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FDIS
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Health informatics — Device interoperability —

Part 10441: Device specialization — Cardiovascular fitness and activity monitor

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This second edition cancels and replaces the first edition (ISO/IEEE 11073-10441:2015), which has been technically revised.

The main changes are as follows:

— updated normative reference to refer to ISO/IEEE 11073-20601-2019;

— updated the version of this device specialization;

— updated the association details based on the new version;

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— updated the wording in 6.3 regarding the observational attributes;

— add one ICS statement regarding version of device specialization;

— added some text to 6.12 to further elaborate the DIM extensibility rule;

— updated the text in 8.5.2 regarding attribute-id-list, to be compliant with 20601-V4;

— removed the year in bibliography to represent the latest version;

— made ISO/IEEE 11073-10101 a normative reference;

— updated the wording at 1.3 and 4.1 regarding the precedence of nomenclature between ISO/IEEE 11073-10101, ISO/IEEE 11073-20601, 104zz, and this standard;

— updated the usage of nomenclature-version. Tied it with the corresponding protocol-version;

— corrected some nomenclature code values;

— added the concepts of target range of heat rate (HR), speed, and energy expended;

— added the concepts of user exercise target and health status.

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IEEE Std 11073-10441™-2025
(Revision of IEEE Std 11073-10441-2013)

Health informatics — Device interoperability

Part 10441: Device specialization — Cardiovascular fitness and activity monitor

Developed by the
IEEE 11073 Standards Committee
of the
IEEE Engineering in Medicine and Biology Society

Approved 12 February 2025

IEEE SA Standards Board

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Abstract: Within the context of the ISO/IEEE 11073 family of standards for device communication, a normative definition of communication between personal telehealth cardiovascular fitness and activity monitor devices and managers (e.g., cell phones, personal computers, personal health appliances, and set top boxes) in a manner that enables plug-and-play interoperability is established in this standard. Appropriate portions of existing standards are leveraged including ISO/IEEE 11073 terminology, information models, application profile standards, and transport standards. The use of specific term codes, formats, and behaviors in telehealth environments restricting optionality in base frameworks in favor of interoperability is specified. A common core of communication functionality for personal telehealth cardiovascular fitness and activity monitor devices is defined in this standard.

Keywords: activity monitor, cardiovascular fitness, IEEE 11073-10441™, medical device communication, personal health devices

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This introduction is not part of IEEE Std 11073-10441-2025, Health Informatics—Device Interoperability—Part 10441: Personal Health Device Communication—Device Specialization—Cardiovascular Fitness and Activity Monitor.

Within the context of the ISO/IEEE 11073 family of standards for device communication, a normative definition of communication between personal telehealth cardiovascular fitness and activity monitor devices and managers (e.g., cell phones, personal computers, personal health appliances, and set top boxes) is established in this standard in a manner that enables plug-and-play interoperability. Appropriate portions of existing standards are leveraged including ISO/IEEE 11073 terminology, information models, application profile standards, and transport standards. The use of specific term codes, formats, and behaviors in telehealth environments restricting optionality in base frameworks in favor of interoperability is specified. A common core of communication functionality for personal telehealth cardiovascular fitness and activity monitor devices is defined in this standard.

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Health informatics — Device interoperability

Part 10441: Device specialization — Cardiovascular fitness and activity monitor

1. Overview

1.1 Scope

Within the context of the ISO/IEEE 11073 family of standards for device communication, this standard establishes a normative definition of the communication between personal cardiovascular fitness and activity monitoring devices and managers (e.g., cell phones, personal computers, personal health appliances, and set top boxes) in a manner that enables plug-and-play interoperability. It leverages appropriate portions of existing standards including ISO/IEEE 11073 terminology and information models. It specifies the use of specific term codes, formats, and behaviors in telehealth environments, restricting optionality in base frameworks in favor of interoperability. This standard defines a common core of communication functionality for personal telehealth, cardiovascular fitness, and activity monitor devices. In this context, cardiovascular fitness and activity monitor devices are being used broadly to cover cardiovascular fitness and activity monitor devices that measure physical actions and the body's various physiological responses to that activity.

1.2 Purpose

This standard addresses a need for an openly defined, independent standard for controlling information exchange to and from personal health devices and managers (e.g., cell phones, personal computers, personal health appliances, and set top boxes). Interoperability is the key to growing the potential market for these devices and to enabling people to be better informed participants in the management of their health.

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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*).[7, 8]

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*).

1.4 Context

See ISO/IEEE 11073-20601[9] for an overview of the environment within which this standard is written.

This document defines the device specialization for the cardiovascular fitness and activity monitor being a specific agent type, and it provides a description of the device concepts, its capabilities, and its implementation according to this standard.

This standard is based on ISO/IEEE 11073-20601, which in turn draws information from both ISO/IEEE 11073-10201 [B1][10] and ISO/IEEE 11073-20101 [B2]. The medical device encoding rules (MDERs) used within this standard are fully described in ISO/IEEE 11073-20601.

The object classes and attributes in this standard are identified by nomenclature codes. Each code consists of a reference identifier (RefID) string and an integer code value. By using a consistent nomenclature, interoperability is enhanced as all implementations maintain the same semantic meaning for the numeric codes. This standard leverages the existing nomenclature codes in ISO/IEEE 11073-10101. Between this standard, ISO/IEEE 11073-10101, ISO/IEEE 11073-20601, and other ISO/IEEE Std 11073-104zz, all required nomenclature codes for implementation are documented. New codes may be defined in newer versions/revisions of each of these documents. In the case of a conflict, when one term code has been assigned to two separate semantic concepts with different RefIDs, in general the oldest definition in actual use should take precedence. The same policy applies when one RefID has two different code values assigned in different specifications. The resolution of such conflicts shall be determined through joint action by the responsible working groups and other stakeholders, and any corrective action shall be published as corrigenda.

NOTE—In this standard ISO/IEEE P11073-104zz is used to refer to the collection of device specialization standards that utilize ISO/IEEE 11073-20601, where zz can be any number from 01 to 99, inclusive.[11]

[7] The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

[8] The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.

[9] Information on references can be found in Clause 2.

[10] The numbers in brackets correspond to those of the bibliography in Annex A.

[11]

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2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so that each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ISO/IEEE 11073-20601, Health informatics—Personal health device communication—Application profile—Optimized Exchange Protocol.[12, 13, 14]

ISO/IEEE 11073-10101, Health informatics—Point-of-care medical device communication—Part 10101: Nomenclature.

See Annex A for all informative material referenced by this standard.

3. Definitions, acronyms, and abbreviations

3.1 Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[15]

agent: A node that collects and transmits personal health data to an associated manager.

class: In object-oriented modeling, a class describes the attributes, methods, and events that objects instantiated from the class utilize.

device: A physical apparatus implementing either an agent or a manager role.

handle: An unsigned 16-bit number that is locally unique and identifies one of the object instances within an agent.

manager: A node receiving data from one or more agent systems. Some examples of managers include cellular phones, health appliances, set top boxes, or computer systems.

mass: An intrinsic property of matter that can be measured using the effect of the gravitational field on an object.

obj-handle: *See*: **handle**.

object: In object-oriented modeling, a particular instantiation of a class. The instantiation realizes attributes, methods, and events from the class.

personal health device (PHD): A device used in personal health applications.

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[12] The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronics Engineers, Inc.

[13] This publication is available from The Institute of Electrical and Electronics Engineers (http://standards.ieee.org/).

[14] ISO/IEC publications are available from the ISO Central Secretariat (http://www.iso.org/). ISO publications are also available in the United States from the American National Standards Institute (http://www.ansi.org/).

[15] *IEEE Standards Dictionary Online* is available at: http://dictionary.ieee.org. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

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personal telehealth device: *See*: **personal health device**.

proportional integral mode (PIM): This mode is defined as the integral of a variable with respect to one of its axes over the duration of the session or subsession. It is used in actigraphy to provide an activity measurement.

root mean square (RMS): The square root of the average of the squares of a variable over the duration of the session or subsession.

time above threshold (TAT): This is defined as the total time that an input variable exceeds a given threshold value over the duration of the session or subsession. It is used in actigraphy to provide an activity measurement.

weight: The force that results from the exertion of gravity on an object. The weight is directly propotional to the mass of the object. However, in the healthcare domain, the term *body weight* is typically used to denote the body mass of a person. This notation applies also to this standard.

3.2 Acronyms and abbreviations

2D two-dimensional

3D three-dimensional

APDU application protocol data unit

ASN.1 Abstract Syntax Notation One

DIM domain information model

ICS implementation conformance statement

MDC medical device communication

MDS medical device system

MOC managed object class

PHD personal health device

PIM proportional integral mode

RPM revolutions per minute

RMS root mean square

RT-SA real-time sample array

TAT time above threshold

VMO virtual medical object

VMS virtual medical system

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