
Aeronavtika - Vgrajene oznake - Možnost izbire pritrditve za namestitev, odstranitev in zamenjavo vgrajenih oznak

Aerospace series - Embedded tags - Choice of fixation for installation, removal and replacement of embedded tags

Luft- und Raumfahrt - On-Board-Etiketten - Auswahl der Befestigung zum Anbringen, Entfernen und Ersetzen von On-Board-Etiketten

Série aérospatiale - Étiquettes embarquées - Choix de fixation pour pose, dépose et remplacement d'étiquettes embarquées

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Aerospace series - Embedded tags - Choice of fixation for installation, removal and replacement of embedded tags

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ASD-STAN.

If this draft becomes a European Standard, 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.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 4906:2022) 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 document is currently submitted to the CEN Enquiry.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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1 Scope

This document is applicable in the aeronautical domain to on-board parts and to equipment intended to be embedded or positioned on any civil or military airborne vehicle with a type certificate.

The purpose of this document is to guide design, manufacturing, maintenance and operations organizations in the installation, removal and replacement of RFID tags (UHF and HF) and Contact Memory Buttons (CMB), according to the environments defined in RTCA DO-160/EUROCAE ED-14 and according to the type of support and the expected fixation performances. This guide will provide help in the specification of the tag installation/removal functions and/or will enable the solutions on offer from tag suppliers to be enhanced.

The term “tag” used in this document covers all the tags used to store electronic data, including RFID tags and CMB tags. As a reminder, the tags can also contain information that can be read by devices other than RFID or CMB readers (e.g. bar codes - Data Matrix, QR codes, etc., and/or alphanumerical characters) and information that can be read by the naked eye without any tools (human-readable).

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 1464, *Adhesives — Determination of peel resistance of adhesive bonds — Floating roller method*

EN 1465, *Adhesives — Determination of tensile lap-shear strength of bonded assemblies*

EN 4817, *Aerospace series — Passive UHF RFID tags intended for aircraft use*

EN 4818, *Aerospace series — Passive HF RFID tags intended for aircraft use*

EN 4819, *Aerospace series — Contact Memory Button (CMB) tags intended for aircraft use*

EN ISO 11343, *Adhesives — Determination of dynamic resistance to cleavage of high-strength adhesive bonds under impact wedge conditions — Wedge impact method (ISO 11343)*

ISO 4578,¹ *Adhesives — Determination of peel resistance of high-strength adhesive bonds — Floating-roller method*

RTCA DO-160G/EUROCAE ED-14G, *Environmental Conditions and Test Procedures for Airborne Equipment*

SAE AS 5678B,² *Passive RFID Tags Intended for Airborne Equipment Use*

SAE AS 6023,² *Active and Battery Assisted Passive Tags Intended for Aircraft Use*

¹ Published by: the International Organization for Standardization (ISO), <https://www.iso.org/>.

² Published by: SAE International (US) Society of Automotive Engineers, <https://www.sae.org/>.

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

3.1

airborne vehicle

any machine capable of taking off and flying in the air

3.2

surface tension

physical-chemical phenomenon related to the molecular interactions of a fluid

Note 1 to entry: It results from the increase in the energy at the interface between two fluids. The system tends towards an equilibrium corresponding to the lowest-energy configuration and therefore modifies its geometry to reduce the surface area of this interface. The force that maintains the system in this configuration is the surface tension.

3.3

primer

material added to make smooth coatings more adhesive to facilitate the application of the second coat (glue, paint, etc.)

3.4

orientation

relative position of an item of equipment

EXAMPLE upright, on its side, upside down

Note 1 to entry: The orientation can affect the reading of tags.

3.5

certification

any form of recognition in accordance with a regulation or a standard based on an appropriate assessment, certifying that a person or organization, a product, a part, or non-fixed equipment meets the applicable requirements of this regulation or this document, as well as the delegated acts and the implementing acts adopted on the basis thereof, through the issue of a certificate testifying this conformity

3.6

declaration

any written declaration made under the sole responsibility of a person or an organization confirming that the applicable requirements of a regulation or a standard, as well as the delegated acts and the implementing acts adopted on the basis thereof and pertaining to a person or an organization, a product, a part, or non-fixed equipment, are met

3.7

equipment

any instrument, mechanism, machine, auxiliary device, software or accessory transported onboard an airborne vehicle by the airborne vehicle operator, which is not a part and which is used, or intended to

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be used, to operate or control the airborne vehicle, that contributes to the survivability of the persons onboard or that has an influence on the operation of the airborne vehicle in complete safety

3.8**counterboring**

machining operation consisting of counterboring a part, in particular to produce the bearing surface of a nut, washer, etc

3.9**peeling**

action consisting of detaching a coating from its support

3.10**part**

any element of an item of equipment, as defined by the type design of the product

3.11**product**

airborne vehicle, engine, propeller; or one of these components

3.12**support**

physical part of an item of equipment or a part on which the tag is positioned

3.13**environmental protection**

measures guaranteeing that the property, persons and organizations taking part in civil aviation activities in the Union obey the applicable law of the Union, meet the international standards and adopt the recommended practices

4 List of acronyms

For the purposes of this document, the following acronyms apply.

APU	Auxiliary Power UNIT
CMB	Contact Memory Button
HF	High Frequency
RFID	Radio Frequency IDentification
RCTA	Radio Technical Commission for Aeronautics
UHF	Ultra-High Frequency
UV	UltraViolet

5 General remarks**5.1 General**

The fixation of the tag to a product, item of equipment or part shall ensure that the tag remains affixed to the product, item of equipment or part for a given duration that is consistent with the lifespan of the product, item of equipment or part, while the tag remains operational (i.e. the tag remains readable/re-writeable) or up to its replacement if failed.

The methods used to install tags vary according to the shape, size, type of material and texture of the equipment, and to the environmental conditions under which the equipment will be monitored.

The tags shall be compatible with the intended type of fixation. The technical documentation provided by the manufacturer usually contains this type of information.

The main criteria to be taken into consideration are as follows:

- the shape of the surface to which the tag will be affixed (flat, cylindrical, etc.), which shall meet the manufacturer's recommendations in terms of the flatness or the curvature of the surface;
- the size of the equipment to be identified and the area available to install the tag;
- the material of the surface of the equipment to be tagged, such as metal, plastic or textile fabric, etc.;
- the length of time for which the equipment shall be tagged (short or long term, permanent or temporary);
- the length of time for which the equipment will be exposed to environmental conditions such as extreme temperatures, humidity, chemicals, abrasion, dust, human contact, pressure, salt water, outdoor exposure to ultraviolet rays and weather conditions, industrial treatments, thermal shocks (from hot to cold and vice versa), instantaneous freezing (dry ice) and laboratory tests;
- the temperature of the equipment when the tag is installed, for example hot injection-moulded products or parts that have just been removed from the mould, or frozen products or parts;
- the position of the tag on the equipment, product or part;
- the lifespan of the tag;
- the reading distance, the orientation of the tag relative to the reader, the type of reader used to collect the data, the time required to read or write on the tag, the number of tags to be read simultaneously, the reading speed;
- the time required to install the tag on the equipment, product or part;
- the human and technical resources required to install the tag (welding machines, surface preparation, etc.).

The fixation of the tags to new equipment, products or parts is qualified at the same time as the equipment, product or part in the different environments using the standard RTCA DO-160.

When tags are affixed to equipment already in use, the fixation is validated as per the standard RTCA DO-160 in an environment that is representative of the equipment in question.

As a general rule:

- sensitive fixation processes shall be qualified;
- the fixation process shall be suited to the lifespan of the equipment and of the tag;
- the fixation process shall be compatible with the environmental conditions that the tag can withstand.

After choosing the fixation process, it is necessary to proceed with performance tests of the tag (reading, writing).

5.2 Choosing the tag

It is necessary to make sure that the type of tag selected is appropriate for the application in question by considering its environmental limits and performing tests on the affixed tags to make sure that the read/write performances meet the expectations with regard to the materials involved.

The tag manufacturer's information on accelerated life cycle tests and the limits of the tag's ease of maintenance shall be taken into consideration when choosing the tags for each application.

Operators shall take account of the life cycle of the equipment on which the tags will be affixed when choosing the tags. If any condition, such as the maintenance, servicing or repair of the equipment, could destroy or damage the tag or its fixation, the operators should take appropriate preventive measures to keep the tag intact. These actions could include a mechanical system to remove the tag, or the use of protective materials to protect the tag, etc. Embedded tags shall be qualified in advance according to the standards SAE AS 5678B, SAE AS 6023, EN 4817, EN 4818 or EN 4819. Additional requirements may apply, depending on the certification specifications (CS-25, CS-E, etc.).

Operators shall consider the implications of the location, position and installation method of the tags. The tag shall be installed so that it does not interfere with the adaptation, the shape or the operation in complete safety or the assembly of the airborne vehicle equipment.

The airborne vehicle operator shall draw up instructions for the installation and replacement of the tags using materials, finishes and surface shapes that are acceptable for the equipment to which the tag is affixed.

5.3 Shape of the support

The shape of the support impacts the mode of fixation and the behaviour of the tag.

5.4 Size of the support

The area where the tag is to be affixed shall be at least as large as the size of the tag. The tag shall not extend beyond the edges of the support to minimize the risks of tearing-off.

5.5 Orientation

To produce the ideal conditions for reading, most RFID tags are oriented in a specific direction relative to the antenna of the reader. If the RFID tag is poorly oriented, its reading range can be reduced radically, or the tag cannot be read at all.

The tag manufacturer's technical documentation can contain information on the recommended orientation.

Tests should also be performed to find the best orientation for a specific tag/reader combination in the real-life environment, and to make sure that the tag can be read, once affixed, without having to remove any nearby equipment.

In the case of a tag located in an air flow, it is recommended to orient the tag in such a way as to minimize the wind resistance to avoid the risk of tearing-off. The position of the tag takes the different use cases of the tagged equipment into consideration. Some compromises can be necessary.

NOTE This subclause is not applicable to CMB tags, which are not sensitive to the orientation of the reader.

5.6 Temperature

The temperature of the fixation process shall be lower than the maximum temperature that the tag can withstand.

If the fixation process involves high temperatures, functional tests shall be carried out to confirm the integrity of the tag.