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## Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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|                  |                        |
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| 1  | 2                                          | (3)                          | 4               | 5                                                                                                                                  | (6)                                                                      | 7                                                  |
|----|--------------------------------------------|------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------|
| MB | Clause No./ Subclause No./Annex (e.g. 3.1) | Paragraph/Figure/ Table/Note | Type of comment | Commend (justification for change) by the MB                                                                                       | Proposed change by the MB                                                | Secretariat observations on each comment submitted |
|    | 3.1                                        | Definition 1                 | ed              | Definition is ambiguous and needs clarifying.                                                                                      | Amend to read '...so that the mains connector to which no connection...' |                                                    |
|    | 6.4                                        | Paragraph 2                  | te              | The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK. | Delete reference to UV photometer.                                       |                                                    |

# DRAFT INTERNATIONAL STANDARD

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ISO/TC 20/SC 16

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## Test methods for civil multi-copter unmanned aircraft system

ICS: 49.020

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## 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](http://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](http://www.iso.org/patents)).

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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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 16, *Unmanned aircraft systems*.

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](http://www.iso.org/members.html).

## Introduction

Multi-copter UAS is the most popular UAS in the market at present, but products with quality from good to bad are intermingled, so it is necessary to evaluate the function and performance of its products. At present, there is no unified standard test method and means to evaluate and test the multi-copter UAS. Therefore, it is necessary to formulate test method standards for civil multi-copter UAS to provide basis for product testing, so as to improve the product quality of the whole multi-copter UAS.

This document applies to the category of civil lightweight and small (maximum take-off weight under 150 kg) electric multi-copter unmanned aircraft system (UAS in short) . Configuration control and subsystem tests are important topics to be considered, but out of the scope of the file. The subsystem test like energy system and flight control system tests can be referred to other documents. The specified test methods can also be applied to the other categories as reference.

# Test methods for civil multi-copter unmanned aircraft system

## 1 Scope

This document specifies the system test methods for civil multi-copter unmanned aircraft system. This document is intended to be a general standard for the test of the overall system UAS functionality with the support of subsystem.

This document is applicable to the category of civil lightweight and small (maximum take-off weight under 150 kg) electric multi-copter unmanned aircraft system (UAS in short) . Configuration control and subsystem tests are important topics to be considered, but out of the scope of the file. The subsystem test like energy system and flight control system tests can be referred to other documents. The specified test methods can also be applied to the other categories as reference.

## 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.

ISO 21384-4:2020, *Unmanned aircraft systems — Part 4: Vocabulary*

ISO 21895:2020, *Categorization and classification of civil unmanned aircraft systems*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 5309, *Vibration test methods for lightweight and small civil UAS*

IEC 60068-2-30:2005, *Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic*

IEC 60068-2-78:2012, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state*

IEC 60529:2013, *Degrees of protection provided by enclosures (IP Code)*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test*

IEC 61000-4-3:2010, *Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test*

IEC 61000-4-5:2017, *Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-21:2011, *Electromagnetic compatibility (EMC) - Part 4-21: Testing and measurement techniques - Reverberation chamber test methods*

IEC 61000-6-1:2016, *Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity standard for residential, commercial and light-industrial environments*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments*

IEC 61000-6-3:2010, *Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments*

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments*

CISPR 16-1-1:2019, *Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus*

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Coupling devices for conducted disturbance measurements*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment - Emission requirements*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21384-4:2020, ISO 21895:2020 and the following 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 <https://www.electropedia.org/>

#### 3.1

##### **mission profile**

the specified mission to be performed, including the event and the environment sequence that the test object experiences

#### 3.2

##### **multi-copter UAS**

rotorcraft lifted by more than two (including two) power driven rotors on substantially vertical axis, capable of hovering and take-off & landing vertically

### 4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

$V_{hm}$  Maximum level flight speed, unit: meters per second (m/s)

$V_{vm}$  Maximum climb rate, unit: meters per second (m/s)

FFT Fast Fourier Transformation

### 5 General principles

#### 5.1 Test purpose

The purpose of test is specified as follows:

- Check whether the functionality, performance index of the UAS meets the design requirements;

- b) Make recommendations on design modifications and whether to conduct supplementary tests.

## 5.2 Test conditions and requirements

### 5.2.1 Technical document

The following documents should be prepared before the test:

- a) The design documents, figures and interface file which are relevant to the test;
- b) Operator's manual.
- c) Other related documents

### 5.2.2 Test object

The test object should fulfill the following requirements:

- a) The test object should conform to the product manuals;
- b) The number of test objects should meet the test requirements;
- c) The test objects must have quality inspection certificates such as enterprise qualification certificate.

### 5.2.3 Equipment and instruments

Test instruments and equipment (including special equipment and auxiliary equipment) shall be verified and calibrated, and shall be qualified within the flight test limitations and within the validity period. All The test instrument used should meet the expected use requirements, and its measurement uncertainty or maximum allowable error should be less than agreed allowable error range of the measured parameter. For test process management, ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories can be referred to.

### 5.2.4 Personnel requirements

Testers must be able to operate the test objects and the test equipment proficiently. Testers must have the corresponding skills and abilities.

## 5.3 Test environmental requirements

Unless otherwise specified in this document, all tests shall be performed by measuring and recording test conditions, including temperature, relative humidity, atmosphere pressure, wind speed.

## 5.4 Test interruption and recovery

Test interruption and recovery methods are specified as follows:

- a) The test is terminated on one of the following conditions:
  - 1) Key indicator(s) of the test object is (are) unqualified;
  - 2) The test object cannot work normally due to malfunction and cannot be repaired.
- b) When the following situations occur during the test, supplementary tests should be carried out as appropriate:
  - 1) Individual test objects failed, the cause has been identified and corrected;