SLOVENSKI STANDARD
SIST EN 4176:2006

01-september-2006

Aeronavtika – Zapirni vijaki, 100° ugreznjena ali dvignjena glava, natezni/strižni tip, ozka toleranca, iz titanove zlitine TI-P64001, anodizirani ali z aluminijem pigmentiranim premazom – Prirobnice iz titanove TI-P99002 ali aluminijeve zlitine 2024 – Metrska serija – Tehnična specifikacija

Aerospace series - Lockbolts, 100° countersunk normal head or protruding head, tension - / sheartype, close tolerance, in titanium alloy TI-P64001, anodized or with aluminium pigmented coating - Collars in titanium TI-P99002 or aluminium alloy 2024 - Metric series - Technical specification

Luft- und Raumfahrt - Paßniete, mit 100° normalem Senkkopf oder Universalkopf, Zug -/Schertyp, aus Titanlegierung TI-P64001, anodisiert oder mit aluminiumpigmentierter Beschichtung - Ringe aus Titan TI-P99002 oder Aluminiumlegierung 2024 - Metrische Reihe - Technische Lieferbedingung

Série aérospatiale - Rivets a bague sertie, a tete fraisée 100° normale ou a tete cylindrique, a traction ou a cisaillement, a tolérance serrée, en alliage de titane TI-P64001, anodisés ou avec revetement alumino-organique - Bagues en titane TI-P99002 ou en alliage d'aluminium 2024 - Série métrique - Spécification technique

Ta slovenski standard je istoveten z: **EN 4176:2005**

ICS:

49.025.20	Aluminij	Aluminium
49.025.30	Titan	Titanium
49.030.20	Sorniki, vijaki, stebelni vijaki	Bolts, screws, studs

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 4176

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English Version

Aerospace series - Lockbolts, 100 countersunk normal head or protruding head, tension- / sheartype, close tolerance, in titanium alloy TI-P64001, anodized or with aluminium pigmented coating - Collars in titanium TI-P99002 or aluminium alloy 2024 - Metric series - Technical specification

Série aérospatiale - Rivets à bague sertie, à tête fraisée 100 normale ou à tête cylindrique, à traction ou à cisaillement, à tolérance serrée, en alliage de titane TI-P64001, anodisés ou avec revêtement alumino-organique - Bagues en titane TI-P99002 ou en alliage d'aluminium 2024 - Série métrique - Spécification technique

Luft- und Raumfahrt - Paßniete, mit 100 normalem Senkkopf oder Universalkopf, Zug- Schertyp, aus Titanlegierung TI-P64001, anodisiert oder mit Aluminium pigmentierter Beschichtung - Ringe aus Titan TI-P99002 oder Aluminiumlegierung 2024 - Metrische Reihe - Technische Lieferbedingung

This European Standard was approved by CEN on 26 October 2005.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Contents

Page

Foreword 3
1 Scope 4
2 Normative references 4
3 Terms and definitions 5
4 Quality assurance 5
5 Requirements 6
6 Delivery 10

Foreword

This European Standard (EN 4176:2005) has been prepared by the European Association of Aerospace Manufacturers - Standardization (AECMA-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 AECMA, 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 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

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

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

1 Scope

This standard specifies the characteristics, qualification and acceptance requirements for tension- / sheartype 100° countersunk normal head or protruding head close tolerance lockbolts in titanium alloy TI-P64001, anodized or with aluminium pigmented coating and collars in titanium TI-P99002 or aluminium alloy 2024, metric series, for use as permanent attachment fasteners in shear applications.

It is applicable whenever referenced.

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 4172, *Aerospace series – Lockbolts, protruding head, sheartype, close tolerance, in titanium alloy TI-P64001, anodized, metric series - Classification: 1 100 MPa (at ambient temperature) / 315 °C.*

EN 4173, *Aerospace series – Lockbolts, 100° countersunk normal head, sheartype, close tolerance, in titanium alloy TI-P64001, anodized, metric series – Classification: 1 100 MPa (at ambient temperature) / 315 °C.*

EN 4174, *Aerospace series – Collars, swage locking, sheartype, in aluminium alloy 2024, anodized or chromated, metric series.*

EN 4175, *Aerospace series – Collars, flanged swage locking, sheartype, in titanium TI-P99002, metric series.*

EN 4401, *Aerospace series – Lockbolts, protruding head, sheartype, close tolerance, in titanium alloy TI-P64001, with aluminium pigmented coating, metric series – Classification: 1 100 MPa (at ambient temperature) / 315 °C.* [1)]

EN 4402, *Aerospace series – Lockbolts, 100° countersunk normal head, sheartype, close tolerance, in titanium alloy TI-P64001, with aluminium pigmented coating, metric series – Classification: 1 100 MPa (at ambient temperature) / 315 °C.* [1)]

EN 9133, *Aerospace series – Quality management systems – Qualification Procedure for aerospace standard parts.*

B46.1:1995, *Surface Texture (Surface Roughness, Waviness, and Lay).* [2)]

MIL-STD-1916, *Department of defense test method standard – DOD preferred methods for acceptance of product.* [3)]

NASM1312-8, *Fastener test methods – Method 8 Tensile strength.* [4)]

NASM1312-16, *Fastener test methods – Method 16 Clamping force for installationformed fasteners.* [4)]

NAS 527:1962, *Inspection Procedure for Flush Fasteners.* [4)]

NAS 1413:1997, *Pins and Collars, Swage Locking.* [4)]

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

2) Published by: American Society of Mechanical Engineers (ASME), 3, Park Avenue, New York, NY 10017, USA.

3) Published by: Department of Defense (DOD), the Pentagon, Washington, DC 20301, USA.

4) Published by: Aerospace Industries Association of America, Inc. (AIA), 1250 Eye Street, NW; Suite 1100, Washington, DC 20005, USA.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1
inspection lot
shall consist of finished parts which are of the same part number, fabricated by the same process, that are treated together in one furnace lot from the same heat of material and submitted for manufacturer's inspection of the same time

3.2
crack
a clear crystalline break passing through the grain boundary without inclusion of foreign elements

3.3
seam
open surface defect

3.4
lap
surface defect caused by folding over metal fins or sharp corners and then compressing them into the surface

3.5
nick
surface defect caused by the sharp edge of a cutting element

3.6
gouge
surface defect caused by a scraft

3.7
inclusions
non-metallic particles originating from the material manufacturing process. These particles may be isolated or arranged in strings.

3.8
sampling plan
a plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision

3.9
acceptable quality level
AQL
a quality level which in a sampling plan corresponds to a specified but relatively high probability of acceptance

It is the maximum per cent defective (or the maximum number of defects per hundred units) that, for purposes of sampling inspection can be considered satisfactory as a process average.

4 Quality assurance

4.1 EN 9133

Qualification requirements shall consist of test as specified in Tables 1 and 2. Evidence shall be submitted, satisfactory to the user, that the manufacturer has produced a fastener of the same basic part number (excluding grip designation), diameter and material as those for which quotations are asked. This fastener shall meet the requirements of this specification.

4.2 Quality conformance inspection and sampling plan shall consist of tests as specified in Tables 4, 5, 6 and 7.

4.3 Quality control records pertaining to the specific work order, lot number or job number shall be available for inspection by the user for a period of three years after manufacturer's final inspection date.

5 Requirements

5.1 Requirements for lockbolts

The requirements for sheartype lockbolts, are given in Table 1. These requirements complement the requirement of all other standards or specifications referenced in the document of the lockbolt, and may be overridden only when specially instructed in the definition document.

Inspection tests, given in Table 1, are mandatory (except as noted) on each inspection lot for the fastener manufacturer. Tests which are not mandatory for the fastener manufacturer may be applied by the receiving contractor.

Table 1

Clause	Characteristic	Technical requirement	Inspection and Test method	Q/A[a]	Sample size
5.1.1	**Design and construction**	In accordance with the standard part drawings referenced within this specification	Conventional measuring methods		Table 5 of MIL-STD-1916
5.1.1.1	**Head protrusion (100° countersunk head)**		NAS 527		NAS 527
5.1.2	**Material**	Titanium alloy TI-P64001 (6Al-4V) – shear strength ≥ 675 MPa – Composition requirements apply to finished lockbolts.	As described by lockbolt manufacturer to assure production parts conform to applicable specifications		
5.1.2.1	**Lubricant**	In accordance with standard part drawings reference this specification.	See applicable specification Visual examination		Table 6
5.1.3	**Dimensions**	The dimensions and any deviations in form and position, measured at ambient temperature, shall be within the limits specified in the definition document.	Conventional measuring methods	Q	MIL-STD-1916
5.1.3.1	**General dimensions**			A	
5.1.3.2	**Surface texture**		B46.1 Visual examination		Table 4
5.1.4	**Protective treatment**	In accordance with standard part drawings reference this specification.	See applicable specification Visual examination		Table 6 qualification
5.1.4.1	**Finish**				
5.1.5	**Manufacturing**	Shall develop mechanical properties as defined herein, without adverse effect on metallurgical properties as defined herein.	Test of shear and metallurgical properties verifies heat treatment.		As applicable in accordance with test requirements
5.1.5.1	**Heat treatment**				
5.1.6	**Mechanical properties**	Table 3 values are applicable to lockbolts having nominal grip of 1,5 times nominal diameter or greater. Values shall be shown in minimum grip with collar in minimum strength condition according to collar standard.	Test No. 8 of NASM1312	Q A	Table 6
5.1.6.1	**Tensile strength**				

continued

Table 1 *(concluded)*

Clause	Characteristic	Technical requirement	Inspection and Test method	Q/A [a]	Sample size
5.1.6.2	**Shear strength**	Table 3 values are applicable to lockbolts having a grip of twice nominal diameter or greater for protruding head type and grip of 2,5 times nominal diameter or greater for flush head type. When the lockbolt is too short to shear test, a piece of wire of the same raw material lot heat treated with the fasteners shall be tested.	Test No. 8 of NASM1312	Q A	Table 6 qualification
5.1.6.3	**Preload clamping force**	Table 3 values are applicable to lockbolts having nominal diameter or greater. Values shall be shown in minimum strength condition according to collar standard.	Test No. 16 of NASM1312	Q A	Table 6 qualification
5.1.6.4	**Test collars**	Unless otherwise specified, test collars shall be as specified in Table 3.	Not applicable		
5.1.6.5	**Installation**	Head dishing of flush head lockbolts shall not exceed 0,077 mm when installed in a clearance fit hole. Lockbolt shall be "pulled" into an 0,003 inch interference fit in 2024T3 aluminium plate in maximum grip. No premature breakage of the lockbolttail shall occur. Test to be performed for qualification only.	Conventional measuring method pull in using standard installation tools		Table qualification only
5.1.7	**Metallurgical properties**	Permitted only as described in Figure 1. A crack is defined in Clause 3. See Table 8.	Discontinuities shall be evaluated by metallurgical examination of cross sections at magnification of × 50 to × 60 (see Figure 2). Inspection stamping of parts not required		
5.1.8	**Product identification**	In accordance with standard part drawings reference this specification.	B46.1 Visual examination		NAS 527
5.1.9	**Delivery**	See Clause 6.	Visual examination	A	Not applicable

[a] Q = Qualification, A = Acceptance

5.2 Requirements for collars

The requirements for sheartype collars are given in Table 2. These requirements complement the requirement of all other standards or specifications referenced in the document of the lockbolt, and may be overridden only when specially instructed in the definition document.

Inspection tests, given in Table 2, are mandatory (except as noted) on each inspection lot for the fastener manufacturer. Tests which are not mandatory for the fastener manufacturer may be applied by the receiving contractor.

Table 2

Clause	Characteristic	Technical requirement	Inspection and Test method	Q/A[a]	Sample size
5.2.1	**Design and construction**	In accordance with the standard part drawings referenced within this specification TI-P99002 titanium alloy or 2024 aluminium alloy (T3510 or T4 condition). See Figure 3 and Table 9 for acceptable collar surface discontinuities.	Conventional measuring methods		Table 5
5.2.2	**Material**		As described by collar manufacturer to assure production parts conform to applicable specifications		
5.2.2.1	**Lubricant**		See applicable specification Visual examination		Table 6
5.2.3	**Dimensions**		Conventional measuring methods		Table 5
5.2.3.1	**General dimensions**				
5.2.3.2	**Surface texture**		B46.1 Visual examination		Table 5
5.2.4	**Protective treatment**	In accordance with standard part drawings reference	See applicable specification		Table 6 qualification
5.2.4.1	**Finish**		Visual examination		
5.2.5	**Mechanical properties**	The ultimate tensile strength of the installed collar shall be equal to or greater than that shown in Table 3 in minimum and maximum grip.	Test No. 8 of NASM1312 for tensile test		Table 6
5.2.5.1	**Ultimate tensile strength** [b]				
5.2.5.2	**Preload clamping force**	The clamp force of the installed collar shall be equal to or greater than that shown in Table 3 in minimum and maximum grip.	Test No. 16 of NASM1312		Table 6 qualification
5.2.5.3	**Test lockbolts**	Unless otherwise specified, test shall be specified in Table 3.	Not applicable		Not applicable

continued