

Aerospace series - Rod end, adjustable, with self-aligning double row ball bearing, in corrosion resisting steel, reduced internal radial clearance and threaded shank in titanium alloy - Dimensions and loads

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 4035:2021 sisaldab Euroopa standardi EN 4035:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 4035:2021 consists of the English text of the European standard EN 4035:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 10.03.2021.	Date of Availability of the European standard is 10.03.2021.
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English Version

**Aerospace series - Rod end, adjustable, with self-aligning  
double row ball bearing, in corrosion resisting steel,  
reduced internal radial clearance and threaded shank in  
titanium alloy - Dimensions and loads**

Série aérospatiale - Embout réglable à rotule sur deux rangées de billes en acier résistant à la corrosion, jeu radial réduit et à tige filetée en alliage de titane -  
Dimensions et charges

Luft- und Raumfahrt - Einstellbarer Ösenkopf mit zweireihigem Pendelkugellager aus korrosionsbeständigem Stahl, reduzierte radiale Lagerluft und Gewindeschraft aus Titanlegierung -  
Maße und Belastungen

This European Standard was approved by CEN on 13 February 2021.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
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## European foreword

This document (EN 4035:2021) 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 document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2021, and conflicting national standards shall be withdrawn at the latest by September 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 4035:2006.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## 1 Scope

This document specifies the characteristics of adjustable rod ends with self-aligning double row ball bearing in corrosion resisting steel with reduced internal radial clearance and threaded shank in titanium alloy, designed to withstand only slow rotations and oscillations under load.

They consist of:

- a rod end comprising:
- circumferential groove to confirm that the assembled rod-end is “in safety” emphasized with the application of red paint;
- 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:  $-54\text{ °C}$  to  $150\text{ °C}$ .

However, being lubricated with the following greases:

- very high pressure grease, ester type (code A), operational range  $-73\text{ °C}$  to  $121\text{ °C}$ ; or
- very high pressure grease, synthetic hydrocarbons, general purpose (code B), operational range  $-54\text{ °C}$  to  $177\text{ °C}$  (see EN 2067);

their field of application when lubricated with code A grease is limited to  $121\text{ °C}$ .

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2067, *Aerospace series — Rod ends with self-aligning ball bearings — Technical specification*

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

EN 2808, *Aerospace series — Anodizing of titanium and titanium alloys*

EN 3315, *Aerospace series — Titanium alloy TI-P64001 — Solution treated and aged — Forgings —  $D_e \leq 75\text{ mm}$*

EN 3813, *Aerospace series — Titanium alloy TI-P64001 (Ti-6Al-4V) — Annealed — Bar and wire for forged fasteners —  $D_e \leq 50\text{ mm}$*

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

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

ISO 5855-2, *Aerospace — MJ threads — Part 2: Limit dimensions for bolts and nuts*

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

TR 3775, Aerospace series — Bolts and pins — Materials<sup>1</sup>

### 3 Terms, definitions and symbols

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp.ui>
- IEC Electropedia: available at <http://www.electropedia.org/>

Symbols of limit deviations are in accordance with definitions of ISO 1132-1.

$\Delta ds$	deviation of a single bore diameter
$\Delta dmp$	single plane mean bore diameter deviation
$C_s$	permissible static radial load
$F_{a \max}$	permissible static axial load

### 4 Required characteristics

#### 4.1 Dimensions — Tolerances — Masses

Configuration: see Figure 1; the bearings are fitted with either seals or shields.

Values: see Figure 1 and Table 1: values after surface treatment.

#### 4.2 Surfaces roughness

Rolling elements and raceway:  $R_a = 0,2 \mu\text{m}$

Bore, side faces and cylindrical outer surface:  $R_a = 0,8 \mu\text{m}$

For code T values prior to the surface treatment

#### 4.3 Materials

Rod end: Titanium alloy EN 3315 or EN 3813 or TR 3775 by hardening and tempering to a strength of  $R_m > 830 \text{ MPa}$  on the whole rod end.

Bearing:

Outer ring	} see EN 3289
Inner ring	
Balls	
Shields	
Seals	

#### 4.4 Surface treatment

Rod end: anodizing EN 2808

<sup>1</sup> Published as ASD-STAN Technical Report at the date of publication of this document by AeroSpace and Defence Industries Association of Europe – Standardization (ASD-STAN) (<https://asd-stan.org/>).