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Information technology - Home Electronic System (HES) application model - Part 5: A safety framework and guidelines for control and data communication messages

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Information technology - Home Electronic System (HES) application model - Part 5: A safety framework and guidelines for control and data communication messages

FOREWORD

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ISO/IEC 15067-5 has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
JTC1-SC25/3327/CDV	JTC1-SC25/3350A/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

A list of all parts in the ISO/IEC 15067 series, published under the general title *Information technology - Home Electronic System (HES) application model*, can be found on the IEC and ISO websites.

INTRODUCTION

Improving safety for consumers using appliances connected to a local area network in a home or building (called "networked appliances") depends on many factors:

– appliance design;
– appliance installation;
– appliance configuration;
– appliance provisioning of features;
– appliance user interface;
– appliance operation;
– appliance field upgrades;
– appliance maintenance;
– appliance repairs.

A network in a home or apartment is also called a "home control system" (hcs). A home control system is any generic communications network used for home automation. The HES communications network specified by the HES series of standards (ISO/IEC 14543 series and related standards) is a subset of home control systems that conforms to the HES standards. Thus, all HESs are home control systems, but not all home control systems are HESs.

A "networked appliance" (also called a "networked product") is any appliance that can respond to some home control system commands. The connection can be as simple as a power switch interposed between the mains and the power cord of a traditional appliance. This power switch receives on/off hcs signals to apply or cut power to the appliance. A "smart appliance" has a data connection to an hcs so it can respond to commands beyond on/off, such as queries and commands regarding operating modes, sensor readings, actuator states, energy consumption, etc. The smart appliance connection technology is not specified; it can be wired or wireless using the Internet Protocol (IP) or non-IP.

This document focuses on the safety aspects of "appliance operation" related to network communications. It specifies safety enhancements for screening and processing digital messages intended for networked appliances, especially for remotely operated devices. Such messages include commands for

– turning an appliance on or off, or
– changing an operation setting such as temperature or speed.

These messages are not related to a specific communications protocol, but can use external and home area network communication protocols to convey the message contents.

This document was developed in consultation with the working group that wrote IEC 63044-4. IEC 63044-4 addresses many hazards and electrical safety issues. This document addresses the following issues that were not included in IEC 63044-4:

– screening out messages that can make the operation of appliances connected to a home network risky and less safe for consumers;
– enhancements provided by the Home Electronic System (HES) gateway such as data security and extensions of HES gateway services for safer operation of attached networked devices.

IEC 63044-4 specifies the identification and handling of corrupted messages by discarding or resending them. However, a particular challenge is recognizing and responding appropriately to a valid message that can create an unsafe operation because of the particular operating environment of appliances and devices attached to a home or building network. Examples are presented in this document.

The specifications in this document provide guidelines for making the operation of appliances safer when attached to a home control system (hcs) network. An HES network is a type of hcs that conforms to the family of HES standards consisting of documents related to the Home Electronic System (HES) prepared by ISO/IEC JTC 1/SC 25. An HES network that includes an HES gateway enhances the safety of operation of connected products. Thus, an HES network can provide a higher level of safety for consumers than a generic hcs network.

NOTE ISO/IEC HES standards are identified by HES or "Home Electronic System" in the title.

Additional HES safety protections can be provided by the HES gateway, which is responsible for:

– a communications interconnection between premises networks and wide area networks;
– a communications interconnection between dissimilar home and building area networks within the same premises;
– interoperability and functional interworking among dissimilar home devices and applications;
– a platform for hosting interoperable application services;
– cybersecurity protection of occupants' data, privacy, and safety.

The HES gateway functions are provided by gateway constituents called "service modules". The HES gateway capability for monitoring message traffic between the home and the outside provides cybersecurity protection and can enhance user safety when operating connected devices and appliances remotely.

The HES gateway can include service modules specialized for monitoring and possibly blocking external appliance messages that are determined to be unsafe. For example, the gateway can correlate an appliance message with local data about occupancy, time-of-day, and the operation of related appliances to determine if the message can cause an unsafe operation.

This document is based in part on the following safety-related documents:

a) IEC Guide 110:2014 [1][1] (second edition, replaced first edition published in 1996)

   IEC Guide 110:2014 was developed to provide background information for technical committees when dealing with safety requirements for products intended to be integrated in a home control system. IEC Guide 110:2014 includes information on functional (operational) safety as well as conventional electrical safety aspects relevant to home control systems.

b) ISO/IEC TR 14762:2000 [2]

   ISO/IEC TR 14762:2000 extended IEC Guide 110 by providing requirements for functional safety of home control networks and associated equipment in homes and buildings.

c) ISO/IEC 14762:2009 [3]

   ISO/IEC 14762:2009 extensively revised ISO/IEC TR 14762:2000 by providing a list of hazards and measures to counter them. It specifies safety protections associated with power feeds (restarting, marking, and construction for proper connections), environmental issues (heat, mechanical stress, and useful lifetime), foreseeable misuse (configuration and proper firmware), operational software and communications, remote management, and operation.

d) IEC 63044-4:2021 [4]

   IEC 63044-4:2021 is an updated version of ISO/IEC 14762:2009 with most of the original content preserved, including the same sequence of normative clauses.

[1] Numbers in square brackets refer to the Bibliography.

ISO/IEC 15067-5 extends materials from IEC Guide 110 and ISO/IEC TR 14762 that were not included in ISO/IEC 14762:2009 or IEC 63044-4:2021:

– remote commands and parameter settings (called "messaging") and the impact on appliance safety;
– safety-related services for screening messages possibly provided by the HES gateway as specified in the ISO/IEC 15045-3 series [5] and associated ISO/IEC 18012 series [6];
– risks posed by various categories of messages when appliances are controllable via hcs networks using remote control from outside and inside the home.

1 Scope

This document addresses the safety of persons and premises when using devices and appliances ("products") with interfaces to a communications network in a home or building ("premises"). Such products are called "networked appliances" and "networked products." This document specifies basic requirements for safer operation of products that can be controlled remotely via a connection to a communications network. The network can enable such products to form integrated applications. These products can interact via the premises network and can be controlled remotely from within the premises and from a wide area network outside connected to the premises network via a communications gateway.

Recommendations and methods for remote-control message screening and guidelines for selecting messages to minimize risk are specified. These specifications can enhance safety in a home control system (hcs).

The safety requirements specified in this document apply together with any relevant product safety standards.

NOTE 1 ISO/IEC HES standards are identified by HES or "Home Electronic System" in the title.

NOTE 2 This document addresses conditions of normal use and fault conditions throughout the lifetime of a product. Sabotage, force majeure, and intentional damage are not addressed in this document.

NOTE 3 This document is not intended for safety-related equipment such a fire-detection and suppression system.

NOTE 4 "Networked applications" and "networked products" describe the same category of devices and are used interchangeably in this document.

2 Normative references

There are no normative references in this document.

3 Terms, definitions, and abbreviated terms

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:

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
cyberspace
whole of interconnected information processing systems, including the Internet, and of data they are processing

[SOURCE: IEC 60050-171:2019 [7], 171-08-03]

3.1.2
cyberspace security
cybersecurity
freedom from unacceptable risk in cyberspace

[SOURCE: IEC 60050-171:2019 [7], 171-08-04, modified – The term "cybersecurity" has been added.]