DRAFT INTERNATIONAL STANDARD

ISO/DIS 9418

ISO/TC **20**/SC **4**

Secretariat: **DIN**

Voting begins on:
2021-01-08

Voting terminates on:
2021-04-02

Aerospace series — Rivets, solid, in aluminium or aluminium alloys — Procurement specification

ICS: 49.030.60

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 9418:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 4, *Aerospace fastener systems*.

This second edition cancels and replaces the first edition (ISO 9418:1998), which has been technically revised.

The main changes compared to the previous edition are as follows:

—

— ISO7966 superseded by ISO7870-3

— ISO8258 superseded by ISO7870-2

— ISO9002 superseded by EN9100

— ISO/TR 13425 canceled

— Subclause 5.2: optical devices introduced

— Subclause 5.4.1: ASTM B565 added

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Aerospace series — Rivets, solid, in aluminium or aluminium alloys — Procurement specification

1 Scope

This International Standard specifies the characteristics and quality assurance requirements for solid rivets made in aluminium or aluminium alloy for aerospace construction.

It is applicable whenever it is referenced in a definition document.

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. The latest edition of the referenced document (including any amendments) applies.

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 7870-1, *Control charts — Part 1: General guidelines*

ISO 7870-2, *Control charts — Part 2: Shewhart control charts*

ISO 7870-3, *Control charts — Part 3: Acceptance control charts*

EN 9100, *Quality management systems – Requirements for Aviation, Space and Defence Organizations*

ASTM E112: *Standard Test Methods for Determining Average Grain Size*

ASTM B565: *Standard test method for shear testing of aluminum and aluminum-alloy rivets and cold-heading wire and rods*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

— IEC Electropedia: available at http://www.electropedia.org/

3.1
batch
quantity of finished rivets, manufactured using the same process, from a single material cast (single heat of alloy), having the same definition document number, diameter and length code, heat treated together to the same specified condition and produced as one continuous run

3.2
rivet wire sample
length of wire, sampled at one end of the coil used for the manufacture of rivets of the batch

Note 1 to entry: The rivet wire samples must undergo the same heat treatments as the rivets of the batch, at the same time.

3.3
rivet sample
rivet sampled at random from the batch

3.4
definition document
document specifying directly or indirectly all the requirements for rivets

Note 1 to entry: The definition document may be an International Standard, an in-house standard or a drawing.

3.5
crack
rupture in the material which may extend in any direction and which may be intercrystalline or transcrystalline in character

3.6
seam
longitudinal open surface defect

3.7
lap
surface defect caused by folding over metal fins or sharp corners and then forming them into the surface

3.8
cold shut
doubling over of metal which may occur during the cold heading operation

3.9
blistering
defect in the metal on or near the surface, resulting from expansion of gas in a sub-surface zone

3.10
pit
small cavity in a metal surface caused by non-uniform electrodeposition or by corrosion

4 Quality assurance

4.1 General

4.1.1 Approval of manufacturers

The manufacturer's operations shall be an approved production organization for aerospace products and shall demonstrate that is has implemented and is able to maintain a quality management system (e.g. according to EN 9100 or another in aerospace accepted and established quality management system).

4.1.2 Acceptance of solid rivets

The purpose of acceptance inspection and tests of a solid rivet is to check, as simply as possible, using a method which is inexpensive but the most representative of the actual conditions of use, with the uncertainty inherent in statistical sampling, that the solid rivets satisfy the requirements of this International Standard.

Acceptance inspections and tests shall be carried out by the manufacturer, or under his responsibility.

The manufacturer is responsible for the quality of the solid rivets manufactured.

4.2 Acceptance inspection and test conditions

Acceptance inspections and tests (requirements, methods, numbers of solid rivets) are specified in Table 1. They shall be carried out on each batch. Solid rivets shall be selected from the batch to be tested by simple random sampling.

Each solid rivet may be submitted to several inspections or tests, provided that none of its characteristics has been altered during any of these inspections or tests.

The solid rivets to be subjected to destructive inspections or tests may be those on which non-destructive inspections or tests have been carried out.

Batches declared unacceptable after the acceptance inspection shall be resubmitted for acceptance only after all the defective units have been removed and/or defects have been corrected.

In this case, the attribute(s) which caused the rejection shall be verified using a sample of twice the normal size with the same acceptable level.

If the reason for rejection results from the operating method, the test apparatus or from faulty heat treatment which can be rectified in a satisfactory manner, the tests may be repeated after elimination of the cause, provided that any surface treatment be removed prior to heat treatment, without being detrimental to rivet final use. A note to this effect shall be added to the corresponding inspection documents.

Unless otherwise specified, the test temperature shall be the ambient temperature.

4.3 Use of "Statistical process control (SPC)"

When a characteristic is obtained by a controlled statistical process, the manufacturer has the possibility, in order to declare conformity of the characteristic, of refraining from the final systematic sampling provided for in this International Standard, if he is capable of **formally justifying** this choice by using ISO/TR 13425 and the standards quoted in it as a basis.

This justification will include the following phases:

— analysis of the product's key characteristics;

— analysis of the risks for each implemented process;

— determination of the parameters and/or characteristics to be respected under SPC;

— determination of the capabilities of each process;

— drawing up an inspection plan and integration in the manufacturing process;

— drawing up of routes and control charts (ISO 7966, ISO 7870, ISO 8258);

— use of control charts for data consolidation;

— determination of the audits to be run and the control to be carried out to ensure reliability of the device.

To be usable in production, this process should have been validated beforehand by the qualifying body, either during the qualification phase, or a posteriori according to the case, by analyzing the justificatory file and the results of the qualification inspections such as provided for in clause 5.

5 Requirements and test methods

See Table 1.

Table 1 — Technical requirements and test methods

Subclause	Characteristic	Requirement	Inspection and test method	Classification of defects and sampling
5.1	**Material**	In accordance with the product standard or definition document	See material standard.	
5.2	**Dimensions**	In accordance with the product standard or definition document	Conventional measurement instruments. All dimensional features may be inspected with digital optical measuring instruments, having a precision level equal or better than conventional measurement tools. In case of dispute, the projection method at a magnification of 25 times for diameters ≤ 6 mm and 10 times for diameters > 6 mm, shall be used as the reference method. Checks shall be made at three equidistant points around the rivet.	Table 2
5.3	**Manufacturing**			
5.3.1	**Heat treatment**	As specified in the material standard		
5.3.2	**Workmanship**	No cracks or blistering Localized, non-continuous seams, laps, cold shuts, tool marks and pits having a maximum depth of 0,07 mm are permissible.	Visual examination with or without magnification. The magnification shall be limited to six times. Defect depth shall be measured perpendicular to a line tangent with the surface. In the event of any doubt, the test specified in 5.4.2 shall be used as the reference method.	Table 2
5.3.3	**Surface treatment**	Treatment: — in accordance with the product standard or definition document; — anodizing thickness is not mandatory.	See applicable surface treatment standard.	Table 2
5.4	**Mechanical properties**			
5.4.1	**Double shear strength**	See Table 3.	According to ASTM B565	Table 4

[a] Aluminium alloy designations are in accordance with those defined by "The Aluminum Association, Inc.", 900 19th Street N.W., Washington, D.C. 20006, USA.

Table 1 *(continued)*

Subclause	Characteristic	Requirement	Inspection and test method	Classification of defects and sampling
5.4.2	**Drivability**		Test device: see Figure 1. Test method: a) progressively upset the protruding end, until the values specified in Figure 2 are obtained; b) examine visually without magnification. Sample definition: see Figure 3.	Table 2
5.4.2.1	**Rivets in aluminium alloys 1050A, 2017A, 2117, 2119, 5056A, 7050, V 65** [a]	Absence of cracks	Test carried out at delivery condition	
5.4.2.2	**Rivets in aluminium alloy 2024** [a]	Absence of cracks	Test carried out within a maximum interval of 1 h after solution treatment	
5.5	**Metallurgical properties**			
5.5.1	**Grain size**	Grain size shall be finer than 3.5 in accordance with ASTM E 112.	Longitudinal cutting through the shank, polishing and etching using the appropriate reagents and then macroscopic examination	One test per batch
5.6	**Product identification marking**	In accordance with the product standard or definition document	Visual examination	Table 2
5.7	**Delivery**			
5.7.1	**Packaging**	The packaging shall: — prevent any damage or corrosion from occurring during handling, transport and storage; — only contain rivets from the same batch, the number of which is left to the manufacturer's discretion; however, the maximum mass is 25 kg; — contain a copy of the manufacturer's delivery note relating to the batch. Furthermore, this note may be sent separately upon request. Any particular or additional packaging requirements shall be specified with the order.	Visual examination	

[a] Aluminium alloy designations are in accordance with those defined by "The Aluminum Association, Inc.", 900 19th Street N.W., Washington, D.C. 20006, USA.