INTERNATIONAL STANDARD

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Second edition
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Health informatics — Device interoperability —

Part 10420:
Personal health device communication — Device specialization — Body composition analyzer

Informatique de santé — Interopérabilité des dispositifs —

Partie 10420: Communication entre dispositifs de santé personnels — Spécialisation de dispositif — Analyseur de composition corporelle

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This second edition cancels and replaces the first edition (ISO/IEEE 11073-10420:2012), which has been technically revised.

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Health informatics—Device interoperability

Part 10420: Personal health device communication—Device specialization—
Body composition analyzer

ISO/IEEE 11073-10420:2022(E)

Abstract: Within the context of the ISO/IEEE 11073 family of standards for device communication, a normative definition of the communication between personal body composition analyzer agents and managers (e.g., cell phones, personal computers, personal health appliances, set-top boxes) is established by this standard in a manner that enables plug-and-play interoperability. It leverages appropriate portions of existing standards including ISO/IEEE 11073 terminology, information models, application profile standards, and transport standards. It specifies the use of specific term codes, formats, and behaviors in telehealth environments to restrict optionality in base frameworks in favor of interoperability. This standard defines a common core of communication functionality for personal telehealth body composition analyzers. In this context, the phrase "body composition analyzer" is used broadly to cover analyzing devices that measure body impedances and compute the various body components including body fat from the impedance.

Keywords: body composition analyzer, IEEE 11073-10420™, medical device communication, personal health devices

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Introduction

This introduction is not part of IEEE Std 11073-10420-2020, Health informatics—Device interoperability—Part 10420: Personal health device communication—Device specialization—Body composition analyzer.

ISO/IEEE 11073 standards enable communication between medical devices and external computer systems. Within the context of the ISO/IEEE 11073 family of standards for device communication, this standard establishes a normative definition of the communication between body composition analyzer agents and managers (e.g., cell phones, personal computers, personal health appliances, set-top boxes) in a manner that enables plug-and-play interoperability. It leverages appropriate portions of existing standards including ISO/IEEE 11073 terminology, information models, application profile standards, and transport standards. It specifies the use of specific term codes, formats, and behaviors in telehealth environments to restrict optionality in base frameworks in favor of interoperability. This standard defines a common core of communication functionality for personal telehealth body composition analyzers. In this context, the phrase "body composition analyzer" is used broadly to cover analyzing devices that measure body impedances and compute the various body components including body fat from the impedance.

The major changes in this revision include the following:

— The addition of basal metabolism numeric object, body muscle numeric object, and bioimpedance analysis method enumeration object

— The use of base offset time

— An upgrade of the baseline protocol

Contents

Health informatics—Device interoperability

Part 10420: Personal health device communication—Device specialization—Body composition analyzer

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 body composition analyzer agents and managers (e.g., cell phones, personal computers, personal health appliances, set-top boxes) in a manner that enables plug-and-play interoperability. It leverages appropriate portions of existing standards including ISO/IEEE 11073 terminology, information models, application profile standards, and transport standards. It specifies the use of specific term codes, formats, and behaviors in telehealth environments to restrict optionality in base frameworks in favor of interoperability. This standard defines a common core of communication functionality for personal telehealth body composition analyzers. In this context, the phrase "body composition analyzer" is used broadly to cover analyzing devices that measure body impedances and compute the various body components including body fat from the impedance.

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, set-top boxes). Interoperability is key to growing the potential market for these devices and enabling people to be better informed participants in the management of their health.

1.3 Context

See IEEE Std 11073-20601™ for an overview of the environment within which this standard is written.[1]

This standard defines the device specialization for the body composition analyzer, being a specific agent type, and it provides a description of the device concepts, its capabilities, and its implementation according to this standard.

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

IEEE Std 11073-10420-2020
Health informatics—Device interoperability
Part 10420: Personal health device communication—Device specialization—Body composition analyzer

This standard is based on IEEE Std 11073-20601, which in turn draws information from both ISO/IEEE 11073-10201 [B6] and ISO/IEEE 11073-20101 [B7]. [2] The medical device encoding rules (MDER) used within this standard are fully described in IEEE Std 11073-20601.

The object classes and attributes in this standard are referenced using nomenclature codes. Each code is identified by a reference identifier (RefID). 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 IEEE Std 11073-10101™. Meanwhile, it defines specialized nomenclature codes that will be collected in future revisions of IEEE Std 11073-10101. Between this standard, IEEE Std 11073-10101, IEEE Std 11073-20601, and other 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, where one term code has been assigned to two separate semantic concepts with different RefIDs, in general the oldest definition that is 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 will be determined through joint action by the responsible working groups and other stakeholders, and any corrective action will be published as corrigenda.

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. [3]

1.4 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). [4,5]

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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).

2. Normative references

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

IEEE Std 11073-10415™, Health informatics—Personal health device communication—Part 10415: Device specialization—Weighing scale. [6]

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

[3] Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

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

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IEEE Std 11073-20601™, Health informatics—Personal health device communication—Part 20601: Application Profile—Optimized Exchange Profile.[7,8]

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 referenced for terms not defined in this clause.[9]

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

basal metabolic rate: The calculated amount of energy that the body consumes to maintain basic essential functions per unit of time.

bioimpedance: The vector sum of resistance and reactance that is used to estimate body composition.

body composition analyzer: A device (e.g., an agent) for measuring the fundamental constituents of the human body that consists of water, protein, mineral, and fat.

body fat: The difference between the body weight and the fat free mass.

body muscle: The muscles in the body.

body water: The total water of the human body.

body weight: The sum of the body water mass, protein mass, mineral mass, and the body fat mass.

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

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

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

fat free mass: The sum of the soft lean mass and mineral mass.

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 a cellular phone, health appliance, set-top box, or a computer system.

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[6] For overlapping objects, this standard follows the definitions from IEEE Std 11073-10415, with potential minor variation. Full details of such objects are reproduced in this standard for the convenience of implementers.

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

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

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

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

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

soft lean mass: The sum of the body water mass and protein mass.

weight: The force that results from the exertion of gravity on an object. The weight is directly proportional to the mass of the object. However, in the health care 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

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	managed object class
PDU	protocol data unit
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 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 healthcare information systems. See the 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 body composition analyzer. It describes all aspects necessary to implement the application layer services and data exchange protocol between an ISO/IEEE 11073 personal health device (body composition analyzer agent) and a manager. This standard defines a sub-set 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) [B8].

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All nomenclature codes referenced in this standard are collected in Annex C. Annex C may contain definitions of codes that are used by this standard and that are not yet present in IEEE Std 11073-10101 and IEEE Std 11073-20601.

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 communication model. See IEEE Std 11073-20601 for a detailed description of the modeling constructs.

4.2.2 Domain information model (DIM)

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 an agent can communicate to a 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 [B8]. 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.

4.3 Compliance with other standards

Devices that comply with this standard may also be required to comply with other domain- and device-specific standards that supersede the requirements of this standard with respect to issues including safety, reliability, and risk management. A user of this standard is expected to be familiar with all other such standards that apply and to comply with any higher specifications thus imposed.

Typically, medical devices should comply with the IEC 60601-1 [B1] base standards with respect to electrical and mechanical safety and any device-specific standard as might be defined in the IEC 60601-2 [B2] series of standards. Software aspects may apply through standards such as IEC 62304 [B3]. Devices that comply with this standard implement higher layers of network software and utilize lower layers as appropriate to the application. The requirements on performance of such applications and conformance are defined elsewhere and are outside the scope of this standard. Moreover, the use of any medical equipment is subject to risk assessment and risk management appropriate to the application. Relevant examples include ISO 14971 [B5] and IEC 80001-1 [B4]. The requirements of such risk assessment, risk management, and conformance are outside the scope of this standard. The applicable versions of the referenced safety related standards may differ by country.

5. Body composition analyzer concepts and modalities

5.1 General

This clause presents the general concepts of body composition analyzers. In the context of personal health devices in this family of standards, a body composition analyzer is a device that analyzes the constituents of the human body. Body composition analyzers may use a variety of techniques for measuring body composition. One typical method is body impedance analysis that measures the impedance with pairs of probes applied at the feet and/or hands and calculates the body composition from these impedances.

In the personal health context, the body composition of a person is typically not measured more frequently than once a day.

5.2 Body fat

Body fat is a measure of the obesity of a person. It has measurement units of kilograms, pounds, or percentage. When using percentage, the body fat is defined as the individual's body fat, in kilograms or pounds, divided by the individual's weight, in kilograms or pounds, as shown in Equation (1).

$$\text{Body fat} = \frac{\text{body fat}}{\text{body weight}} \times 100 \tag{1}$$

The normal range of body fat is 10% to 20% for men and 18% to 28% for women, with the standard value of 15% and 2%, respectively.

5.3 Body height

Refer to 5.3 of IEEE Std 11073-10415-2019. In this standard, body height is required to compute the body composition of a person. It is measured by the device or entered manually. The unit can be either inches or centimeters.

5.4 Body weight

Refer to 5.2 of IEEE Std 11073-10415-2019. In this standard, body weight is required to compute the body composition of a person. It is measured by the device or entered manually. The unit can be either pounds or kilograms.

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5.5 Body mass index

Refer to 5.4 of IEEE Std 11073-10415-2019. The body mass index (BMI) is a measure for indicating an overweight or underweight condition of a person and is defined as the individual's body weight divided by the square of height.

5.6 Fat free mass

The fat free mass is the sum of the soft lean mass and the mineral mass (also known as bone mass). It has units of kilograms or pounds.

5.7 Soft lean mass

The soft lean mass is the sum of the body water and the protein mass. It has units of kilograms or pounds.

5.8 Body water

Body water accounts for the largest portion of body composition, being about 50% to 70% of body weight. It has units of kilograms, pounds, or percentage. The body water percent is defined as the individual's body water, in kilograms or pounds, divided by the individual's weight, in kilograms or pounds, as shown in Equation (2).

$$\text{Body water} = \frac{\text{body water}}{\text{body weight}} \times 100 \qquad (2)$$

5.9 Basal metabolic rate

Basal metabolic rate is the calculated amount of energy that the body consumes to maintain basic essential functions per unit of time. It has a unit of kilojoules per day.

5.10 Bioimpedance analysis method

Bioimpedance is defined as the ability of body tissue to impede electric current. Measurement of bioimpedance is obtained from the whole body or multiple body segments. Body composition status can be derived by assessing the bioimpedance measurements. Various analysis methods are used by the devices in the market. Typical choices are single-frequency bioimpedance analysis (SF-BIA), multiple-frequency bioimpedance analysis (MF-BIA), bioimpedance spectroscopy (BIS), and bioimpedance vector analysis (BIVA) method (see Sami et al. [B9]). The most used frequency of SF-BIA is 50 kHz. When taking segment-based measurements, a body segmentation model shall be employed. A popular choice for this measurement is the five-cylinder model (trunk, left and right upper extremity, left and right lower extremity). Knowing the underlying bioimpedance analysis method may help the body composition analyzer user and service provider to better understand the data produced by this device.

5.11 Body muscle

Body muscle is the amount of the muscles in the body. Body muscles include smooth muscles, skeletal muscles, and cardiac muscles. It has units of kilograms, pounds, or percentage. When using percentage, the body muscle is defined as the individual's muscle mass, in kilograms or pounds, divided by the individual's weight, in kilograms or pounds, as shown in Equation (3).

$$\text{Muscle percentage} = \frac{\text{muscle mass}}{\text{body weight}} \times 100 \qquad\qquad (3)$$

6. Body composition analyzer DIM

6.1 Overview

This clause describes the DIM of the body composition analyzer.

6.2 Class extensions

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

6.3 Object instance diagram

The object instance diagram of the body composition analyzer DIM, defined for the purposes of this standard, is shown in Figure 1.

The objects of the DIM, as shown in Figure 1, are described in 6.5 to 6.10. This includes the medical device system (MDS) object (see 6.5), the numeric objects (see 6.6), the RT-SA objects (see 6.7), the enumeration objects (see 6.8), the PM-store objects (see 6.9), and the scanner objects (see 6.10). See 6.11 for rules for extending the body composition analyzer information model beyond elements as described in this standard. Each clause that describes an object of the body composition analyzer contains the following information:

— The nomenclature code used to identify the class of the object. One example where this code is used is the configuration event, where the object class is reported for each object. This allows the manager to determine whether the class of the object being specified is a numeric, real-time sample array, enumeration, scanner, or PM-store class.

— The attributes of the object. Each object has attributes that represent and convey information on the physical device and its data sources. Each object has a Handle attribute that identifies the object instance within an agent. Attribute values are accessed and modified using methods such as GET and SET. Attribute types are defined using ASN.1 [B8]. The ASN.1 definitions for new attribute types specific to this standard are in Annex B, and the ASN.1 definitions for existing attribute types referenced in this standard are in IEEE Std 11073-20601.

— The methods available on the object.

— The potential events generated by the object. Data are sent to the manager using events.

— The available services such as getting or setting attributes.

The attributes for each class are defined in tables that specify the name of the attribute, its value, and its qualifier. The qualifiers mean M—Attribute is Mandatory, C—Attribute is Conditional and depends on the condition stated in the Remark or Value column (if IEEE Std 11073-20601 is referenced, then it contains the conditions), R—Attribute is Recommended, NR—Attribute is Not Recommended, and O—Attribute is Optional. Mandatory attributes shall be implemented by an agent. Conditional attributes shall be implemented if the condition applies and may be implemented otherwise. Recommended attributes should be implemented by the agent. Not recommended attributes should not be implemented by the agent. Optional attributes may be implemented by the agent. If any attribute (from the DIM of IEEE Std 11073-20601) is not included in the definition of that object in this standard, it shall not be included in that object by an implementation, unless it is a vendor-specific attribute extended according to 6.12.
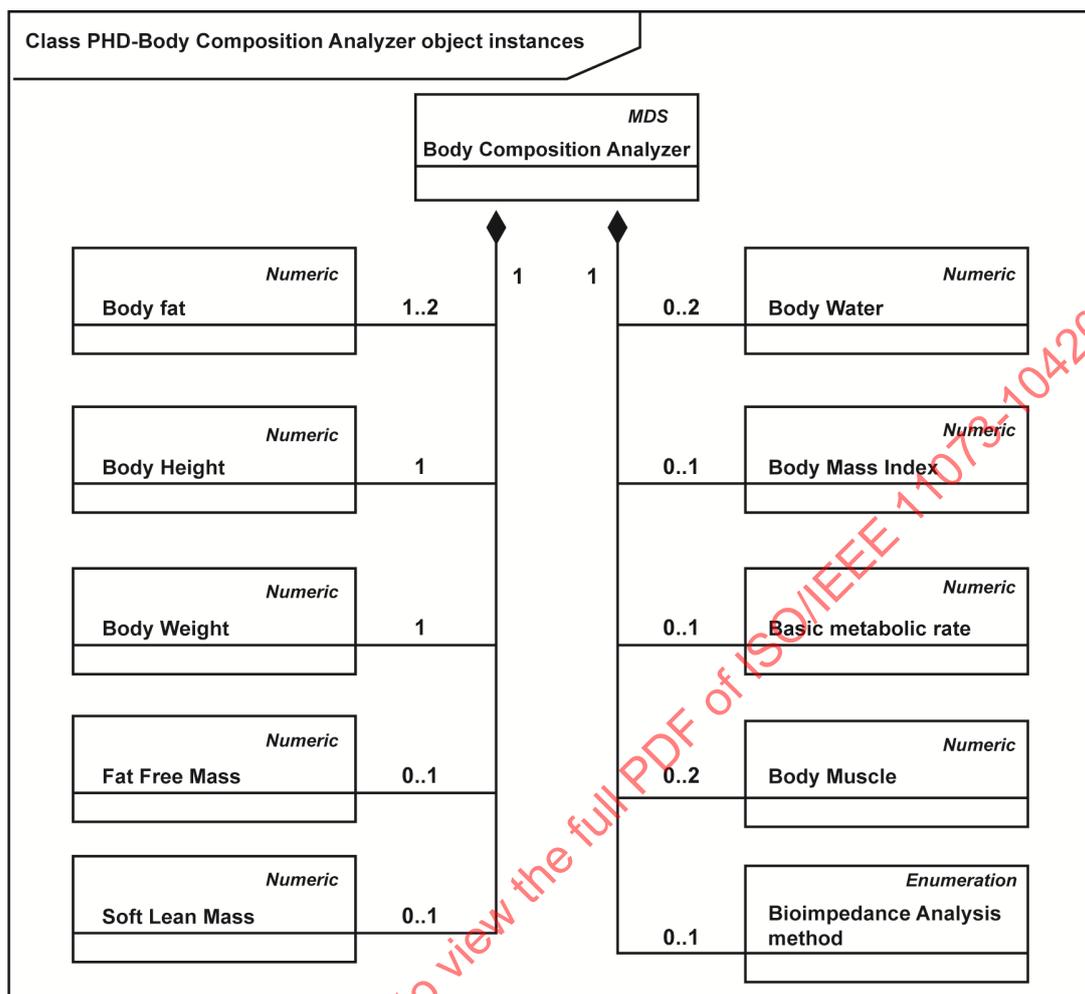
Figure 1—Body composition analyzer DIM

6.4 Types of configuration

6.4.1 General

As specified in IEEE Std 11073-20601, there are two styles of configuration available. Subclauses 6.4.2 and 6.4.3 briefly introduce standard and extended configurations.

6.4.2 Standard configuration

Standard configurations are defined in the IEEE Std 11073-104zz specializations (such as this standard) and are assigned a well-known identifier (Dev-Configuration-Id). The usage of a standard configuration is negotiated at association time between the agent and manager. If the manager recognizes and selects to operate using the configuration, then the agent can send measurements immediately. If the manager does not recognize the configuration, the agent provides the configuration prior to transmitting measurement information.

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This standard contains two standard configurations: Dev-Configuration-Id=0x07D0 is for an agent using absolute time, and Dev-Configuration-Id=0x07D1 is for an agent using base-offset-time.

6.4.3 Extended configuration

In extended configurations, the agent's configuration is not predefined in a standard. The agent determines the objects, attributes, and values that will be used in a configuration and assigns a configuration identifier. When the agent associates with a manager, an acceptable configuration is negotiated. Typically, the manager does not recognize the agent's configuration on the first connection, so the manager responds that the agent needs to send its configuration information as a configuration event report. If, however, the manager recognizes the configuration, either because it was preloaded in some way or the agent had previously associated with the manager, then the manager responds that the configuration is known and no further configuration information needs to be sent.

6.5 Medical device system (MDS) object

6.5.1 MDS object attributes

Table 1 summarizes the attributes of the body composition analyzer MDS object. The nomenclature RefID to identify the MDS class is MDC_MOC_VMS_MDS_SIMP.

Table 1—MDS object attributes

Attribute name	Value	Qualifier		
		Extended configuration	Standard configuration (Dev-Configuration-Id=0x07D0)	Standard configuration (Dev-Configuration-Id=0x07D1)
Handle	0	M	M	M
System-Type	Attribute not present. See IEEE Std 11073-20601.	C	C	C
System-Type-Spec-List	{MDC_DEV_SPEC_PROFILE_BCA, 2}	M	M	M
System-Model	{"Manufacturer", "Model"}	M	M	M
System-Id	Extended unique identifier (64-bits) (EUI-64)	M	M	M
Dev-Configuration-Id	Standard config: 0x07D0 (2000) Standard config: 0x07D1 (2001) Extended configs: 0x4000-0x7FFF	M	M	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C	C	C
Production-Specification	See IEEE Std 11073-20601.	O	O	O
Mds-Time-Info	See IEEE Std 11073-20601.	C	M	M
Date-and-Time	See IEEE Std 11073-20601.	C	R	NR
Base-Offset-Time	See IEEE Std 11073-20601.	C	NR	C
Relative-Time	See IEEE Std 11073-20601.	C	NR	NR
HiRes-Relative-Time	See IEEE Std 11073-20601.	C	NR	NR

Table 1—MDS object attributes *(continued)*

Attribute name	Value	Qualifier		
		Extended configuration	Standard configuration (Dev-Configuration-Id=0x07D0)	Standard configuration (Dev-Configuration-Id=0x07D1)
Date-and-Time-Adjustment	See IEEE Std 11073-20601.	C	C	C
Power-Status	*onBattery* or *onMains*	R	R	R
Battery-Level	See IEEE Std 11073-20601.	R	R	R
Remaining-Battery-Time	See IEEE Std 11073-20601.	R	R	R
Reg-Cert-Data-List	See IEEE Std 11073-20601.	O	O	O
Confirm-Timeout	See IEEE Std 11073-20601.	O	O	O
NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.				

In the response to a Get MDS Object command, only implemented attributes and their corresponding values are returned.

See IEEE Std 11073-20601 for descriptive explanations of the individual attributes as well as for information on attribute id and attribute type.

The Dev-Configuration-Id attribute holds a locally unique 16-bit identifier that identifies the device configuration. For a body composition analyzer agent with extended configuration, this identifier is chosen in the range of extended-config-start to extended-config-end (see IEEE Std 11073-20601) as shown in Table 1.

The agent sends the Dev-Configuration-Id during the Associating state (see 8.3) to identify its configuration for the duration of the association. If the manager already holds the configuration information relating to the Dev-Configuration-Id, it recognizes the Dev-Configuration-Id and the Configuring state (see 8.4) is skipped; the agent and manager then enter the Operating state. If the manager does not recognize the Dev-Configuration-Id, the agent and manager enter the Configuring state.

If an agent implements multiple IEEE Std 11073-104zz specializations, System-Type-Spec-List is a list of type/version pairs, each referencing the respective device specialization and version of that specialization.

6.5.2 MDS object methods

Table 2 defines the methods (actions) of the MDS object. These methods are invoked using the Action service. In Table 2, the "Subservice type name" column defines the name of the method; the "Mode" column defines whether the method is invoked as an unconfirmed action (i.e., roiv-cmip-action from IEEE Std 11073-20601) or a confirmed action (i.e., roiv-cmip-confirmed-action); the "Subservice type (action-type)" column defines the nomenclature code to use in the action-type field of an action request and response (see IEEE Std 11073-20601); the "Parameters (action-info-args)" column defines the associated ASN.1 data structure (see IEEE Std 11073-20601 for ASN.1 definitions) to use in the action message for the action-info-args field of the request; and the "Results (action-info-args)" column defines the structure to use in the action-info-args of the response.

Table 2—MDS object methods

Service	Subservice type name	Mode	Subservice type (action-type)	Parameters (action-info-args)	Results (action-info-args)
ACTION	Set-Time	Confirmed	MDC_ACT_SET_TIME	SetTimeInvoke	—
	Set-Base-Offset-Time	Confirmed	MDC_ACT_SET_BO_TIME	SetBOTimeInvoke	—
	MDS-Data-Request	Confirmed	MDC_ACT_DATA_REQUEST	DataRequest	DataResponse

— **Set-Time:**
This method allows the manager to set a real-time clock in the agent with the absolute time. The agent indicates whether the Set-Time command is valid using the mds-time-capab-set-clock bit in the Mds-Time-Info attribute (see IEEE Std 11073-20601). Agents with an internal real-time clock shall indicate this capability by also setting the mds-time-capab-real-time-clock bit in the Mds-Time-Info attribute.

The Set-Time method can be supported only if the Absolute-Time-Stamp attribute is supported.

— **Set-Base-Offset-Time:**
This method allows the manager to set a real-time clock in the agent with the base time and offset. The agent indicates whether the Set-Base-Offset-Time command is valid using the mds-time-capab-set-clock bit in the Mds-Time-Info attribute (see IEEE Std 11073-20601).

The Set-Base-Offset-Time method can be supported only if the Base-Offset-Time-Stamp attribute is supported.

— **MDS-Data-Request:**
This method allows the manager system to request measurement data from the agent. This method may be supported.

Agents following only this device specialization and no others shall send event reports (see 6.5.3) using agent-initiated measurement data transmission. Agents following this device specialization as well as others shall send event reports in the appropriate fashion. During the association procedure (see 8.3), data-req-mode-capab shall be set to the appropriate value for the event report style. Implementation of the MDS-Data-Request method/action is not required in this standard and is not shown in Table 2.

6.5.3 MDS object events

Table 3 defines the events that can be sent by the body composition analyzer MDS object.

Table 3—Body composition analyzer MDS object events

Service	Subservice type name	Mode	Subservice type (event-type)	Parameters (event-info)	Results (event-reply-info)
EVENT REPORT	MDS-Configuration-Event	Confirmed	MDC_NOTI_CONFIG	ConfigReport	ConfigReportRsp
	MDS-Dynamic-Data-Update-Var	Confirmed	MDC_NOTI_SCAN_REPORT_VAR	ScanReportInfoVar	—
	MDS-Dynamic-Data-Update-Fixed	Confirmed	MDC_NOTI_SCAN_REPORT_FIXED	ScanReportInfoFixed	—
	MDS-Dynamic-Data-Update-MP-Var	Confirmed	MDC_NOTI_SCAN_REPORT_MP_VAR	ScanReportInfoMPVar	—
	MDS-Dynamic-Data-Update-MP-Fixed	Confirmed	MDC_NOTI_SCAN_REPORT_MP_FIXED	ScanReportInfoMPFixed	—

— **MDS-Configuration-Event:**
This event is sent by the body composition analyzer agent during the configuring procedure if the manager does not already know the body composition analyzer agent's configuration from past associations or because the manager has not been implemented to recognize the configuration according to the body composition analyzer specialization. The event provides static information about the supported measurement capabilities of the body composition analyzer agent.

— **MDS-Dynamic-Data-Update-Var:**
This event provides dynamic measurement data from the body composition analyzer agent for the body fat, body height, body weight and optionally body mass index, fat free mass, soft lean mass, body water, basal metabolic rate, and body muscle numeric objects. These data are reported using a generic attribute list variable format. The event is sent as an unsolicited message by the agent (i.e., an agent-initiated measurement data transmission). See 8.5.3 for more information on unsolicited event reporting.

— **MDS-Dynamic-Data-Update-Fixed:**
This event provides dynamic measurement data from the body composition analyzer agent for the body fat, body height, body weight and optionally body mass index, fat free mass, soft lean mass, body water, basal metabolic rate, and body muscle numeric object. These data are reported in the fixed format defined by the Attribute-Value-Map attribute of the object. The event is sent as an unsolicited message by the agent (i.e., an agent-initiated measurement data transmission). See 8.5.3 for more information on unsolicited event reporting.

— **MDS-Dynamic-Data-Update-MP-Var:**
This is the same as MDS-Dynamic-Data-Update-Var, but allows inclusion of data from multiple people.

— **MDS-Dynamic-Data-Update-MP-Fixed:**
This is the same as MDS-Dynamic-Data-Update-Fixed, but allows inclusion of data from multiple people.

NOTE—IEEE Std 11073-20601 requires that managers support all of the MDS Object Events listed above.

6.5.4 Other MDS services

6.5.4.1 GET service

A body composition analyzer agent shall support the GET service, which is provided by the MDS object to retrieve the values of all implemented MDS object attributes. The GET service can be invoked only after the manager has confirmed selection of the agent's configuration.

The manager may request the MDS object attributes of the body composition analyzer agent in which case the manager shall send the "Remote Operation Invoke | Get" message (see roiv-cmip-get in IEEE Std 11073-20601) with the reserved MDS handle value of 0. The body composition analyzer agent shall report its MDS object attributes to the manager using the "Remote Operation Response | Get" message (see rors-cmip-get in IEEE Std 11073-20601). See Table 4 for a summary of the GET service including some message fields.

Table 4—Body composition analyzer MDS object GET service

Service	Subservice type name	Mode	Subservice type	Parameters	Results
GET	<na>	<implied confirmed>	<na>	GetArgumentSimple = (obj-handle = 0), attribute-id-list <*optional*>	GetResultSimple = (obj-handle = 0), attribute-list

See 8.5.2 for details on the procedure for getting the MDS object attributes.

6.5.4.2 SET service

The body composition analyzer specialization does not require an implementation to support the MDS object SET service.

6.6 Numeric objects

6.6.1 General

The body composition analyzer DIM (see Figure 1) contains three mandatory objects (body fat, body height, and body weight) and six optional numeric objects (body mass index, fat free mass, soft lean mass, body water, basal metabolic rate, and body muscle). These are described in 6.6.2 through 6.6.10.

Sometimes, the interpretation of one attribute value in an object depends on other attribute values in the same object. For example, Unit-Code and Unit-LabelString provide context for the observed values. Whenever a contextual attribute changes, the agent shall report these changes to the manager using an MDS object event (see 6.5.3) prior to reporting any of the dependent values.

6.6.2 Body fat

Table 5 summarizes the attributes of the body fat numeric object. The nomenclature RefID to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The body fat numeric object shall be supported by a body composition analyzer agent. The agent is also allowed to report two body fat objects, one in percentage and the other in kilograms or pounds.

For a body composition analyzer agent with a standard configuration, the AttrValMap structure (see IEEE Std 11073-20601) of the Attribute-Value-Map attribute shall contain the attribute id and attribute

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length information of the Simple-Nu-Observed-Value and Absolute-Time-Stamp (or Base-Offset-Time-Stamp) attribute in the same order as indicated in Table 5.

The body fat numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as for information on attribute id and attribute type.

6.6.3 Body height

Table 6 summarizes the attributes of the body height numeric object in the standard configurations. The nomenclature RefID to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The body height numeric object shall be supported by a body composition analyzer agent.

The body height numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

6.6.4 Body weight

Table 7 summarizes the attributes of the body weight numeric object. The body weight numeric object shall be supported by a body composition analyzer agent.

Table 5—Body fat numeric object attributes

Attribute name	Extended configuration Value	Qual.	Standard configuration (Dev-Configuration-Id = 0x07D0) Value	Qual.	Standard configuration (Dev-Configuration-Id = 0x07D1) Value	Qual.
Handle	See IEEE Std 11073-20601.	M	3	M	3	M
Type	MDC_PART_SCADA | MDC_BODY_FAT	M	MDC_PART_SCADA | MDC_BODY_FAT	M	MDC_PART_SCADA | MDC_BODY_FAT	M
Supplemental-Types	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Spec-Small	See IEEE Std 11073-20601.	M	mss-avail-intermittent, mss-avail-stored-data, mss-upd-aperiodic, mss-msmt-aperiodic, mss-acc-agent-initiated, mss-cat-calculation	M	mss-avail-intermittent, mss-avail-stored-data, mss-upd-aperiodic, mss-msmt-aperiodic, mss-acc-agent-initiated, mss-cat-calculation	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, its value shall be {ms-struct-simple, 0}.	NR	Attribute not initially present. If present, its value shall be {ms-struct-simple, 0}.	NR
Measurement-Status	See IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Metric-Id	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_PERCENT or MDC_DIM_KILO_G or MDC_DIM_LB	M	MDC_DIM_PERCENT	M	MDC_DIM_PERCENT	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C	MDC_ATTR_NU_VAL_OBS_SIMP, then MDC_ATTR_TIME_STAMP_ABS	M	MDC_ATTR_NU_VAL_OBS_SIMP, then MDC_ATTR_TIME_STAMP_BO	M
Source-Handle-Reference	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR

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Table 5—Body fat numeric object attributes *(continued)*

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Label-String	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C	If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Measure-Active-Period	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C	See IEEE Std 11073-20601. If fixed format is used and the standard configuration is unchanged, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C	See IEEE Std 11073-20601. If fixed format is used and the standard configuration is unchanged, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C

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Table 5—Body fat numeric object attributes *(continued)*

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	R

NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.

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Table 6—Body height numeric object attributes

Attribute name	Extended configuration Value	Qual.	Standard configuration (Dev-Configuration-Id = 0x07D0) Value	Qual.	Standard configuration (Dev-Configuration-Id = 0x07D1) Value	Qual.
Handle	2	M	2	M	2	M
Type	MDC_PART_SCADA | MDC_LEN_BODY_ACTUAL	M	MDC_PART_SCADA | MDC_LEN_BODY_ACTUAL	M	MDC_PART_SCADA | MDC_LEN_BODY_ACTUAL	M
Supplemental-Types	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Spec-Small	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cat-manual | mss-acc-manager-initiated.	M	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cat-manual	M	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cat-manual	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Metric-Id	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_CENTI_M or MDC_DIM_INCH	M	MDC_DIM_CENTI_M or MDC_DIM_INCH	M	MDC_DIM_CENTI_M or MDC_DIM_INCH	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C	MDC_ATTR_NU_VAL_OBS_SIMP, then MDC_ATTR_TIME_STAMP_ABS	M	MDC_ATTR_NU_VAL_OBS_SIMP, then MDC_ATTR_TIME_STAMP_BO	M

Table 6—Body height numeric object attributes *(continued)*

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Source-Handle-Reference	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Label-String	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Measure-Active-Period	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C	If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C	If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C

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Table 6—Body height numeric object attributes *(continued)*

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	R

NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.

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Table 7—Body weight numeric object attributes

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Handle	See IEEE Std 11073-20601.	M	1	M	1	M
Type	MDC_PART_SCADA | MDC_MASS_BODY_ACTUAL	M	MDC_PART_SCADA | MDC_MASS_BODY_ACTUAL	M	MDC_PART_SCADA | MDC_MASS_BODY_ACTUAL	M
Supplemental-Types	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Spec-Small	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cast-manual | mss-acc-manager-initiated	M	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cast-manual	M	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cast-manual	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Metric-Id	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_KILO_G or MDC_DIM_LB	M	MDC_DIM_KILO_G	M	MDC_DIM_KILO_G	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C	MDC_ATTR_NU_VAL_OBS_SIMP, then MDC_ATTR_TIME_STAMP_ABS	M	MDC_ATTR_NU_VAL_OBS_SIMP, then MDC_ATTR_TIME_STAMP_BO	M
Source-Handle-Reference	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR

Table 7—Body weight numeric object attributes *(continued)*

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Label-String	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O	Attribute not initially present. If present, follow IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601. If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601. If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Measure-Active-Period	See IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR	Attribute not initially present. If present, follow IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601. If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601. If fixed format is used and the standard configuration is not adjusted, this attribute is mandatory; otherwise, the conditions from IEEE Std 11073-20601 apply.	C

Table 7—Body weight numeric object attributes *(continued)*

Attribute name	Extended configuration		Standard configuration (Dev-Configuration-Id = 0x07D0)		Standard configuration (Dev-Configuration-Id = 0x07D1)	
	Value	Qual.	Value	Qual.	Value	Qual.
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C	Attribute not initially present. If present, follow IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	R	Attribute not initially present. If present, follow IEEE Std 11073-20601.	R

6.6.5 Body mass index

Table 8 summarizes the attributes of the body mass index numeric object. This object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations.

Table 8—Body mass index numeric object attributes

Attribute name	Extended configuration	
	Value	Qual.
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_RATIO_MASS_BODY_LEN_SQ	M
Supplemental-Types	See IEEE Std 11073-20601.	NR
Metric-Spec-Small	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-msmt-aperiodic | mss-acc-agent-initiated | mss-cat-calculation	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	R
Metric-Id	See IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_KILO_G_PER_M_SQ	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	This attribute shall not be present if Source-Handle-Reference-List is present. If present, the value of this attribute shall be set to the Handle value of the associated body weight object. This attribute shall be present if the manager-selected version of protocol doesn't support the Source-Handle-Reference-List. See IEEE Std 11073-20601.	C
Source-Handle-Reference-List	The value of this attribute shall be set to the Handle values of the associated body weight object and body height object. If this attribute is used, the Source-Handle-Reference shall not be present. See IEEE Std 11073-20601.	R
Label-String	See IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	R
Relative-Time-Stamp	See IEEE Std 11073-20601.	NR
HiRes-Time-Stamp	See IEEE Std 11073-20601.	NR
Measure-Active-Period	See IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	NR
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	NR
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	NR
Accuracy	See IEEE Std 11073-20601.	R

The body mass index numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

6.6.6 Fat free mass

Table 9 summarizes the attributes of the fat free mass numeric object. The nomenclature code to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The fat free mass numeric object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations.

Table 9—Fat free mass numeric object attributes

Attribute name	Extended configuration	
	Value	Qual
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_MASS_BODY_FAT_FREE	M
Supplemental-Types	See IEEE Std 11073-20601.	NR
Metric-Spec-Small	See IEEE Std 11073-20601.	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	R
Metric-Id	See IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_KILO_G or MDC_DIM_LB	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	See IEEE Std 11073-20601.	NR
Label-String	See IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C
Measure-Active-Period	See IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R
NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.		

The fat free mass numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

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6.6.7 Soft lean mass

Table 10 summarizes the attributes of the soft lean mass numeric object. The nomenclature code to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The soft lean mass numeric object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations.

Table 10 —Soft lean mass numeric object attributes

Attribute name	Extended configuration	
	Value	Qual.
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_MASS_BODY_SOFT_LEAN	M
Supplemental-Types	See IEEE Std 11073-20601.	NR
Metric-Spec-Small	See IEEE Std 11073-20601.	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	R
Metric-Id	See IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_KILO_G or MDC_DIM_LB	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	See IEEE Std 11073-20601.	NR
Label-String	See IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C
Measure-Active-Period	See IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R
NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.		

The soft lean mass numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

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6.6.8 Body water

Table 11 summarizes the attributes of the body water numeric object. The nomenclature code to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The body water numeric object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations. The agent is allowed to report two body water objects, one in kilograms or pounds and the other in percentage.

Table 11 —Body water numeric object attributes

Attribute name	Extended configuration	
	Value	**Qual.**
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_BODY_WATER	M
Supplemental-Types	See IEEE Std 11073-20601.	NR
Metric-Spec-Small	See IEEE Std 11073-20601.	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	R
Metric-Id	See IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_KILO_G or MDC_DIM_LB or MDC_DIM_PERCENT	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	See IEEE Std 11073-20601.	NR
Label-String	See IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C
Measure-Active-Period	See IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R
NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.		

The body water numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

6.6.9 Basal metabolic rate

Table 12 summarizes the attributes of the basal metabolic rate numeric object. The nomenclature code to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The basal metabolic rate numeric object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations.

Table 12 —Basal metabolic rate numeric object attributes

Attribute name	Extended configuration	
	Value	**Qual.**
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_BODY_BASAL_METABOLIC_RATE_CALC	M
Supplemental-Types	See IEEE Std 11073-20601.	NR
Metric-Spec-Small	See IEEE Std 11073-20601.	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	R
Metric-Id	See IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_KILO_JOULES_PER_DAY	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	See IEEE Std 11073-20601.	NR
Label-String	See IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C
Measure-Active-Period	See IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R
NOTE— See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.		

The basal metabolic rate numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

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6.6.10 Body muscle

Table 13 summarizes the attributes of the body muscle numeric object. The nomenclature code to identify the numeric class is MDC_MOC_VMO_METRIC_NU. The body muscle numeric object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations. The agent is also allowed to report two body muscle objects, one in percentage and the other in kilograms or pounds.

Table 13 —Body muscle numeric object attributes

Attribute name	Extended configuration	
	Value	Qual.
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_BODY_MUSCLE	M
Supplemental-Types	See IEEE Std 11073-20601.	NR
Metric-Spec-Small	See IEEE Std 11073-20601.	M
Metric-Structure-Small	See IEEE Std 11073-20601.	NR
Measurement-Status	See IEEE Std 11073-20601.	R
Metric-Id	See IEEE Std 11073-20601.	NR
Metric-Id-List	See IEEE Std 11073-20601.	NR
Metric-Id-Partition	See IEEE Std 11073-20601.	NR
Unit-Code	MDC_DIM_PERCENT or MDC_DIM_KILO_G or MDC_DIM_LB	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	See IEEE Std 11073-20601.	NR
Label-String	See IEEE Std 11073-20601.	O
Unit-LabelString	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	C
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	C
Relative-Time-Stamp	See IEEE Std 11073-20601.	C
HiRes-Time-Stamp	See IEEE Std 11073-20601.	C
Measure-Active-Period	See IEEE Std 11073-20601.	NR
Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Simple-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Basic-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Compound-Nu-Observed-Value	See IEEE Std 11073-20601.	C
Accuracy	See IEEE Std 11073-20601.	R
NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.		

The body muscle numeric object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

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6.7 Real-time sample array objects

Real-time sample array objects are not required by this standard.

6.8 Enumeration objects

6.8.1 General

The enumeration objects listed in this clause represent the enumeration observations that can be produced by a body composition analyzer agent. The nomenclature RefID to identify an enumeration object class is MDC_MOC_VMO_METRIC_ENUM.

6.8.2 Bioimpedance analysis method

Table 14 summarizes the attributes of the bioimpedance analysis method enumeration object. This object may be supported by a body composition analyzer agent with extended configuration and shall not be present in the standard configurations.

Table 14—Bioimpedance enumeration object attributes

Attribute name	Extended configuration	
	Value	Qual.
Handle	See IEEE Std 11073-20601.	M
Type	MDC_PART_SCADA | MDC_BIA_METHOD	M
Supplemental-Types	Attribute not initially present. If present, follow IEEE Std 11073-20601. If present, can be one of the following nomenclatures representing the measurement model: MDC_BIA_MDL_WHOLE_BODY MDC_BIA_MDL_5CYL_TLREXT	O
Metric-Spec-Small	mss-avail-intermittent | mss-avail-stored-data | mss-upd-aperiodic | mss-acc-agent-initiated | mss-acc-manager-initiated | mss-cat-setting	M
Attribute-Value-Map	See IEEE Std 11073-20601.	C
Source-Handle-Reference	See IEEE Std 11073-20601.	O
Absolute-Time-Stamp	See IEEE Std 11073-20601.	NR
Base-Offset-Time-Stamp	See IEEE Std 11073-20601.	NR
Relative-Time-Stamp	See IEEE Std 11073-20601.	NR
HiRes-Time-Stamp	See IEEE Std 11073-20601.	NR
Enum-Observed-Value-Simple-OID	Can either be a vender-defined nomenclature or one of the following nomenclatures representing the analysis method: MDC_BIA_MTD_SINGLE_FREQ MDC_BIA_MTD_MULTI_FREQ MDC_BIA_MTD_SPECTROSCOPY MDC_BIA_MTD_VECTOR	M
Enum-Observed-Value-Partition	See IEEE Std 11073-20601.	O
NOTE—See IEEE Std 11073-20601 for information on whether an attribute is static or dynamic.		

The bioimpedance analysis method enumeration object does not support any methods, events, or other services.

See IEEE Std 11073-20601 for descriptive explanations on the individual attributes as well as information on attribute id and attribute type.

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6.9 PM-store objects

PM-store objects are not required by this standard.

6.10 Scanner objects

Scanner objects are not required by this standard.

6.11 Class extension objects

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

6.12 Body composition analyzer DIM extensibility rules

The body composition analyzer DIM of this standard may be extended by including vendor-specific metrics and attributes as required. For example, a vendor might require including a body fat mass, intracellular water, extracellular water, etc. Any object or attribute extensions implemented should follow the guidelines of this standard as closely as possible. Such vendor-specific attributes shall be identified by assigning nomenclature codes from the private numbering space (0xF000–0xFFFF) within the corresponding partition as defined in IEEE Std 11073-20601.

A body composition analyzer agent having a configuration with extensions beyond the standard configurations, as specified in this standard, shall use a configuration ID in the range of IDs reserved for extended configurations (see IEEE Std 11073-20601).

7. Body composition analyzer service model

7.1 General

The service model defines the conceptual mechanisms for data exchange services. These services are mapped to messages that are exchanged between the agent and manager. Protocol messages within the ISO/IEEE 11073 series of standards are defined in ASN.1 [B8]. See IEEE Std 11073-20601 for a detailed description of the personal health device service model. Subclauses 7.2 and 7.3 define the specifics of object access and event reporting services for a body composition analyzer agent according to this standard.

7.2 Object access services

The object access services of IEEE Std 11073-20601 are used to access the objects defined in the DIM of the body composition analyzer.

The following generic object access services are supported by a body composition analyzer agent according to this standard:

— **GET service:** Used by the manager to retrieve the values of the agent MDS object attributes. The list of body composition analyzer MDS object attributes is given in 6.5.4.1.

— **SET service:** Used by the manager to set the values of the agent object attributes. There are no settable attributes defined for a body composition analyzer agent according to this standard.

— **Event report service:** Used by the agent to send configuration reports and measurement data to the manager. The list of event reports for the body composition analyzer specialization is given in 0.

— **Action service:** Used by the manager to invoke actions (or methods) supported by the agent. An example is Set-Time action, which is used to set a real-time clock with the absolute time at the agent. The MDS-Data-Request method may be supported.

Table 15 summarizes the object access services described in this standard.

7.3 Object access event report services

The event report service (see Table 15) is used by the agent to report its information (e.g., measurements). Event reports in this standard are a property of the MDS object only. The event reports used in this standard are defined in IEEE Std 11073-20601.

The following conditions apply for a body composition analyzer agent according to this standard:

— Event reports shall be used in confirmed mode

— Agent-initiated mode shall be supported for measurement data transmission

A body composition analyzer agent, which is designed to operate in an environment where data may be collected from multiple people, may use one of the multi-person event report styles to transmit all the data from each person in a single event. If this functionality is not required, the agent may use the single-person event report styles, which have reduced overhead.

A manager shall support both single-person and multi-person event reports. A body composition analyzer agent may support either one or both single-person and multi-person event reports. The formats for single- and multiple-person reports are described in IEEE Std 11073-20601.

Table 15—Body composition analyzer object access services

Service	Subservice type name	Mode	Subservice type	Parameters	Result	Remarks
GET	<na>	<implied Confirmed>	<na>	GetArgumentSimple = (obj-handle = 0), attribute-id-list <optional>	GetResultSimple = (obj-handle = 0), attribute-list	Allows the manager to retrieve the value of an attribute of an object in the agent.
EVENT REPORT	MDS-Configuration-Event	Confirmed	MDC_NOTI_CONFIG	ConfigReport	ConfigReportRsp	Configuration Report to inform manager of the configuration of the agent.
	MDS-Scan-Report-Var	Confirmed	MDC_NOTI_SCAN_REPORT_VAR	ScanReportInfoVar	—	Data Report to provide dynamic data to manager for some or all of the agent's objects in variable format.
	MDS-Scan-Report-Fixed	Confirmed	MDC_NOTI_SCAN_REPORT_FIXED	ScanReportInfoFixed	—	Data Report to provide dynamic data to manager for some or all of the agent's objects in fixed format.
	MDS-Scan-Report MP-Var	Confirmed	MDC_NOTI_SCAN_REPORT_MP_VAR	ScanReportInfoMPVar	—	This is the same as MDS-Dynamic-Data-Update-Var, but allows inclusion of data from multiple people.
	MDS-Scan-Report-MP-Fixed	Confirmed	MDC_NOTI_SCAN_REPORT_MP_FIXED	ScanReportInfoMPFixed	—	This is the same as MDS-Dynamic-Data-Update-Fixed, but allows inclusion of data from multiple people.
ACTION	Set-Time	Confirmed	MDC_ACT_SET_TIME	SetTimeInvoke	—	Manager method to invoke the agent to set time to requested value.
	Set-Base-Offset-Time	Confirmed	MDC_ACT_SET_BO_TIME	SetBOTimeInvoke	—	Manager method to invoke the agent to set time to requested value.
	MDS-Data-Request	Confirmed	MDC_ACT_DATA_REQUEST	DataRequest	DataResponse	Manager method to invoke the agent to request measurement data.

8. Body composition analyzer communication model

8.1 Overview

The following clauses describe the general communication model and procedures of the body composition analyzer agent as defined in IEEE Std 11073-20601. Therefore, the respective parts of IEEE Std 11073-20601 are not reproduced; rather the specific choices and restrictions with respect to optional elements (e.g., objects, attributes, and actions) and specific extensions (e.g., nomenclature terms) are specified.

For an illustrative overview of the various message transactions during a typical measurement session, see the sequence diagram for the example use case in Annex D and the corresponding protocol data unit (PDU) examples in Annex E.

8.2 Communications characteristics

In this subclause, limits on the size of an application protocol data unit (APDU) transmitted or to be received by a body composition analyzer agent are defined. Small limits allow for simple implementations in terms of low cost and complexity.

A body composition analyzer agent implementing only this device specialization shall not transmit any APDU larger than N_{tx} and shall be capable of receiving any APDU up to a size of N_{rx}. For this standard, N_{tx} shall be 7730 octets and N_{rx} shall be 1230 octets.

For a body composition analyzer agent implementing functions from other device specializations, an upper bound estimation of the APDU sizes brings the following: an agent shall not transmit any APDU larger than the sum of N_{tx} of all the device specializations implemented and shall be capable of receiving any APDU up to the sum of N_{rx} of all the device specializations implemented. If these numbers are higher than the maximum size determined in IEEE Std 11073-20601, the latter shall be applied.

In case the APDU size limit does not allow for the inclusion of a certain amount of multiple pending measurements at the agent, they shall be sent using multiple event reports. See 8.5.3 for the maximum number of measurements allowed for inclusion in a single event report.

8.3 Association procedure

8.3.1 General

Unless otherwise stated, the association procedure for a body composition analyzer agent and manager according to this standard shall be pursued as specified in IEEE Std 11073-20601.

Table 16 lists the valid combinations of protocol version and nomenclature version. In the association procedure, an agent indicating support to a specific protocol version shall indicate support to the corresponding nomenclature version as well. In the association procedure, a manager selecting a specific protocol version shall select the corresponding nomenclature version.

To indicate support for multiple protocol versions, the bit values are combined. For example, if the agent supports protocol-version2, protocol-version3, and protocol-version4, it shall use protocol version bits 0x70000000 and nomenclature-version bits 0xE0000000.

Further valid combinations from future versions of this specification may be used by implementations that comply with those future versions.

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Table 16 —Valid combinations of protocol and nomenclature version

Protocol version	Bit value	Corresponding nomenclature version	Bit value
1	0x80000000	1	0x80000000
2	0x40000000	1	0x80000000
3	0x20000000	2	0x40000000
4	0x10000000	3	0x20000000

8.3.2 Agent procedure—association request

In the association request sent by the agent to the manager:

a) The version of the association procedure used by the agent shall be set to assoc-version1 (i.e., *assoc-version* = 0x80000000).

b) The DataProtoList structure element of the data protocol identifier shall be set to data-proto-id-20601 (i.e., *data-proto-id* = 0x5079).

c) The *data-proto-info* field shall contain a PhdAssociationInformation structure which shall contain the following parameter values:

1) The version of the data exchange protocol shall be set to protocol-version4 (i.e., *protocol-version* = 0x10000000). Support for any other version may be indicated by setting additional bits. When protocols lower than protocol-version4 are used, the agent shall use only features in that protocol.

2) At least the MDER encoding rules shall be supported (i.e., *encoding-rules* = 0x8000).

3) The protocol version bits and nomenclature version bits shall consist of valid combinations of bits as defined in Table 16.

4) The *functional-units* field may have the test association bits set but shall not have any other bits set.

5) The *system-type* field shall be set to sys-type-agent (i.e., *system-type* = 0x00800000).

6) The *system-id* field shall be set to the value of the System-Id attribute of the MDS object of the agent. The manager may use this field to determine the identity of the body composition analyzer with which it is associating and, optionally, to implement a simple access restriction policy.

7) The *dev-config-id* field shall be set to the value of the Dev-Configuration-Id attribute of the MDS object of the agent.

8) If the agent supports only the body composition analyzer specialization, then the field indicating the data request modes (*data-req-mode-capab*) supported by the body composition analyzer agent shall be set to *data-req-supp-init-agent*.

9) If the agent supports only the body composition analyzer specialization, then *data-req-init-manager-count* shall be set to zero, and *data-req-init-agent-count* shall be set to 1.

8.3.3 Manager procedure—association response

In the association response message sent by the manager:

a) The *result* field shall be set to an appropriate response from those defined in IEEE Std 11073-20601. For example, if all other conditions of the association protocol are satisfied, *accepted* is returned when the manager recognizes the *dev-config-id* of the agent and *accepted-unknown-config* otherwise.

b) In the DataProtoList structure element, the data protocol identifier shall be set to data-proto-id-20601 (i.e., *data-proto-id* = 0x5079).

c) The *data-proto-info* field shall be filled in with a PhdAssociationInformation structure, which shall contain the following parameter values:

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1) The manager following this specialization shall support protocol-version4. The manager may support additional protocol versions and select them if the agent offers them. When protocols lower than protocol-version4 are used, the manager shall use only features in that protocol.
2) The manager shall respond with a single selected encoding rule that is supported by both agent and manager. The manager shall support at least the MDER encoding rules.
3) The manager shall select a valid combination of protocol version and nomenclature version as defined in Table 16.
4) The *functional-units* field shall have all bits reset except for those relating to a test association.
5) The *system-type* field shall be set to sys-type-manager (i.e., *system-type* = 0x80000000).
6) The *system-id* field shall contain the unique system id of the manager device, which shall be a valid EUI-64 type identifier.
7) The *dev-config-id* field shall be manager-config-response (0).
8) The *data-req-mode-capab* field shall be 0.
9) The *data-req-init-*-count* field shall be 0.

8.4 Configuring procedure

8.4.1 General

The agent enters the Configuring state if it receives an association response of *accepted-unknown-config*. In this case, the configuration procedure as specified in IEEE Std 11073-20601 shall be followed. Subclause 8.4.2 specifies the configuration notification and response messages for a body composition analyzer agent with standard configuration ID 2001 (0x07D1). Normally, a manager would already know the standard configuration. However, standard configuration devices are required to send their configuration, if requested. This requirement covers a case where an agent associates with a manager that does not have preconfigured knowledge of the standard configuration (e.g., due to a version mismatch between agent and manager).

8.4.2 Body composition analyzer—standard configuration

8.4.2.1 Agent procedure

The agent performs the configuration procedure using a "Remote Operation Invoke | Confirmed Event Report" message with an MDC_NOTI_CONFIG event to send its configuration to the manager (see IEEE td 11073-20601). The ConfigReport structure is used for the *event-info* field (see Table 3). For a body composition analyzer agent with standard configuration ID 2001 (0x07D1), the format and contents of the configuration notification message are as follows:

```
0xE7 0x00                 APDU CHOICE Type (PrstApdu)
0x00 0x9C                 CHOICE.length = 156
0x00 0x9A                 OCTET STRING.length = 154
0xXX 0xXX                 invoke-id (differentiates this message from any other outstanding)
0x01 0x01                 CHOICE(Remote Operation Invoke | Confirmed Event Report)
0x00 0x94                 CHOICE.length = 148
0x00 0x00                 obj-handle = 0 (MDS object)
0xXX 0xXX 0xXX 0xXX       event-time (set to 0xFFFFFFFF if RelativeTime is not supported)
0x0D 0x1C                 event-type = MDC_NOTI_CONFIG
0x00 0x8A                 event-info.length = 138 (start of ConfigReport)
0x07 0xD1                 config-report-id (Dev-Configuration-Id value=2001)
0x00 0x03                 config-obj-list.count = 3 Measurement objects will be "announced"
0x00 0x84                 config-obj-list.length = 132
0x00 0x06                 obj-class = MDC_MOC_VMO_METRIC_NU
0x00 0x03                 obj-handle = 3    (→ 1st Measurement is body fat)
```

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```
0x00  0x04                    attributes.count = 4
0x00  0x24                    attributes.length = 36
0x09  0x2F                    attribute-id = MDC_ATTR_ID_TYPE
0x00  0x04                    attribute-value.length = 4
0x00  0x02  0xE1  0x4C        MDC_PART_SCADA | MDC_BODY_FAT
0x0A  0x46                    attribute-id = MDC_ATTR_METRIC_SPEC_SMALL
0x00  0x02                    attribute-value.length = 2
0xF0  0x42                    intermittent, stored data, upd & msmt aperiodic, agent init, calculated
0x09  0x96                    attribute-id = MDC_ATTR_UNIT_CODE
0x00  0x02                    attribute-value.length = 2
0x02  0x20                    MDC_DIM_PERCENT
0x0A  0x55                    attribute-id = MDC_ATTR_ATTRIBUTE_VAL_MAP
0x00  0x0C                    attribute-value.length = 12
0x00  0x02                    AttrValMap.count = 2
0x00  0x08                    AttrValMap.length = 8
0x0A  0x56  0x00  0x02        MDC_ATTR_NU_VAL_OBS_ SIMP | value length = 2
0x0A  0x82  0x00  0x08        MDC_ATTR_TIME_STAMP_BO | value length = 8
0x00  0x06                    obj-class = MDC_MOC_VMO_METRIC_NU
0x00  0x02                    obj-handle = 2    (→2nd Measurement is body height)
0x00  0x04                    attributes.count = 4
0x00  0x24                    attributes.length = 36
0x09  0x2F                    attribute-id = MDC_ATTR_ID_TYPE
0x00  0x04                    attribute-value.length = 4
0x00  0x02  0xE1  0x44        MDC_PART_SCADA | MDC_LEN_BODY_ACTUAL
0x0A  0x46                    attribute-id = MDC_ATTR_METRIC_SPEC_SMALL
0x00  0x02                    attribute-value.length = 2
0xF0  0x48                    intermittent, stored data, upd & msmt aperiodic, agent init, manual
0x09  0x96                    attribute-id = MDC_ATTR_UNIT_CODE
0x00  0x02                    attribute-value.length = 2
0x05  0x11                    MDC_DIM_CENTI_M
0x0A  0x55                    attribute-id = MDC_ATTR_ATTRIBUTE_VAL_MAP
0x00  0x0C                    attribute-value.length = 12
0x00  0x02                    AttrValMap.count = 2
0x00  0x08                    AttrValMap.length = 8
0x0A  0x56  0x00  0x04        MDC_ATTR_NU_VAL_OBS_SIMP, 4
0x0A  0x82  0x00  0x08        MDC_ATTR_TIME_STAMP_BO, 8
0x00  0x06                    obj-class = MDC_MOC_VMO_METRIC_NU
0x00  0x01                    obj-handle = 1    (→3rd Measurement is body weight)
0x00  0x04                    attributes.count = 4
0x00  0x24                    attributes.length = 36
0x09  0x2F                    attribute-id = MDC_ATTR_ID_TYPE
0x00  0x04                    attribute-value.length = 4
0x00  0x02  0xE1  0x40        MDC_PART_SCADA | MDC_MASS_BODY_ACTUAL
0x0A  0x46                    attribute-id = MDC_ATTR_METRIC_SPEC_SMALL
0x00  0x02                    attribute-value.length = 2
0xF0  0x48                    intermittent, stored data, upd & msmt aperiodic, agent init, manual
0x09  0x96                    attribute-id = MDC_ATTR_UNIT_CODE
0x00  0x02                    attribute-value.length = 2
0x06  0xC3                    MDC_DIM_KILO_G
0x0A  0x55                    attribute-id = MDC_ATTR_ATTRIBUTE_VAL_MAP
0x00  0x0C                    attribute-value.length = 12
0x00  0x02                    AttrValMap.count = 2
```

```
0x00 0x08                    AttrValMap.length = 8
0x0A 0x56 0x00 0x04          MDC_ATTR_NU_VAL_OBS_SIMP, 4
0x0A 0x82 0x00 0x08          MDC_ATTR_TIME_STAMP_BO, 8
```

At the locations of the message, where the content is not fixed, the value "0xXX" denotes a placeholder and depends on the implementation or on the preceding messaging of the agent.

8.4.2.2 Manager procedure

The manager shall respond to a configuration notification message using a "Remote Operation Response | Confirmed Event Report" data message with an MDC_NOTI_CONFIG event using the ConfigReportRsp structure for the *event-info* field (see Table 3). As a response to the standard configuration notification message in 8.4.2.1, the format and contents of the manager's configuration notification response message are as follows:

```
0xE7 0x00                    APDU CHOICE Type (PrstApdu)
0x00 0x16                    CHOICE.length = 22
0x00 0x14                    OCTET STRING.length = 20
0xXX 0xXX                    invoke-id (differentiates this message from any other outstanding)
0x02 0x01                    CHOICE (Remote Operation Response | Confirmed Event Report)
0x00 0x0E                    CHOICE.length = 14
0x00 0x00                    obj-handle = 0 (MDS object)
0xXX 0xXX 0xXX 0xXX          currentTime
0x0D 0x1C                    event-type = MDC_NOTI_CONFIG
0x00 0x04                    event-reply-info.length = 4
0x07 0xD1                    ConfigReportRsp.config-report-id = 0x07D1
0x00 0x00                    ConfigReportRsp.config-result = accepted-config
```

Again, the value "0xXX" denotes a placeholder and refers to a fixed location, varying content parts of the message.

8.5 Operating procedure

8.5.1 General

Measurement data and status information are communicated from the body composition analyzer agent during the Operating state. If not stated otherwise, the operating procedure for a body composition analyzer agent of this standard shall be as specified in IEEE Std 11073-20601.

8.5.2 GET body composition analyzer MDS attributes

See Table 4 for a summary of the GET service.

If the attribute-id-list field in the roiv-cmip-get service message is empty, the body composition analyzer agent shall respond with a rors-cmip-get service message in which the attribute-list contains a list of all implemented attributes of the MDS object.

If the manager requests specific MDS object attributes, indicated by the elements in attribute-id-list, the body composition analyzer agent shall respond with a rors-cmip-get service message in which the attribute-list contains a list of the requested attributes of the MDS object that are implemented.

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8.5.3 Measurement data transmission

See Table 3 for a summary of the event report services available for measurement data transfer.

Measurement data transfer for a body composition analyzer agent of this standard shall always be initiated by the body composition analyzer (see agent-initiated measurement data transmission in IEEE Std 11073-20601). To limit the amount of data being transported within an APDU, the body composition analyzer agent shall not include more than 25 temporarily stored measurements in a single event report. If more than 25 pending measurements are available for transmission, they shall be sent using multiple event reports. If multiple body fat measurements are available, up to 25 measurements should be transmitted within a single event report. Alternatively, they may be transmitted using a single event report for each body fat measurement. However, the former strategy is recommended to reduce overall message size and power consumption.

A body composition analyzer agent with standard configuration shall use the fixed format data update messages method for transmitting measurement data. A body composition analyzer agent with extended configuration may use either fixed or variable format data update messages for transmitting measurement data.

8.6 Time synchronization

Time synchronization between a body composition analyzer agent and a manager may be used to coordinate the clocks used when reporting physiological events. Note that the mechanism for synchronizing an agent to a manager is outside the scope of this standard. If time synchronization is used, then this shall be reported in the Mds-Time-Info attribute of the MDS object.

9. Test associations

9.1 General

The test association provides a manufacturer the mechanism to test or demonstrate features of a product in a comprehensive manner. This clause defines the behavior of the standard body composition analyzer agent during a test association. Support for test association is optional.

9.2 Behavior with standard configuration

An agent or manager entering a test association using the configuration ID for the standard body composition analyzer of this standard shall enter the Operating state in test mode. When in test mode, where possible, this should be indicated visually to any user. Normal functionality shall be suspended and any test data generated shall not be processed by the device as physiological data.

The body composition analyzer agent shall send a simulated body fat value of 20%, a body height of 170 cm, and a body weight of 55 kg within 30 s of entering the Operating state. If the measurement-status attribute of the numeric object is implemented, then the test-data bit shall be set.

The test association is terminated in a manner consistent with the agent's normal behavior for terminating an association.

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9.3 Behavior with extended configurations

This specification does not define a test association that uses an extended configuration.

10. Conformance

10.1 Applicability

This standard shall be used in conjunction with IEEE Std 11073-20601.

An implementation or a system can conform to the following elements of this standard:

— DIM class hierarchy and object definitions (object attributes, notifications, methods, and data type definitions)

— Nomenclature code values

— Protocol and service models

— Communication service model (association and configuration)

10.2 Conformance specification

This standard offers levels of conformance with respect to strict adherence to the standard device and the use of extensions for the following:

— Information model of a specific device

— Use of attributes, value ranges and access methods

A vendor shall specify the level of conformance for an implementation based on this standard and provide details of the way in which the definitions of this standard and any extensions are applied.

Specifications shall be provided in the form of a set of implementation conformance statements (ICSs) as detailed in 10.4.

This standard is used in conjunction with IEEE Std 11073-20601. It is recommended that the ICS for this standard be created first so that the ICS created for IEEE Std 11073-20601 may refer to the ICS for this standard where applicable.

10.3 Levels of conformance

10.3.1 General

This standard defines the levels of conformance detailed in 10.3.2 and 10.3.3.

10.3.2 Conformance level 1: Base conformance

The application uses elements of the information, service, and communication models (object hierarchy, actions, event reports, and data type definitions) and the nomenclature scheme defined in IEEE Std 11073-20601 and IEEE Std 11073-104zz. All mandatory features defined in the object definition tables and in the

ICS tables are implemented. Furthermore, any conditional, recommended, or optional features that are implemented shall follow the requirements in IEEE Std 11073-20601 and IEEE Std 11073-104zz.

10.3.3 Conformance level 2: Extended nomenclature (ASN.1 and/or IEEE 11073-10101)

Conformance level 2 meets conformance level 1, but also uses or adds extensions in at least one of the information, service, communication, or nomenclature models. These extensions shall conform to nomenclature codes from ASN.1 [B8] and/or within the IEEE 11073-10101 framework (0xF000–0xFFFF). These extensions should be defined in ICS tables pointing toward their references.

10.4 Implementation conformance statements (ICSs)

10.4.1 General format

The ICSs are provided as an overall conformance statement document that comprises a set of tables in the form given by the templates in 10.4.2 through 10.4.6.

Each ICS table has the following columns:

Index	Feature	Reference	Req/Status	Support	Comment

The table column headings have the following meaning:

— **Index,** which is an identifier (e.g., a tag) of a specific feature.

— **Feature,** which briefly describes the characteristic for which a conformance statement is being made.

— **Reference,** which is a reference to the clause or subclause within this standard or to an external source for the definition of the feature (may be empty).

— **Req/Status,** which specifies the conformance requirement (e.g., mandatory, recommended). In some cases, this standard does not specify conformance requirements but requests the status of a particular feature be provided.

— **Support,** which specifies the presence or absence of a feature and any description of the characteristics of the feature in the implementation. This column is to be filled out by the implementer.

— **Comment,** which contains any additional information on the feature. This column is to be filled out by the implementer.

Subclauses 10.4.2 to 10.4.6 specify the format of the specific ICS tables.

10.4.2 General ICS

The general ICS specifies the versions/revisions that are supported by the implementation and high-level system behavior. Table 17 shows the general ICS.
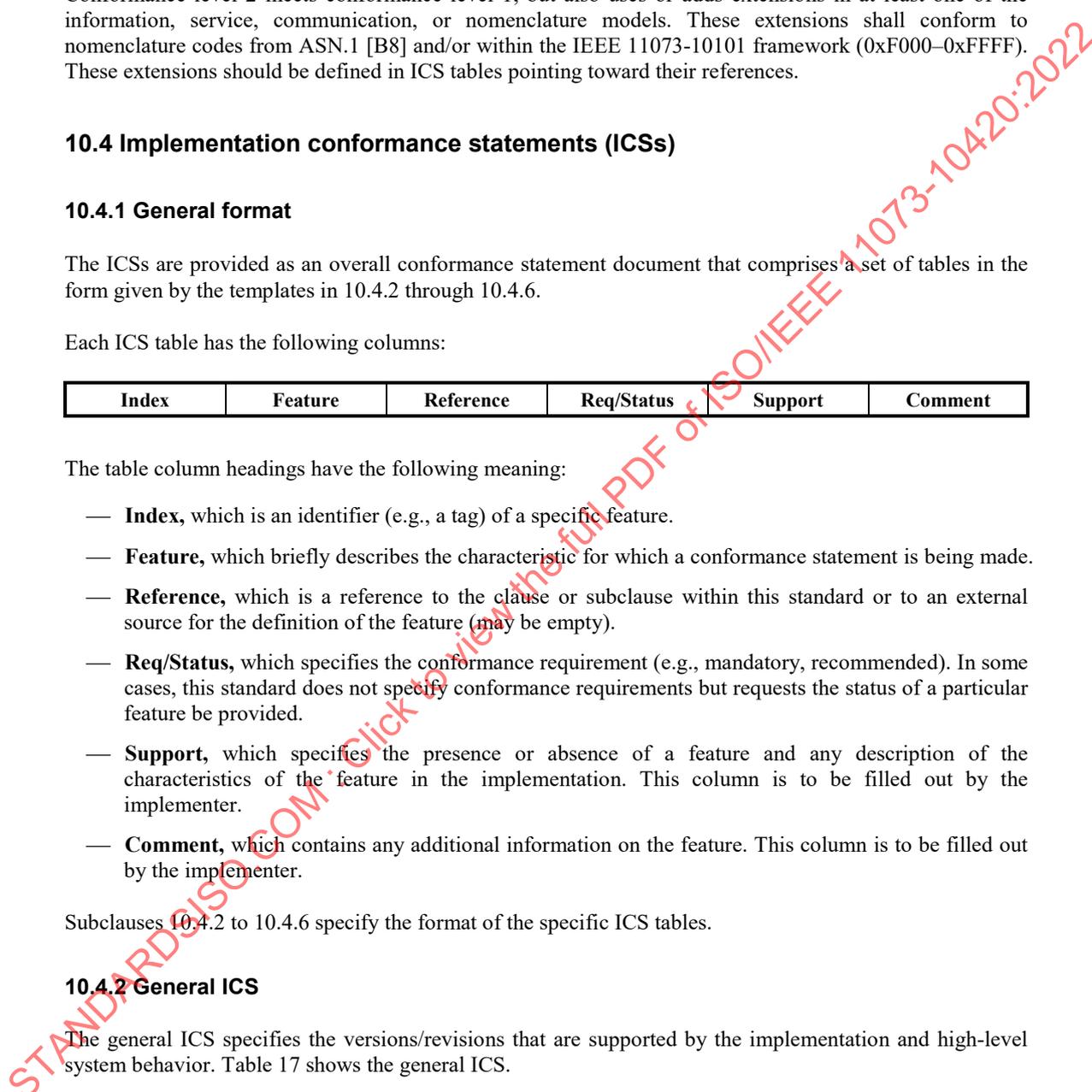
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Table 17 —IEEE 11073-10420 general ICS table

Index [a]	Feature	Reference	Req./Status	Support	Comment
GEN11073-10420-1	Implementation Description	—	Identification of the device/ application. Description of functionality.		
GEN11073-10420-2	Standards followed and their revisions	(standard documents)	(set of existing revisions)	(set of supported revisions)	
GEN11073-10420-3	Nomenclature document used and revision	(standard documents)	(set of existing revisions)	(set of supported revisions)	
GEN11073-10420-4	Conformance Adherence - Level 1 -	See 10.3.2	Base conformance declaration that device meets the following IEEE 11073-10420 conformance requirements: a) All mandatory requirements shall be implemented. b) If implemented, conditional, recommended, and optional requirements shall conform to standard.	Yes/No (No is not expected as No implies that the implementation is non-conformant)	
GEN11073-10420-5	Conformance Adherence - Level 2 -	See 10.3.3	In addition to GEN11073-10420-4, if the device implements extensions and/or additions, they shall conform to nomenclature codes from ASN.1 [B8] and/or IEEE 11073-10101 framework. These extensions should also be defined in ICS tables pointing toward their reference.	Yes/No	
GEN11073-10420-6	Object Containment Tree	See 6.3	Provide Object Containment Diagram showing relations between object instances used by the application. A conforming implementation uses only object relations as defined in the DIM.		
GEN11073-10420-7	Nomenclature document used and revision	(standard documents)	(set of existing revisions)	(set of supported revision)	
GEN11073-10420-8	Data Structure Encoding	—	—	Description of encoding method(s) for ASN.1 data structures.	
GEN11073-10420-9	Use of Private Objects	—	Does the implementation use objects that are not defined in the DIM?	Yes/No (If yes: explain in Table 18.]	

Table 17—IEEE 11073-10420 general ICS table *(continued)*

Index [a]	Feature	Reference	Req./Status	Support	Comment
GEN11073-10420-10	Use of Private Nomenclature Extensions	—	Does the implementation use private extensions to the nomenclature (i.e., 0xF000-0xFFFF codes from IEEE Std 11073-10101)? Private Nomenclature extensions are allowed *only* if the standard nomenclature does not include the specific terms required by the application.	Yes/No [If yes: explain in the Table 21.]	
GEN11073-10420-11	IEEE Std 11073-20601 Conformance		Provide the conformance report required by IEEE Std 11073-20601.		

[a] The prefix *GEN11073-10420-* is used for the index in the general ICS table.

10.4.3 DIM MOC ICS

The DIM managed object class (MOC) ICS defines which objects are implemented. Information on each object shall be provided as a separate row in the template of Table 18.

Table 18—Template for DIM MOC ICS table

Index	Feature	Reference	Req./Status	Support	Comment
MOC-*n*	Object description	Reference to the clause in the standard or other location where the object is defined.	Implemented	Specify restrictions, e.g., max. number of supported instances.	

The *n* in the Index column should be the object handle for implementations that have predefined objects. Otherwise, the Index column shall simply be a unique number (1..*m*).

All private objects should be specified and include either a reference to the definition for the object or, where no publicly available reference is available, the definition of the object should be appended to the conformance statement.

The Support column should indicate any restrictions for the object implementation.

An object containment diagram (class instance diagram) should be provided as part of the DIM MOC ICS.

10.4.4 MOC attribute ICS

The MOC attribute ICS defines which attributes, including any inherited attributes, are used/supported in each object of an implementation. Information on each attribute of an object shall be provided as a separate row in the template of Table 19. A separate MOC attribute ICS shall be provided for each object.

Table 19 —Template for MOC attribute ICS table

Index	Feature	Reference	Req./Status	Support	Comment
ATTR-*n-x*	Attribute Name. Extended attributes shall include the attribute ID also.	Fill in the reference to the ASN.1 structure if the attribute is not defined in this standard.	M = Mandatory / C = Conditional / R = Recommended / O = Optional (as per definition in attribute definition tables)	Implemented? Yes/No Static/Dynamic Specify restrictions, (e.g., value ranges). Describe how attribute is accessed (e.g., Get, Set, sent in config event report, sent in a data event report). Describe any specific restrictions.	

The Support column shall specify the following:

— Whether the attribute is implemented

— For extension attributes, whether the attribute value is static or dynamic

— Any value ranges

— Restrictions on attribute access or availability

— Any other applicable information

The *n* in the Index column refers to the ID of the managed object for which the table is supplied (i.e., the index of the managed object as specified in the MOC ICS). There is one separate table for each supported managed object.

The *x* in the Index column is a unique serial number (1..*m*).

10.4.5 MOC notification ICS

The MOC notification ICS specifies all implemented notifications (typically in the form of the event report service) that are emitted by the agent. Table 20 provides a template for use. One table has to be provided for each object that supports special object notifications. One row of the table shall be used for each notification.

Table 20 —Template for MOC notification ICS table

Index	Feature	Reference	Req./Status	Support	Comment
NOTI-*n-x*	Notification Name and Notification ID	Reference to the clause in the standard or other location where the event is defined.		The Support column shall specify how the notification is sent and any restrictions.	

The *n* in the Index column refers to the ID of the managed object for which the table is supplied (i.e., the index of the managed object as specified in the MOC ICS). There is one separate table for each managed object that supports specific object notifications (i.e., events).

The *x* in the Index column is a unique serial number (1..*m*).

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All private notifications should be specified and include reference to the definition for the notification. Where no publicly available reference is available, the definition of the notification should be appended to the conformance statement.

10.4.6 MOC nomenclature ICS

The MOC nomenclature ICS specifies all nonstandard nomenclature codes that are utilized by the agent. Table 21 provides a template for use. One row of the table is to be used for each nomenclature element.

Table 21 —Template for MOC nomenclature ICS table

Index	Feature	Reference	Req./Status	Support	Comment
NOME-*n*	Nomenclature Name and Nomenclature value	Reference to the clause in the standard or other location where the nomenclature is defined or used.		Describe how the nomenclature is used. Describe any specific restrictions.	

The *n* in the Index column is a unique serial number (1..*m*).

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Annex A

(informative)

Bibliography

[B1]   IEC 60601-1, Ed. 3, Medical electrical equipment—Part 1: General requirements for basic safety and essential performance.[10]

[B2]   IEC 60601-2 (all parts), Medical electrical equipment—Part 2: Particular requirements for the basic safety and essential performance for specific device.

[B3]   IEC 62304, Medical device software—Software life-cycle processes.

[B4]   IEC 80001-1, Application of risk management for IT-networks incorporating medical devices—Part 1: Roles, responsibilities, and activities.

[B5]   ISO 14971, Medical devices—Application of risk management to medical devices.[11]

[B6]   ISO/IEEE 11073-10201, Health informatics—Point-of-care medical device communication—Part 10201: Domain information model.[12]

[B7]   ISO/IEEE 11073-20101, Health informatics—Point-of-care medical device communication—Part 20101: Application Profiles—Base Standard.

[B8]   ITU-T Rec. X.680, Information technology—Abstract Syntax Notation One (ASN.1): Specification of basic notation.[13]

[B9]   Khalil, S. F., et al., "The Theory and Fundamentals of Bioimpedance Analysis in Clinical Status Monitoring and Diagnosis of Diseases," *Sensors*, vol. 14, pp. 10895–10928, 2014, doi:10.3390/s140610895.

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[10] IEC publications are available from the International Electrotechnical Commission (https://www.iec.ch/) and the American National Standards Institute (http://www.ansi.org/).
[11] ISO publications are available from the International Organization for Standardization (http://www.iso.org/) and the American National Standards Institute (http://www.ansi.org).
[12] ISO/IEEE publications are available from the International Organization for Standardization (http://www.iso.org/) and The Institute of Electrical and Electronics Engineers, Inc. (https://standards.ieee.org/).
[13] ITU-T publications are available from the International Telecommunication Union (https://www.itu.int).

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Annex B

(normative)

Any additional ASN.1 definitions

No additional ASN.1 definition is defined.

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Annex C

(normative)

Allocation of identifiers

This annex contains the nomenclature codes used in this document and not found in IEEE Std 11073-20601. For those not contained in this annex, the normative definition is found in IEEE Std 11073-20601.

The format used here follows that of IEEE Std 11073-10101.

```
/********************************************************************************
* From Medical supervisory control and data acquisition (MDC_PART_SCADA)
********************************************************************************/

#define MDC_BODY_FAT                         57676  /* body fat                        */
#define MDC_MASS_BODY_FAT_FREE               57684  /* body fat free mass              */
#define MDC_MASS_BODY_SOFT_LEAN              57688  /* body soft lean mass             */
#define MDC_BODY_WATER                       57692  /* body water                      */
#define MDC_MASS_BODY_ACTUAL                 57664  /* body mass object                */
#define MDC_LEN_BODY_ACTUAL                  57668  /* body height object              */
#define MDC_RATIO_MASS_BODY_LEN_SQ           57680  /* body mass index object          */
#define MDC_BODY_BASAL_METABOLIC_RATE_CALC   57696  /* body basal metabolic
                                                        rate -calculated              */
#define MDC_BODY_MUSCLE                      57700  /* body muscle                     */
#define MDC_BIA_METHOD                       57704  /* bioimpedance analysis method    */


/********************************************************************************
* From Dimensions (MDC_PART_SITES)
********************************************************************************/

#define MDC_BIA_MTD_SINGLE_FREQ              12288  /* Bioimpedance analysis with
                                                        single-frequency current      */
#define MDC_BIA_MTD_MULTI_FREQ               12289  /* multi-frequency BIA             */
#define MDC_BIA_MTD_SPECTROSCOPY             12290  /* bioimpedance spectroscopy       */
#define MDC_BIA_MTD_VECTOR                   12291  /* bioimpedance vector analysis    */
#define MDC_BIA_MDL_WHOLE_BODY               12292  /* Whole body model (1-cylinder)   */
#define MDC_BIA_MDL_5CYL_TLREXT              12293  /* 5-cylinder segment model with trunk,
                                                        left and right upper extremity, left and
                                                        right lower extremity */


/********************************************************************************
* From Dimensions (MDC_PART_DIM)
********************************************************************************/
#define MDC_DIM_CENTI_M                      1297   /* cm                              */
#define MDC_DIM_INCH                         1376   /* in                              */
#define MDC_DIM_LB                           1760   /* lb                              */
#define MDC_DIM_KG_PER_M_SQ                  7747   /* kg m-2                          */
#define MDC_DIM_KILO_G                       1731   /* kg                              */
#define MDC_DIM_KILO_JOULES_PER_DAY          10499  /* kJ/day                          */
#define MDC_DIM_PERCENT                      544    /* %                               */
#define MDC_DIM_KILO_OHM                     4291   /* Ω                               */
```