BS EN 4906:2023

BSI Standards Publication

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

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee ACE/1, International and European Aerospace Policy and Processes.

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

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

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

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European foreword

This document (EN 4906:2023) 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 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.

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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 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 4905, *Aerospace series — Passive UHF RFID for airborne 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-160/EUROCAE ED-14, *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: ISO International Organization for Standardization http://www.iso.ch/.

[2] Published by: SAE International (US), https://www.sae.org/.

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3 Terms and definitions

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

ISO and IEC maintain terminology 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/

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.

Note 2 to entry: 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.

Note 3 to entry: 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
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 be used, to operate or control the airborne vehicle, that contributes to the survivability of the persons onboard or that has on influence on the operation of the airborne vehicle in complete safety

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3.7
counterboring
machining operation consisting of counterboring a part, in particular to produce the bearing surface of a nut, washer, etc

3.8
peeling
action consisting of detaching a coating from its support

3.9
part
any element of an item of equipment, as defined by the type design of the product

3.10
product
airborne vehicle, engine, propeller; or one of these components

3.11
support
physical part of an item of equipment or a part on which the tag is positioned

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

RTCA 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.

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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).

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