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Aerospace series - Unmanned Aircraft Systems - Part 001: Product requirements and verification

Luft- und Raumfahrt - Unbemannte Luftfahrzeugsysteme - Teil 001: Anforderungen und Prüfverfahren

Série aérospatiale - Aéronefs télépilotés - Partie 001 : Exigences produit et méthodes de vérification

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European foreword

This document (EN 4709-001:2026) has been prepared by Technical Committee CEN/TC 471 “Unmanned Aircraft Systems”, the secretariat of which is held by BNAE.

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of an identical text or by endorsement, at the latest by September 2026, and conflicting national standards shall be withdrawn at the latest by September 2026.

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

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For relationship with EU Directive(s)/Regulation(s), see informative Annex ZA, which is an integral part of this document.

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1 Scope

This document provides technical specification and verification method to support compliance with the requirements defined by the product harmonisation legislation set by Chapter II of Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems.

This document does not cover UAS lighter than air (e.g. airships and balloons).

This document is only applicable for UA with energy sources based on electro-chemical technologies.

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 71-1:2014+A1:2018, *Safety of toys - Part 1: Mechanical and physical properties*

EN 4709-003:2026, *Aerospace series — Unmanned Aircraft Systems — Part 003: Geo-awareness requirements*

EN IEC 62368-1:2024,[1] *Audio/video, information and communication technology equipment — Part 1: Safety requirements*

EN ISO 2307:2019, *Fibre ropes — Determination of certain physical and mechanical properties* (ISO 2307:2019)

[1] Document impacted by EN IEC 62368-1:2024/A11:2024.

3 Terms, definitions and acronyms

3.1 Terms and definitions

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

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/

3.1.1
automatic flight
flight following pre-programmed instructions, loaded in the unmanned aircraft (UA) flight control system that the UA executes

3.1.2
open category
category of UAS operation that, considering the risks involved, does not require a prior authorization by the competent authority nor a declaration by the UAS operator before the operation takes place

3.1.3
specific category
category of UAS operation that, considering the risks involved, requires an authorization by the competent authority before the operation takes place and takes into account the mitigation measures identified in an operational risk assessment, except for certain standard scenarios where a declaration by the operator is sufficient

3.1.4
certified category
category of UAS operation that, considering the risks involved, requires the certification of the UA, an operator approved by the competent authority, and where applicable, a licensed remote pilot in order to ensure an appropriate level of safety

3.1.5
competent authority
one or more entities designated by a Member State and having the necessary powers and allocated responsibilities for performing the tasks related to certification, oversight and enforcement in accordance with this Regulation and with the delegated and implementing acts adopted on the basis thereof, and with Regulation (EC) No 549/2004

3.1.6
direct remote identification
system that ensures the local broadcast of information about a unmanned aircraft in operation, including the marking of the unmanned aircraft, so that this information can be obtained without physical access to the unmanned aircraft

3.1.7
follow-me mode
mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius

3.1.8
geo-awareness
function that, based on the data provided by Member States, detects a potential breach of airspace limitations and alerts the remote pilots so that they can take immediate and effective action to prevent that breach

3.1.9
hazard
condition or object with the potential to cause injuries, damage, loss of material or a reduction of the ability to perform a prescribed function

3.1.10
maximum take-off mass
MTOM
maximum unmanned aircraft mass, including payload and fuel, as defined by the manufacturer or the builder, at which the unmanned aircraft can be operated

Note 1 to entry: Fuel has to be considered as batteries for this document.

3.1.11
unmanned aircraft system operator
legal or natural person who operates or intends to operate one or more UAS

3.1.12
remote pilot
natural person responsible for safely conducting the flight of a UA by operating its flight controls, either manually or, when the UA flies automatically, by monitoring its course and remaining able to intervene and change its course at any time

3.1.13
standard scenario
type of UAS operation in the ‘specific’ category, as defined in Appendix 1 of the Annex to Regulation (EU) 2019/947, for which a precise list of mitigating measures has been identified in such a way that the competent authority can be satisfied with declarations in which operators declare that they will apply the mitigating measures when executing this type of operation

3.1.14
unmanned aircraft
UA
aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board

3.1.15
unmanned aircraft system
UAS
unmanned aircraft and the equipment to control it remotely

[SOURCE: ISO/CD 21384-2]

3.1.16
visual line of sight
VLOS
type of UAS operation in which the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions

3.1.17
equipment to control unmanned aircraft remotely
any instrument, equipment, mechanism, apparatus, appurtenance, software or accessory that is necessary for the safe operation of a UA other than a part and which is not carried on board that UA

3.1.18
payload
instrument, mechanism, equipment, part, apparatus, appurtenance or accessory, including communications equipment, that is installed in or attached to the aircraft and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller

3.1.19
type of UA
basic design arrangement of the UA: fixed-wing, rotary wing

EXAMPLE Multicopter or helicopter.

3.1.20
list of items
list that identifies the UAS and all removable and adaptable items including payloads, accessories, batteries and add-ons that are approved by the manufacturer to be attached to the main structure of the UA and are provided in any packaging configurations in which the UAS is placed on the market

Note 1 to entry: The list is provided with the description of the UA in the technical documentation.

Note 2 to entry: The list includes all payloads and batteries but not spare parts.

Note 3 to entry: The list identifies the items by part number and mass.

3.1.21
UAS combination
UAS including a variable set of elements such as components, payloads or accessories, and different types of batteries

3.1.22
primary structural elements
parts of the structure of the UA the failure of which would lead to a hazardous or more serious failure condition

EXAMPLE Primary UA structure bearing aerodynamic, inertial and propulsion forces; control surface and control system structural elements, control surface hinges; structural elements of systems used in launching and recovery phases ([8]).

3.1.23
tether
mechanical device for the purpose of effectively restraining the UA within the range permitted by the length of the tether as its primary function

Note 1 to entry: Not all cables linking the UA to the ground are considered as tether in the sense of this document, e.g. an electric cable powering the UA, even if it was the only source of power and a loss of connection would inevitably lead to a loss of flight. However, the tether may be used to transmit electrical power to the UA as a secondary function.

3.1.24
mode of control
mode used to distinguish between different methods of exercising control over the direction of flight of the UA

Note 1 to entry: This includes but is not limited to attitude, heading, track, speed, altitude, rate of climb. All flight modes are clearly defined in the flight manual explaining how remote pilot input (e.g. sticks) are associated to air vehicle degrees of freedom. Necessary conditions for each flight mode is also defined (e.g. GNSS coverage is necessary for ground velocity or position control mode)

3.1.25
control operational modes
the UA can be operated in the following operational modes, according to STANAG4703 UL47.1 definition here rephrased. The expression “control operational modes” is used to address safety relevant control categories

Note 1 to entry: Several flight control modes can be used for each category.

[SOURCE: STANAG4703 UL47.1]

3.1.26
automatic mode
control operational mode where UA attitude, speed and flight path are fully controlled by the flight control system, however the remote plot is always able to take control, when needed.

Note 1 to entry: No remote pilot input is needed to address flight controls and vehicle steering, other than to change the operational mode, load or modify the required flight plan or waypoint parameters.

EXAMPLE Examples of automatic modes are waypoint path navigation, waypoint holding (hovering/loitering), automatic take-off, automatic landing, follow-me mode, or return to home.

3.1.27
semi-automatic mode
control operational mode where the remote pilot commands outer loop parameters such as altitude, heading and air speed

Note 1 to entry: This is an assisted manual mode where the flight control system operates the UA controls to achieve the commanded outer loop parameter value. Envelope flight protection and/or control decoupling functions should be in place in this control operational mode. The flight manual clearly specifies, for any possible/available control mode that is classified as semi-automatic, for each degree of freedom, the level of involvement of the remote pilot to address control stability.

Note 2 to entry: A wide range of flight control modes are semi-automatic, from low level attitude/rate control, autopilot heading/speed/altitude control, velocity control; position control may be considered semi-automatic if

remote pilot input is transformed into position commands continuously (or an automatic mode if remote pilot inputs only modify waypoint coordinates in on-board autopilot).

3.1.28
manual direct mode
control operational mode where the remote pilot directly commands UA controls

EXAMPLE Aerodynamic surfaces through servo-actuators and engine through electronic speed control.

Note 1 to entry: This is an unassisted direct piloting manual mode. This control operational mode does not benefit from autopilot aiding action (e.g. flight envelope protection FEP) in excess of stability augmentation.

3.1.29
manual mode
control operational mode where the remote pilot is using manipulators or similar inceptors to change the trajectory of flight in real-time

Note 1 to entry: such as in manual direct piloting mode and semi-automatic mode, as opposed to automatic mode where high level commands (such as setting waypoints or actuating an RTH button) are used to change the trajectory.

3.1.30
automated mode
automatic mode and semi-automatic mode (as opposed to manual direct piloting mode) which depend on automation in excess of stability augmentation to control the trajectory of flight

3.1.31
holding
hovering for hovering capable aircraft, i.e., maintaining altitude and position; for fixed wing aircraft holding corresponds to loitering, i.e., flying a minimum distance orbit around current position, at low speed and holding altitude

Note 1 to entry: Holding is used to address a flight condition where aircraft minimizes risks of flight path deviation (to reduce the risk of collisions) and loss of control.

Note 2 to entry: Besides the general minimum speed and minimum displacement requirement, radius/turn rate/bank angle/load factor and speed are specifically selected for each aircraft in order to provide a safe and stable flight condition (e.g. proper margins with respect to stall speed and load factors).

3.1.32
command and control (C2) link loss recovery
automatic mode that the UA reverts as a fail-safe function in the event of a C2 link loss

Note 1 to entry: A non-exhaustive list of typical link loss recovery modes includes:

— holding;
— return to home (RTH);
— automatic landing.

3.1.33
flight termination function
function responsible for the termination of flight in a way that reduces the effect on third parties in the air or on the ground

Note 1 to entry: The flight termination function may be an existing function such as landing or a succession of existing functions such a holding with subsequent landing or a parachute deployment.

3.1.34
return to home
automatic mode intended for returning to a pre-defined, safe landing position (“home”)

EXAMPLE The take-off position is a type of pre-defined, safe landing position.

Note 1 to entry: This mode does not necessarily entail commence to land; typically includes climb or descent to a safe height, following a predefined route, approaching the landing position.

3.1.35
automatic landing,
automatic mode where the UA attempts an automatic landing or an emergency landing

3.1.36
safely controllable
capability of the UAS to provide a general ability to the remote pilot to exercise control over the UA at any time and to change the position of the UA as far as required to avoid hazards to other persons using the airspace and persons on the ground

Note 1 to entry: As long as the UA is controlled manually (see manual mode), this includes manoeuvrability and handling qualities, unless functions are automated (see automated mode)

3.1.37
nominal mode
basic mode of operation encountered in normal operation in the absence of any loss of features, functions or capabilities, or degradation of performance

3.1.38
degraded mode
temporary, persistent, or permanent reduction in features, functions, and capabilities, including the ability to cope with adverse environmental conditions outside of the limitations of the service envelope defined by the manufacturer likely to occur when operating close to or at those limitations

Note 1 to entry: Such limitations are (but not limited to): GNSS reception due to satellite constellation, ionospheric disturbances, jamming, etc.; magnetic deviation and disturbance affecting the compass (magnetometer); data link quality, in terms of latency, bandwidth, availability and integrity.

Note 2 to entry: Failures of one or, if applicable, more systems relevant for stability, controllability and remote pilot workload, such as (if required) accelerometers, gyroscopes, airspeed sensors, engine speed sensors, electrical power supply systems (batteries), power distribution systems (harnesses, connectors, voltage converters, fuses, etc.), and systems relevant for health monitoring such as internal temperatures and battery status, that are likely to occur during the life of the product are taken into account.