



**SLOVENSKI STANDARD**  
**SIST EN 6052:2022**

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**Aeronavtika - Sistem zakovic, aluminijeva zlitina, strižni tip, palčne mere -  
Tehnična specifikacija**

Aerospace series - Rivet-collar-system, aluminium alloy, shear type, inch series -  
Technical Specification

Luft- und Raumfahrt - Passniet-Schließring-System aus Aluminiumlegierung für  
Scherbeanspruchung, Zöllige Reihe - Technische Lieferbedingungen

Série aérospatiale - Système rivet-collier, alliage d'aluminium, type cisaillement, série en  
inches - Spécification technique

**Ta slovenski standard je istoveten z: EN 6052:2022**

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## Aerospace series - Rivet-collar-system, aluminium alloy, shear type, inch series - Technical Specification

Série aérospatiale - Système rivet-collier, alliage  
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Aluminiumlegierung für Scherbeanspruchung, Zöllige  
Reihe - Technische Lieferbedingungen

This European Standard was approved by CEN on 6 October 2022.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (EN 6052:2022) 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 document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, 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of an identical text or by endorsement, at the latest by April 2023, and conflicting national standards shall be withdrawn at the latest by April 2023.

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**EN 6052:2022 (E)****1 Scope**

This document defines the requirements for qualification, acceptance, delivery and inspection of 100° countersunk head, 100° countersunk reduced head and protruding head close tolerance pins, shear type in aluminium alloy 7050-T73 and collars of aluminium alloy 3003 and of aluminium alloy 6061-T7 for use as permanent fasteners in aerospace applications.

**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 3115, *Aerospace series — Aluminium alloy 7050-T73 — Wire for solid rivets —  $D \leq 10$  mm*

ANSI/ASQ Z 1.4, *Sampling Procedures and Tables for Inspection by Attributes*<sup>1</sup>

ANSI/ASME B 46.1, *Surface Texture, Surface Roughness, Waviness and Lay*<sup>1</sup>

ASTM-B193, *Standard Test Method for Resistivity of Electrical Conductor Materials*<sup>2</sup>

ASTM E 1417/E 1417M, *Standard Practice for Liquid Penetrant Testing*<sup>2</sup>

ASTM E 8/E 8Ma, *Standard Test Methods for Tension Testing of Metallic Materials*<sup>2</sup>

ASTM-E92, *Standard Test Methods for Vickers Hardness and Knoop Hardness of Metallic Materials*<sup>2</sup>

ASTM-G-110, *Standard Practice for Evaluating Intergranular Corrosion Resistance of Heat Treatable Aluminum Alloys by Immersion in Sodium Chloride + Hydrogen Peroxide Solution*<sup>2</sup>

NASM1312, *Fastener Test Methods*<sup>3</sup>

FED-SPEC QQ-A-430, *Aluminium Alloy Rod and Wire, for Rivets and Cold Heading*<sup>4</sup>

SAE AMS2644, *Inspection Material, Penetrant*<sup>5</sup>

**3 Terms and definitions**

No terms and definitions are listed in this document.

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/>
- IEC Electropedia: available at <https://www.electropedia.org/>

1 Published by: Department of Defense (DoD), the Pentagon, Washington, D.C., 20307, USA.

2 Published by: American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, P.A., 19428, USA.

3 Published by: Aerospace Industries Association of America Inc. (AIA), 1250 Eye Street, N.W., Washington, D.C., 20005-3924, USA.

4 Published by: Superintendent of documents, US Government Printing House, Washington, D.C., 20402, USA.

5 Published by: Engineering Society for Advancing Mobility Land, Sea, Air and Space International (SAE), 400 Commonwealth Drive, Warrendale, P.A., 15096-0001, USA.

## 4 General requirements

The close tolerance pins and collars covered by this specification shall be of the types, sizes, configurations and materials designated by the part numbers specified on the applicable standards which refer to this specification.

## 5 Requirements for pins in aluminium alloy 7050-T73

The requirements for 7050-T73 aluminium alloy pins, shear type are given in Table 1. These requirements complement the requirements of all other standards or specifications referenced in the document of the pins and may be overridden only when specially instructed in the definition document.

Inspection tests given in Table 1 and Table 2 are mandatory (except as noted) on each lot as defined in 7.2 for the fastener manufacturer. Tests which are not mandatory for the fastener manufacturer may be applied by the receiving contractor.

**Table 1 — Requirements for pins in aluminium alloy 7050-T73**

Clause	Characteristic	Technical requirement	Inspection and test method	Qualification Sampling	Acceptance Sampling
5.1	General dimensions	The dimensions and any deviations in form and position, measured at ambient temperature, shall be within the limits specified in the standard part drawings and this procurement specification	Conventional measuring methods	According to Table 3	According to Table 5
5.2	Shank diameter	Underfill permissible, shall be within the specified shank diameter range	Standard micrometer 6,35 mm (1/4") diameter		
5.3	Shank straightness	Refer to Table 8	Conventional measuring methods		
5.4	Sealant escape groove	Refer to Figure 3 and Table 10			
5.5	Head protrusion (100° heads)	According to standard part drawings	In accordance with EN pin standards		
5.6	Surface texture		Visual examination according to ANSI/ASME B 46.1		
5.7	Lubricants		According to applicable specification and visual examination		
5.8	Finish				
5.9	Product identification		Visual examination		
5.10	Delivery	Refer to Clause 8			
5.11	Shear strength	Table 7 double shear values are applicable for pins having a grip of 2 × nominal diameter or greater for protruding head type and grip of 2,5 × nominal diameter or greater for flush head type. If the pin is too short to perform the shear test, a piece of wire of the same raw material lot heat treated with the fasteners shall be tested. The test wire shall have the	Test no 13 of NASM1312	According to Table 3	According to Table 6

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Clause	Characteristic	Technical requirement	Inspection and test method	Qualification Sampling	Acceptance Sampling
		<p>same coating as for pins.</p> <p>Minimum shear strength test of fasteners is to be performed on pins or wire without cetyl alcohol lubrication applied.</p>			
5.12	Tensile strength	<p>Table 7 values are applicable for pins having a grip of <math>1,5 \times</math> nominal diameter or greater.</p> <p>Qualification and acceptance testing shall be performed with a <math>7^\circ</math> sloped surface (collar side) in minimum and maximum grip with collar according to collar standard.</p>	Test no 8 of NASM1312		
5.13	Head dishing	<p>After installation in a clearance fit of 0,025 mm, head dishing of flush head pins shall not exceed 0,076 mm (see Figure 6).</p> <p>Testing shall be performed with a <math>7^\circ</math> sloped surface (collar side) in minimum and maximum grip.</p>	Test no. 8 of NASM1312		
5.14	Pin break load	<p>Table 7 values are applicable.</p> <p>Tensile load shall be applied axially at a rate, which breaks the pin at a minimum of 4 s of load application.</p> <p>Test plate countersink for countersunk pins shall have <math>2^\circ</math> angular misalignment from the hole centerline.</p> <p>Test plate for protruding head pins shall have a <math>2^\circ</math> slope under the pin head.</p> <p>After evaluation of the pin break loads, head dishing of flush head pins shall not exceed 0,076 mm (see Figure 6).</p> <p>Cracks shall not be allowed in any location of the pin. The presence of cracks shall be determined by fluorescent penetrant inspection according to ASTM E 1417/E 1417M, method B or D, sensitivity level 2 or higher.</p> <p>The penetrant materials used shall be according to SAE AMS2644. Examine all surfaces at <math>10 \times</math> to <math>30 \times</math> magnification.</p>	<p>Test no. 8 of NASM1312</p> <p>ASTM E 1417/E 1417M</p>		



Clause	Characteristic	Technical requirement	Inspection and test method	Qualification Sampling	Acceptance Sampling
		Penetrant inspection shall be performed prior to all surface coating and lubricating.			
5.15	Preload	Table 7 values are applicable to pins having a nominal grip of $1,5 \times$ nominal diameter or greater.  Qualification testing shall be performed with a $7^\circ$ sloped surface (collar side) in minimum and maximum grip with a collar having low strength according to collar standard.  Acceptance testing shall be performed with a $7^\circ$ sloped surface (collar side) in minimum and maximum grip.	Test no. 16 of NASM1312	According to Table 3	According to Table 6
5.16	Fatigue life	Average life 65 000 cycles, minimum life 45 000 cycles, loads according to Table 7.  Tests shall be performed on pins having a grip of $3 \times$ nominal diameter.  Tests shall be performed in maximum grip condition.	Test no. 11 of NASM1312		N/A
5.17	Installation	Pins shall be pulled into $0,076 \text{ mm} \pm 0,005 \text{ mm}$ interference fit in 2024T3 aluminium plate in maximum grip.  No premature breakage of the standard installation pintail shall occur. Installation load shall not exceed 90 % of minimum pin break load. Test to be performed using pins with longest grip length.	Use standard pneumatic installation tools and conventional measuring methods.  For all installation tests there shall be a transition radius of 0,5 mm to 0,7 mm on edge of fastener hole (head side).  Tests shall be performed in maximum grip conditions with a $3^\circ$ sloped surface (collar side).		N/A
5.18	Test collars	Test collars are specified in Table 7 unless stated otherwise	Refer to Table 7		
5.19	Material	7050-T73 aluminium alloy according to FED-SPEC QQ-A-430 and EN 3115, shear strength 283 MPa to 324 MPa.	Verify composition	Each tenth lot from each mill	
			Verify mechanical properties	Each lot	
5.20	Discontinuities	Discontinuities shall be permitted only as outlined in Figure 1 and Table 9.  Specimens shall be prepared as shown in Figure 2. All surfaces shall be examined at $10 \times$ to $30 \times$ magnification. Indications shall be evaluated by metallurgical examination of cross sections at $50 \times$ to $60 \times$ magnification.	The presence of cracks shall be determined by fluorescent penetrant inspection according to ASTM E 1417/E 1417M, method B or D, sensitivity level 2 or	According to Table 3	According to Table 6

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Clause	Characteristic	Technical requirement	Inspection and test method	Qualification Sampling	Acceptance Sampling
		Cracks shall not be allowed in any location of the pin.  Penetrant inspection shall be performed prior to all surface coating and lubricating or with all coatings removed.	higher.  Penetrant materials used according to SAE AMS2644.		
5.21	Electrical conductivity (EC)	Requirements for EC [% IACS] shall be as follows:  EC $\geq$ 40 %: Lot is acceptable EC $\geq$ 38 % and < 40 %: SCF test required EC < 38 %: Lot is rejectable	ASTM-B193  Test shall be performed on a wire from the same wire lot and heat treatment as the pin or on top of the pin head after smooth and flat machining ( $R_A = 32\mu\text{m}$ ).		
5.22	Stress corrosion factor (SCF)	Test shall be required if EC $\geq$ 38 % and < 40% (see 5.21)  SCF shall be < 32 % and shall be calculated as follows:  SCF = $y_s$ [Pa] - EC [% IACS]  Tensile yield strength shall be measured on a wire from the same wire lot and heat treatment as the pin.	ASTM E 8/E 8Ma (0,2 % offset method)		
5.23	Intergranular corrosion	Intergranular corrosion according to ASTM-G-110  Localised intergranular corrosion shall not exceed 0,3 mm in depth. Average depth shall not exceed 0,2 mm.	ASTM-G-110		
5.24	Microstructure	Microstructure shall be free from bursts, voids and overheating			

## 6 Requirements for collars in aluminium alloy 3003 and 6061

The requirements for collars in 3003 and 6061 aluminium alloy, shear type are given in Table 2. These requirements complement the requirements of all other standards or specifications referenced in the documents of the collars, and may be overridden only when specially instructed in the definition document.

Inspection tests given in Table 1 and Table 2 shall be mandatory (except as noted) on each lot as defined in 7.2 for the fastener manufacturer.

Table 2 — Requirements for collars in aluminium alloy 3003 and 6061

Clause	Characteristic	Technical requirement	Inspection and test method	Qualification Sampling	Acceptance Sampling
6.1	General dimensions	The dimensions and any deviations in form and position, measured at ambient temperature, shall be within the limits specified in the standard part drawings and this procurement specification	Conventional measuring methods	According to Table 4	According to Table 5
6.2	Surface texture	According to standard part drawings	Visual examination according to ANSI/ASME B 46.1		
6.3	Lubricants		According to applicable specification and visual examination		
6.4	Finish		Visual examination		
6.5	Product identification				
6.6	Delivery	Refer to Clause 8	N/A		
6.7	Tensile strength	The ultimate tensile strength of the installed collar shall be equal to or greater than the values shown in Table 7. Qualification and acceptance testing shall be performed with a 7° sloped surface (collar side) in minimum and maximum grip with collar according to collar standard.	Test no. 8 of NASM1312	According to Table 4	According to Table 6
6.8	Preload	The preload of the installed collar shall be equal to or greater than the values shown in Table 7. Qualification and acceptance testing shall be performed with a 7° sloped surface (collar side) in minimum and maximum grip with collar according to collar standard.	Test no. 16 of NASM1312		
6.9	Fatigue life	Average life 65 000 cycles, minimum life 45 000 cycles, loads according to Table 7. Tests shall be performed on pins having a grip of 3 × nominal diameter. Tests shall be performed in maximum grip condition.	Test no. 11 of NASM1312	According to Table 4	N/A
6.10	Test pins	Test pins are specified in Table 7 unless stated otherwise	Refer to Table 7		
6.11	Material	3003 aluminium alloy (H12 to H17 temper for raw material) or 6061 aluminium alloy (T7 condition) according to FED-SPEC QQ-A-430	Verify composition	Each tenth lot from each mill	
			Verify mechanical properties	Each lot	
6.12	Discontinuities	Discontinuities shall be permitted only as outlined in Figure 5.	Fluorescent penetrant inspection	According to Table 4	According to Table 6