

SLOVENSKI STANDARD
oSIST prEN ISO 20685-2:2016
01-september-2016

Ergonomija - Postopki 3D-skeniranja za mednarodno združljive baze antropometrijskih podatkov - 2. del: Ovrednotenje protokolne površinske oblike in ponovljivosti relativnih položajev mejnikov (ISO 20685-2:2015)

Ergonomics - 3-D scanning methodologies for internationally compatible anthropometric databases - Part 2: Evaluation protocol of surface shape and repeatability of relative landmark positions (ISO 20685-2:2015)

iTeh Standards
(<https://standards.iteh.ai>)

Ergonomie - Méthodologies d'exploration tridimensionnelles pour les bases de données anthropométriques compatibles au plan international - Partie 2: Protocole d'évaluation de la forme extérieure et de la répétabilité des positions relatives de repères (ISO 20685-2:2015)

[SIST EN ISO 20685-2:2017](https://standards.iteh.ai/catalog/standards/sist/d277f5e1-6c1d-48de-97a7-55be906bfbd3/sist-en-iso-20685-2-2017)

<https://standards.iteh.ai/catalog/standards/sist/d277f5e1-6c1d-48de-97a7-55be906bfbd3/sist-en-iso-20685-2-2017>

Ta slovenski standard je istoveten z: prEN ISO 20685-2

ICS:

13.180

Ergonomija

Ergonomics

oSIST prEN ISO 20685-2:2016

en,fr,de

INTERNATIONAL STANDARD

ISO
20685-2

First edition
2015-08-01

Ergonomics — 3-D scanning methodologies for internationally compatible anthropometric databases —

Part 2:

Evaluation protocol of surface shape and repeatability of relative landmark positions

*Ergonomie — Méthodologies d'exploration tridimensionnelles
pour les bases de données anthropométriques compatibles au plan
international —*

*Partie 2: Protocole d'évaluation de la forme extérieure et de la
répétabilité des positions relatives de repères*



Reference number
ISO 20685-2:2015(E)

© ISO 2015

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[SIST EN ISO 20685-2:2017](https://standards.iteh.ai/catalog/standards/sist/d277f5e1-6c1d-48de-97a7-55be906bfbd3/sist-en-iso-20685-2-2017)

<https://standards.iteh.ai/catalog/standards/sist/d277f5e1-6c1d-48de-97a7-55be906bfbd3/sist-en-iso-20685-2-2017>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Test protocol for evaluating surface shape measurement	3
4.1 General aspects.....	3
4.2 Test sphere.....	3
4.3 Procedure.....	3
4.3.1 Measurement of test sphere.....	3
4.3.2 Calculation of quality parameters.....	4
4.3.3 Report.....	4
5 Test protocol for evaluating repeatability of landmark positions	5
5.1 General aspects.....	5
5.2 Test object.....	5
5.3 Landmarks.....	5
5.4 Procedure.....	6
5.4.1 Measurement.....	6
5.4.2 Calculation of quality parameter.....	7
5.4.3 Report.....	7
6 Evaluation of hidden area	7
6.1 General aspect.....	7
6.2 Recruitment of subjects.....	7
6.3 Posture control and measurement.....	7
6.4 Procedure to evaluate the hidden area.....	8
6.5 Report.....	8
Annex A (informative) Sample of test object	9
Annex B (informative) Example of test and report	11
Annex C (informative) Example of report of evaluation of hidden area	17
Annex D (informative) Simultaneous superimposition of landmark coordinate data from 10 scans	19
Bibliography	20

ISO 20685-2:2015(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://www.iso.org/foreword)

The committee responsible for this document is ISO/TC 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*.

ISO 20685 consists of the following parts, under the general title *3-D scanning methodologies for internationally compatible anthropometric databases*:

— *Part 2: Evaluation protocol of surface shape and repeatability of relative landmark positions*

A revision of ISO 20685:2010 is under preparation; when revised, it will become

— *Part 1: Evaluation protocol for body dimensions extracted from 3-D body scans*

Introduction

Anthropometric measures are key to many International Standards. These measures can be gathered using a variety of instruments. An instrument with relatively new application to anthropometry is a three-dimensional (3-D) scanner. 3-D scanners generate a 3-D point cloud of the outside of the human body that can be used in a number of situations including clothing and automotive design, engineering and medical applications. Recently, digital human models are created from a 3-D point cloud, and used for various applications related to technological design process. Quality control of scan-extracted anthropometric data is important since required quality can differ according to applications.

There are a number of different fundamental technologies that underlie commercially available systems. These include stereophotogrammetry, ultrasound and light (laser light, white light and infrared), among others. Further, the software that is available to process data from the scan varies in its methods. Additionally, methods to extract landmark positions are different between commercially available systems. In some systems, anthropometrists decide landmark locations and paste marker stickers, and scanner system calculate locations of marker stickers and identify their names, while in other systems, landmark positions are automatically calculated from the surface shape data. Quality of landmark locations have significant effects on the quality of scan-extracted 1-D measurements as well as digital human models created based on these landmarks.

As a result of differences in fundamental technology, hardware and software, the quality of body surface shape and landmark locations from several different systems can be different for the same individual. Since 3-D scanning can be used to gather these data, it was important to develop an International Standard that allows users of such systems as well as users of scan-extracted measurements to judge whether the 3-D system is adequate for these needs.

The intent of this part of ISO 20685 is to ensure the quality control process of body scanners, especially that of surface shape and locations of landmarks as specified by ISO 7250-1.

Document Preview

[SIST EN ISO 20685-2:2017](https://standards.iteh.ai/catalog/standards/sist/d277f5e1-6c1d-48de-97a7-55be906bfbd3/sist-en-iso-20685-2-2017)

<https://standards.iteh.ai/catalog/standards/sist/d277f5e1-6c1d-48de-97a7-55be906bfbd3/sist-en-iso-20685-2-2017>

Ergonomics — 3-D scanning methodologies for internationally compatible anthropometric databases —

Part 2:

Evaluation protocol of surface shape and repeatability of relative landmark positions

1 Scope

This part of ISO 20685 addresses protocols for testing of 3-D surface-scanning systems in the acquisition of human body shape data and measurements. It does not apply to instruments that measure the motion of individual landmarks.

While mainly concerned with whole-body scanners, it is also applicable to body-segment scanners (head scanners, hand scanners, foot scanners). This International Standard applies to body scanners that measure the human body in a single view. When a hand-held scanner is evaluated, it has to be noted that the human operator can contribute to the overall error. When systems are evaluated in which the subject is rotated, movement artefacts can be introduced; these can also contribute to the overall error. This part of ISO 20685 applies to the landmark positions determined by an anthropometrist. It does not apply to landmark positions automatically calculated by software from the point cloud.

The quality of surface shape of the human body and landmark positions is influenced by performance of scanner systems and humans including measurers and subjects. This part of ISO 20685 addresses the performance of scanner systems by using artefacts rather than human subjects as test objects.

Traditional instruments are required to be accurate to millimetre. Their accuracy can be verified by comparing the instrument with a scale calibrated according to an international standard of length. To verify or specify the accuracy of body scanners, a calibrated test object with known form and size is used.

The intended audience is those who use 3-D body scanners to create 3-D anthropometric databases including 3-D landmark locations, the users of these data, and scanner designers and manufacturers. This part of ISO 20685 intends to provide the basis for the agreement on the performance of body scanners between scanner users and scanner providers as well as between 3-D anthropometric database providers and data users.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7250-1, *Basic human body measurements for technological design — Part 1: Body measurement definitions and landmarks*

ISO 10360-8, *Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring systems (CMS) — Part 8: CMMs with optical distance sensors*

ISO 20685, *3-D scanning methodologies for internationally compatible anthropometric databases*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO 20685-2:2015(E)

3.1
error of spherical form measurement
 error within the range of the Gaussian radial distance, determined by a least-squares fit of measured data points on a test sphere

Note 1 to entry: Error of spherical form measurement is associated with the performance of the body scanner and the sphericity of the test sphere.

3.2
spherical form dispersion value
 smallest width of a spherical shell that includes n % of all the measured data points

Note 1 to entry: See [Figure 1](#), right.

Note 2 to entry: n should be 90 %.

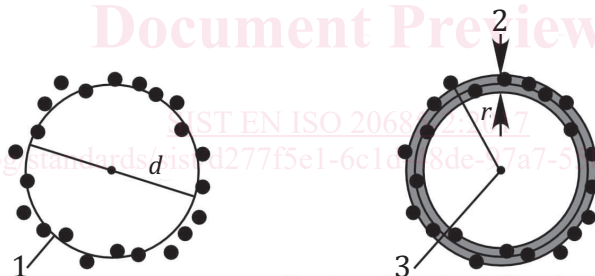
3.3
standard deviation of radial distances
 standard deviation of radial distances from measured data points and best-fit sphere

Note 1 to entry: Standard deviation of radial distances is an indicator of error of spherical form measurement and is highly correlated with error of spherical form measurement (90 %).

3.4
error of diameter measurement
 error of the diameter of a least-squares fit of measured data points on a test sphere

Note 1 to entry: See [Figure 1](#), left.

Note 2 to entry: It is calculated as the measured diameter minus the calibrated diameter.



Key

- 1 best-fit sphere
- 2 spherical form dispersion value (n)
- 3 centre of the best-fit sphere
- d diameter of the best-fit sphere
- r radial distance of a measured data point from the centre of the best-fit sphere

NOTE Spherical form dispersion value (n), in which n % of the measured data points are located, is shown as the radial thickness of the shaded area of the right figure. Spherical form dispersion value (n) is calculated as the $100 - n/2$ percentile value minus $n/2$ percentile value of the radial distances of the measured data points from the centre of the best-fit sphere.

Figure 1 — Error of diameter measurement and spherical form dispersion value