BS EN 4156:2013

BSI Standards Publication

Aerospace series — Rod ends, with self-aligning double row ball bearings and threaded shank in steel — Inner ring and balls in corrosion resisting steel — Dimensions and loads — Inch series

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National foreword

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Série aérospatiale - Embouts à rotule sur deux rangées de billes et à tige filetée en acier - Bague intérieure et billes en acier résistant à la corrosion - Dimensions et charges - Série en inches

Luft- und Raumfahrt - Ösenköpfe mit zweireihigem Pendelkugellager und Gewindeschaft aus Stahl - Innenring und Wälzkörper aus korrosionsbeständigem Stahl - Maße und Belastungen - Zoll Reihe

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 4156:2013) 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of an identical text or by endorsement, at the latest by June 2014, and conflicting national standards shall be withdrawn at the latest by June 2014.

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1 Scope

This European Standard specifies the characteristics of adjustable rod ends with self-aligning double row ball bearing and threaded shank in steel, inner ring and balls in corrosion resisting steel.

They consist of:

— a rod end comprising:
  — either seals or shields;
  — an optional longitudinal groove for locking purpose;
— an inner ring with balls.

These rod ends are intended for use with flight control rods or rods for aerospace structures.

They are intended to be used in the temperature range: – 54 °C to 150 °C.

However, being lubricated with the following greases:

— very high pressure grease, ester type (code A), operational range – 73 °C to 121 °C according MIL-PRF-23827 type II
— very high pressure grease, synthetic hydrocarbons, general purpose (code B), operational range – 54 °C to 177 °C (see EN 2067), according MIL-PRF-81322.
— very high pressure grease, lithium type (code C) operational range – 73 °C to 121 °C according MIL-PRF-23827 type I.

Their field of application when lubricated with codes A and C grease is limited to 121 °C.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2030, *Aerospace series — Steel FE-PM3501 (X105CrMo17) — Hardened and tempered — Bars $D \leq 150$ mm*

EN 2067, *Aerospace series — Rod ends with self-aligning ball bearings — Technical specification*

EN 2099, *Aerospace series — Steel FE-PL71 — Carburized, hardened and tempered — Bars $D_e \leq 100$ mm* [1)]

EN 2133, *Aerospace series — Cadmium plating of steels with specified tensile strength ≤ 1 450 MPa, copper, copper alloys and nickel alloys*

1) In preparation at the date of publication of this standard.

EN 2135, *Aerospace series — Steel FE-PL61 — Carburized, hardened and tempered — Bar $D_e \leq 40$ mm* [2)]

EN 2424, *Aerospace series — Marking of aerospace products*

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

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

ISO 3161, *Aerospace — UNJ threads — General requirements and limit dimensions*

ISO 3353-1, *Aerospace — Lead and runout threads — Part 1: Rolled external threads*

ISO 8075, *Aerospace — Surface treatment of hardenable stainless steel parts*

MIL-PRF-23827, *Grease, aircraft and instrument, gear and actuator screw, NATO code number G-354* [3)]

MIL-PRF-81322, *Grease, aircraft, general purpose, wide temperature range NATO code G-395* [3)]

3 Symbols and definitions

For the purposes of this document, the symbols and definitions given in ISO 1132-1 and the following apply.

Δ_{ds} is the deviation of a single bore diameter;

Δ_{dmp} is the single plane mean bore diameter deviation;

α is the angular displacement permissible between inner and outer ring axis of a set of aligning bearing;

C_s is the permissible static radial load;

F_a max. is the permissible static axial load.

4 Required characteristics

4.1 Dimensions – Tolerances – Masses

Configuration : see Figure 1.

Values : see Figure 1 and Table 1: values after cadmium plating and passivating.

4.2 Surface roughness

See Figure 1, values prior to cadmium plating and passivating.

Rolling elements and raceways: $R_a = 0{,}2$ µm (8 µin).

2) Published as ASD-STAN Prestandard at the date of publication of this standard (www.asd-stan.org).

3) Published by: Department of Defense (DoD), http://www.defenselink.mil/.

4.3 Materials

Rod end : Steel EN 2135 or EN 2099; heat treated to obtain:

— by case hardening, hardening and tempering a surface hardness of ≥ 58 HRC on the raceway;

— by hardening and tempering a strength $R_m \geq 830$ MPa on the whole rod end.

Inner ring : Steel EN 2030.

Rolling elements : Steel EN 2030.

Seals : Polytetrafluoroethylene (PTFE) or glass fabric reinforced polytetrafluoroethylene (PTFE).

Shields : Corrosion resisting material.

Retaining rings : Corrosion resisting material.

4.4 Surface treatment

Rod end : All outer surfaces with the exception of the raceway, cadmium plating and chromating as per EN 2133, 10 µm to 20 µm (400 µin to 800 µin).

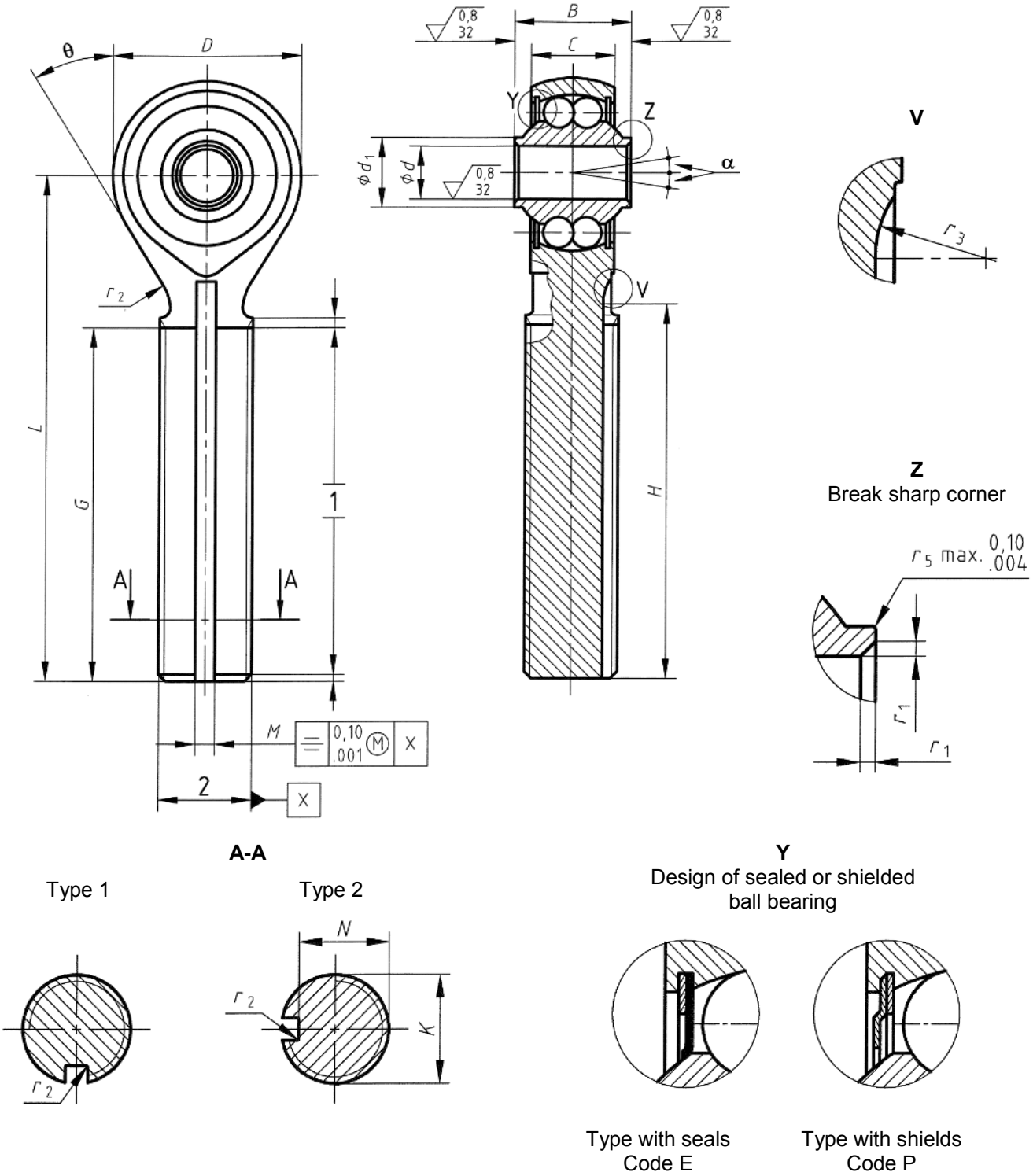
Exception: threads, coat thickness 5 µm to 10 µm (200 µin to 400 µin).

Inner ring and rolling elements : passivated ISO 8075.

3,2 µm
125 µin , 0,8 µm
32 µin

Dimensions in millimetres (inches)

Break sharp edges and corners and remove all burrs and slivers.



Z
Break sharp corner

Key

1 conforms to ISO 3353-1

2 thread

NOTE The installation of seals and shields is at the manufacturer's option.

Figure 1

Table 1 *(1 of 2)*

Dimensions in millimetres (inches)

Code	Diameter d			B	C	D	d_1	G [a]	H	K [b]
	Nominal	Tolerance		$^{0}_{-0,12}$	± 0,12	± 0,25		± 0,5	± 0,5	Type of thread UNJF-3A
		Δ_{dmp}	Δ_{ds}	$\left(^{0}_{-0.005}\right)$	(± 0.005)	(± 0.010)	min.	(± 0.02)	(± 0.02)	
01	6,350 (0.250 0)	$^{0}_{-0,008}$ $\left(^{0}_{-0.000\,3}\right)$	$^{0}_{-0,013}$ $\left(^{0}_{-0.000\,5}\right)$	14,00 (0.551)	10,00 (0.394)	22,50 (0.886)	8,4 (0.33)	27,0 (1.06)	29,3 (1.15)	6,350-28 (0.250 0-28)
02								37,0 (1.46)	39,3 (1.55)	7,938-24 (0.312 5-24)
03										9,525-24 (0.375 0-24)
04								42,0 (1.65)	44,3 (1.74)	11,113-20 (0.437 5-20)
05								52,0 (2.05)	54,3 (2.14)	12,700-20 (0.500 0-20)
06								59,0 (2.32)	61,3 (2.41)	14,288-18 (0.562 5-18)
07								63,0 (2.48)	65,3 (2.57)	15,875-18 (0.625 0-18)
10	7,938 (0.312 5)			15,00 (0.591)		28,50 (1.122)	10,8 (0.43)	37,0 (1.46)	39,3 (1.55)	7,938-24 (0.3125-24)
11										9,525-24 (0.375 0-24)
12								42,0 (1.65)	44,3 (1.74)	11,113-20 (0.437 5-20)
13								52,0 (2.05)	54,3 (2.14)	12,700-20 (0.500 0-20)
14								59,0 (2.32)	61,3 (2.41)	14,288-18 (0.5625-18)
15							13,8 (0.54)	63,0 (2.48)	65,3 (2.57)	15,875-18 (0.6250-18)
20	9,525 (0.375 0)			20,00 (0.787)	14,00 (0.551)	32,00 (1.260)		37,0 (1.46)	39,3 (1.55)	9,525-24 (0.3750-24)
21								42,0 (1.65)	44,3 (1.74)	11,113-20 (0.4375-20)
22								52,0 (2,05)	54,3 (2.14)	12,700-20 (0.5000-20)
23								48,0 (1.89)	50,3 (1.98)	14,288-18 (0.5625-18)
24								63,0 (2.48)	65,3 (2.57)	15,875-18 (0.6250-18)

Table 1 *(2 of 2)*

Dimensions in millimetres (inches)

Code	L ± 0,25 (± 0.010)	M ± 0,13 0 (+ 0.005 0)	N 0 − 0,13 (0 − 0.005)	r_1	r_2 ± 0,3 (± 0.01)	r_3 ± 0,25 (± 0.010)	r_4	α° [c] min.	θ° max.	Type	Mass ≈ g/piece (lb/piece)
01	54,00 (2.126)	1,57 (0.062)	5,11 (0.201)	0,3 to 0,5 (0.01 to 0.02)	7,0 (0.28)	6,48 (0.255)	0,13 to 0,38 (0.005 to 0.015)	8	32	1	37 (0.082)
02			6,60 (0.260)		6,0 (0.24)						41 (0.090)
03		2,36 (0.093)	7,90 (0.311)		5,0 (0.20)					2	46 (0.101)
04	60,00 (2.362)		9,40 (0.370)		7,0 (0.28)					1	56 (0.123)
05	77,50 (3.051)		11,07 (0.436)		6,0 (0.24)						73 (0.161)
06	85,00 (3.346)	3,18 (0.125)	12,14 (0.478)						19		77 (0.170)
07	80,00 (3.150)		13,74 (0.541)		7,0 (0.28)				35		98 (0.216)
10	60,00 (2.362)	1,57 (0.062)	6,60 (0.260)	0,3 to 0,8 (0.01 to 0.03)	5,0 (0.20)						60 (0.132)
11		2,36 (0.093)	7,90 (0.311)								64 (0.141)
12	62,00 (2.441)		9,40 (0.370)							2	71 (0.157)
13	74,00 (2.913)		11,07 (0.436)							1	86 (0.190)
14	80,00 (3.150)	3,18 (0.125)	12,14 (0.478)		7,0 (0.28)				30		103 (0.227)
15	83,00 (3.268)		13,74 (0.541)								114 (0.251)
20	62,00 (2.441)	2,36 (0.093)	7,90 (0.311)		5,0 (0.20)				35		94 (0.207)
21	67,00 (2.638)		9,40 (0,370)								106 (0.234)
22	75,00 (2.953)		11,07 (0.436)								122 (0.270)
23	73,00 (2.874)	3,18 (0.125)	12,14 (0.478)						30	2	132 (0.291)
24	85,00 (3.346)		13,74 (0.541)							1	144 (0.317)

[a] G = minimum length of useful threads.

[b] Thread rolled as per ISO 3161.

[c] Maximum value for the user.

4.5 Loads, starting torques and clearances

See Table 2.

Table 2

Dimensions in millimetres (inches)

Diameter code	Permissible static loads		Starting torque [a]		Clearance [a]		
	Radial load C_s [b] N (lfb)	Axial load F_a max. [b] N (lfb)	Nm (in lbs) max.		μm (μin)		
			With seals	With shields	Radial		Axial
					Code N	Code R	max.
01	6 810 (1 531)	2 128 (478)	4,0 (0.036)	2,0 (0.018)	2 to 10 (79 to 394)	1 to 5 (39 to 197)	80 (3 150)
02							
03							
04							
05							
06							
07							
10	10 780 (2 423)	3 369 (757)	10,0 (0.089)	5,0 (0.044)			
11							
12							
13							
14							
15							
20	12 750 (2 866)	3 984 (895)	12,0 (0.106)	7,0 (0.062)			
21							
22							
23							
24							

[a] Definition and testing as per EN 2067.

[b] Definition and testing for ultimate static loads as per EN 2067, Annex E.

4.6 Retention of seals or shields

Definition and testing as per EN 2067, Annex A.

Table 3

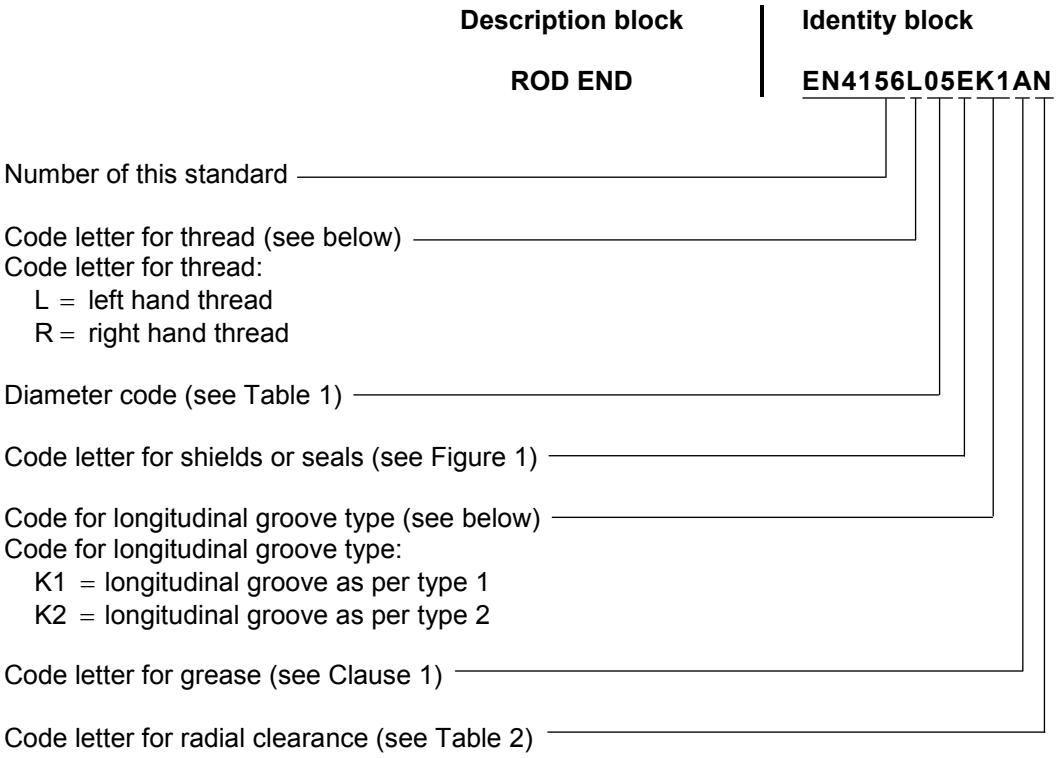
Diameter code	**Test torque** Nm (in lbs) min.
01 to 24	5,0 (0.044)

5 Qualification

See EN 9133.

6 Designation

EXAMPLE



NOTE If necessary, the originator code I9005 should be placed between the description block and the identity block.

7 Marking

EN2424, style A.

Marking position and method are at manufacturer's option.

8 Technical specification

EN 2067.

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