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BSI Standards Publication

# Health informatics - Personal health device communication

Part 10442: Device specialization - Strength fitness equipment

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The UK participation in its preparation was entrusted to Technical Committee IST/35, Health informatics.

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# EN ISO 11073-10442

February 2017

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English Version

# Health informatics - Personal health device communication - Part 10442: Device specialization - Strength fitness equipment (ISO/IEEE 11073-10442:2015, Corrected version 2017-11-01)

Informatique de santé - Communication entre dispositifs de santé personnels - Partie 10442: Spécialisation des dispositifs - Équipement de mise en forme musculaire (ISO/IEEE 11073-10442:2015, Version corrigée 2017-11-01)

Medizinische Informatik - Kommunikation von Geräten für die persönliche Gesundheit - Teil 10442: Gerätespezifikation - Fitnessgeräte für das Krafttraining (ISO/IEEE 11073-10442:2015, korrigierte Fassung 2017-11-01)

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IEEE Std 11073-10442™-2008

## Health informatics—Personal health device communication

# Part 10442: Device specialization—Strength fitness equipment

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**Abstract:** 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 strength fitness 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 strength fitness devices. In this context, strength fitness devices are being used broadly to cover strength fitness devices that measure musculo-skeletal strength-conditioning activities.

**Keywords:** medical device communication, personal health devices, strength fitness equipment

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## Introduction

This introduction is not part of IEEE Std 11073-10442-2008, Health informatics—Personal health device communication—Part 10442: Device specialization—Strength fitness equipment.

ISO/IEEE 11073 standards enable communication between medical devices and external computer systems. This document uses the optimized framework created in IEEE Std 11073-20601[a] and describes a specific, interoperable communication approach for strength fitness equipment. These standards align with and draw on the existing clinically focused standards to provide easy management of data from either clinical or personal health devices.

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## Health informatics—Personal health device communication

# Part 10442: Device specialization—Strength fitness equipment

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## 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 strength fitness 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 strength fitness devices. In this context, strength fitness devices are being used broadly to cover strength fitness devices that measure musculo-skeletal strength-conditioning activities.

### 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 Context

See IEEE Std 11073-20601™ for an overview of the environment within which this standard is written.

This document, IEEE Std 11073-10442 defines the device specialization for the strength fitness device, 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 IEEE Std 11073-20601, which in turn draws information from both ISO/IEEE 11073-10201:2004 [B3][1] and ISO/IEEE 11073-20101:2004 [B4]. The medical device encoding rules (MDER) used within this standard are fully described in IEEE Std 11073-20601.

This standard reproduces relevant portions of the nomenclature found in ISO/IEEE 11073-10101:2004 [B2] and adds new nomenclature codes for the purposes of this standard. Between this standard and IEEE Std 11073-20601, all required nomenclature codes for implementation are documented.

NOTE—In this standard, IEEE Std 11073-104zz is used to refer to the collection of device specialization standards that utilize IEEE Std 11073-20601, where zz can be any number from 01 to 99, inclusive.[2]

## 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.

IEEE Std 11073-20601™-2008, Health informatics—Personal health device communication—Part 20601: Application profile—Optimized exchange protocol.[3, 4]

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

## 3. Definitions, acronyms, and abbreviations

### 3.1 Definitions

For the purposes of this standard, the following terms and definitions apply. The *Authoritative Dictionary of IEEE Standards Terms* [B1] should be referenced for terms not defined in this clause.

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

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

**3.1.3 compute engine:** *See*: **manager.**

**3.1.4 device:** A term used to refer to a physical apparatus implementing either an agent or a manager role.

[1] The numbers in brackets correspond to those of the bibliography in Annex A.
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**3.1.5 handle:** An unsigned 16-bit number that is locally unique and identifies one of the object instances within an agent.

**3.1.6 manager:** A node receiving data from one or more agent systems. Some examples of managers include a cellular phone, health appliance, set top box, or a computer system.

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

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

**3.1.9 personal health device:** A device used in personal health applications.

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

## 3.2 Acronyms and abbreviations

| | |
|---|---|
| APDU | application protocol data unit |
| ASN.1 | Abstract Syntax Notation One |
| DIM | domain information model |
| EUI-64 | extended unique identifier (64 bits) |
| ICS | implementation conformance statement |
| MDC | medical device communication |
| MDER | medical device encoding rules |
| MDS | medical device system |
| MOC | medical object class |
| OID | object identifier |
| PDU | protocol data unit |
| PHD | personal health device |
| RT-SA | real-time sample array |
| VMO | virtual medical object |
| VMS | virtual medical system |

# 4. Introduction to ISO/IEEE 11073 personal health devices

## 4.1 General

This standard and the remainder of the series of ISO/IEEE 11073 personal health device (PHD) standards fit in the larger context of the ISO/IEEE 11073 series of standards. The full suite of standards enables agents to interconnect and interoperate with managers and with computerized health-care information systems. See IEEE Std 11073-20601 for a description of the guiding principles for this series of ISO/IEEE 11073 personal health device standards.

IEEE Std 11073-20601 supports the modeling and implementation of an extensive set of personal health devices. This standard defines aspects of the strength fitness device. It describes all aspects necessary to implement the application layer services and data exchange protocol between an ISO/IEEE 11073 PHD strength fitness agent and a manager. This standard defines a subset of the objects and functionality contained in IEEE Std 11073-20601 and extends and adds definitions where appropriate. All new definitions are given in Annex B in Abstract Syntax Notation One (ASN.1). Nomenclature codes referenced in this standard, which are not defined in IEEE Std 11073-20601, are normatively defined in Annex C.


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## 4.2 Introduction to IEEE 11073-20601 modeling constructs

### 4.2.1 General

The ISO/IEEE 11073 series of standards, and in particular IEEE Std 11073-20601 is based on an object-oriented systems management paradigm. The overall system model is divided into three principal components: the domain information model (DIM), the service model, and the communications model. See IEEE Std 11073-20601 for a detailed description of the modeling constructs.

### 4.2.2 Domain information model

The DIM is a hierarchical model that describes an agent as a set of objects. These objects and their attributes represent the elements that control behavior and report on the status of the agent and data that the agent can communicate to the manager. Communication between the agent and the manager is defined by the application protocol in IEEE Std 11073-20601.

### 4.2.3 Service model

The service model defines the conceptual mechanisms for the data exchange services. Such services are mapped to messages that are exchanged between the agent and the manager. Protocol messages within the ISO/IEEE 11073 series of standards are defined in ASN.1. The messages defined in IEEE Std 11073-20601 can coexist with messages defined in other standard application profiles defined in the ISO/IEEE 11073 series of standards.

### 4.2.4 Communication model

In general, the communication model supports the topology of one or more agents communicating over logical point-to-point connections to a single manager. For each logical point-to-point connection, the dynamic system behavior is defined by a connection state machine as specified in IEEE Std 11073-20601.

### 4.2.5 Implementing the models

An agent implementing this standard shall implement all mandatory elements of the information, service, and communication models as well as all conditional elements where the condition is met. The agent should implement the recommended elements, and it may implement any combination of the optional elements. A manager implementing this standard shall utilize at least one of the mandatory, conditional, recommended, or optional elements. In this context, “utilize” means to use the element as part of the primary function of the manager device. For example, a manager whose primary function is to display data would need to display a piece of data in the element in order to utilize it.

# 5. Strength fitness device concepts and modalities

## 5.1 General concepts

Strength fitness agents measure the extent to which a person can perform a certain motion with a given resistance. The agents in this category are varied, and they range from single exercise machines, such as a leg press, to multi-function agents that can be used to perform a variety of exercises. While these agents may take a variety of forms, the measurements they capture are largely the same.

Agents in this category operate in a store and forward mode. Exercise is measured for a period of time, and sometime after the exercise period has ended, the agent transfers all the measurements to the manager. This period of exercise measurement is called a set.


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### 5.2 Set

A set is an episode of a strength training exercise performed on a single agent at the same resistance. A set includes the time that it was started, the muscle group engaged, and optionally, the duration. A set may also have other measurements associated with it, such as the repetition count, details for each repetition, resistance, exercise laterality, exercise grip, exercise position, and exercise movement.

### 5.3 Repetition

A repetition is an instance of a given strength exercise. Each repetition is associated with a set and defines when the repetition was performed. Additionally, the repetition may specify the duration and/or the distance of the repetition.

### 5.4 Repetition count

The repetition count is the number of time an exercise had been performed within an associated set.

### 5.5 Resistance

The resistance is a representation of the amount of force applied to accomplish the exercise.

### 5.6 Exercise position

The position employed to perform the exercise.

### 5.7 Exercise laterality

Exercise laterality identifies which side of the body engaged in the exercise.

### 5.8 Exercise grip

The grip employed to perform the exercise.

### 5.9 Exercise movement

The movement employed in the exercise.

## 6. Strength fitness domain information model

### 6.1 Overview

This clause describes the domain information model for strength fitness equipment.

### 6.2 Class extensions

In this standard, no class extensions are defined with respect to IEEE Std 11073-20601.


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