



Health informatics—Device interoperability

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

IEEE Engineering in Medicine and Biology Society

Developed by the
IEEE 11073™ Standards Committee

IEEE Std 11073-10420™-2020
(Revision of IEEE Std 11073-10420-2010)



Health informatics—Device interoperability

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

Developed by the

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

Approved 4 June 2020

IEEE SA Standards Board

THIS IS A REDLINE DOCUMENT PRODUCED BY TECHSTREET, A BUSINESS OF CLARIVATE ANALYTICS

This document is intended to provide users with an indication of changes from one edition to the next. It includes a full-text version of the new document, plus an indication of changes from the previous version.

Redlines are designed to save time and improve efficiencies by using the latest software technology to find and highlight document changes. More professionals are using valuable new technologies like redlines, to help improve outcomes in a fast paced global business world.

Because it may not be technically possible to capture all changes accurately, it is recommended that users consult previous editions as appropriate. In all cases, only the current base version of this publication is to be considered the official document.

Redline Processing Notes:

1. ~~Red Text~~ - Red strikethrough text denotes deletions.
2. Blue Text - Blue underlined text denotes modifications and additions.

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

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2020 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 17 November 2020. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-1-5044-6812-1 STD24244
Print: ISBN 978-1-5044-6813-8 STDPD24244

IEEE prohibits discrimination, harassment, and bullying.

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE Standards documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page (<https://standards.ieee.org/ipr/disclaimers.html>), appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.”

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board. IEEE develops its standards through an accredited consensus development process, which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed by volunteers with scientific, academic, and industry-based expertise in technical working groups. Volunteers are not necessarily members of IEEE or IEEE SA, and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE makes no warranties or representations concerning its standards, and expressly disclaims all warranties, express or implied, concerning this standard, including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In addition, IEEE does not warrant or represent that the use of the material contained in its standards is free from patent infringement. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity, nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: THE NEED TO PROCURE SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE is the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that the presenter's views should be considered the personal views of that individual rather than the formal position of IEEE, IEEE SA, the Standards Committee, or the Working Group.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE or IEEE SA. However, **IEEE does not provide interpretations, consulting information, or advice pertaining to IEEE Standards documents.**

Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its Societies and Standards Coordinating Committees are not able to provide an instant response to comments, or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in evaluating comments or in revisions to an IEEE standard is welcome to join the relevant IEEE working group. You can indicate interest in a working group using the Interests tab in the Manage Profile & Interests area of the [IEEE SA myProject system](#). An IEEE Account is needed to access the application.

Comments on standards should be submitted using the [Contact Us](#) form.

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not constitute compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Data privacy

Users of IEEE Standards documents should evaluate the standards for considerations of data privacy and data ownership in the context of assessing and using the standards in compliance with applicable laws and regulations.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under US and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate licensing fees, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400;

<https://www.copyright.com/>. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every 10 years. When a document is more than 10 years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit [IEEE Xplore](#) or [contact IEEE](#). For more information about the IEEE SA or IEEE's standards development process, visit the IEEE SA Website.

Errata

Errata, if any, for all IEEE standards can be accessed on the [IEEE SA Website](#). Search for standard number and year of approval to access the web page of the published standard. Errata links are located under the Additional Resources Details section. Errata are also available in [IEEE Xplore](#). Users are encouraged to periodically check for errata.

Patents

IEEE Standards are developed in compliance with the [IEEE SA Patent Policy](#).

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE SA Website at <https://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

IMPORTANT NOTICE

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. IEEE Standards development activities consider research and information presented to the standards development group in developing any safety recommendations. Other information about safety practices, changes in technology or technology implementation, or impact by peripheral systems also may be pertinent to safety considerations during implementation of the standard. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

Participants

At the time this revision was submitted to the IEEE SA Standards Board for approval, the Personal Health Devices Working Group had the following membership:

Daidi Zhong and Michael J. Kirwan, *Co-Chairs*

Linling Wang and Sungkee Lee, *Co-Vice Chairs*

Karsten Aalders
Charles R. Abbruscato
Nabil Abujbara
Maher Abuzaid
James Agnew
Manfred Aigner
Jorge Alberola
David Aparisi
Lawrence Arne
Diego B. Arquillo
Serafin Arroyo
Muhammad Asim
Kit August
Doug Baird
David Baker
Anindya Bakshi
Ananth Balasubramanian
Sunlee Bang
M. Jonathan Barkley
Gilberto Barrón
David Bean
John Bell
Olivia Bellamou-Huet
Rudy Belliardi
Daniel Bernstein
George A. Bertos
Chris Biernacki
Ola Björnsne
Thomas Blackadar
Thomas Bluethner
Douglas P. Bogia
Xavier Boniface
Shannon Boucousis
Julius Broma
Lyle G. Bullock Jr.
Bernard Burg
Chris Burns
Jeremy Byford-Rew
Satya Calloji
Carole C. Carey
Craig Carlson
Santiago Carot-Nemesio
Randy W. Carroll
Seungchul Chae
Peggy Chien
David Chiu
Jinyong Choi
Chia-Chin Chong
Saeed A. Choudhary
Jinhan Chung
John A. Cogan
John T. Collins
Cory Condek

Todd H. Cooper
David Cornejo
Douglas Coup
Nigel Cox
Hans Crommenacker
Tomio Crosley
Allen Curtis
Jesús Daniel Trigo
David Davenport
Russell Davis
Sushil K. Deka
Ciro de la Vega
Pedro de-las-Heras-Quiros
Jim Dello Stritto
Kent Dicks
Hyoungdo Do
Jonathan Dougherty
Xiaolian Duan
Sourav Dutta
Jakob Ehrensvar
Fredrik Einberg
Javier Escayola Calvo
Mark Estes
Leonardo Estevez
Bosco T. Fernandes
Christoph Fischer
Morten Flintrup
Joseph W. Forler
Russell Foster
Eric Freudenthal
Matthias Frohner
Ken Fuchs
Jing Gao
Marcus Garbe
John Garguilo
Liang Ge
Rick Geimer
Igor Gejdos
Ferenc Gerbovics
Alan Godfrey
Nicolae Goga
Julian Goldman
Raul Gonzalez Gomez
Chris Gough
Channa Gowda
Charles M. Gropper
Amit Gupta
Jeff Guttmacher
Rasmus Haahr
Christian Habermann
Michael Hagerty
Jerry Hahn
Robert Hall

Shu Han
Nathaniel Hamming
Rickey L. Hampton
Sten Hanke
Aki Harma
Jordan Hartmann
Kai Hassing
Wolfgang Heck
Nathaniel Heintzman
Charles Henderson
Jun-Ho Her
Helen B. Hernandez
Timothy L. Hirou
Allen Hobbs
Alex Holland
Arto Holopainen
Kris Holtzclaw
Robert Hoy
Anne Huang
Ron Huby
David Hughes
Robert D. Hughes
Jiyoung Huh
Hugh Hunter
Philip O. Isaacson
Atsushi Ito
Michael Jaffe
Praduman Jain
Hu Jin
Danny Jochelson
Akiyoshi Kabe
Steve Kahle
Tomio Kamioka
James J. Kang
Kei Kariya
Andy Kaschl
Junzo Kashiara
Colin Kennedy
Ralph Kent
Laurie M. Kermes
Ahmad Kheirandish
Junhyung Kim
Minho Kim
Min-Joon Kim
Taekon Kim
Tetsuya Kimura
Alfred Kloos
Jeongmee Koh
Jean-Marc Koller
John Koon
Patty Krantz
Raymond Krasinski
Alexander Kraus

Ramesh Krishna
 Geoffrey Kruse
 Falko Kuester
 Rafael Lajara
 Pierre Landau
 Jaechul Lee
 JongMuk Lee
 Kyong Ho Lee
 Rami Lee
 Woojae Lee
 Qiong Li
 Xiangchen Li
 Zhuofang Li
 Patrick Lichter
 Jisoon Lim
 Joon-Ho Lim
 Xiaoming Liu
 Wei-Jung Lo
 Charles Lowe
 Don Ludolph
 Christian Luszick
 Bob MacWilliams
 Srikanth Madhurbootheswaran
 Miriam L. Makhlof
 Romain Marmot
 Sandra Martinez
 Miguel Martínez de Espronceda
 Cámara
 Peter Mayhew
 Jim McCain
 László Meleg
 Alexander Mense
 Behnaz Minaei
 Jinsei Miyazaki
 Erik Moll
 Darr Moore
 Chris Morel
 Carsten Mueglitz
 Soundharya Nagasubramanian
 Alex Neefus
 Trong-Nghia Nguyen-Dobinsky
 Michael E. Nidd
 Jim Niswander
 Hiroaki Niwamoto
 Thomas Norgall
 Yoshiteru Nozoe
 Abraham Ofek
 Brett Olive
 Begonya Otal
 Marco Paleari
 Bud Panjwani
 Carl Pantiskas
 Harry P. Pappas
 Hanna Park

Jong-Tae Park
 Myungeun Park
 Soojun Park
 Phillip E. Pash
 TongBi Pei
 Soren Petersen
 James Petisce
 Peter Piction
 Michael Pliskin
 Varshney Prabodh
 Jeff Price
 Harald Prinzhorn
 Harry Qiu
 Tanzilur Rahman
 Phillip Raymond
 Terrie Reed
 Barry Reinhold
 Brian Reinhold
 Melvin I. Reynolds
 John G. Rhoads
 Jeffrey S. Robbins
 Chris Roberts
 Moskowitz Robert
 Stefan Robert
 Scott M. Robertson
 Timothy Robertson
 David Rosales
 Bill Saltzstein
 Giovanna Sannino
 Jose A. Santos-Cadenas
 Stefan Sauermann
 John Sawyer
 Alois Schloegl
 Paul S. Schluter
 Mark G. Schnell
 Richard A. Schrenker
 Antonio Scorpiniti
 KwangSeok Seo
 Riccardo Serafin
 Sid Shaw
 Frank Shen
 Min Shih
 Mazen Shihabi
 Redmond Shouldice
 Sternly K. Simon
 Marjorie Skubic
 Robert Smith
 Ivan Soh
 Motoki Sone
 Emily Sopenisky
 Rajagopalan Srinivasan
 Nicholas Steblay
 Lars Steubesand

John (Ivo) Stivorc
 Raymond A. Strickland
 Chandrasekaran Subramaniam
 Hermann Suominen
 Lee Surprenant
 Ravi Swami
 Ray Sweidan
 Na Tang
 Haruyuyki Tatsumi
 Isabel Tejero
 Tom Thompson
 Jonas Tirén
 Janet Traub
 Gary Tschautscher
 Masato Tsuchid
 Ken Tubman
 Akib Uddin
 Sunil Unadkat
 Fabio Urbani
 Philipp Urbauer
 Laura Vanzago
 Alpo Värri
 Andrei Vasilateanu
 Dalimar Velez
 Martha Velezis
 Rudi Voon
 Barry Vornbrock
 Isobel Walker
 David Wang
 Jerry P. Wang
 Yao Wang
 Yi Wang
 Steve Warren
 Fujio Watanabe
 Toru Watsuji
 Kathleen Wible
 Paul Williamson
 Jan Wittenber
 Jia-Rong Wu
 Will Wykeham
 Arton Xhafa
 Ricky Yang
 Melanie S. Yeung
 Qiang Yin
 Done-Sik Yoo
 Zhi Yu
 Jianchao Zeng
 Jason Zhang
 Jie Zhao
 Thomas Zhao
 Yuanhong Zhong
 Qing Zhou
 Miha Zoubek
 Szymon Zyskoter

The following members of the individual Standards Association balloting group voted on this revision. Balloters may have voted for approval, disapproval, or abstention.

Bjoern Andersen
Pradeep Balachandran
Lyle G. Bullock Jr.
Juan Carreon
Pin Chang
Malcolm Clarke
David Fuschi
Randall Groves
Werner Hoelzl

Raj Jain
Stuart Kerry
Yongbum Kim
Raymond Krasinski
Javier Luiso
H. Moll
Nick S. A. Nikjoo
Bansi Patel

Beth Pumo
Stefan Schlichting
Thomas Starai
Mark-Rene Uchida
John Vergis
Lisa Ward
Yu Yuan
Oren Yuen
Daidi Zhong

When the IEEE SA Standards Board approved this revision on 4 June 2020, it had the following membership:

Gary Hoffman, *Chair*
Jon Walter Rosdahl, *Vice Chair*
John D. Kulick, *Past Chair*
Konstantinos Karachalios, *Secretary*

Ted Burse
Doug Edwards
J. Travis Griffith
Grace Gu
Guido R. Hiertz
Joseph L. Koepfinger*

David J. Law
Howard Li
Dong Liu
Kevin Lu
Paul Nikolich
Damir Novosel
Dorothy Stanley

Mehmet Ulema
Lei Wang
Sha Wei
Philip B. Winston
Daidi Zhong
Jingyi Zhou

*Member Emeritus

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

1. Overview	13
1.1 Scope	13
1.2 Purpose	13
1.3 Context	13
1.4 Word usage	14
2. Normative references	14
3. Definitions, acronyms, and abbreviations	15
3.1 Definitions	15
3.2 Acronyms and abbreviations	16
4. Introduction to ISO/IEEE 11073 personal health devices	16
4.1 General	16
4.2 Introduction to IEEE 11073-20601 modeling constructs	17
4.2.1 General	17
4.2.2 Domain information model (DIM)	17
4.2.3 Service model	17
4.2.4 Communication model	17
4.2.5 Implementing the models	17
4.3 Compliance with other standards	17
5. Body composition analyzer concepts and modalities	18
5.1 General	18
5.2 Body fat	18
5.3 Body height	18
5.4 Body weight	18
5.5 Body mass index	19
5.6 Fat free mass	19
5.7 Soft lean mass	19
5.8 Body water	19
5.9 Basal metabolic rate	19
5.10 Bioimpedance analysis method	19
5.11 Body muscle	19
6. Body composition analyzer DIM	20
6.1 Overview	20
6.2 Class extensions	20
6.3 Object instance diagram	20
6.4 Types of configuration	21
6.4.1 General	21
6.4.2 Standard configuration	21
6.4.3 Extended configuration	22
6.5 Medical device system (MDS) object	22
6.5.1 MDS object attributes	22
6.5.2 MDS object methods	23
6.5.3 MDS object events	25
6.5.4 Other MDS services	26
6.6 Numeric objects	26
6.6.1 General	26
6.6.2 Body fat	26
6.6.3 Body height	27

6.6.4 Body weight	27
6.6.5 Body mass index	37
6.6.6 Fat free mass	38
6.6.7 Soft lean mass	39
6.6.8 Body water	40
6.6.9 Basal metabolic rate	41
6.6.10 Body muscle	42
6.7 Real-time sample array objects	43
6.8 Enumeration objects	43
6.8.1 General	43
6.8.2 Bioimpedance analysis method	43
6.9 PM-store objects	44
6.10 Scanner objects	44
6.11 Class extension objects	44
6.12 Body composition analyzer DIM extensibility rules	44
7. Body composition analyzer service model	44
7.1 General	44
7.2 Object access services	44
7.3 Object access event report services	45
8. Body composition analyzer communication model	47
8.1 Overview	47
8.2 Communications characteristics	47
8.3 Association procedure	47
8.3.1 General	47
8.3.2 Agent procedure—association request	48
8.3.3 Manager procedure—association response	48
8.4 Configuring procedure	49
8.4.1 General	49
8.4.2 Body composition analyzer—standard configuration	49
8.5 Operating procedure	51
8.5.1 General	51
8.5.2 GET body composition analyzer MDS attributes	51
8.5.3 Measurement data transmission	52
8.6 Time synchronization	52
9. Test associations	52
9.1 General	52
9.2 Behavior with standard configuration	52
9.3 Behavior with extended configurations	53
10. Conformance	53
10.1 Applicability	53
10.2 Conformance specification	53
10.3 Levels of conformance	53
10.3.1 General	53
10.3.2 Conformance level 1: Base conformance	53
10.3.3 Conformance level 2: Extended nomenclature (ASN.1 and/or IEEE 11073-10101)	54
10.4 Implementation conformance statements (ICSs)	54
10.4.1 General format	54
10.4.2 General ICS	54
10.4.3 DIM MOC ICS	56
10.4.4 MOC attribute ICS	56
10.4.5 MOC notification ICS	57
10.4.6 MOC nomenclature ICS	58

Annex A (informative) Bibliography	59
Annex B (normative) Any additional ASN.1 definitions	60
Annex C (normative) Allocation of identifiers.....	61
Annex D (informative) Message sequence examples	62
Annex E (informative) Protocol data unit examples	64
Annex F (informative) Revision history.....	76

Health informatics—Device interoperability

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

~~IMPORTANT NOTICE: This standard is not intended to ensure safety, security, health, or environmental protection. Implementers of the standard are responsible for determining appropriate safety, security, environmental, and health practices or regulatory requirements.~~

~~This IEEE document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading "Important Notice" or "Important Notices and Disclaimers Concerning IEEE Documents." They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/IPR/disclaimers.html>.~~

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 ~~analyzing devices~~ 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 ~~and IEEE Std 11073-20601™-2008⁺~~, information models, application profile standards, and transport standards. It specifies the use of specific term codes, formats, and behaviors in telehealth environments ~~restricting~~ to restrict optionality in base frameworks in favor of interoperability. This standard defines a common core of communication functionality for personal telehealth body composition ~~analyzer devices~~ analyzers. In this context, the phrase "body composition analyzer" ~~devices are being~~ is used broadly to cover ~~body composition~~ analyzer analyzing devices that measure body impedances, and compute the various body components including body fat from the impedance.

⁺ ~~Information on references can be found in Clause 2.~~

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 11073-20601-2008TM 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.

This standard is based on IEEE Std 11073-20601-2008, which in turn draws information from both ISO/IEEE 11073-10201:2004 [B2]² [B6] and ISO/IEEE 11073-20101:2004 [B3] [B7].² The medical device encoding rules (MDER) used within this standard are fully described in IEEE Std 11073-20601-2008.

~~This standard reproduces relevant portions of the nomenclature found in ISO/IEEE 11073-10101:2004 [B1] and adds new nomenclature codes for the purposes of this standard. Between this standard and IEEE Std 11073-20601-2008 all required nomenclature codes for implementation are documented.~~

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

² The numbers in brackets correspond to ~~those~~ [the numbers](#) of the bibliography in Annex A.

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-~~2008~~, 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}

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.

⁵ The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is used only in statements of fact.

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

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

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

2. Normative references

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

IEEE Std 11073-~~20601-2008~~,10101TM, Health informatics—~~Personal health~~ Point-of-care medical device communication—Part ~~20601: Application Profile—Optimized Exchange Profile.~~^{4,–5} 10101: Nomenclature.

IEEE Std 11073-10415~~TM-2008~~,TM, Health informatics—Personal health device communication—Part 10415: Device specialization—Weighing scale.⁶

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

⁵~~The IEEE standards or products referred to in this clause are trademarks of the Institute of Electrical and Electronics Engineers, Inc.~~

⁶For 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.

[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*; ~~*Glossary of Terms & Definitions*~~⁶ [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.

⁷ IEEE publications are available from The Institute of Electrical and Electronics Engineers, Inc., ~~445 Hoes Lane, Piscataway, NJ 08854, USA~~ (<https://standards.ieee.org/>).

⁶ ~~The IEEE Standards Dictionary: Glossary of Terms & Definitions is available at <http://shop.ieee.org/>.~~

⁸ [The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronics Engineers, Inc.](#)

⁹ [IEEE Standards Dictionary Online is available at <http://dictionary.ieee.org/>. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.](#)

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, ~~it~~ [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.

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)

~~FFM~~ ~~fat free mass~~

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

~~PHD~~ ~~personal health device~~

~~SLM~~ ~~soft lean mass~~

VMO virtual medical object

VMS virtual medical system

4. Introduction to ISO/IEEE 11073 personal health devices

4.1 General

This standard and the remainder of the series of ISO/IEEE 11073 personal health device ~~(PHD)~~ standards fit in the larger context of the ISO/IEEE 11073 series of standards. The full suite of standards enables agents to interconnect and interoperate with managers and with computerized healthcare information systems. See the IEEE Std 11073-20601-~~2008~~ for a description of the guiding principles for this series of ISO/IEEE 11073 Personal Health Device standards.

IEEE Std 11073-20601-~~2008~~ supports the modeling and implementation of an extensive set of personal health devices. This standard defines aspects of the body composition analyzer-~~device~~. It describes all aspects necessary to implement the application layer services and data exchange protocol between an ISO/IEEE 11073 ~~PHD~~ [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-~~2008~~, and extends and adds definitions where appropriate. ~~The~~ [All new definitions are given in Annex B in](#) Abstract Syntax Notation One (ASN.1) ~~[B4] definitions referenced in this standard are in IEEE Std 11073-20601-2008. All additional new definitions are given in Annex B. Nomenclature codes referenced in this standard, which are not defined in IEEE Std 11073-20601-2008, are normatively defined in Annex C~~ [B8](#).

[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-~~2008~~, 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-~~2008~~ 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-~~2008~~.

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 [[B4](#)[B8](#)]. The messages defined in IEEE Std 11073-20601-~~2008~~ 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 11073-20601²⁰⁰⁸. ~~The security of this communication is largely determined by, but not limited to, the physical security of the device along with the inherent security of the underlying transports. Additional security may be defined by future revisions of IEEE Std 11073-20601-2008.~~

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~~-device~~ concepts and modalities

5.1 General

This clause presents the general concepts of body composition ~~analyzer-devices~~ 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 ~~analyzer-devices~~ 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~~-(kg)~~_z pounds~~-(lb)~~_z or percentage~~-(%)~~_z. When using percentage, the body fat ~~percent~~ is defined as the individual's body fat_z in kilograms or pounds, divided by the individual's weight_z in kilograms or pounds, as shown in Equation (1).

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

(1)

(New)

$$\text{Body fat (\%)} = \frac{\text{body fat [kg]}}{\text{body weight [kg]}} \times 100$$

(1)

(Deleted)

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-~~2008~~ [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-~~2008~~ [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.](#)

5.5 Body mass index

Refer to 5.4 of IEEE Std 11073-10415-~~2008~~ [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 (~~FFM~~) is the sum of the soft lean mass (~~SLM~~) and the mineral mass. (also known as bone mass). It has units of kilograms (~~kg~~) or pounds (~~lb~~).

5.7 Soft lean mass

The ~~SLM~~ soft lean mass is the sum of the body water and the protein mass. It has units of kilograms (~~kg~~) or pounds (~~lb~~).

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 (~~kg~~), pounds (~~lb~~), 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).

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

(New)

$$\text{Body water (\%)} = \frac{\text{body water [kg]}}{\text{body weight [kg]}} \times 100 \quad (2)$$

~~(Deleted)~~

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).

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

(New)

6. Body composition analyzer ~~domain information model~~ DIM

6.1 Overview

This clause describes the ~~domain information model~~ 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-~~2008~~.

6.3 Object instance diagram

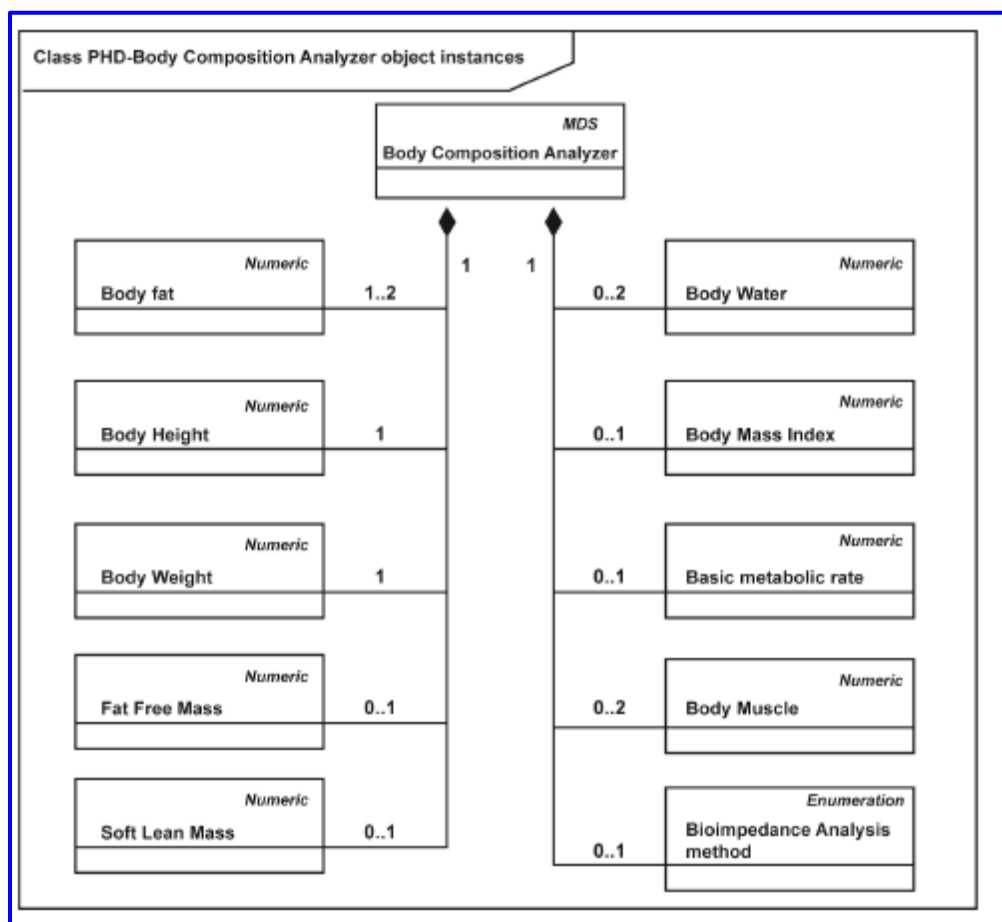
The object instance diagram of the body composition analyzer ~~domain information model~~ [DIM](#), defined for the purposes of this standard, is shown in Figure 1.

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:

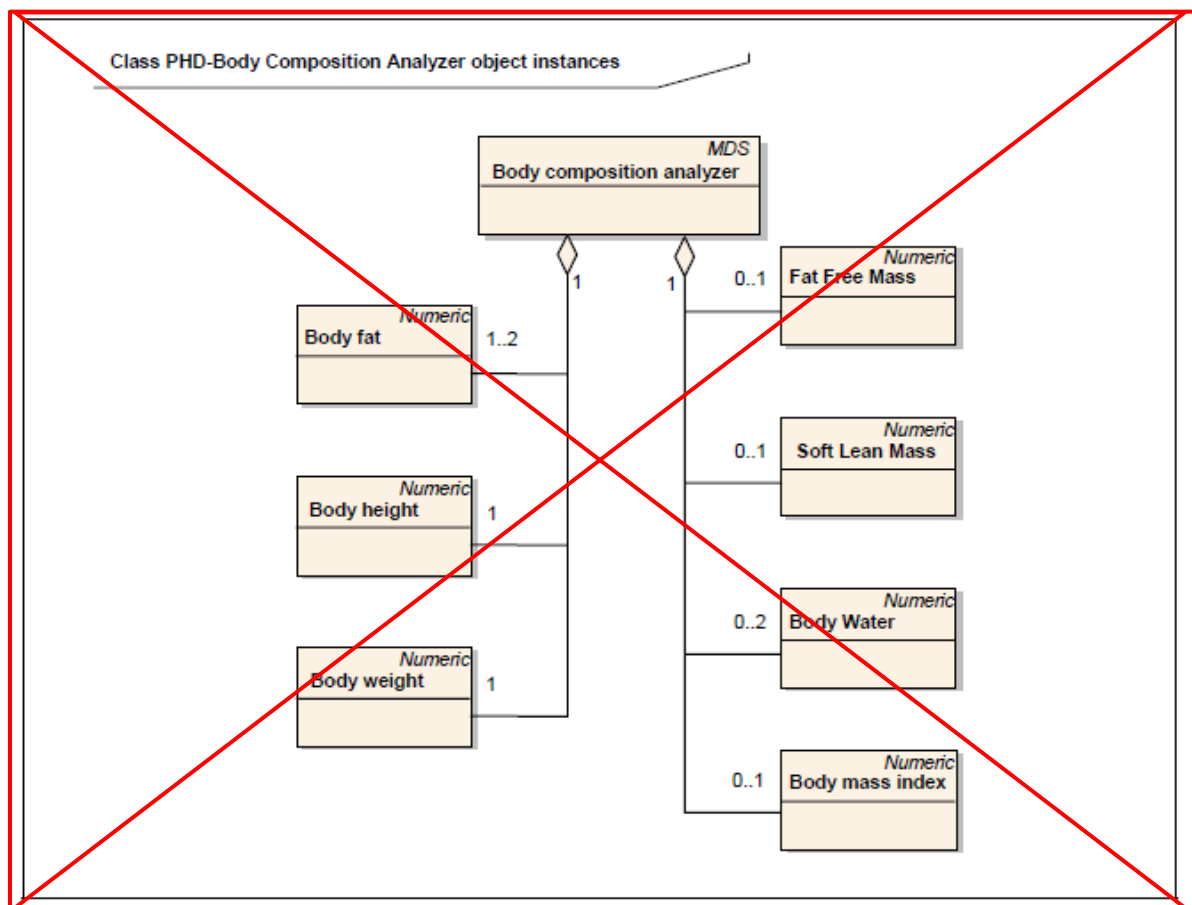
- The nomenclature code used to identify the class of the object. One example where this code is used is the configuration event, where the object class is reported for each object. This allows the manager to determine whether the class of the object being specified is a numeric, real-time sample array, 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 [~~B4~~[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-~~2008~~.
- 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 11073-20601-2008 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. ~~The attributes can be either static, meaning that they shall remain unchanged after the configuration is agreed upon, or dynamic, meaning that the attribute may change at some point after configuration.~~



[\(New\)](#)



(Deleted)

Figure 1—Body composition analyzer—~~domain information model~~ DIM

6.4 Types of configuration

6.4.1 General

As specified in IEEE Std 11073-20601-~~2008~~, 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.

[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 ~~code~~ [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

[\(New\)](#)

Attribute name	Value	Qual.
Handle	0	M
System-Type	Attribute not present. See IEEE Std 11073-20601-2008	C
System-Type-Spec-List	{MDC_DEV_SPEC_PROFILE_BCA, 1}	M
System-Model	{“Manufacturer”, “Model”}	M
System-Id	Extended unique identifier (64-bits) (EUI-64)	M
Dev-Configuration-Id	Standard config: 0x07D0 (2000) Extended configs: 0x4000-0x7FFF	M
Attribute-Value-Map	See IEEE Std 11073-20601-2008	C
Production-Specification	See IEEE Std 11073-20601-2008	O
Mds-Time-Info	See IEEE Std 11073-20601-2008	C
Date-and-Time	See IEEE Std 11073-20601-2008	C
Relative-Time	See IEEE Std 11073-20601-2008	C
HiRes-Relative-Time	See IEEE Std 11073-20601-2008	C
Date-and-Time-Adjustment	See IEEE Std 11073-20601-2008	C
Power-Status	<i>onBattery</i> or <i>onMains</i>	R
Battery-Level	See IEEE Std 11073-20601-2008	R
Remaining-Battery-Time	See IEEE Std 11073-20601-2008	R
Reg-Cert-Data-List	See IEEE Std 11073-20601-2008	O
Confirm-Timeout	See IEEE Std 11073-20601-2008	O

(Deleted)

NOTE—See IEEE Std 11073-20601-2008 for information on whether an attribute is static or dynamic.

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	<i>onBattery</i> or <i>onMains</i>	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.				

(New)

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

See IEEE Std 11073-20601-~~2008~~ 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-~~2008~~) 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-~~2008~~) 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-~~2008~~); the “Parameters (action-info-args)” column defines the associated ASN.1 data structure (see IEEE Std 11073-20601-~~2008~~ 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

(New)

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	—

(Deleted)

— **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 11073-20601-2008). 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 agent supports the Absolute-Time-Stamp attribute, this method shall be implemented 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-capabset-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.