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IEEE Standard Interface Requirements and Performance Characteristics of Payload Devices in Drones

IEEE Communications Society

Developed by the
Access and Core Networks Standards Committee

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Access and Core Networks Standards Committee
of the
IEEE Communications Society

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Abstract: General interface requirements and performance characteristics of payload devices in drones are presented. The drone payload interfaces are described in three categories: mechanical interface, electrical interface, and data interface. Mechanical interface is used to fix the payload to the drone. Electrical interface is an electromechanical device used to join electrical terminations. The electrical interface includes the power supply interface and the two-way communication interface. Data interface refers to the communication protocol. The requirements and performance characteristics of the drone payload interface are detailed from the aspect of protection from temperature extremes, humidity, water, dust, vibration/shock, mold, salt spray, etc. Typical drone payloads, interface requirements, and performance characteristics of specific payloads are illustrated.

Keywords: adapter, attitude adjustment function, communication, communication protocol compatible, configuration, conformity assessment, connectors, control, data interface, dissimilar connector, drone, drone payload, electrical interface, electromechanical, electromechanical device, extendibility, framework, gimbal, humidity, IEEE 1937.1™, infrared, interface, LiDAR, mechanical interface, mildew, mold, mold resistance, mounting holes, optical, performance characteristics, power consumption, power supply, protocol, pulse per second, removable, requirements, salt spray, scalability, sensors, shock, shockproof, stabilizing, synchronization, temperature, temperature range, test plan, unauthorized access, useful life, voltage, wireless interface, waterproof

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Introduction

This introduction is not part of IEEE Std 1937.1-2020, IEEE Standard Interface Requirements and Performance Characteristics of Payload Devices in Drones.

Unmanned aircraft (UA), commonly known as drones, are aircraft without human pilots aboard. Civil UA have been developing rapidly worldwide in recent years. UA have attracted enthusiasts in the fields of personal entertainment and professional aerial photography, promoted quality of life, and inspired the potential of the UA industry. As an efficient tool, UA have promoted the work efficiency of many industries with wide application demand, such as agriculture, infrastructure, public safety, energy, film and television media, and other industries. The drone industry has developed rapidly in recent years. Capabilities and functionalities of drones have increased and the drone industry continues to expand. Well accepted standards for interface requirements and performance characteristics of payload devices in drones are critical and necessary. Drone manufacturers and users have gained insight, experience, and knowledge that can be shared with the world.

Generally speaking, drones should carry different kinds of payloads to accomplish different purposes.

There are many drone manufacturers producing different kinds of drones, including fixed-wing drones, multi-copter drones, electrically powered drones, and gas powered drones. No matter how big or small, drones have to carry specific payloads to complete specific functions. On the other hand, there are many payloads manufacturers producing different kinds of payloads. Various kinds of payloads need different support from the drones, for fixing the payload, for power supply, and for data transmission. Payload interface standards are needed for the interfaces to allow different payloads to be used in different drones produced by different manufacturers, and so that different drones can carry different payloads made by different manufacturers.

As emerging technology is developing and demands are also growing to develop new solutions for drone payload interfaces—even for one payload interface that can be used for many kinds of payloads—the related standards should be developed accordingly.

The IEEE P1937.1 working group consists of many important and experienced stakeholders in the drone industry, including DJI, State Grid Corporation of China (SGCC), China Southern Power Grid Co., Ltd. (CSG), China Academy of Sciences (CAS), and CESI. As working group members, they are pursuing the common goal of promoting the drone industry by rapidly developing good services for clients.

The standard working group is preparing to carry out the IEEE Conformity Assessment Program (ICAP), including conformity assessment for the drone payload interface, to help the industry develop better and help customers acquire qualified products.

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IEEE Standard Interface Requirements and Performance Characteristics of Payload Devices in Drones

1. Overview

1.1 Scope

This standard establishes a framework for drone interface to payload. It defines the interfaces, performance metrics, provisioning, operation control, and management for drone payload devices.

This standard specifies payload interface requirements for drones that have a maximum take-off mass (MTOM) less than 25 kg, the drones' built-in payload not included.

1.2 Purpose

IEEE Std 1937.1™ describes the general interface requirements and performance characteristics of payload devices in drones.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals is *required to*).[1, 2]

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals is *recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals is *permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals is *able to*).

[1]The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.
[2]The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.