
Clothing — Digital fittings —

Part 1:

**Vocabulary and terminology used for
the virtual human body**

Habillement — Essayage virtuel —

*Partie 1: Vocabulaire et terminologie utilisés pour le corps humain
virtuel*

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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).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 133, *Clothing sizing systems — size designation, size measurement methods and digital fittings*.

ISO 18825 consists of the following parts, under the general title *Clothing — Digital fittings*:

- *Part 1: Vocabulary and terminology used for the virtual human body*
- *Part 2: Vocabulary and terminology used for attributes of the virtual human body*

Introduction

The virtual human model exists in various formats in the virtual world and is applied in many different industrial sectors. The virtual human body used in the fashion field reflects the attributes of different areas of the human body based on physical measurements and shape characteristics.

Various types of virtual human body-based IT-fashion convergence technology are being attempted today, according to rapid development of the vast online fashion market, including the internet, mobile market, smart TVs, and virtual fittings at shops and stores. Meanwhile, the increased demand of mass customized and made-to-measure garments these days encourages efforts to innovate the traditional process of planning, production and sales. The use of digital technology in this new ubiquitous environment of the international apparel industry is leading to use of three-dimensional information on consumers and digital human bodies that reflect somatotype characteristics, and consumers can now go online anytime, anywhere, to try on clothes, evaluate the style and fit, and place orders. Despite such advances, there is a lack of an International Standard related to the virtual human body.

Therefore, this part of ISO 18825 is the first in a series of International Standards that deal with the virtual human body, a necessary component of the 3D virtual garment system used in the apparel industry. The main goals of this International Standard are to define a virtual human body to be used to improve online communication and reliability of fashion products sold online and in-store through visual confirmation of size, shape, fit and design. This International Standard will establish a single index and reference for all virtual garment programs that are currently using various, confusing terminology.

This part of ISO 18825 specifies vocabulary, terminology and definitions related to digital fitting, such as virtual human body shapes, composition and attributes, and thus supports online and in-store consumers, fashion designers, product developers, technologists, manufacturers and retailers who have an interest in the style and fit of clothes. Developers will be able to use unified vocabulary and terminology when they devise virtual garment systems. Online consumers, fashion designers, manufacturers and sellers using virtual garment systems will be able to make use of the vocabulary and terminology regarding virtual body dimensions. It is therefore expected to improve convenience for consumers, improve efficiency in clothing manufacturing and contribute to a decrease in the return rate of clothes purchased online.

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Clothing — Digital fittings —

Part 1: Vocabulary and terminology used for the virtual human body

1 Scope

This part of ISO 18825 covers vocabulary and terminology used for the virtual human body in the virtual garment system used as a main tool in various fields of clothing application. This part of ISO 18825 is applicable to all stages of online clothing communication and business, including design, manufacture, order, sales, distribution and customer management.

2 Terms and definitions

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

2.1 General terms

2.1.1

virtual human model

three-dimensional model in digital format

2.1.1.1

parametric human body

virtual human model with changeable parameters such as size and shape, etc.

Note 1 to entry: Parametric human body is created by modifying the parameters of the exemplar model imported from the 3D model library. The exemplar models differ with countries as they are based on a database. Therefore, a parametric human body can be made on the basis of height variations, BMI (body mass index) and so on (see [Figure A.1](#)).

Note 2 to entry: The parameters of the parametric human body are presented in the parametric human body software. The parameters of the parametric human body can be added depending on the purpose of users.

Note 3 to entry: See [Figure 1](#).

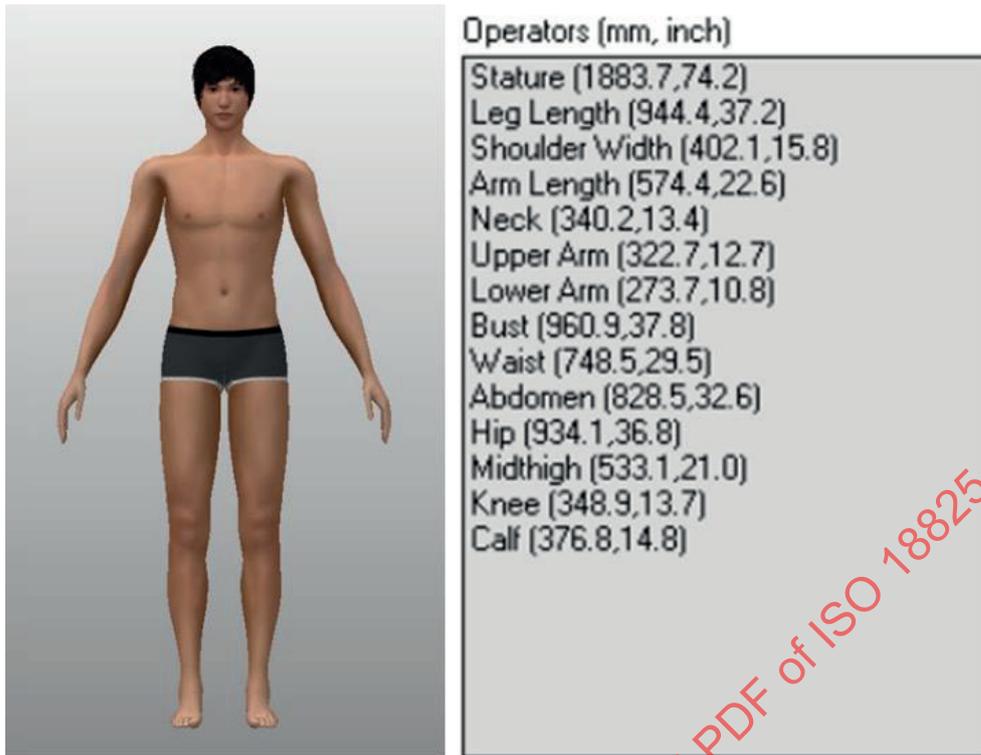


Figure 1 — Examples of parameters of a male adult body

2.1.1.2

virtual human body

virtual human model for digital fitting in the apparel industry, including information such as size, shape, cross section, body texture and skeletal structure

Note 1 to entry: Also called “fashion avatar”. In computing, an avatar is the graphical representation of the user or the user’s alter ego or character.

Note 2 to entry: The virtual human body is classified into two key types — virtual clone (virtual shape) and virtual twin (virtual size); see [Table B.1](#).

2.1.1.2.1

virtual clone

virtual shape

virtual human body that is created by forming three-dimensional surface data from a 3D body scanned point cloud (see ISO 20685:2010, 3.21), using surface modeling processes, including noise elimination, hole-filling and mesh generation

Note 1 to entry: It is essential that a user get scanned first to create a virtual clone (virtual shape).

Note 2 to entry: The virtual clone (virtual shape) is identical to the body shape of the user.

Note 3 to entry: See [Figure 2](#).

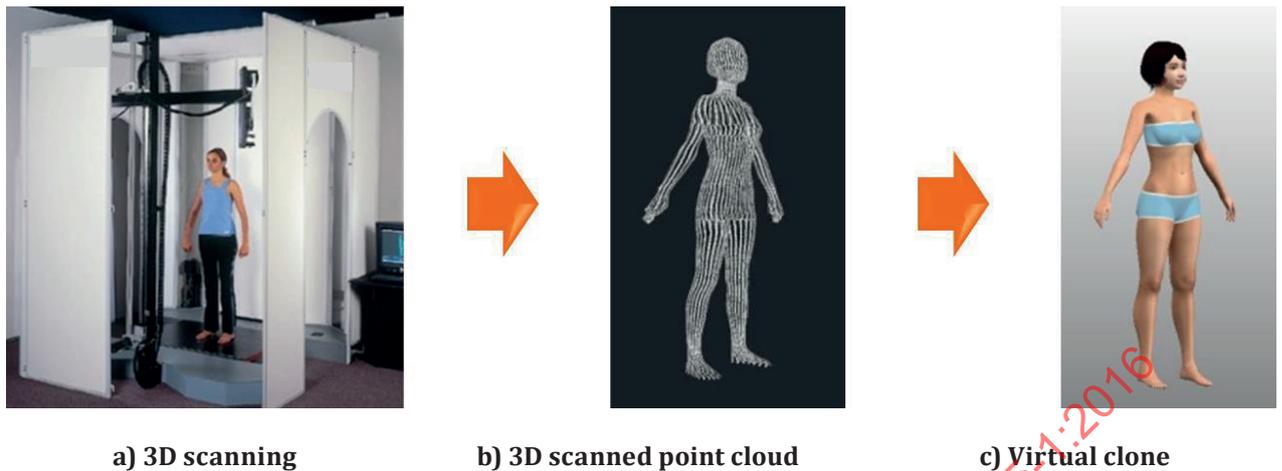


Figure 2 — Process of creating a virtual clone (virtual shape)

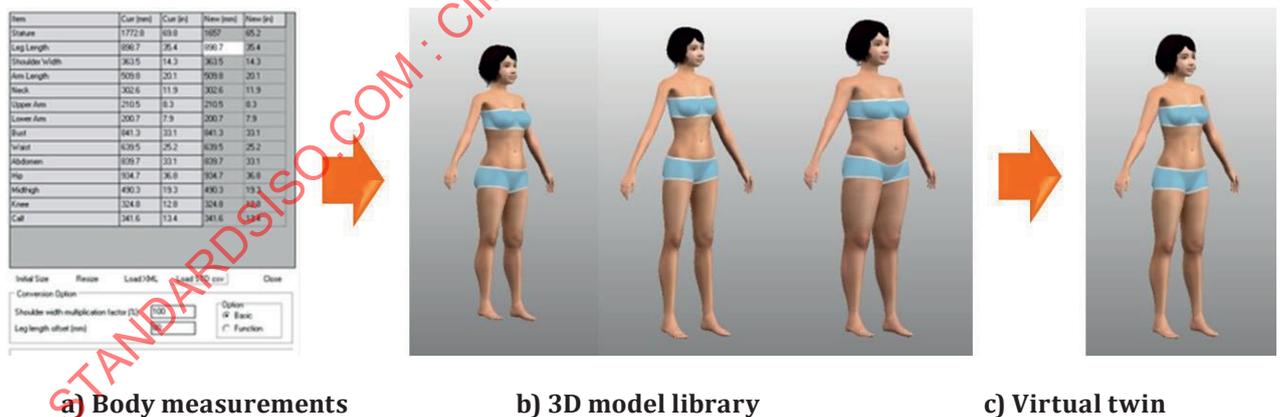
2.1.1.2.2
virtual twin
virtual size

morphed virtual human body that is applied body dimensions acquired either through manual or automatic measurements

Note 1 to entry: The virtual twin (virtual size) is a *parametric human body* (2.1.1.1) as it can be altered with parameters.

Note 2 to entry: The virtual twin (virtual size) is not identical to the user; but is a close approximation that can be altered by entering parameters retrieved from a population database.

Note 3 to entry: See [Figure 3](#).



NOTE Body measurements are necessary to create a virtual twin. The actual text in a) is not important.

Figure 3 — Process of creating a virtual twin (virtual size)

2.2 Terms relating to basic composition and attributes

2.2.1

virtual body segment

part of the body that depicts the shape of the *virtual human body* (2.1.1.2)

Note 1 to entry: The software is based on at least 10 basic virtual body segments — the virtual head, virtual torso, two virtual arms, two virtual hands, two virtual legs, and two virtual feet.

Note 2 to entry: A virtual body segment consists of virtual body regions. A virtual body region refers to a specific area subdividing the virtual body segment.

Note 3 to entry: The shape and size of virtual body segments can change by entering parameters of the *virtual twin (virtual size)* (2.1.1.2.2).

2.2.2

virtual cross section

closed contour extracted from the plane cutting a *virtual body segment* (2.2.1) perpendicular to its main axis or the three principle axes

Note 1 to entry: See [Figure 4](#).

Note 2 to entry: The main axis is the axis that connects the joints on either side of the virtual body segment.

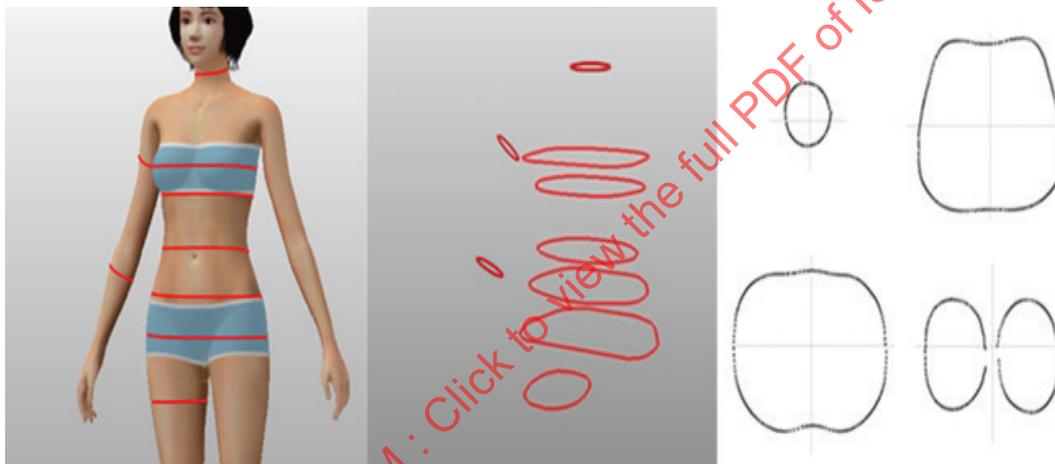


Figure 4 — Examples of virtual cross sections

2.2.3

virtual body dimension

size information on *virtual body segments* (2.2.1) of the *virtual human body* (2.1.1.2) that corresponds to measured anthropometric dimensions of the user in the virtual standing position

Note 1 to entry: Virtual standing position: the head is in the Frankfurt plane, the long axes of the feet should be parallel to one another and 200 mm apart. The upper arms are abducted to form a 20° angle with the sides of the torso and the elbows are straight. But the palms face toward the torso. This position shall be used for evaluating the fit of garments.

Note 2 to entry: Virtual body dimensions for the virtual human body can be selected from anthropometric dimensions as defined by ISO 8559.

EXAMPLE Virtual shoulder width, virtual crotch height, virtual neck girth, virtual waist girth, virtual hip girth, virtual knee girth, virtual calf girth, etc.

2.2.4

virtual body landmark

points which define the characteristic of the body shape of the user in the virtual standing position

EXAMPLE Virtual top head point, virtual side neck-base point, virtual shoulder point, virtual side waist point, virtual hip point, virtual front knee point, etc. (see ISO 18825-2).

Note 1 to entry: For example, points of bony prominence, peak points on a convex or concave surface, or points like the navel can be virtual body landmarks (see [Figure 5](#)).



Figure 5 — Examples of virtual body dimensions and virtual body landmarks

2.2.5

virtual skeletal structure

frame of the *virtual human body* ([2.1.1.2](#)) representing bones and joints

EXAMPLE 1 Virtual neck bone, virtual collar bone, virtual arm bone, virtual forearm bone, virtual torso bone, virtual pelvic bone, virtual thigh bone and virtual leg bone.

EXAMPLE 2 Virtual neck joint, virtual neck-base joint, virtual shoulder joint, virtual elbow joint, virtual wrist joint, virtual waist joint, virtual hip joint, virtual knee joint and virtual ankle joint.

Note 1 to entry: See [Figure 6](#).

Note 2 to entry: Virtual joints are the part of the virtual human body where two or more virtual bones meet and are able to move together. The virtual skeletal structure enables the virtual human body to express realistic motions and body poses.

Note 3 to entry: The virtual joints and virtual bones of the virtual human body are based on H-Anim (see ISO/IEC 19774) but were simplified as they will be used for virtual garment systems of the clothing industry.

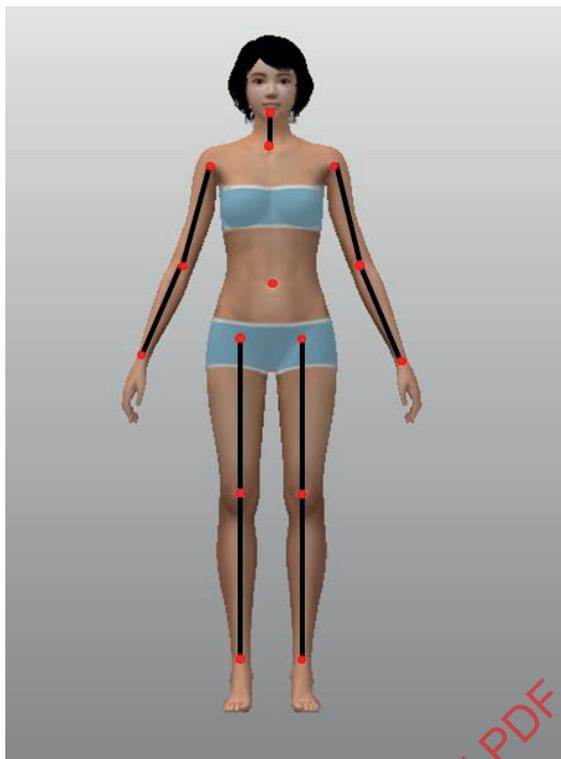


Figure 6 — Examples of virtual bones and virtual joints

2.2.6

virtual body texture

surface appearance of the *virtual human body* (2.1.12) surface

Note 1 to entry: See [Figure 7](#).

Note 2 to entry: Virtual body texture is expressed realistically by mapping elements of the image, such as skin and hair, etc.

Note 3 to entry: Colours and tones of virtual body texture can be adjusted.



Figure 7 — Examples of virtual body texture

2.3 Terms relating to optional composition and attributes

2.3.1

virtual body pose

static position of the *virtual human body* (2.1.1.2) taken by adjusting the angles between two *virtual body segments* (2.2.1) sharing a joint

Note 1 to entry: See [Figure 8](#).

Note 2 to entry: The virtual human body can be presented in many different virtual body poses, including a standing pose, a walking pose, a knees-bent pose, arms raised with bent elbows pose and shoulder/arms backward and forward pose.

Note 3 to entry: Virtual body poses are necessary to evaluate the fit of virtual garments on a virtual human body in a certain pose.

Note 4 to entry: There are various methods that create virtual poses appropriate to evaluate the fit of virtual garments according to a virtual garment system.



Figure 8 — Examples of virtual body poses

2.3.2 virtual motion

activity or process of continually changing body poses of the *virtual human body* (2.1.1.2)

Note 1 to entry: Virtual motion can be created by rotating virtual joints and interpolating individual *virtual body poses* (2.3.1).

Note 2 to entry: The rotation of virtual joints is a simplification of the rotation of real joints; however, it is possible for virtual human body to run or walk.

Note 3 to entry: Virtual motions are necessary to evaluate the fit of virtual garments on a virtual human body doing certain virtual motions.

Note 4 to entry: There are various methods that control virtual motions appropriate to evaluate the fit of virtual garments according to a virtual garment system.

2.3.3 virtual flesh

representation of muscle and fat of the *virtual human body* (2.1.1.2) used as a modeling element when creating various *virtual body poses* (2.3.1) and *virtual motions* (2.3.2)

Note 1 to entry: Needs to be considered for mechanical interactions between a garment (see ISO 18163 and ISO 18831) and a virtual human body.

Annex A (informative)

Examples of parametric human body types

The size and shape of a parametric human body can be expressed visually according to adult/children or male/female body types.

NOTE Parametric human body types can be classified, assigning a certain criterion according to the purpose of users in the parametric human body software.



Operators (mm, inch)

Stature	(1871.7,73.7)
Leg Length	(944.4,37.2)
Shoulder Width	(359.3,14.1)
Arm Length	(595.8,23.5)
Neck	(308.3,12.1)
Upper Arm	(216.9,8.5)
Lower Arm	(191.0,7.5)
Bust	(829.3,32.6)
Waist	(634.8,25.0)
Abdomen	(674.6,26.6)
Hip	(807.7,31.8)
Midthigh	(376.8,14.8)
Knee	(300.6,11.8)
Calf	(290.2,11.4)



Operators (mm, inch)

Stature	(1890.1,74.4)
Leg Length	(944.4,37.2)
Shoulder Width	(402.1,15.8)
Arm Length	(574.4,22.6)
Neck	(340.2,13.4)
Upper Arm	(322.7,12.7)
Lower Arm	(273.7,10.8)
Bust	(960.9,37.8)
Waist	(748.5,29.5)
Abdomen	(828.5,32.6)
Hip	(934.1,36.8)
Midthigh	(533.1,21.0)
Knee	(348.9,13.7)
Calf	(376.8,14.8)



Operators (mm, inch)

Stature	(1895.7,74.6)
Leg Length	(928.5,36.6)
Shoulder Width	(407.0,16.0)
Arm Length	(572.0,22.5)
Neck	(372.0,14.6)
Upper Arm	(376.4,14.8)
Lower Arm	(278.7,11.0)
Bust	(1083.6,42.7)
Waist	(1101.1,43.3)
Abdomen	(1122.5,44.2)
Hip	(1189.2,46.8)
Midthigh	(657.7,25.9)
Knee	(427.8,16.8)
Calf	(434.7,17.1)



Operators (mm, inch)

Stature	(1755.7,69.1)
Leg Length	(898.7,35.4)
Shoulder Width	(329.7,13.0)
Arm Length	(526.7,20.7)
Neck	(265.2,10.4)
Upper Arm	(153.1,6.0)
Lower Arm	(137.5,5.4)
Bust	(765.4,30.1)
Waist	(528.5,20.8)
Abdomen	(701.0,27.6)
Hip	(801.2,31.5)
Midthigh	(373.4,14.7)
Knee	(295.5,11.6)
Calf	(286.1,11.3)



Operators (mm, inch)

Stature	(1773.8,69.8)
Leg Length	(898.8,35.4)
Shoulder Width	(363.5,14.3)
Arm Length	(509.8,20.1)
Neck	(304.5,12.0)
Upper Arm	(211.3,8.3)
Lower Arm	(202.0,8.0)
Bust	(841.6,33.1)
Waist	(639.7,25.2)
Abdomen	(839.8,33.1)
Hip	(935.6,36.8)
Midthigh	(491.3,19.3)
Knee	(325.7,12.8)
Calf	(342.8,13.5)



Operators (mm, inch)

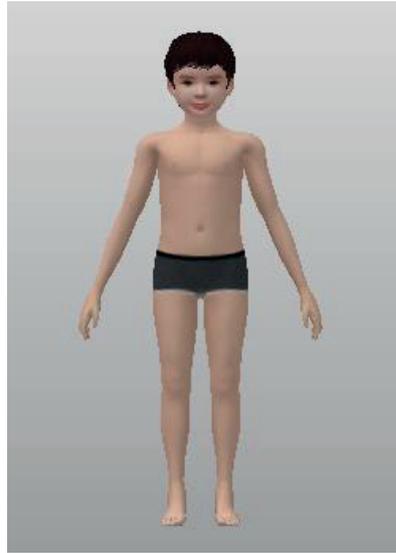
Stature	(1795.7,70.7)
Leg Length	(893.7,35.2)
Shoulder Width	(379.6,14.9)
Arm Length	(501.8,19.8)
Neck	(331.4,13.0)
Upper Arm	(300.8,11.8)
Lower Arm	(227.9,9.0)
Bust	(1075.2,42.3)
Waist	(941.5,37.1)
Abdomen	(1068.4,42.1)
Hip	(1148.5,45.2)
Midthigh	(657.7,25.9)
Knee	(468.3,18.4)
Calf	(403.5,15.9)

a) Adult body types



Operators (mm, inch)

Stature (1175.6,46.3)
 Leg Length (566.5,22.3)
 Shoulder Width (229.7,9.0)
 Arm Length (392.4,15.4)
 Upper Arm (168.1,6.6)
 Lower Arm (145.8,5.7)
 Bust (537.5,21.2)
 Waist (425.6,16.8)
 Abdomen (473.3,18.6)
 Hip (484.0,19.1)
 Midthigh (277.1,10.9)
 Knee (204.1,8.0)
 Calf (176.5,7.0)



Operators (mm, inch)

Stature (1226.5,48.3)
 Leg Length (579.5,22.8)
 Shoulder Width (230.2,9.1)
 Arm Length (381.5,15.0)
 Upper Arm (192.8,7.6)
 Lower Arm (160.3,6.3)
 Bust (625.2,24.6)
 Waist (539.1,21.2)
 Abdomen (600.4,23.6)
 Hip (633.0,24.9)
 Midthigh (351.5,14.2)
 Knee (241.4,9.5)
 Calf (233.7,9.2)



Operators (mm, inch)

Stature (1280.6,50.4)
 Leg Length (585.3,23.0)
 Shoulder Width (250.0,9.8)
 Arm Length (403.1,15.9)
 Upper Arm (283.0,11.1)
 Lower Arm (190.2,7.5)
 Bust (695.2,27.4)
 Waist (690.4,27.2)
 Abdomen (710.6,28.0)
 Hip (663.4,26.1)
 Midthigh (426.4,16.8)
 Knee (290.8,11.4)
 Calf (281.5,11.1)