INTERNATIONAL STANDARD

ISO 13415

First edition
1997-12-15

Aerospace — Airframe needle track roller, stud type, single-row, sealed — Inch series

Aéronautique et espace — Galets de came à aiguilles, sur axe, à une rangée, avec joints, pour cellule d'aéronef — Série «inch»

Reference number
ISO 13415:1997(E)

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 13415 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 15, *Airframe bearings*.

Annexes A and B of this International Standard are for information only.

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Introduction

At the time this International Standard was developed, the Imperial units sizes of airframe needle roller bearings were dominant in world application. The basis for this International Standard is the imperial units provided in annex A.

Aerospace — Airframe needle track roller, stud type, single-row, sealed — Inch series

1 Scope

This International Standard specifies the characteristics, boundary dimensions, tolerances, internal clearances and permissible static radial loads of inch series, single-row, stud type needle track rollers used in airframe applications.

The airframe needle track rollers covered by this International Standard are designed to operate in the temperature range –54 °C to +121 °C.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 683-17:—[1], *Heat-treated steels, alloy steels and free-cutting steels — Part 17: Ball and roller bearing steels.*

ISO 1132:1980, *Rolling bearings — Tolerances — Definitions.*

ISO 2082:1986, *Metallic coatings — Electroplated coatings of cadmium on iron or steel.*

ISO 3161:1996, *Aerospace — UNJ threads, with controlled root radius, for aerospace — Inch series.*

ISO 3353:1976, *Aerospace — Rolled threads for bolts — Lead and runout requirements.*

ISO 4520:1981, *Chromate conversion coatings on electroplated zinc and cadmium coatings.*

ISO 5593:1997, *Rolling bearings — Vocabulary.*

ISO 6158:1984, *Metallic coatings — Electroplated coatings of chromium for engineering purposes.*

ISO 13411:1997, *Aerospace — Airframe needle roller, cylindrical roller and track roller bearings — Technical specification.*

AMS 2417E:1993, *Plating, zinc-nickel alloy.*[2]

[1] To be published. (Revision of ISO 683-17:1976)

[2] Available from: SAE International
400 Commonwealth Drive
Warrendale, PA 15096-0001
USA

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5593 apply.

4 Symbols

4.1 For the purposes of this International Standard, the symbols given in ISO 1132 apply. The symbols (except those for tolerances) shown in the figures and the values given in the tables denote nominal dimensions unless specified otherwise.

4.2 The following additional symbols for bearings covered by this International Standard also apply.

C_1 track contact width

C_s permissible static radial load

d_1 stud diameter

d_2 cotter pin hole diameter

d_a clamping face diameter

R crown radius of outer ring

L_1 length of thread on stud

L_2 distance from centreline of cotter pin hole to end of thread

L_3 distance from bottom of slot to opposite side of stud

L_4 slot length (bottom of slot)

H bottom of slot to opposite side of stud grip

b slot width

5 Required characteristics

5.1 Dimensions — Tolerances — Internal clearances — Loads

For values, see table 1. For configuration, see figure 1.

Dimensions in millimetres (except thread size), tolerance and clearance values in micrometres

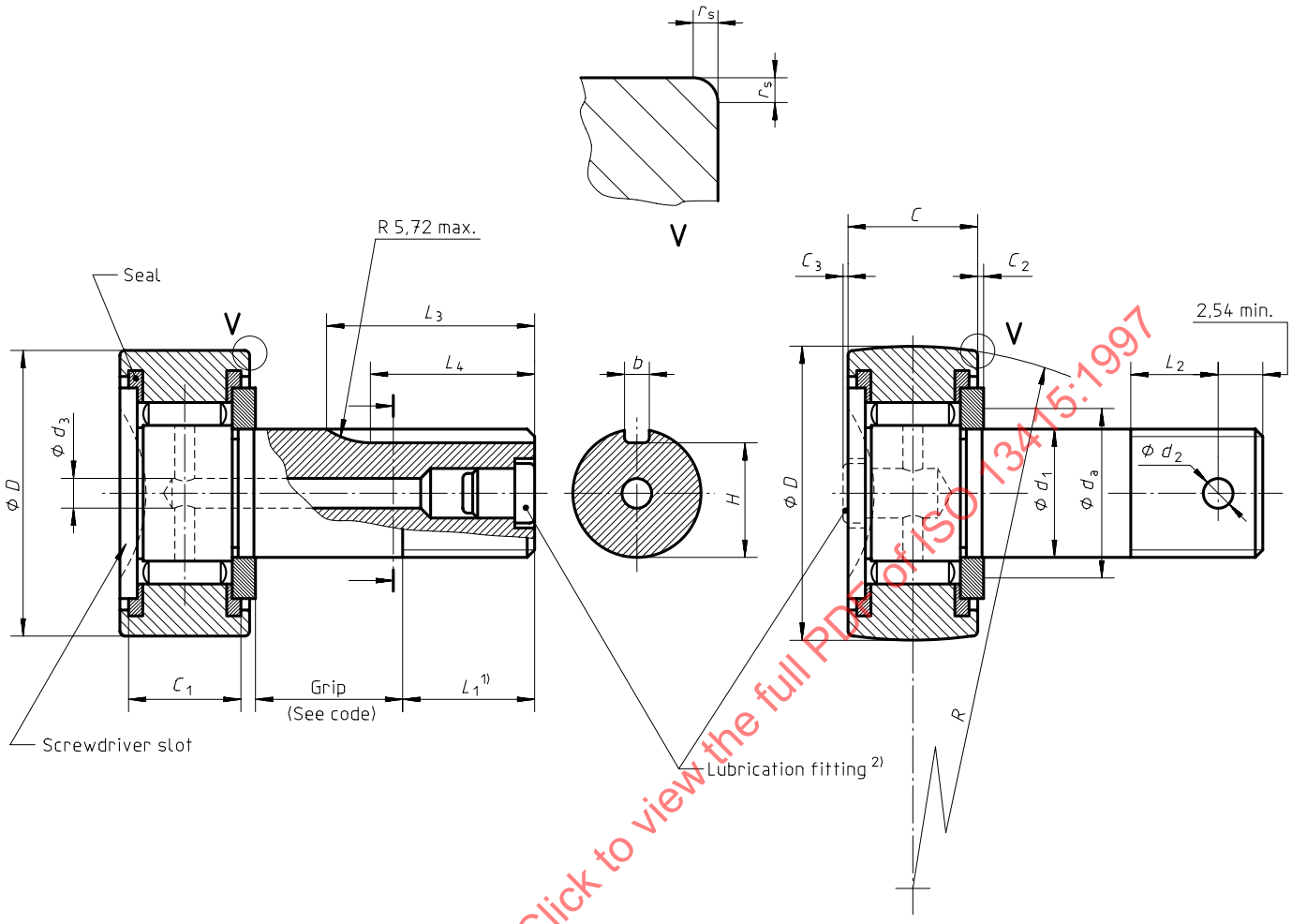
Diameter code	D	C 0 −127	d_1	Tolerance values Δ_{Dmp}	Tolerance values Δ_{d1mp}	C_1 min.	C_2 min.	C_3 max.	R ref.	d_2 ref.	r_s min.	d_a min.	Thread size UNJF class 3A[1] in	L_1 ref.	L_2 min.	L_3 ref.	L_4 +769 0	H +77 −77	b +52 −52
3	12,7	7,14	4,83	+25 −38	0 −38	5,84	0,15	1,27	254	1,8	0,25	7,55	0,19 – 32	8,74	5,35	—	—	—	—
4	17,462	7,14	6,35			5,84				1,9		9,12	0,25 – 28		5,68	13,56	9,52	5,443	1,613
5	19,05	8,74	7,93			7,36						10,72	0,312 5 – 24	9,12	5,94	13,87	9,9	7,031	
6	22,225	11,92	9,53			9,65				2,7	0,64	12,7	0,375 – 24		6,73	14,53		8,219	2,405
7	25,4	13,49	11,1			10,92						14,28	0,437 5 – 20	10,72	7,18	16,13	11,5	9,807	
8	28,575	16,67	12,7			13,46					1,02	15,88	0,5 – 20		7,97	16,81		10,998	3,2

1) See ISO 3161.

Table 1

Diameter code	Internal clearance Radial, G_r max.	Internal clearance Axial, G_a max	Install torque Nm max.	C_s kN	Mass kg ≈
3	43	635	0,9	3,51	0,006 + (Grip length code no. × 0,000 23)
4			2,25	4,18	0,014 + (Grip length code no. × 0,000 41)
5			4,51	7,38	0,02 + (Grip length code no. × 0,000 64)
6			6,21	12,09	0,037 + (Grip length code no. × 0,000 91)
7			16,94	15,16	0,057 + (Grip length code no. × 0,001 18)
8			23,16	23,04	0,086 + (Grip length code no. × 0,001 59)

Dimensions in millimetres



1) See ISO 3353 for thread runout requirements.
2) See annex B.

Figure 1

5.2 Surface roughness

Rollers: R_a = 0,2 µm max.

Inner ring raceway: R_a = 0,4 µm max.

Outer ring raceway: R_a = 1,0 µm max.

End washers: R_a = 1,6 µm max. at roller contact area.

6 Materials

Ring/stud: bearing steel - ISO 683-17, type 1, raceways and stud flange hardness 58 HRC to 66 HRC (670 HV to 860 HV), stud core hardness 36 HRC to 44 HRC (354 HV to 434 HV).

Rollers: bearing steel - ISO 683-17, type 1, heat treated to 58 HRC to 66 HRC (670 HV to 860 HV).

End washers: steel heat treated to 51 HRC to 60 HRC (528 HV to 697 HV) at roller contact area.

Seals: acetal resin, nylon or equivalent.

7 Surface treatment

7.1 Bearings made of conventional rolling bearing steel shall have the external surfaces of the outer ring chromium plated, and all other external surfaces cadmium or zinc-nickel plated.

7.2 Where cadmium plating is specified (code letters D and M), it shall be in accordance with ISO 2082. The thickness of the plating shall not be less than 7 µm and not more than 15 µm. The bearing shall be embrittlement-relieved within 4 h of plating by heat treatment at 140 °C ± 10 °C for a minimum of 8 h followed by chromate treatment in accordance with ISO 4520 (code letter D only).

7.3 Where chromium plating is specified (code letters D, M and Z), it shall be in accordance with ISO 6158. The thickness of the plating shall be not less than 10 µm, 8 µm on faces and ring chamfers, and not more than 25 µm.

7.4 Where zinc-nickel plating is specified (code letter Z), it shall be in accordance with AMS 2417E, type 2. The thickness of the plating shall not be less than 7 µm and not more than 15 µm.

8 Optional features

8.1 Lubrication fitting/cotter pin hole and slot in threaded end of stud

Bearings may be supplied with a suitable lubrication fitting (see annex B) in the flanged or the threaded end of the stud. They may also be supplied with a cotter pin hole. Bearings may be supplied with a slot in the threaded end of the stud to receive a tang in the bore of a mounting washer. These features are specified through a designation code in the part number as noted below.

Code	Feature
S	lubrication fitting in flanged end of stud, no cotter pin hole, no slot in threaded end of stud
R	lubrication fitting in flanged end of stud, no cotter pin hole, slot in threaded end of stud
P	lubrication fitting in flanged end of stud, with cotter pin hole, no slot in threaded end of stud
J	lubrication fitting in flanged end of stud, with cotter pin hole, slot in threaded end of stud
T	lubrication fitting in threaded end of stud, no cotter pin hole, no slot in threaded end of stud
U	lubrication fitting in threaded end of stud, no cotter pin hole, slot in threaded end of stud
L	lubrication fitting in both threaded and flanged ends of stud, no cotter pin hole, no slot in threaded end of stud
W	lubrication fitting in both threaded and flanged ends of stud, no cotter pin hole, slot in threaded end of stud

8.2 Outer ring profile

Bearings may be supplied with the outside surface of the outer ring crowned. This feature is specified through a designation code in the part number as noted below.

Code	Feature
N	no crown (cylindrical)
C	crown on the outer ring

8.3 Grip length

Bearings shall be supplied with grip lengths designated by a two-digit code as specified in table 2.

Table 2

Grip length code	Nominal grip length mm	Grip length code	Nominal grip length mm
01	1,588	41	65,088
02	3,175	42	66,675
03	4,762	43	68,262
04	6,35	44	69,85
05	7,938	45	71,438
06	9,525	46	73,025
07	11,112	47	74,612
08	12,7	48	76,2
09	14,288	49	77,788
10	15,875	50	79,375
11	17,462	51	80,962
12	19,05	52	82,55
13	20,638	53	84,138
14	22,225	54	85,725
15	23,812	55	87,312
16	25,4	56	88,9
17	26,988	57	90,488
18	28,575	58	92,075
19	30,162	59	93,662
20	31,75	60	95,25
21	33,338	61	96,838
22	34,925	62	98,425
23	36,512	63	100,012
24	38,1	64	101,6
25	39,688	65	103,188
26	41,275	66	104,775
27	42,862	67	106,362
28	44,45	68	107,95
29	46,038	69	109,538
30	47,625	70	111,125
31	49,212	71	112,712
32	50,8	72	114,3
33	52,388	73	115,888
34	53,975	74	117,475
35	55,562	75	119,062
36	57,15	76	120,65
37	58,738	77	122,238
38	60,325	78	123,825
39	61,912	79	125,412
40	63,5	80	127

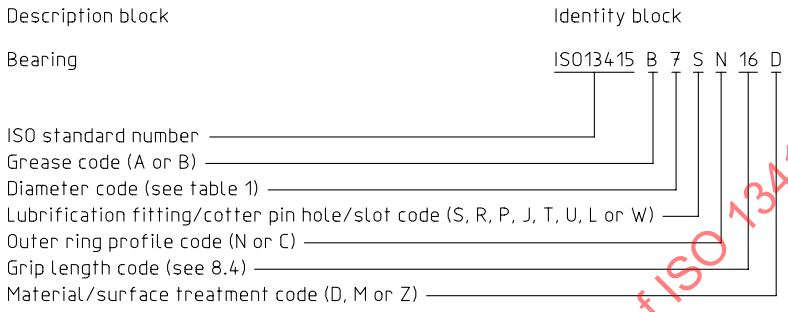
9 Lubrication

The bearing shall be prelubricated with either grease A or B, as specified by the customer.

NOTE — Descriptions of grease A and grease B are given in ISO 13411:1997, annex I.

10 Designation

Bearings covered by this International Standard shall be designated only in the manner shown in the following example:



where the following codes are applied:

— greases:

A = ester type grease;

B = synthetic hydrocarbon type grease;

— lubrication fitting/cotter pin hole and slot in threaded end of stud (see 8.1):

S = lubrication fitting in flanged end of stud, no cotter pin hole, no slot in threaded end of stud;

R = lubrication fitting in flanged end of stud, no cotter pin hole, slot in threaded end of stud;

P = lubrication fitting in flanged end of stud, with cotter pin hole, no slot in threaded end of stud;

J = lubrication fitting in flanged end of stud, with cotter pin hole, slot in threaded end of stud;

T = lubrication fitting in threaded end of stud, no cotter pin hole, no slot in threaded end of stud;

U = lubrication fitting in threaded end of stud, no cotter pin hole, slot in threaded end of stud;

L = lubrication fitting in both threaded and flanged ends of stud, no cotter pin hole, no slot in threaded end of stud;

W = lubrication fitting in both threaded and flanged ends of stud, no cotter pin hole, slot in threaded end of stud;

— outer ring profiles:

N = no crown (cylindrical);

C = crown on outer ring;

— materials/surface treatments:

D = material: low alloy bearing steel;

surface treatment: outer ring - chromium plated;

washer - cadmium plated with chromate conversion coating;

stud/inner ring - cadmium plated with chromate conversion coating, or black oxide coated;

M = material: low alloy bearing steel;

surface treatment: outer ring - chromium plated;

washer - cadmium plate without chromate conversion coating;

stud/inner ring - cadmium plated without chromate conversion coating;

Z = material: low alloy bearing steel;

surface treatment: outer ring - chromium plated;

washer - zinc-nickel plated;

stud/inner ring - zinc-nickel plated.

11 Identification marking

In addition to the manufacturer's name or trademark, each bearing shall be permanently and legibly marked, using the identity block as defined in clause 10. Marking position and method shall be at the manufacturer's option.

12 Technical specification

Airframe needle track rollers supplied to this International Standard shall conform to the requirements of ISO 13411.

Annex A
(informative)

Imperial (non-SI) units

Tables A.1 and A.2 give the imperial (non-SI) unit information that is the basis for this International Standard.

Table A.1

Dimensions in inches, tolerance and clearance values in 0,000 1 in

Diameter code	D	C $^{0}_{-50}$	d_1	Tolerance values Δ_{Dmp}	Tolerance values Δ_{d1mp}	C_1 min.	C_2 min.	C_3 max.	R ref.	d_2 ref.	r_s min.	d_a min.	Thread size UNJF class 3A[1] in	L_1 ref.	L_2 min.	L_3 ref.	L_4 $^{+300}_{0}$	H $^{+30}_{-30}$	b $^{+20}_{-20}$
3	0,5	0,281	0,19	+ 10 – 15	0 – 15	0,23	0,006	0,05	10	0,007	0,01	0,297	0,190 0 – 32	0,344	0,211	—	—	—	—
4	0,687 5	0,281	0,25							0,076		0,359	0,250 0 – 28		0,224	0,534	0,375	0,214 3	0,063 5
5	0,75	0,344	0,312			0,29						0,422	0,312 5 – 24	0,359	0,234	0,546	0,39	0,276 8	
6	0,875	0,469	0,375			0,38					0,025	0,5	0,375 0 – 24		0,265	0,572		0,323 6	0,094 7
7	1	0,531	0,437			0,43				0,106		0,562	0,437 5 – 20	0,422	0,283	0,635	0,453	0,386 1	
8	1,125	0,656	0,5			0,53					0,04	0,625	0,500 0 – 20		0,314	0,662		0,433	0,126

1) See ISO 3161.

Diameter code	Internal clearance Radial, G_r max.	Internal clearance Axial, G_a max	Install torque Nm max.	C_s kN	Mass kg ≈
3	17	250	8	790	0,014 + (Grip length code no. × 0,000 5)
4			20	940	0,031 + (Grip length code no. × 0,000 9)
5			40	1 660	0,043 + (Grip length code no. × 0,001 4)
6			55	2 720	0,081 + (Grip length code no. × 0,002)
7			150	3 860	0,125 + (Grip length code no. × 0,002 6)
8			205	6 080	0,19 + (Grip length code no. × 0,003 5)

Table A.2

Grip length code	Grip length in	Grip length code	Grip length in
01	0,062 5	41	2,562 5
02	0,125	42	2,625
03	0,187 5	43	2,687 5
04	0,25	44	2,75
05	0,312 5	45	2,812 5
06	0,375	46	2,875
07	0,437 5	47	2,937 5
08	0,5	48	3
09	0,562 5	49	3,062 5
10	0,625	50	3,125
11	0,687 5	51	3,187 5
12	0,75	52	3,25
13	0,812 5	53	3,312 5
14	0,875	54	3,375
15	0,937 5	55	3,437 5
16	1	56	3,5
17	1,062 5	57	3,562 5
18	1,125	58	3,625
19	1,187 5	59	3,687 5
20	1,25	60	3,75
21	1,312 5	61	3,812 5
22	1,375	62	3,875
23	1,437 5	63	3,937 5
24	1,5	64	4
25	1,562 5	65	4,062 5
26	1,625	66	4,125
27	1,687 5	67	4,187 5
28	1,75	68	4,25
29	1,812 5	69	4,312 5
30	1,875	70	4,375
31	1,937 5	71	4,437 5
32	2	72	4,5
33	2,062 5	73	4,562 5
34	2,125	74	4,625
35	2,187 5	75	4,687 5
36	2,25	76	4,75
37	2,312 5	77	4,812 5
38	2,375	78	4,875
39	2,437 5	79	4,937 5
40	2,5	80	5