and 99 % by mass of SiO_2.

B.3 Method

a) Conditions:

   1) constant temperature: 60 °C to 65 °C;

   2) relative humidity: 10 %;

   3) air flow rate: 7 m/s to 10 m/s;

   4) dust concentration: (6 ± 3) g/m^3.

b) Position of bearing:

   The axis of the bearing shall be in the extension of the air jet axis.

c) Duration of test:

   6 h: the jet shall be directed for 3 h on to each face of the bearing.

Annex C
(normative)

Test on the running behaviour of the bearings, retention of seals and shields at the limit temperatures

C.1 Method

a) Carry out the test with code B grease only (see Annex G).

b) Measure the starting torque at zero load before the test. The recorded value is the average of life readings.

c) Subject the bearing to a rotation rate of three turns per minute in a test chamber as follows:

   1) for 100 h at the minimum temperature; and then

   2) for 100 h at the maximum temperature.

d) Measure the starting torque at zero load. The recorded value is the average of five readings.

Annex D
(normative)

Verification of running accuracy

D.1 Radial running accuracy of inner ring (K_{ia})

D.1.1 Principle

See Figure D.1 as an example.

D.1.2 Method

— Mount the bearing as shown in Figure D.1, without stresses, with its marked face pointing upwards;
— Immobilize the outer ring;
— Apply the load F (see Table D.1), to the outer ring;
— Give the mandrel and inner ring under the measuring load at least one turn;
— Record the difference K_{ia} between the maximum and minimum readings on the radial dial gauge.

D.2 Radial running accuracy of outer ring (K_{ea})

D.2.1 Principle

See Figure D.1 as an example.

D.2.2 Method

— Mount the bearing as show in Figure D.1, without stresses, with its marked face pointing upwards;
— Immobilize the inner ring;
— Apply the load F (see Table D.1), to the outer ring;
— Give the outer ring under the measuring load at least one turn;
— Record the difference K_{ea} between the maximum and minimum readings on the radial dial gauge.

D.3 Axial running accuracy of outer ring (S_{ea})

D.3.1 Principle

See Figure D.1 as an example.

D.3.2 Method

— Mount the bearing as show in Figure D.1, without stresses, with its marked face pointing upwards;
— Immobilize the inner ring;
— Apply the load F (see Table D.1) to the outer ring;
— Give the outer ring under the measuring load at least one turn;
— Record the difference S_{ea} between the maximum and minimum readings on the axial dial gauge.

D.4 Axial running accuracy of inner ring (S_{ia})

D.4.1 Principle

See Figure D.2 as an example.

D.4.2 Method

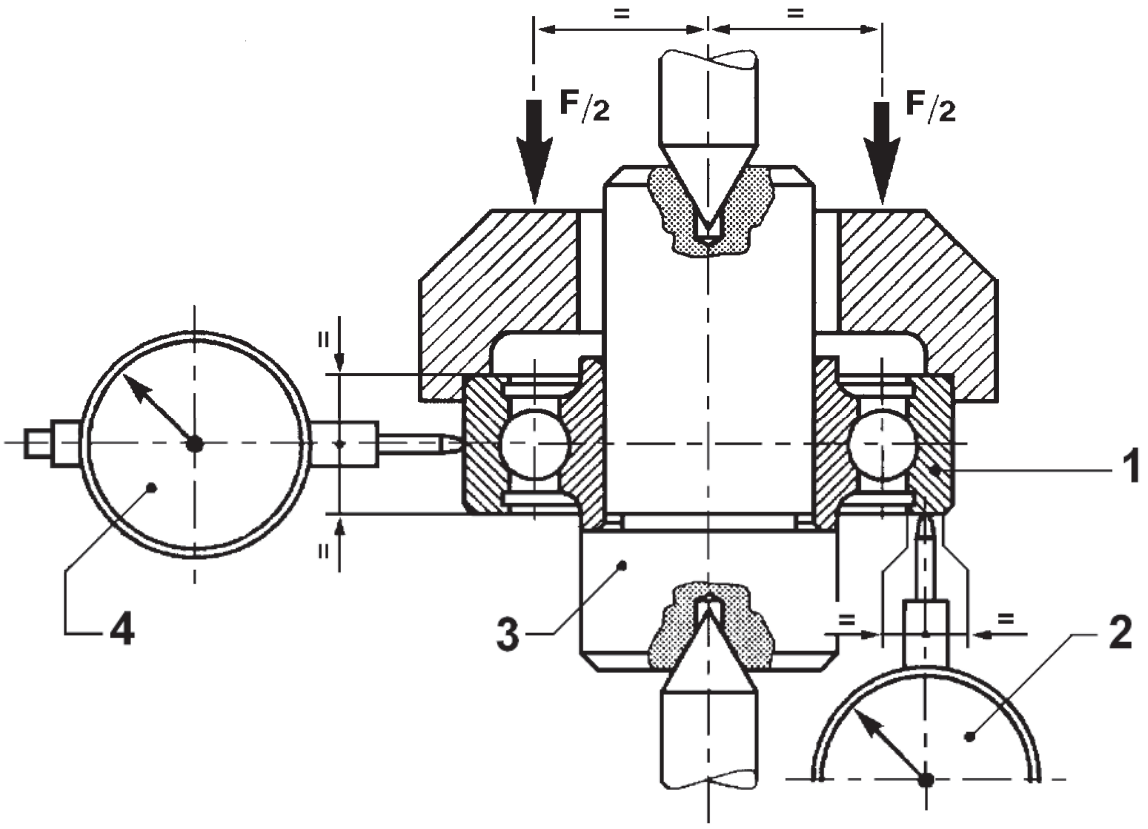
— Mount the bearing as shown in Figure D.2, without stresses, with is marked face pointing upwards;

— Immobilize the outer ring;

— Apply the load F (see Table D.1), to the inner ring;

— Give the mandrel and inner ring under the measuring load at least one turn;

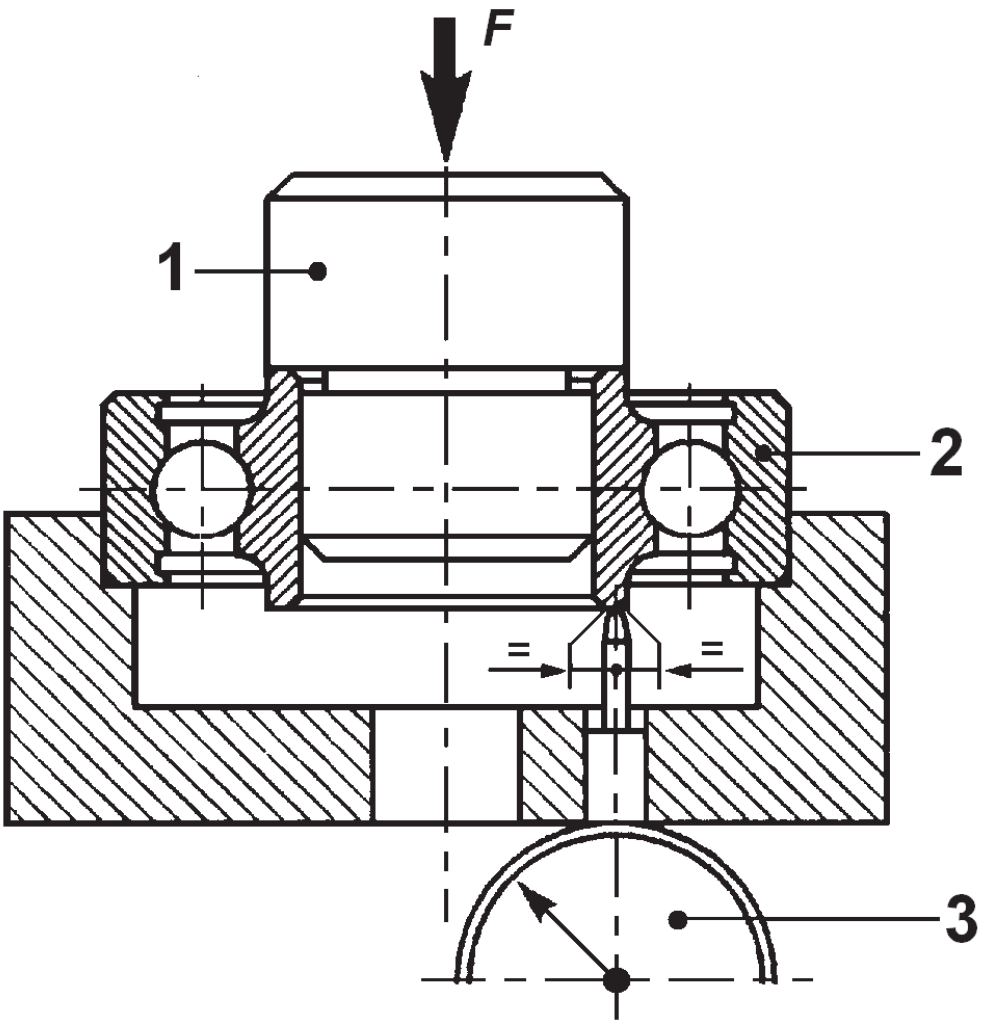
— Record the difference S_{ia} between the maximum and minimum readings on the axial dial gauge.



Key

1 bearing
2 dial gauge (S_{ea})
3 mandrel
4 dial gauge (K_{ia} and K_{ea})

Figure D.1



Key

1 mandrel
2 bearing
3 dial gauge (S_{ia})

Figure D.2

Table D.1

Nominal diameter mm	F max. N
≤ 30	6
> 30	7,5

Annex E
(normative)

Verification of internal clearances

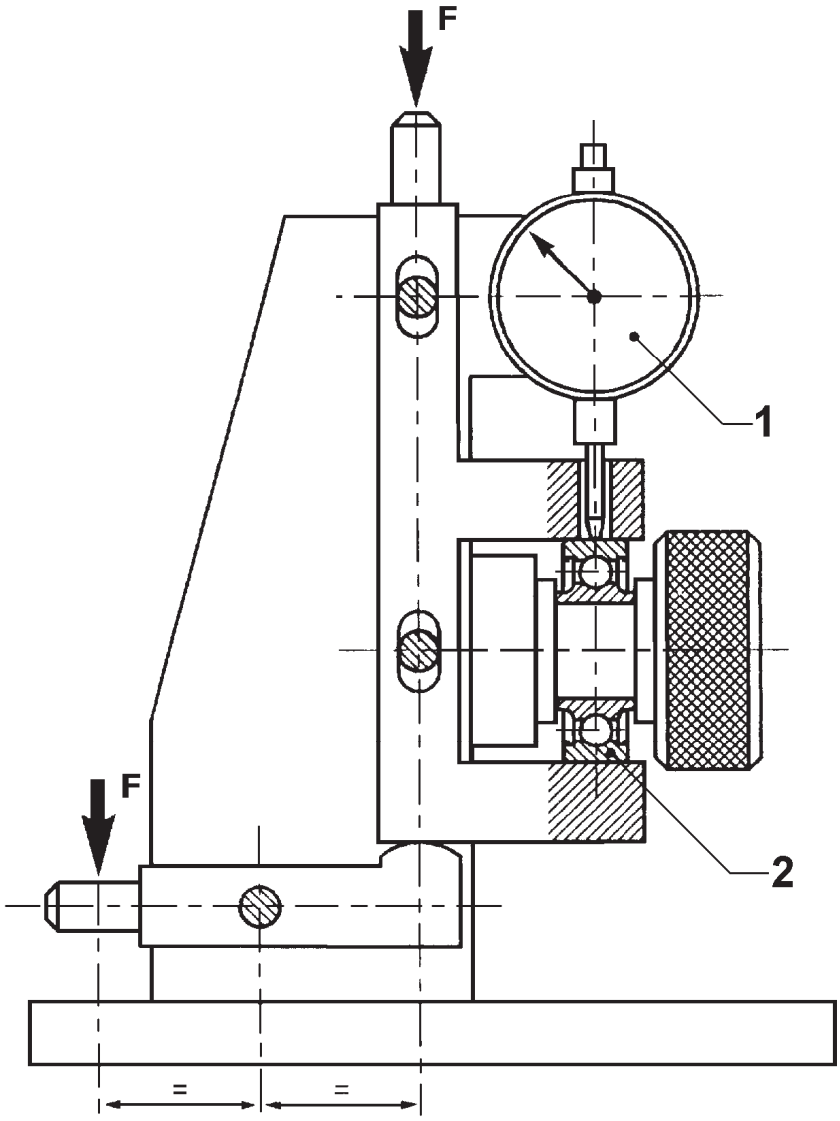
E.1 Radial internal clearance (G_r)

E.1.1 Principle

See Figure E.1 as an example.

E.1.2 Method

— Mount the bearing vertically and immobilize the inner ring;
— Place a dial gauge in the radial plane of the bearing;
— Apply the load F (see Table E.1), in the direction of the dial gauge and then in the opposite direction;
— Record the difference G_r between the maximum and minimum readings on the dial gauge;
— Repeat this measurement in various angular positions by rotating one ring in relation to the other.



Key

1 dial gauge
2 bearing

Figure E.1

Table E.1

Nominal diameter mm	*F* max. N			
	EN 3045 to EN 3047	**EN 3053 to EN 3055**	**EN 3281 to EN 3283**	**EN 3284 to EN 3292**
≤ 8	25		25	25
> 8	50			50

E.2 Axial internal clearance (G_a)

E.2.1 Principle

See Figure E.2 as an example.

E.2.2 Method

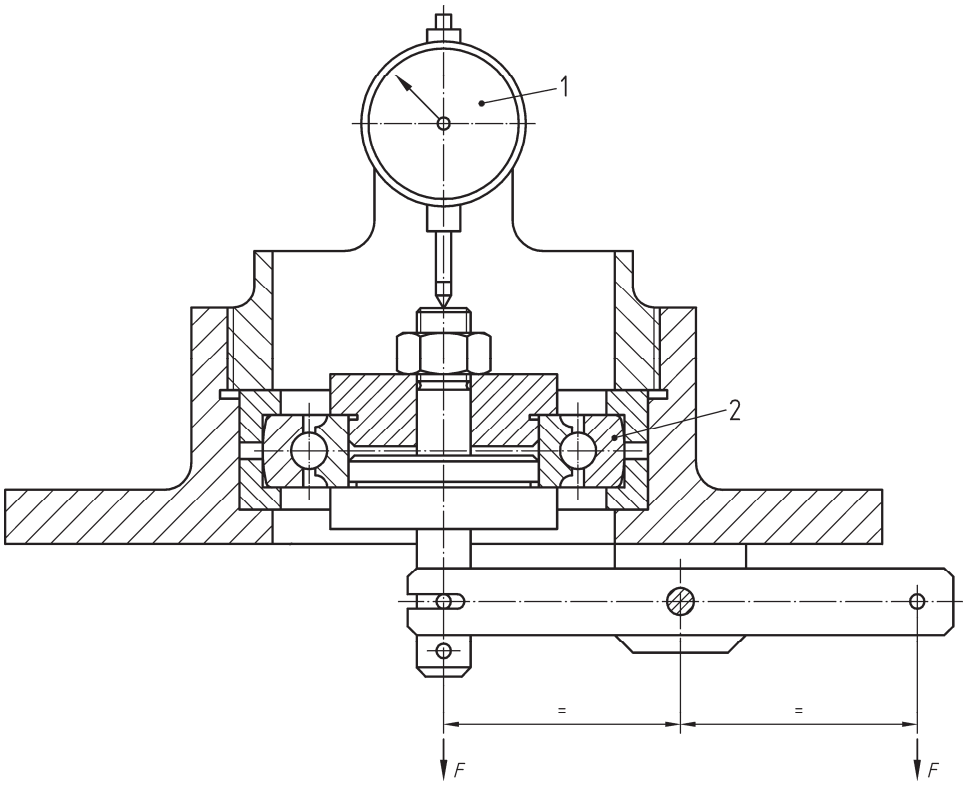
— Mount the bearing horizontally and immobilize the outer bearing;

— Place a dial gauge in the axis of the bearing;

— Apply the load F (see Table E.2) in the direction of the dial gauge and then in the opposite direction;

— Record the difference G_a between the maximum and minimum readings on the dial gauge;

— Repeat this measurement in different angular positions by rotating one ring in relation to the other.



Key

1 dial gauge
2 bearing

Figure E.2

Table E.2

Nominal diameter mm	F max. N			
	EN 3045 to EN 3047	**EN 3053 to EN 3055**	**EN 3281 to EN 3283**	**EN 3284 to EN 3292**
≤ 6	25		25	25
> 6	50			50

E.3 Diagonal internal clearance (G_d)

E.3.1 Principle

See Figure E.3 as an example.

E.3.2 Method

— Mount the bearing horizontally and immobilize the outer ring;

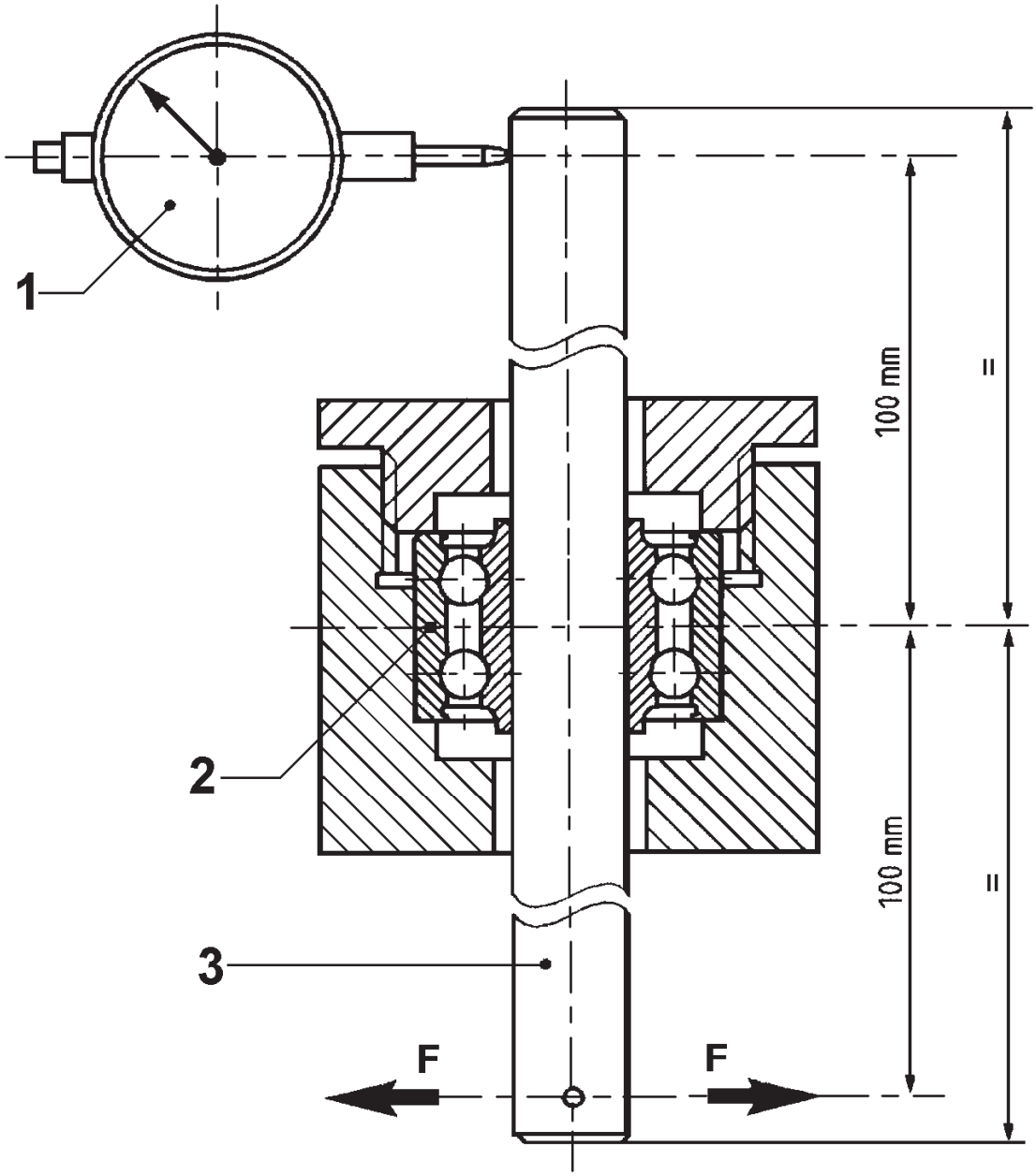
— Fit a pin without stresses in the bore of the bearing;

— Place a dial gauge on this pin;

— Gradually apply the load F (see Table E.3) on the side opposite the dial gauge, in the same direction as the dial gauge and then in the opposite direction;

— Record the difference G_d between the maximum and minimum readings on the dial gauge;

— Repeat this measurement in different angular positions by rotating one ring in relation to the other.



Key

1 dial gauge
2 bearing
3 pin

Figure E.3

Table E.3

Nominal diameter mm	F max. N **EN 3056 to EN 3058**
All diameters	10

Annex F
(normative)

Verification of permissible and ultimate static loads

F.1 Permissible radial static loads (C_s)

F.1.1 Principle

See Figures F.1 and F.2 as examples.

F.1.2 Method

— Mount the bearing as shown in Figure F.1 (it shall turn freely by hand);
— Apply load C_s gradually at 1 %/s;
— Maintain it for 1 min;
— Remove the load;
— Transfer and mount the bearing as shown in Figure F.2;
— Apply a radial load F of 25 N;
— Turn the bearing manually;
— Check.

F.2 Ultimate radial static loads

This test follows the F.1 test.

F.2.1 Principle

See Figure F.1 as an example.

F.2.2 Method

— Mount the bearing as shown in Figure F.1 (it shall turn freely by hand);
— Apply a radial load of 1,5 C_s gradually at 1 %/s;
— Maintain it for 1 min;
— Remove the load;
— Check.

F.3 Permissible axial static loads (F_a max.)

F.3.1 Principle

See Figures F.3 and F.4 as examples.

F.3.2 Method

— Mount the bearing as shown in Figure F.3 (it shall turn freely by hand);
— Apply the load F_a max. gradually at 1 %/s;
— Maintain it for 1 min;
— Remove the load;
— Transfer and mount the bearing as shown in Figure F.4;
— Apply an axial load F of 25 N;
— Rotate the bearing manually;
— Check.

F.4 Ultimate axial static loads

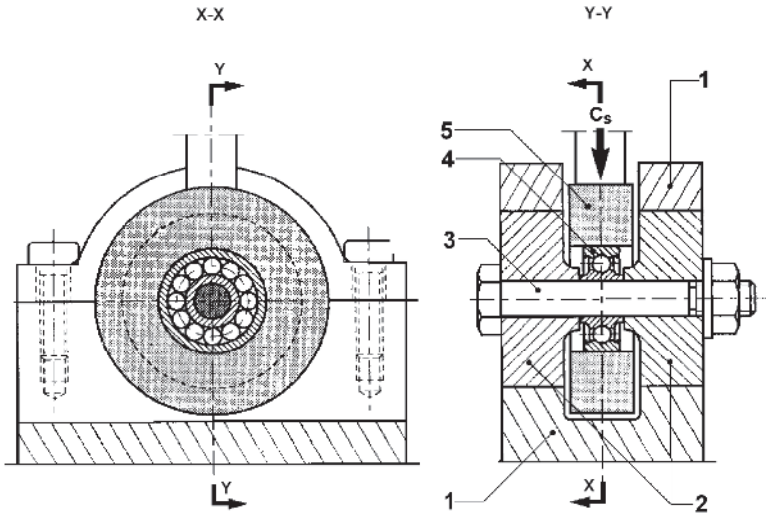
This test follows the F.3 test.

F.4.1 Principle

See Figure F.3 as an example.

F.4.2 Method

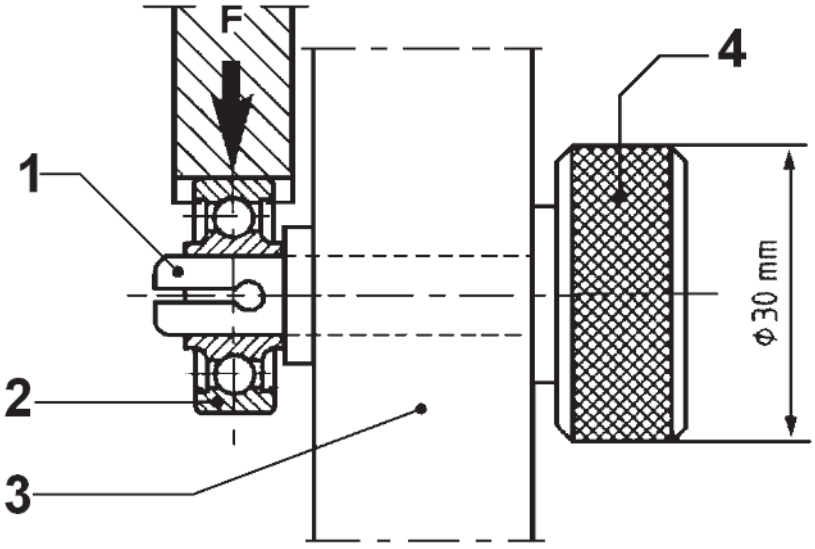
— Mount the bearing as shown in Figure F.3 (it shall turn freely by hand);
— Apply an axial load of 1,5 F_a max. gradually at 1 %/s;
— Maintain it for 1 min;
— Remove the load;
— Check.



Key

1 clamping device
2 spacers
3 high tensile steel clamping shaft
4 bearing
5 circular piece in hardened steel

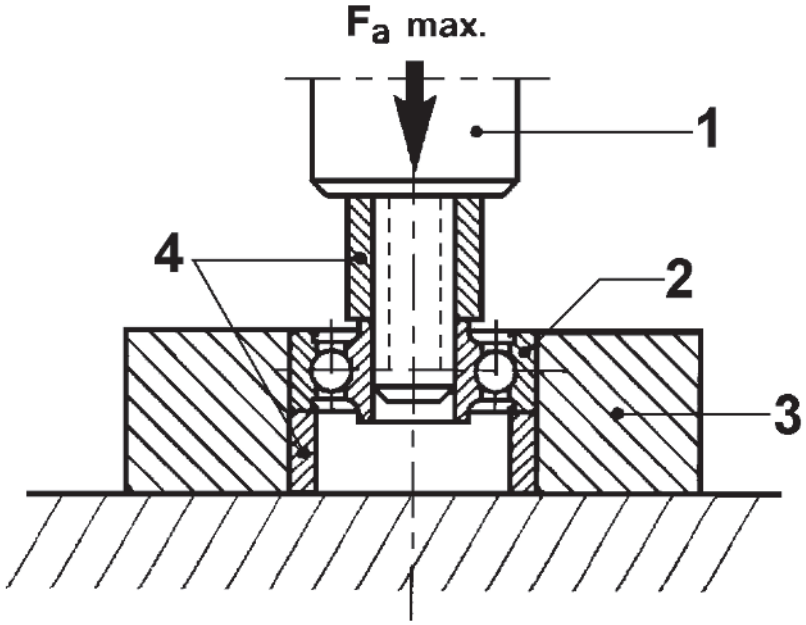
Figure F.1



Key

1 shaft
2 bearing
3 support
4 knurled knob

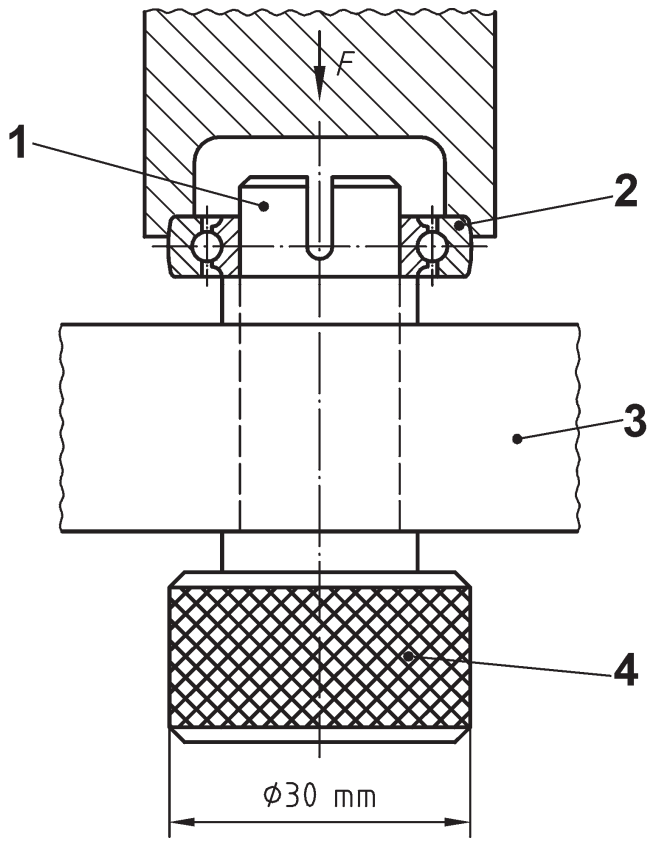
Figure F.2



Key

1	load shaft	3	circular piece in hardened steel
2	bearing	4	spacers

Figure F.3



Key

1 shaft
2 bearing
3 support
4 knurled knob

Figure F.4

Annex G
(normative)

Lubricants – Essential characteristics

G.1 Ester type extreme pressure grease, code A

Type	:	Synthetic + gelling agent + extreme pressure additives
Dropping point	:	Shall not be below 163 °C
Worked penetration	:	270 mm to 310 mm
Limits of use	:	From – 73 °C to 121 °C

G.2 Synthetic hydrocarbon grease, code B

Type	:	Synthetic + high melting point gelling agent
Dropping point	:	Shall not be below 232 °C
Worked penetration	:	265 mm to 320 mm
Limits of use	:	From – 54 °C to 177 °C

Annex H
(normative)

Simplified qualification procedure

H.1 Rules for application

H.1.1 This procedure which is based on experience acquired between suppliers and users will only be applicable to manufacturers of airframe bearings who at least meet the following criteria.

H.1.2 Be holder of an approval according to EN 9100 on all production sites for the products to be qualified.

H.1.3 Be a manufacturer who is well established in terms of his manufacturing facilities and be one who has supplied established airframe bearings to European prime users for a number of years to National or Company aerospace standards and has obtained qualification according to EN 2063 or this specification or has significant statistical quality data (analytical data) for those products that produce an equivalent level of safety.

NOTE Definitions

Established airframe bearings

products which meet the requirements of National or Company aerospace metric standards or former declassified EN product standards and corresponding specifications accepted as equivalent to the applicable EN product standard

European prime users

European aircraft and helicopter manufacturers

Significant Statistical Quality Data

In support of qualification request, supply documentary evidence such as inspection data, manufacturing tests, historical production quantities to identified clients to demonstrate acceptable quality

H.1.4 The manufacturer shall propose which procedure is to be applicable, to be decided upon by the ASD-CERT mandated body in connection with the preparation of the test programme.

H.2 Choice of references

H.2.1 The tables hereafter define the composition of products regulated by this technical specification in three groups, each one subdivided into two or three divisions.

H.2.2 Rigid rolling bearings (Table H.1):

Group 1

- Division 1: Standard series single row ball bearings:
  - EN 3284 - EN 3285 - EN 3286 — Normal clearance (Subdivision 1A).
  - EN 3045 - EN 3046 - EN 3047 — Reduced clearance (Subdivision 1B).
- Division 2: Light weight series single row ball bearings:
  - EN 3281 - EN 3282 - EN 3283 — Normal clearance (Subdivision 2A).
  - EN 4033 — Reduced clearance (Subdivision 2B).
- Division 3: Double row ball bearings:
  - EN 3056 - EN 3057 - EN 3058

H.2.3 Self-aligning rolling bearings (Table H.2):

Group 2

- Division 4: Standard series double row ball bearings:
  – EN 3287 - EN 3288 - EN 3289.
- Division 5: Light weight series double row ball bearings:
  – EN 4034.

Group 3

- Division 6: Standard series single row roller bearings:
  – EN 3290 - EN 3291 - EN 3292.
- Division 7: Light series single row roller bearings:
  – EN 3053 - EN 3054 - EN 3055.

H.3 Method

H.3.1 Qualification of bearings in EN product standards may be undertaken by testing individual bearings (one reference) or subdivisions of bearings as shown in Tables H.1 and H.2.

Qualification for divisions or groups of bearings can be obtained via qualification of sets of subdivisions of bearings.

H.3.2 Rules for qualification of individual bearings:

H.3.2.1 Qualification of one bearing size of an EN product standard qualifies the bearing immediately before and the one immediately after the bearing in question, within the range of bearings indicated in the product standard.

H.3.2.2 If the manufacturer has not previously obtained qualification according to this specification the first bearing of the division to be tested shall be subject to full testing.

If an extension of the manufacturer's qualified range of bearings is being undertaken the following rules apply.

H.3.3 Rules for qualification of subdivisions of bearings:

H.3.3.1 The manufacturer shall have obtained full qualification according to this specification (or EN 2063 for the old product standards) for a cadmium plated bearing and a sealed bearing from the group of bearings in question.

H.3.3.2 Each subdivision bearing may be selected and tested according to the rules of H.3.2.1. Examples of bearing selection are shown in Tables H.1 and H.2.

H.3.3.3 To obtain qualification for a complete subdivision, all of the selected bearings identified in the respective table or an alternative selection of bearings according to the rules of H.3.2.1, shall pass the static radial and axial load tests according to this technical specification.

The self-aligning bearings in groups 2 and 3 shall also pass according to this specification seal retention test.

H.3.4 Rules for qualification of a whole division or group:

H.3.4.1 To obtain qualification for a division of bearings, all the subdivisions of bearings of that division shall be tested according to the rules of H.3.2 and H.3.3.

H.3.4.2 To obtain qualification for a group of bearings, all the divisions if that group shall be tested according to the rules of H.3.2 and H.3.3.

H.3.5 Summary of special features incorporated in this simplified procedure:

H.3.5.1 The bearings covered by this technical specification have been divided [1)] into:

a) three groups:

   1) rigid ball bearings;

   2) self-aligning ball bearings;

   3) self-aligning roller bearings;

b) seven divisions covering each of the types of bearings;

c) nine types of bearings separated subdivisions.

H.3.5.2 EN product standards with the same boundary dimensions and made of the same material have been made into one subdivision. This is proposed because the only differences of internal clearance and geometric running tolerances will not affect capability of the bearings to support the static loads specified in the respective product standards.

Consequently the subdivision 1A qualifies subdivision 1B and the subdivision 2A qualifies subdivision 2B.

H.3.5.3 The selection of bearings to be tested has been made to provide an even distribution over the range of each EN product standard. It is the same basis as used by the American AS 7949 standard.

H.3.5.4 As each group of bearings has all its seals designed and manufactured to the same proven basis only one size within each group need be sand and dust tested according to this technical specification or EN 2063.

H.3.5.5 The seal retention test is required to be carried out for both self-aligning bearing groups because this is a test of the physical capability of the bearings.

H.4 Bearing distribution

Tables H.1 and H.2 define the bearing repartition in group, division and subdivision.

1) See Tables H.1 and H.2.

Table H.1 — Rigid rolling bearings

						EN	Material	Cylinder bore													
								5	6	8	10	12	15	17	20	25	30	35	40	50	60
Group 1	Division 1	Subdivision 1A	Single row bearings	Standard section	Normal clearance	EN 3284	Bearing steel	5	(6)	8	10	12	15	17	(20)	25	(30)				
						EN 3285	Cadmium plated bearing steel	5	(6)	8	10	(12)	15	17	20	30	30				
						EN 3286	Corrosion resisting steel	5	(6)	8	10	(12)	15	17	(20)	25	(30)				
		Subdivision 1B			Reduced clearance	EN 3045	Bearing steel	5	6	8	10	12	15	17	20	25	30				
						EN 3046	Cadmium plated bearing steel	5	6	8	10	12	15	17	20	25	30				
						EN 3047	Corrosion resisting steel	5	6	8	10	12	15	17	20	25	30				
	Division 2	Subdivision 2A		Weak section	Normal clearance	EN 3281	Bearing steel				10	(12)	15	17	20	25	30	(35)	40	50	(60)
						EN 3282	Cadmium plated bearing steel				10	12	15	17	(20)	25	30	35	40	50	60
						EN 3283	Corrosion resisting steel				10	(12)	15	17	(20)	25	30	(35)	40	50	(60)
		Subdivision 2B			Reduced clearance	EN 4033	Corrosion resisting steel				10	12	15	17	20	25	30	35	40	50	60
	Division 3	–	Double row bearings	–		EN 3056	Bearing steel			8	(10)	12	(15)	17	20						
						EN 3057	Cadmium plated bearing steel			8	10	12	15	(17)	20						
						EN 3058	Corrosion resisting steel			8	(10)	12	15	(17)	20						

NOTE Bearing marked ( ) represent only one example of sampling among others.

Table H.2 — Self-aligning rolling bearings

				EN	Material	Cylinder bore														
						5	6	8	10	12	15	16	17	20	25	30	32	35	40	
Group 2	Division 4	Double row bearings	Normal clearance	EN 3287	Bearing steel	5	(6)	8	10	12	15		(17)			30				
				EN 3288	Cadmium plated bearing steel	5	6	8	10	(12)	15		17			30				
				EN 3289	Corrosion resisting steel	5	(6)	8	10	(12)	15		(17)			30				
	Division 5		Narrow series	EN 4034	Corrosion resisting steel					(15)	16		(20)	25		(32)				
Group 3	Division 6	Single row bearings	Normal clearance	EN 3290	Bearing steel			8	(10)	12	15		17	20	25	(30)				
				EN 3291	Cadmium plated bearing steel			8	10	12	15		(17)	20	25	30				
				EN 3292	Corrosion resisting steel			8	(10)	12	15		(17)	20	25	(30)				
	Division 7		Narrow series	EN 3053	Bearing steel		6	(8)	10	12	15		17							
				EN 3054	Cadmium plated bearing steel		6	8	10	12	(15)		17							
				EN 3055	Corrosion resisting steel		6	(8)	10	12	(15)		17							

NOTE Bearing marked ( ) represent only one example of sampling among others.

Bibliography

AS 7949, *Bearings, Ball, Airframe, Anti-friction, General Standard for* [2)]

2) Published by: SAE National (US) Society of Automotive Engineers (http://www.sae.org/).

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