Results
guide

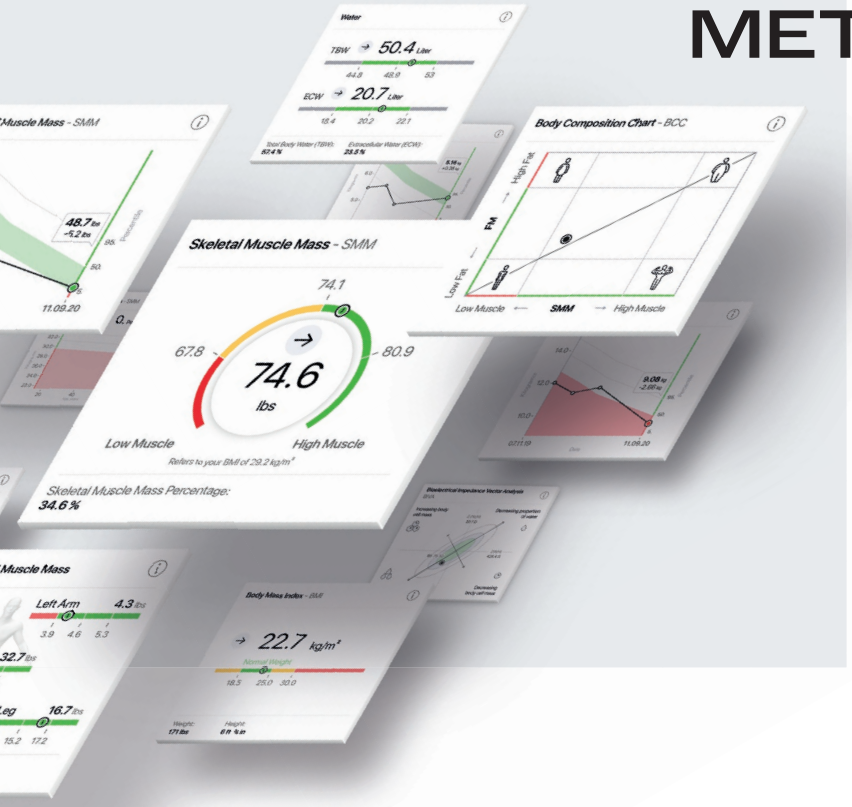
seca
Precision for health

UNDERSTANDING YOUR BODY COMPOSITION RESULTS

Body composition goes beyond a number on the scale. The seca Results Guide explains key body composition parameters, provides normal ranges, and offers tips to help interpret each measurement for deeper insights into the unique makeup of your individual body.

Helping you help.

KEY BODY COMPOSITION METRICS

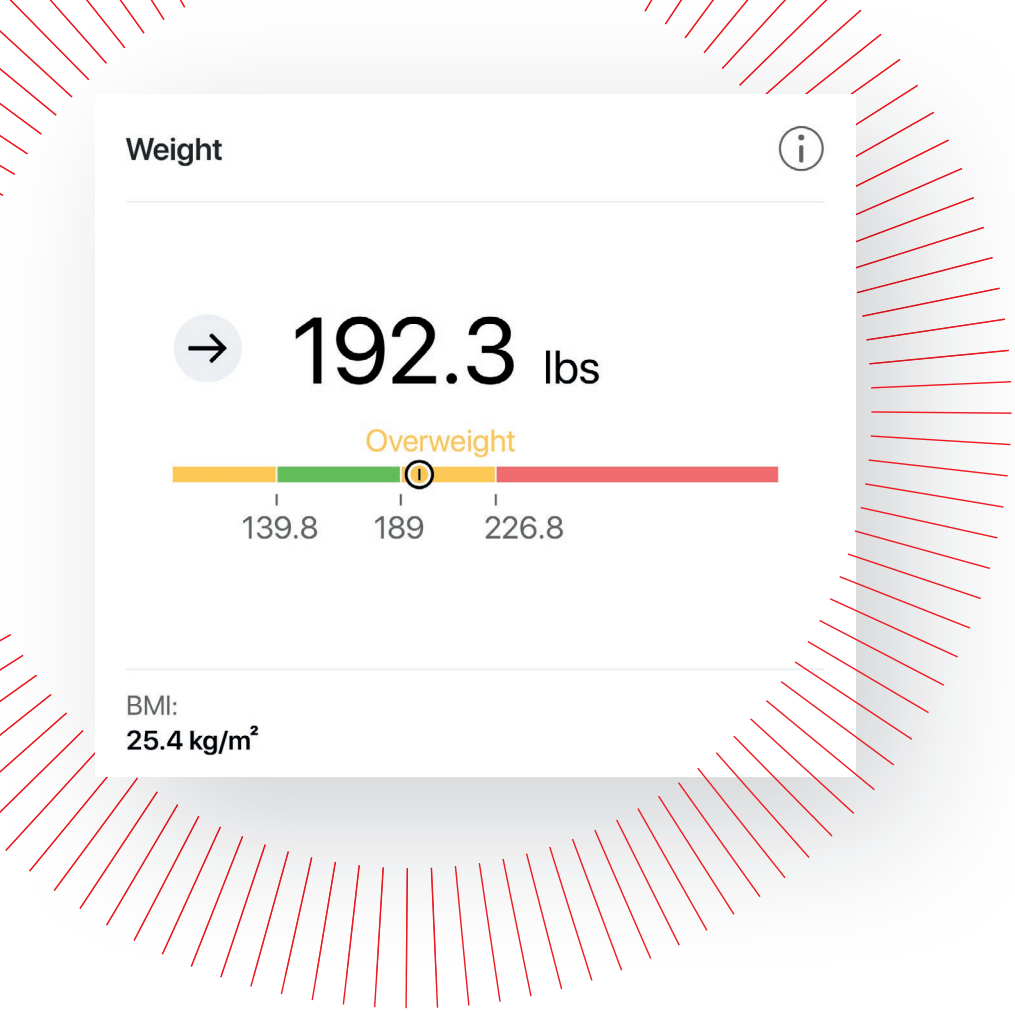


Discover which key body composition metrics are most valuable for your patients or clients and how to prioritize them in assessments.

seca has 19+ parameters that can be visualized as a rectangular tile, and customized to show up to 6 per page. When reviewing all the parameters, it may be best to consider your options by type of measurement: anthropometric, muscle mass, fat mass, water parameters and other/combination parameters/charts.

Scan or Click Here to Watch the Video "Setting Up Custom Reports"

Anthropometric	Muscle Mass	Fat Mass	Water Parameters	Other/combination
Weight	Skeletal Muscle Mass (SMM)	Fat Mass Index	Total Body Water, Extracellular Water	Resting Energy Expenditure (REE)
BMI	Skeletal Muscle Mass over age	Fat Mass %	Water Ratio (ECW/ TBW)	TRU Body Score
	Segmental Skeletal Muscle Mass	Waist Circumference	Bioelectrical Impedance Vector Analysis (BIVA)	Body Composition Chart (BCC)
	Fat Free Mass Index (FFMI)	Visceral Adipose Tissue (VAT)		
	Skeletal Muscle Index by MRI (SMI)			
	Appendicular Skeletal Muscle Index by DXA (ASMI)			
	Phase Angle			



seca
Precision for health

WEIGHT

What is the parameter and what are normal ranges?

Weight is reported in pounds (or kg) for an absolute measurement. Weight is represented with normal range parameters for WHO BMI ranges (underweight, normal weight, overweight, obesity).

Weight is represented with normal range parameters for World Health Organization (WHO) BMI ranges:

- Weight for BMI <18.5 kg/m² in yellow corresponds to underweight category
- Weight for BMI 18.5-25 kg/m² in green corresponds to normal weight category
- Weight for BMI 25-30 kg/m² in yellow corresponds to overweight category
- Weight for BMI >30 kg/m² in red corresponds to obesity category

Tips for understanding this measurement:

- BMI and weight alone are insufficient measures to assesses health for individuals as it does not measure body composition or overall health and cannot distinguish between fat, muscle, or water.
- Some patient populations do not want to discuss absolute weight. seca's monitor can be turned around so the weight and BMI are not visible.
- These measures do still need to be collected as the data is required for other calculations, however the results can be customized to remove the 'weight' tile.

seca
Precision for health

BMI

What is the parameter and what are normal ranges?

BMI is calculated from the measured weight and height and is presented in weight in kg divided by meters squared (kg/m^2) so body weight can be assessed irrespective of height.

BMI is represented with normal range parameters for World Health Organization (WHO) BMI ranges:

- BMI <18.5 kg/m^2 in yellow corresponds to underweight category
- BMI 18.5-25 kg/m^2 in green corresponds to normal weight category
- BMI 25-30 kg/m^2 in yellow corresponds to overweight category
- BMI >30 kg/m^2 in red corresponds to obesity category

Tips for understanding this measurement:

- BMI and weight alone are insufficient measures to assesses health for individuals as it does not measure body composition or overall health and cannot distinguish between fat, muscle, or water.
- Historically, BMI has been used in medical contexts and by insurance companies to evaluate access to obesity treatments.
- However, the medical community is recognizing its limitations and moving towards more comprehensive ways to gauge health and excess adiposity.

seca
Precision for health

FAT FREE MASS INDEX

What is the parameter and what are normal ranges?

Fat Free Mass (FFM) as an absolute value is given in the bottom left corner of the tile in pounds, and percentage of total body weight. To eliminate dependence on height, the Fat Free mass (FFM) is divided by height in meters squared. Fat Mass Index (FMI) and Fat-Free Mass Index (FFMI) total together to equal BMI.

FFMI is represented with reference ranges from the Global Leadership Initiative on Malnutrition (GLIM) and the European Society of Clinical Nutrition and Metabolism (ESPEN):

Women:

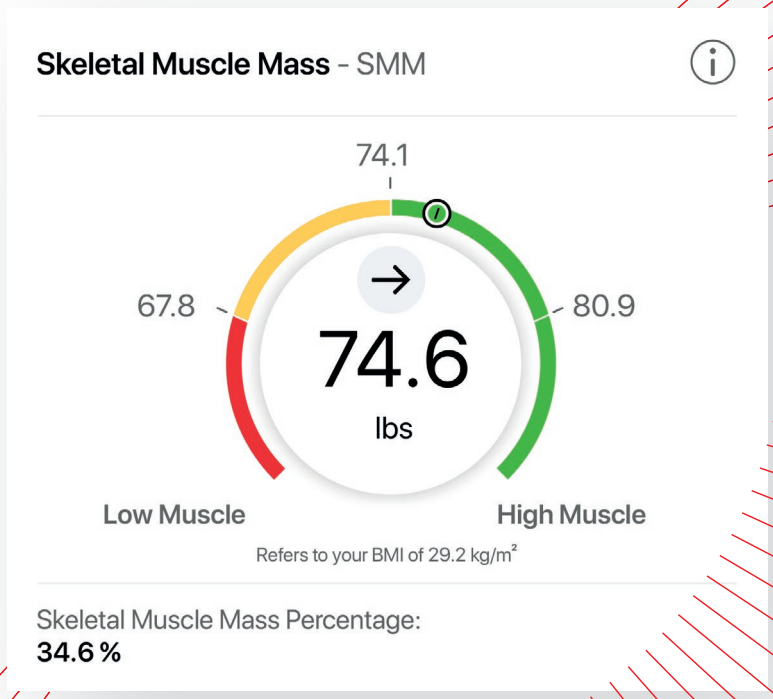
- FFMI <15 kg/m^2 in red corresponds to Low FFMI
- FFMI >15 kg/m^2 in green corresponds to Normal FFMI

Men:

- FFMI <17 kg/m^2 in red corresponds to Low FFMI
- FFMI >17 kg/m^2 in green corresponds to Normal FFMI

Tips for understanding this measurement:

- Fat-free mass (FFM) is the metabolically active tissue in the body that includes bones, muscles, vital organs, connective tissue, and water.
- When considering the body in 2 compartments, there is Fat Mass, and everything else, called Fat Free Mass.
- Too little FFM is associated with difficulties in daily life activities, lower quality of life, fat accumulation and higher risk of developing sarcopenia and osteoporosis.
- FFMI is a suitable marker indicating loss of muscle mass (sarcopenia) or malnutrition.
- FFM is the primary determinant of total energy expenditure (TEE) in all age groups and is associated with improved strength and muscle.
- During weight loss, there are no definitive guidelines that define excessive loss of FFM, but many use the ‘quarter FFM rule’ that says in healthy weight loss the proportion attributed to FFM is <25% of weight lost.



seca
Precision for health

SKELETAL MUSCLE MASS

What is the parameter and what are normal ranges?

Skeletal muscle mass (SMM) refers to the muscles that are connected to your bones and play a critical role in voluntary, active body movement and posture. Having a healthy amount of skeletal muscle is beneficial as it contributes to your overall strength, metabolism, and daily activities. It's a great indicator of your physical well-being and fitness level. Substantial loss of muscle can result in decreased basal metabolism, functional impairment, and poorer quality of life.

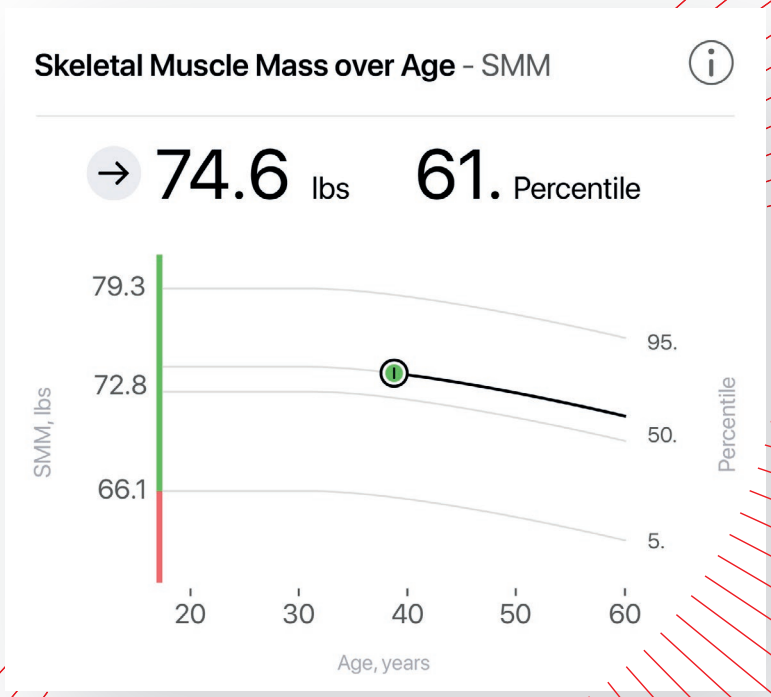
SMM is represented in pounds for your total skeletal muscle mass and colors correspond to comparison to your reference group based on age, gender, ethnicity, and BMI. The marks on the outside of the circle indicate the pounds of muscle mass that correspond to 5%, 50%, and 95% of the reference group:

- Low muscle mass falls in the red zone and corresponds to <5% compared to your reference group
- Low/normal muscle mass falls in the yellow zone and corresponds to 5-50%
- High/normal muscle mass falls in the green zone and corresponds to 50-95%
- High muscle mass falls in the green zone and corresponds to >95%

Looking at percentage of SMM to total weight (in the bottom left corner of tile) can show how muscle mass is changing when body weight changes.

Tips for understanding this measurement:

- The amount of skeletal muscle mass you have is calculated using validation studies that compare it to a whole-body MRI, making this measurement incredibly accurate, with a 97% reliability rate.
- This data is valuable for tracking trends as you embark on a journey to increase muscle mass through strength and resistance training, coupled with a higher protein intake.
- While pursuing weight loss, it's crucial to focus on both diet and exercise.
- This helps preserve your lean muscle mass, as rapid and substantial weight loss can lead to reductions in both body fat and muscle mass.
- By putting emphasis on maintaining your muscle health, you're ensuring a strong foundation for your overall well-being.
- This parameter takes weight/BMI into account, so people with obesity may have a low muscle mass, because they are being compared to others of similar weight/BMI.



seca
Precision for health

SKELETAL MUSCLE MASS OVER AGE

What is the parameter and what are normal ranges?

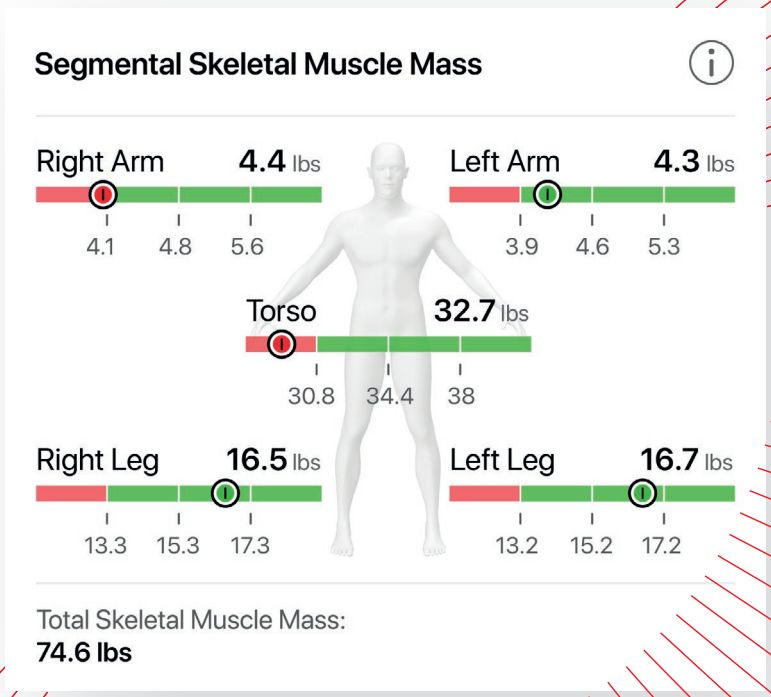
Skeletal Muscle Mass over Age is represented with time/age on the x axis, and SMM on the y axis. The circle/dot is where muscle mass is now, and the black line shows what is likely to happen over time, as muscle mass decreases approximately 3-8% per decade after age 30, and the rate of decline is even higher after age 60. This view is intended to show continuous loss of SMM with age and motivate people to engage in nutrition and physical activity regimens to mitigate rate of decline.

SMM is represented in pounds for total skeletal muscle mass and the percentile as compared to your reference group based on age, gender, ethnicity, and BMI. The light grey lines show the same degree of muscle mass loss over time and the marks on the y axis indicate pounds of muscle mass that correspond to 5, 50, and 95% of the reference group:

- Low muscle mass falls in the red zone and corresponds to <5% compared to your reference group
- Low/normal muscle mass falls in the green zone and corresponds to 5-50%
- High/normal muscle mass falls in the green zone and corresponds to 50-95%
- High muscle mass falls in the green zone and corresponds to >95%

Tips for understanding this measurement:

- The SMM over age parameter with the barbell does not compare individuals to those in the same BMI category, so the reference group is larger and above average musculature becomes apparent and is only appropriate for certain fitness settings.
- People at higher weights often show higher muscle mass when looking at the parameter with the barbell, because they are being compared to a group from all weights. Someone who weighs 300 lbs with 50 lbs of muscle, may have low muscle compared to others around 300 lbs, but compared to people who are 100 lbs, that 50 lbs of muscle mass is higher. In medical settings, it is recommended to use the parameter without the barbell.
- Preserving muscle mass as one ages must be the primary objective.



seca
Precision for health

SEGMENTAL SKELETAL MUSCLE MASS

What is the parameter and what are normal ranges?

Segmental Skeletal Muscle Mass (SMM) shows the muscle mass in each limb (right arm, left arm, right leg, left leg) and torso, as well as total SMM in pounds (bottom left corner) which enables detection of muscular asymmetries, past or recent injuries (fractures and immobilization), and may indicate neuromuscular problems to investigate further.

Segmental SMM is represented in pounds and colors correspond to comparison to your reference group based on age, gender, ethnicity, and BMI. The marks under the bar indicate the pounds of muscle mass that correspond to 5%, 50%, and 95% of the reference group:

- Low muscle mass falls in the red zone and corresponds to <5% compared to your reference group
- Low/normal muscle mass falls in the green zone and corresponds to 5-50%
- High/normal muscle mass falls in the green zone and corresponds to 50-95%
- High muscle mass falls in the green zone and corresponds to >95%

Tips for understanding this measurement:

- The Segmental SMM parameter with the barbell does not compare individuals to those in the same BMI category, so the reference group is larger and above average musculature comes apparent and is only appropriate for certain fitness settings.
- People at higher weights often show higher muscle mass when looking at the parameter with the barbell, because they are being compared to a group from all weights.
- Someone who weighs 300 lbs with 50 lbs of muscle, may have low muscle compared to others around 300 lbs, but compared to people who are 100 lbs, that 50 lbs of muscle mass is higher.
- In medical settings, it is recommended to use the parameter without the barbell.
- Consider handedness when reviewing (left-handed individuals have more muscles in left arm compared with the reference group which will be a majority right-handed).
- Exercise professionals may recommend training based on differences between upper and lower body muscle mass and strength.
- This parameter allows further breakdown of where someone is carrying their musculature.

seca
Precision for health

SKELETAL MUSCLE INDEX BY MRI

What is the parameter and what are normal ranges?

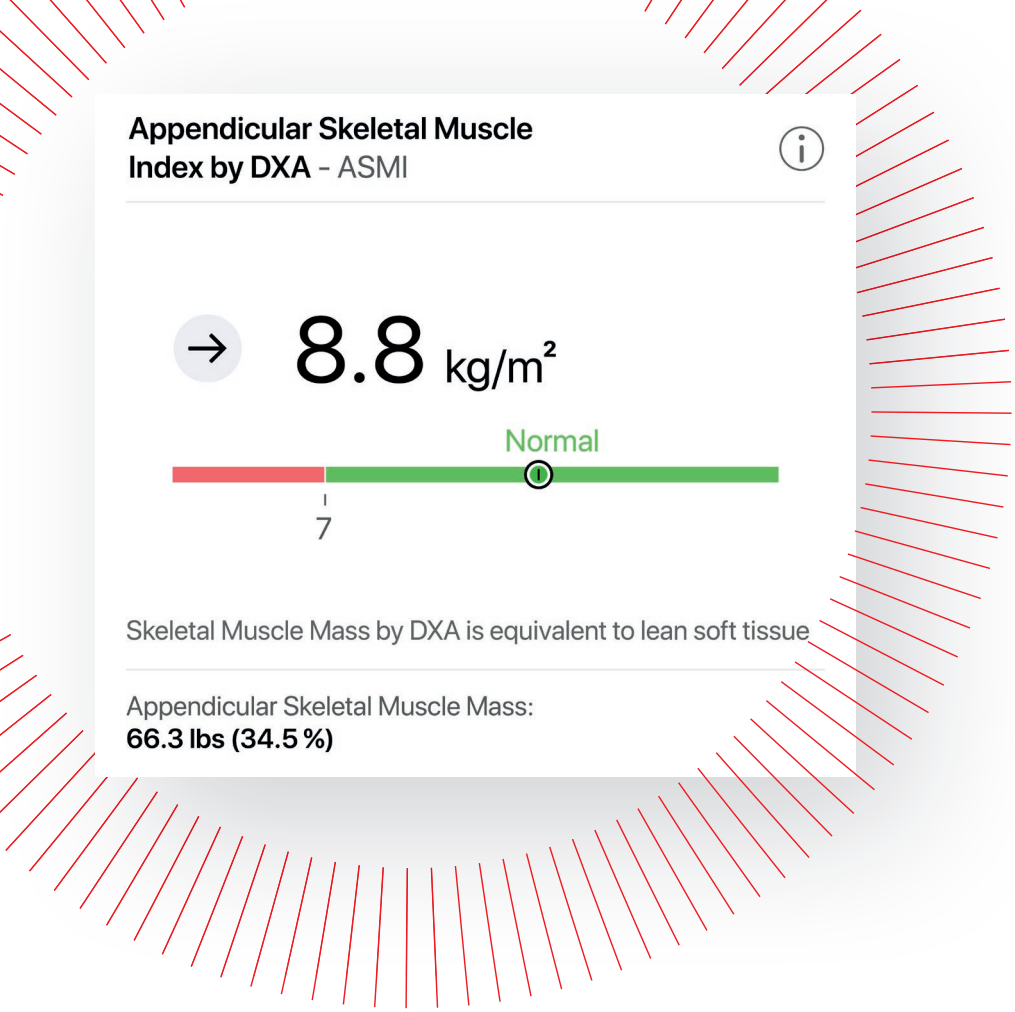
Skeletal muscle mass (SMM) refers to the muscles that are connected to your bones and play a critical role in voluntary, active body movement and posture. Having a healthy amount of skeletal muscle is beneficial as it contributes to your overall strength, metabolism, and daily activities. It's a great indicator of your physical well-being and fitness level. Substantial loss of muscle can result in decreased basal metabolism, functional impairment, and poorer quality of life.

Skeletal Muscle Index (SMI) by MRI is represented in kg/m2, as a ratio of the mass over height squared. SMI has limit values adapted for gender and ethnicity from Jensen et al., 2019:

- Low SMI falls in the red zone, below the cutoff value shown below the bar for gender/ethnicity
- Normal SMI falls in the green zone, below the cutoff value shown below the bar for gender/ethnicity

Tips for understanding this measurement:

- The title, 'SMI by MRI' is meant to indicate that the Skeletal Muscle Mass for seca's BIA is validated using whole body MRI as the gold standard reference method.
- Skeletal muscle index is a useful metric to see a loss of muscle mass or sarcopenia.
- The Skeletal Muscle Mass is given in the bottom left of this tile, so if you want to see total SMM, without the comparison to reference group, this tile can be used.
- As compared to the Appendicular Skeletal Muscle Index (ASMI) which uses the lean soft tissue for arms and legs only (obtained from DXA validation), the SMI uses skeletal muscle mass from the total body, and will be higher than ASMI.



seca
Precision for health

APPENDICULAR SMM BY DXA

What is the parameter and what are normal ranges?

Appendicular Skeletal Muscle Index (ASMI) by DXA is the weight of lean soft tissue that includes everything except fat and bone/mineral obtained from DXA in the 4 limbs (arms/legs, not torso) divided by height squared (in meters). Lean soft tissue is the sum of body water, total body protein, carbohydrates, non-fat lipids and soft tissue mineral. Because ASMI is obtained from a validation study with DXA, it will be slightly larger than muscle, because the skin and connective tissue are included in DXA-obtained Lean Soft Tissue. ASMI is a suitable marker for diagnosing loss of muscle mass, sarcopenia, or malnutrition.

ASMI is represented with thresholds defined by medical societies, the Global Leadership Initiative on Malnutrition (GLIM) and the Asian Working Group for Sarcopenia (AWGS) defined by gender as:

Women:

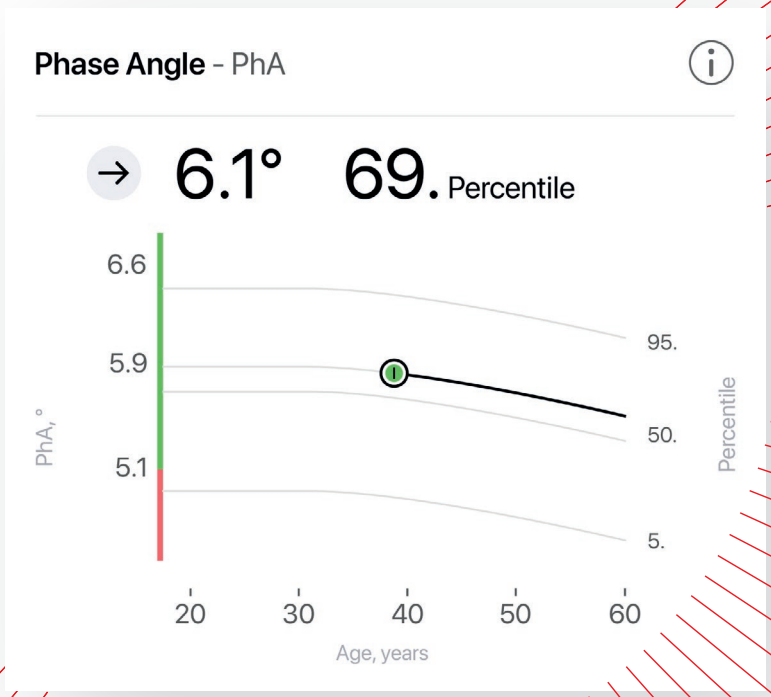
- ASMI <5.7 kg/m² in red corresponds to Low ASMI
- ASMI >5.7 kg/m² in green corresponds to Normal ASMI

Men:

- ASMI <7.0 kg/m² in red corresponds to Low ASMI
- ASMI >7.0 kg/m² in green corresponds to Normal ASMI

Tips for understanding this measurement:

- The ASMI by DXA Tile has Appendicular Skeletal Muscle mass (Lean Soft Tissue) is given in kg or lbs and % of total weight at the bottom (this is the only place this is represented in our software).
- As compared to the Skeletal Muscle Index (SMI) which uses the skeletal muscle from the whole body (obtained by MRI validation), the ASMI uses lean soft tissue for arms and legs only and will be lower than SMI because the trunk is not considered.



seca
Precision for health

PHASE ANGLE

What is the parameter and what are normal ranges?

Phase Angle (PhA) refers to the delay in voltage seen in alternating current electrical signals as they pass through the body's cell membranes. Because these membranes act as insulators, the voltage and current can become are not perfectly in sync, with one lagging behind the other. This difference in timing is measured in degrees. When plotted on a graph, this phase difference can be visualized as the angle between two points on a circle, corresponding to one complete cycle of the waveform. The phase angle indicates the amount of water inside and outside the cells, as well as the overall quality and health of the cells, and is calculated from water resistance (R) and cell reactance (Xc). In a healthy population, PhA usually ranges from 5-7, but values above 9.5 can be reached in athletes.

PhA is represented with limit values adapted for gender, ethnicity, height, and age from Jensen et al., 2019

- Low PhA falls in the red zone and corresponds to <5% compared to your reference group
- Low/normal PhA falls in the green zone and corresponds to 5-50%
- High/normal PhA falls in the green zone and corresponds to 50-95%
- High PhA falls in the green zone and corresponds to >95%

Tips for understanding this measurement:

- A higher PhA suggests that the cell membranes are intact and robust, reflecting good cellular health and overall function.
- Higher PhA is associated with: younger age, male gender, more physically active, higher BMI until 30-40, then lower PhA seen.
- Increased glycogen stores within the ICW is related to higher muscle mass, and higher PhA.
- When ECW is decreased in dehydration, PhA may be elevated due to lack of water homeostasis.
- A lower PhA may indicated damaged or less functional cell membranes which can be a sign of poor cellular health and reduced membrane integrity.
- Lower PhA is associated with: older age, female gender, less physically active, lower BMI until 30-40, then higher PhA seen.
- During weight loss, there is often some loss of muscle, and decrease in ICW, with a larger proportion of the TBW as ECW.

seca
Precision for health

FAT MASS INDEX

What is the parameter and what are normal ranges?

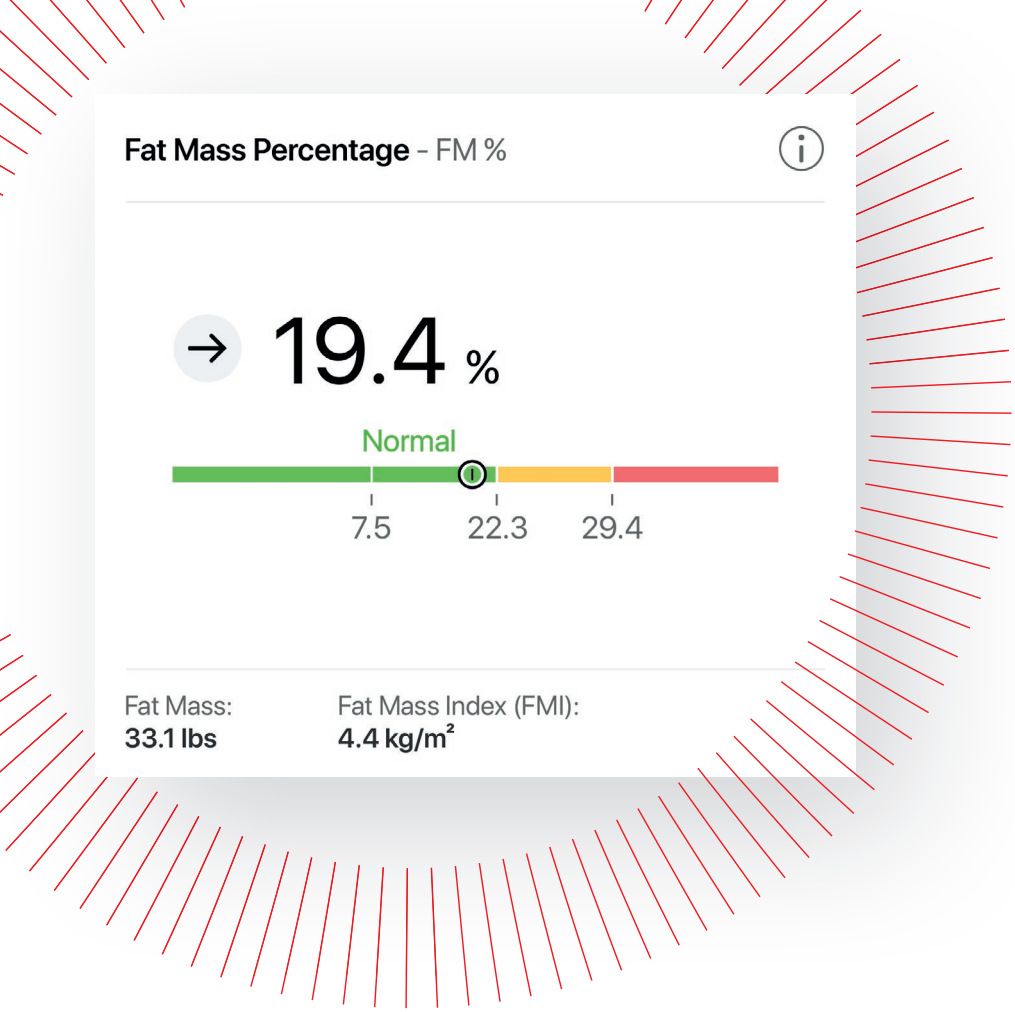
Fat Mass Index (FMI) is a measure that quantifies the amount of fat mass in relation to their height. It is calculated like BMI by dividing fat mass by height squared in order to eliminate dependence on height. Unlike BMI which includes both fat and fat free mass, FMI specifically looks at fat mass. Fat Mass Index and Fat Free Mass Index add up to equal Body Mass Index (just like Fat Mass and Fat Free Mass equal Total Weight).

FMI and BMI are closely correlated, allowing for an interpretation of an individual's Fat Mass using a conversion formula developed to give context to the FMI (Peine et al., 2013). Limit values adapted for gender, ethnicity and age are linked to BMI values.

- Low FMI corresponds with BMI <18.5 kg/m² in green (underweight category)
- Normal FMI corresponds with BMI 18.5-25 kg/m² in green (normal weight category)
- Increased FMI corresponds with BMI 25-30 kg/m² in yellow (overweight category)
- High FMI corresponds with BMI >30 kg/m² in red (obesity category)

Tips for understanding this measurement:

- When thinking about the body in 2 compartments: Fat Mass and Fat Free Mass, you can more easily see whether Fat Mass is unfavorable, leading to recommendations for changes to nutrition or physical activity regimens.
- While Fat Free Mass has specific cutoffs indicating malnutrition, Fat Mass does not, but is highly correlated with BMI, so cutoffs based on underweight, normal weight, overweight and obesity can be made.



seca
Precision for health

FAT MASS PERCENTAGE

What is the parameter and what are normal ranges?

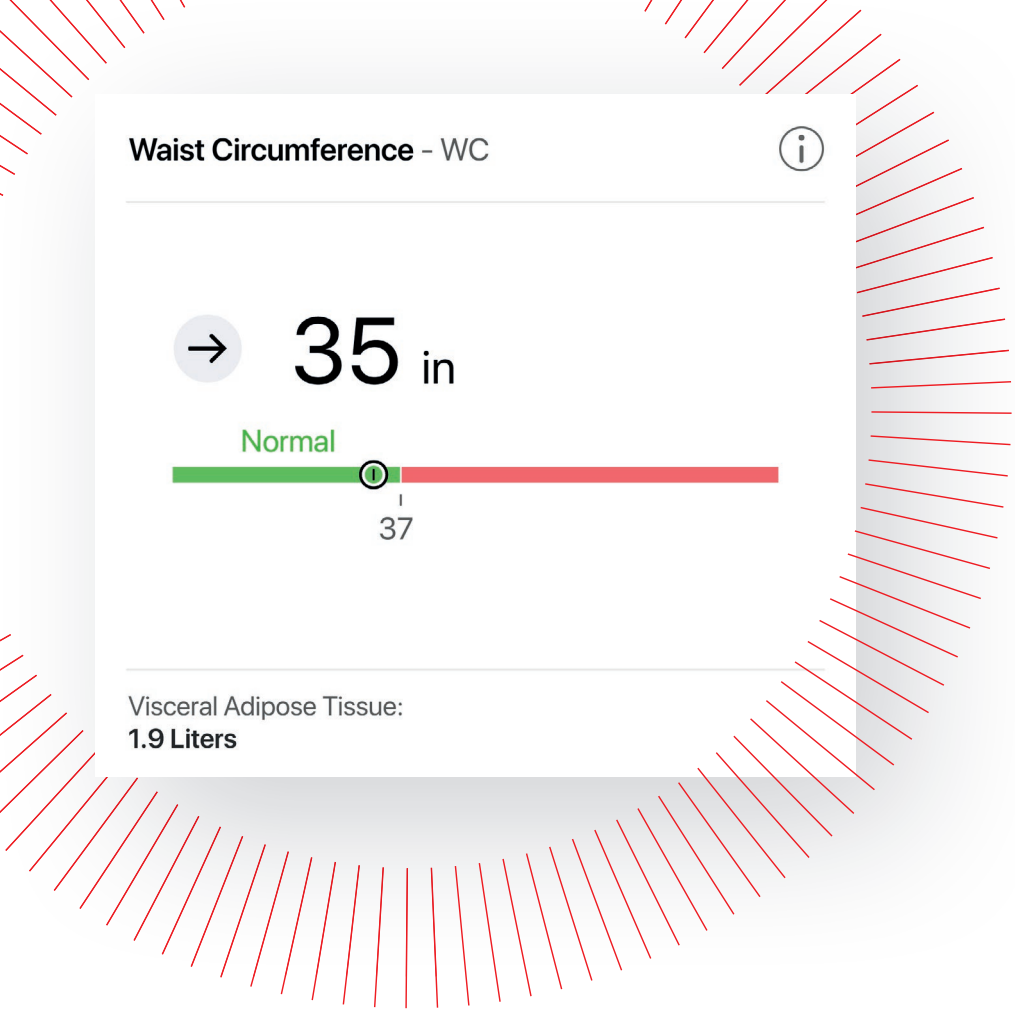
The "Fat Mass %" indicates the percentage of total body weight that is composed of adipose tissue. This percentage is evaluated using BMI benchmarks established by the World Health Organization (WHO), which takes into account factors such as gender, ethnicity, and age.

FM% and BMI are closely correlated, allowing for an interpretation of an individual's Fat Mass using a conversion formula developed to give context to the FMI (Peine et al., 2013). Limit values adapted for gender, ethnicity and age are linked to BMI values.

- Low FM% corresponds with BMI <18.5 kg/m² in green (underweight category)
- Normal FM% corresponds with BMI 18.5-25 kg/m² in green (normal weight category)
- Increased FM% corresponds with BMI 25-30 kg/m² in yellow (overweight category)
- High FM% corresponds with BMI >30 kg/m² in red (obesity category)

Tips for understanding this measurement:

- While there isn't a universally defined body fat percentage that signifies "health," it's important to note that having excess body fat, particularly around the internal organs, has been associated with an elevated risk of health problems such as heart disease, diabetes, and specific types of cancers.
- During weight loss efforts, the primary objective is to shed excess adiposity (body fat) while retaining lean muscle mass and hydration levels.
- Monitoring Body Fat % becomes a valuable tool in assessing the effectiveness of interventions or treatments aimed at weight loss/management.
- This parameter supports a focusing on a more favorable body composition by reducing body fat and maintaining muscle mass, rather than on weight loss alone.



seca
Precision for health

WAIST CIRCUMFERENCE

What is the parameter and what are normal ranges?

Waist Circumference (WC) is measured by finding the midpoint between the lowest rib and the top of the hipbone with a measuring tape. A high waist circumference, especially due to abdominal obesity, is associated with increased health risks such as type 2 diabetes, cardio-vascular disease, metabolic syndrome, certain cancers, and fatty liver disease. The upper limit in the software is 78 in (200 cm).

Waist Circumference is represented with specific thresholds from the International Diabetes Federation (IDF) for gender and ethnicity:

Women:

- WC > 31.5 in (80 cm) red corresponds to high waist circumference
- WC < 31.5 in (80 cm) green corresponds to normal waist circumference

Men (European, South Asian, Middle Eastern, North African):

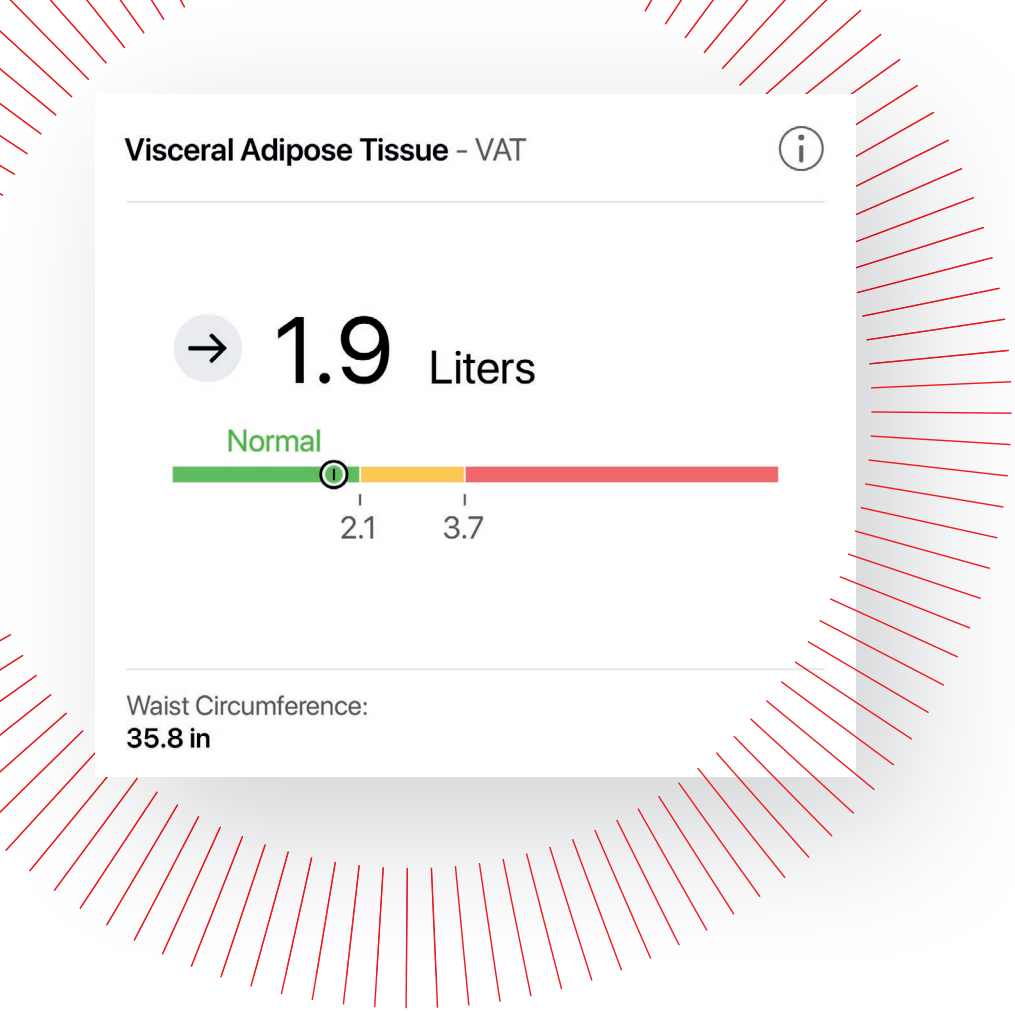
- WC > 37 in (94 cm) red corresponds to high waist circumference
- WC < 37 in (94 cm) green corresponds to normal waist circumference

Men (Sub-Saharan African, Eastern Mediterranean, South/Central American):

- WC > 35.5 in (90 cm) red corresponds to high waist circumference
- WC < 35.5 in (90 cm) green corresponds to normal waist circumference

Tips for understanding this measurement:

- An elevated waist circumference measurement indicates excess adiposity (body fat) in the abdominal area.
- While the software uses cutoffs from the International Diabetes Federation Guidelines, many select to use the National Heart, Lung, And Blood Institute (NHLBI) guidelines that indicate increased risk of health issues with waist circumference >35 inches in women and >40 inches in men.
- Talk to your healthcare provider about your numbers for more individualized guidance.



seca
Precision for health

VISCERAL ADIPOSE TISSUE

What is the parameter and what are normal ranges?

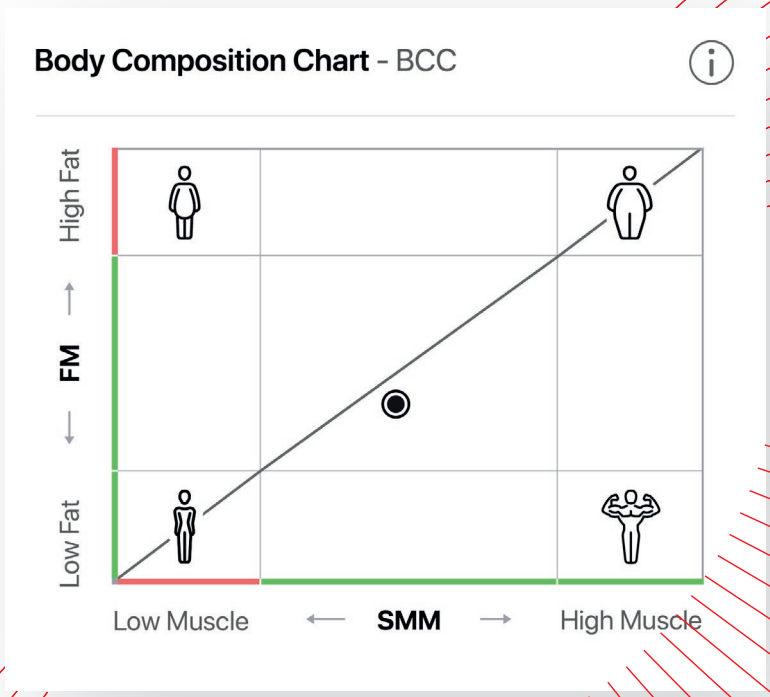
Visceral Adipose Tissue (VAT) refers to fat that is stored deep within the abdominal cavity surrounding internal organs such as the liver, pancreas, and intestines. Excess adipose tissue around the organs is linked to type 2 diabetes, heart disease, and high blood pressure because VAT is more metabolically active and produces hormones and inflammatory markers that contribute to inflammation and other metabolic diseases.

VAT is represented with values adapted for age, gender, and ethnicity and linked to WHO BMI reference ranges:

- Normal VAT corresponds with BMI <25 kg/m^2 in green (normal weight category)
- Increased VAT corresponds with BMI 25-30 kg/m^2 in yellow (overweight category)
- High VAT corresponds with BMI >30 kg/m^2 in red (obesity category)

Tips for understanding this measurement:

- The gold standard to measure VAT is using precise 3D imaging with whole-body MRI, which is not feasible or accessible, so validation studies have been done to show that using Bioimpedance Analysis is 97% accurate compared to MRI.
- Combining waist circumference with BIA allows for a more comprehensive understanding of body composition and impact on health.
- Looking at VAT in addition to BMI and FM% helps to individualize recommendations based on the location of excess adiposity.
- Someone with a high BMI and high FM% may have a smaller waist circumference and lower level of VAT, indicating that their individual risk for cardiometabolic disease is lower, even if BMI and FM% are higher.



seca
Precision for health

BODY COMPOSITION CHART

What is the parameter and what are normal ranges?

The body composition chart (BCC) combines Fat Mass (FM) and Skeletal Muscle Mass (SMM) in a coordinate system, independent of BMI. Looking at the FM and SMM together can describe body composition as one of 4 generalized types and indicate how body composition is changing over time.

The values of Fat Mass and Skeletal Muscle Mass are individual values for age, ethnicity, and gender (but not BMI) of the reference population:

Muscle Mass (x axis)

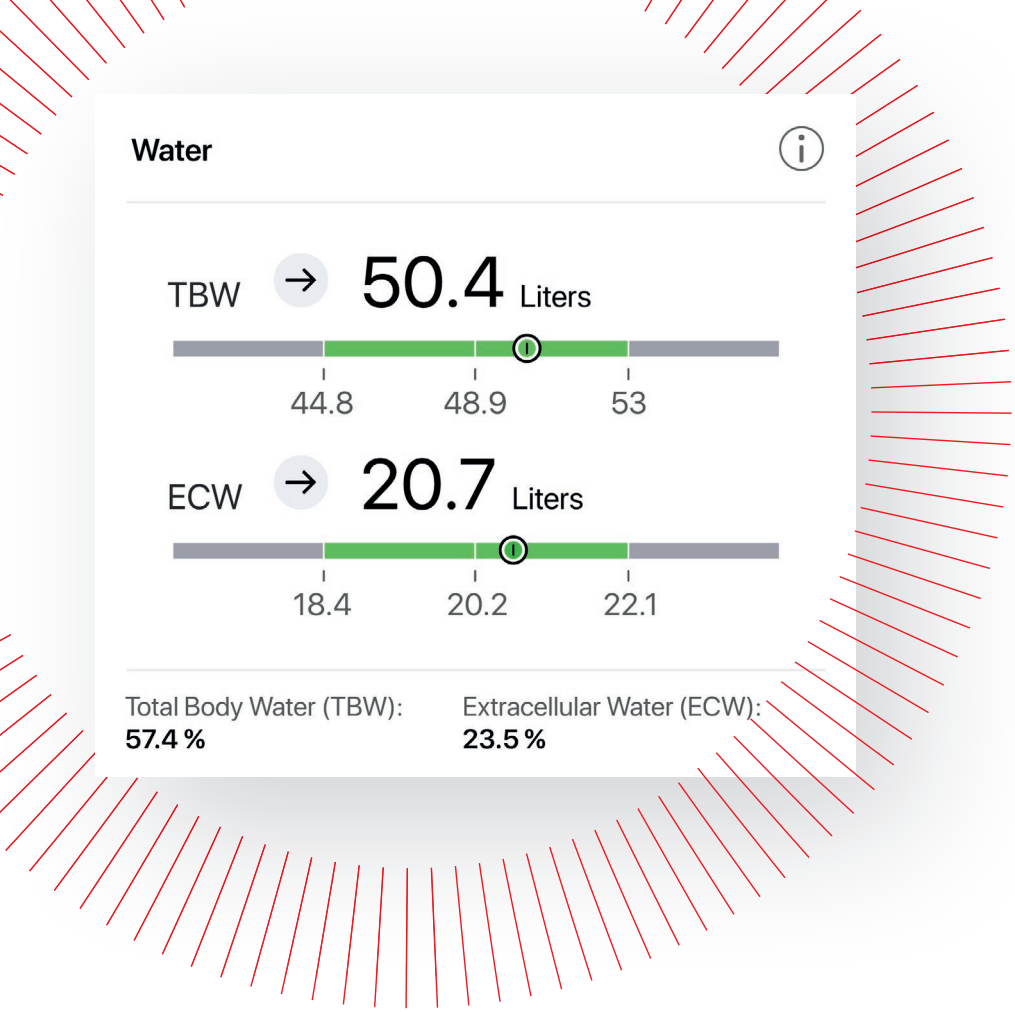
- Low Muscle falls in red and represents below the 5th percentile
- Normal/high muscle mass is in green and represents above the 5th percentile

Fat Mass (y axis)

- High fat mass falls in red and represents above 95th percentile
- Normal/low fat mass is in green and represents below the 95th percentile

Tips for understanding this measurement:

- Archetypes are a graphical representation but are not used to label or phenotype.
- The graph can be helpful to visualize a starting place and direction to strive for.
- The diagonal line represents a ratio where neither fat mass nor muscle mass is predominant.
- Beneficial weight loss where mainly fat mass is lost is seen by a move down and to the right.
- Unfavorable weight loss where mainly muscle mass is lost is seen by a move to the left.
- This graphic is also helpful for those who do not want to see numbers but want to get a sense of where their body composition is in regard to muscle and fat mass.
- When viewing the BCC chart in Trend View, you will see a table with the values for total mass of skeletal muscle and fat mass, and a zoomed in portion of the chart to show movement.



seca
Precision for health

WATER

What is the parameter and what are normal ranges?

Water is regarded as the largest body compartment and can make up about 45-65% of total body weight in a healthy population. Total body water is broken down into water outside the cells (Extracellular Water or ECW) and inside the cells (Intracellular or ICW).

TBW and ECW are represented in total amount (in liters), with limit values adapted by gender, ethnicity, BMI and age. TBW and ECW are also given as a percentage of total body weight.

- Below Average TBW/ECW in grey represents below the 5th percentile
- Average TBW/ECW in green represents 5-50th and 50th-95th percentile
- Above Average TBW/ECW in grey represents above the 95th Percentile

Tips for understanding this measurement:

- On average about 1/3 of the total body water is ECW and 2/3 is ICW, but this differs based on body composition.
- Because muscle is made up of ~75-80% water, those with high SMM will have higher ICW and higher TBW (higher muscle, more water inside cell).
- Fat tissue is made up of about 25% water, but fat cells have lower ICW and larger ECW (fat cells repel water so more adipocytes, more ECW).
- The Gold standard for measuring TBW is Deuterium dilution and ECW is sodium bromide dilution.
- ICW cannot be measured directly by BIA or reference methods (must be calculated as TBW – ECW = ICW).
- ECW can increase in inflammation, renal disease, edema, and in obesity.
- A high sodium diet can draw water out of cell (decreasing ICW) into the body, and increasing ECW.
- Aging decreases TBW, men have more TBW than women (50-65% in men vs 45-60% in women).
- In people with obesity, there may be a higher hydration component of the FFM due to increased water in the adipose tissue.
- Higher TBW may indicate overhydration or fluid retention, or may be due to higher muscle mass.
- Lower TBW may indicate dehydration, but is often associated with obesity because a higher fat mass relative to lean mass leads to a lower percentage of TBW.

seca
Precision for health

WATER RATIO

What is the parameter and what are normal ranges?

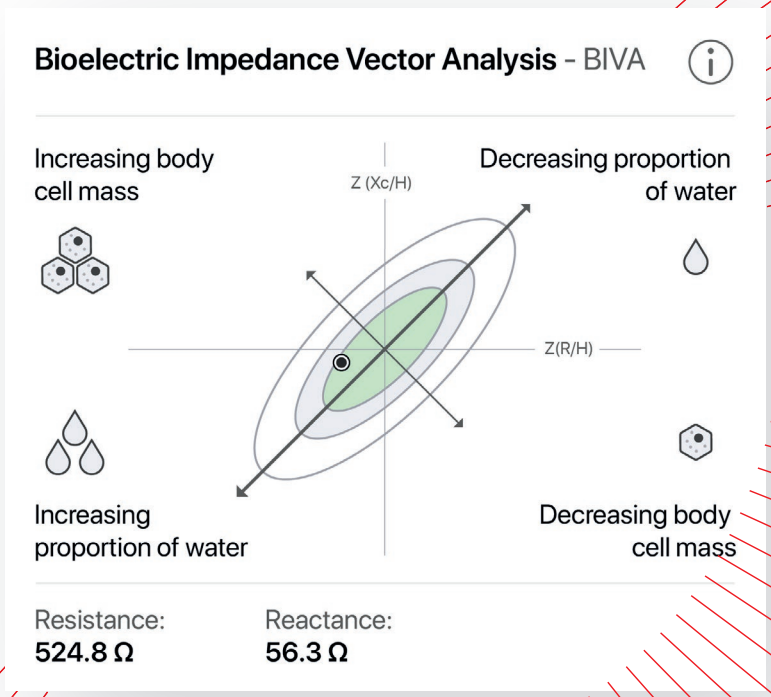
The water ratio describes the ratio of Extracellular Water (ECW) to Total Body Water (TBW). A typical ratio is often cited as 3:1 indicating 75% is ICW and 25% is ECW, however, is its essential to recognize that individual variations exist based on factors such as age, sex, health, and body composition.

The water ratio of extracellular water (ECW) to total body water (TBW) is given as a percentage and limit values are adapted for gender, ethnicity, BMI and age of the reference population:

- Below Average water ratio of ECW/TBW in grey represents below the 5th percentile
- Average water ratio of ECW/TBW in green represents 5-50th and 50th-95th percentile
- Above Average water ratio of ECW/TBW in grey represents above the 95th Percentile

Tips for understanding this measurement:

- Measured values outside normal range for ECW/TBW don't necessarily allow for conclusion to be drawn about clinical water balance (dehydration or water accumulation), but they usually reflect distorted fat/muscle ratio.
- Because muscle is made up of ~75-80% water, those with high SMM will have higher ICW and higher TBW (higher muscle, more water inside cell).
- Fat tissue is made up of about 25% water, but fat cells have lower ICW and larger ECW (fat cells repel water so more adipocytes, more ECW).
- ECW can increase in inflammation, renal disease, edema, and in obesity. A high sodium diet can draw water out of cell (decreasing ICW) into the body, and increasing ECW.
- Higher muscle mass is related to higher ICW, therefore a lower ECW, and a lower ECW/TBW ratio.
- Higher fat mass is related to higher ECW and lower ICW and a higher ECW/TBW ratio.
- A lower water ratio is more favorable than a higher ratio as it indicates more muscle that fat.



seca
Precision for health

BIOELECTRIC IMPEDANCE VECTOR ANALYSIS 1/2

What is the parameter and what are normal ranges?

A Bioelectrical Impedance Vector Analysis (BIVA) plot is a graphical tool to assess body composition and hydration status. The direct (raw) measurements of cell reactance (Xc) and water resistance (R) are plotted as a vector from its components, normalized by height: Resistance/height (R/H) is on the X axis and Reactance/height Xc/H is on the Y axis. The chart shows 4 quadrants for where shows a body cell mass axis (upper left to lower right) and a hydration axis (lower left to upper right).

Body cell mass refers to the metabolically active part of the body and is indicated by the reactance (Xc) component of the bioimpedance measurement. Reactance is related to the capacitive properties of cell membranes, reflecting integrity and quantity of body cell mass. Higher reactance is related to higher body cell mass, better cellular health and higher proportion of muscle tissue.

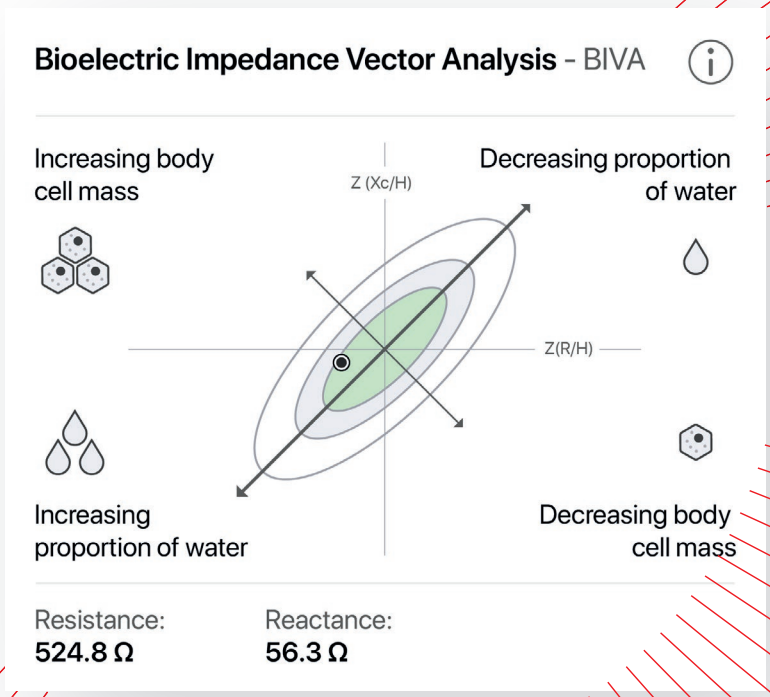
The proportion of water refers to the balance of fluids in the body and is indicated by the resistance (R) component of the bioimpedance measurement. Resistance is related to the flow of electrical current through body fluids. Low resistance values indicate higher total body water content, and higher resistance indicates lower total body water content.

In the BIVA plot, the tolerance ellipses indicate the probability that a patient's measured values are located at a certain distance from the mean vector of the healthy reference population (gender, age, ethnicity).

- Green represents the 50th percentile
- Gray represents the 75th percentile
- White represents the 95th percentile

Tips for understanding this measurement:

- The BIVA plot is a 2-D chart. Think of the tolerance ellipses as a circle around where the points fall on a scatter plot.
- When the black dot is in each quadrant it indicates higher or lower body cell mass and proportion of water.
- The BIVA tile has Resistance and Reactance (Measured raw data in Ohms) at the bottom of the tile.
- Higher reactance is associated with higher muscle mass, higher intracellular water, and higher phase angle and higher body cell mass.
- Higher resistance is associated with lower total body water due to fewer conductive pathways which like to pass the electric current, particularly intracellular water, and a shift to more extracellular water.



seca
Precision for health

BIOELECTRIC IMPEDANCE VECTOR ANALYSIS 2/2

See below for information about each vector:

Hydration Status
(R, long axis from lower left to upper right corners)
A shift of the point parallel to the long-axis indicates a change in the body fluid volume:

- If the Point shifts up and to the right, the body is losing water
- If the Point shifts down and to the left, water is retained

Body Cell Mass
(Xc, short axis from lower right to upper left)
A shift along the short-axis indicates a change in body cell mass:

- Point shifts up and to the left, body cell mass increases
- Point shifts down and to the right, body cell mass decreases

Evaluation of the 4 quadrants of BIVA plot:

Upper Right Quadrant (High Reactance, High Resistance)

- High body cell mass and good cell membrane integrity and muscle mass; high resistance, lower total body water possibly due to lower hydration

Upper Left Quadrant (High Reactance, Low Resistance)

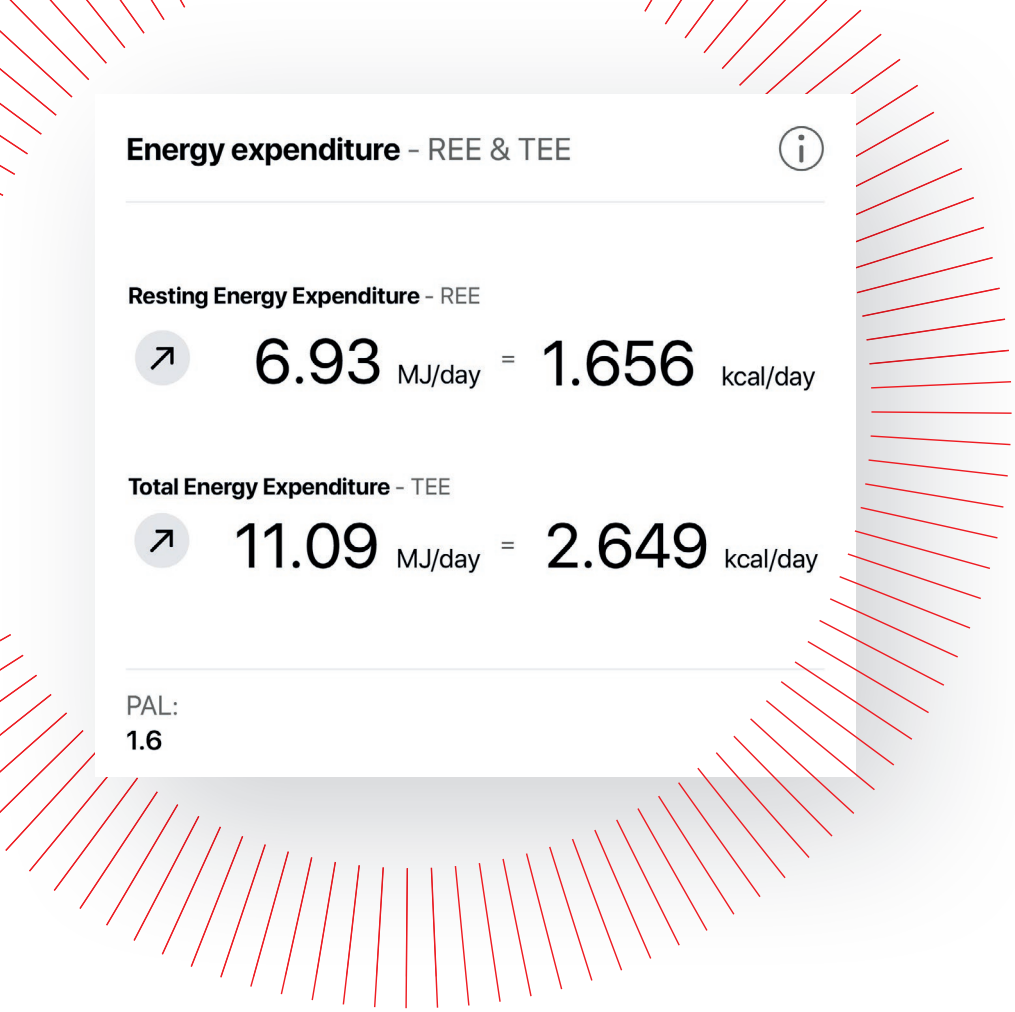
- High body cell mass and good cell membrane integrity and muscle mass; low resistance suggests high total body water, particularly ICW

Lower Right Quadrant (Low Reactance, High Resistance)

- Lower body cell mass or poor cell membrane integrity; high resistance has lower total body water indicating dehydration; low muscle mass, low hydration, malnutrition or muscle wasting, chronic illness, sarcopenia

Lower Left Quadrant (Low Reactance, Low Resistance)

- Low Reactance indicates lower body cell mass or poor cell membrane integrity, low resistance suggests higher total body water, particular ECW; fluid overload and low muscle mass, edema/fluid retention, people with obesity



seca
Precision for health

RESTING ENERGY EXPENDITURE

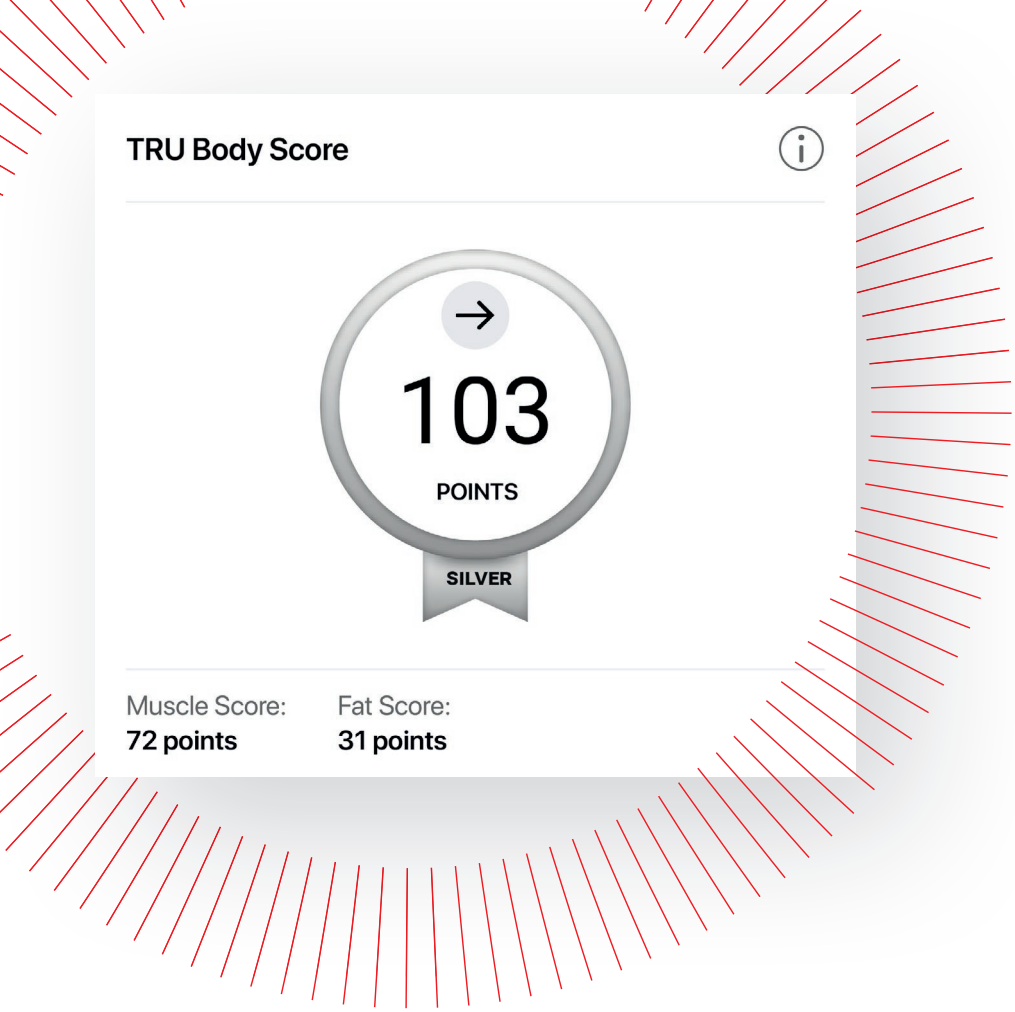
What is the parameter and what are normal ranges?

Resting Energy Expenditure (REE), also often called 'Basal Metabolic Rate', is the amount of energy the body expends just as a result of the brain working, metabolism, heartbeat, respiration, and other basic functions while at rest. These functions make up about 50-75% of total energy expenditure. REE is influenced by factors like age, gender, weight, height, and body composition (muscle and fat). Rather than an equation that simply uses body weight, seca's device uses fat free mass and fat mass to calculate REE taking body composition into account, and is validated with indirect calorimetry as a reference method.

Physical Activity Level (PAL) is used to calculate the Total Energy Expenditure (TEE) taking into account daily movement at work and leisure. The more active a lifestyle, the higher the PAL. Multiplying the REE by the PAL gives you an estimate of your TEE, or how many calories per day needed prior to adjustment for weight loss, maintenance, or weight gain goals. PAL value is based on the Johansson & Westerterp (2008) validation with doubly labelled water. The default value for the PAL is 1.6, lowest value is 1.2 (almost exclusively laying down), and highest is 2.5 (very active).

Tips for understanding this measurement:

- Greater fat-free mass, is related to greater resting energy expenditure (REE), where the body will burn more calories while at rest.
- Building and preserving muscle mass through strength training or resistance exercises is a key way to raise REE.
- Physical activity further contributes by boosting overall energy expenditure.
- To maintain a healthy REE, it's important to eat regularly and avoid extreme diets that could lead to drops in metabolic rate.
- A higher REE allows you to consume more calories each day while still maintaining your weight.



seca
Precision for health

TRU BODY SCORE 1/2

What is the parameter and what are normal ranges?

The TRU Body Score summarizes the parameters that are of highest importance for fitness populations at a glance (muscle mass and fat mass). The TRU Body score is given in points which are then associated with a medal (White, Bronze, Silver, Gold, and Platinum) and a percentage of people in reference group with higher TRU body score

The TRU Body score is given and the colored section is associated with:

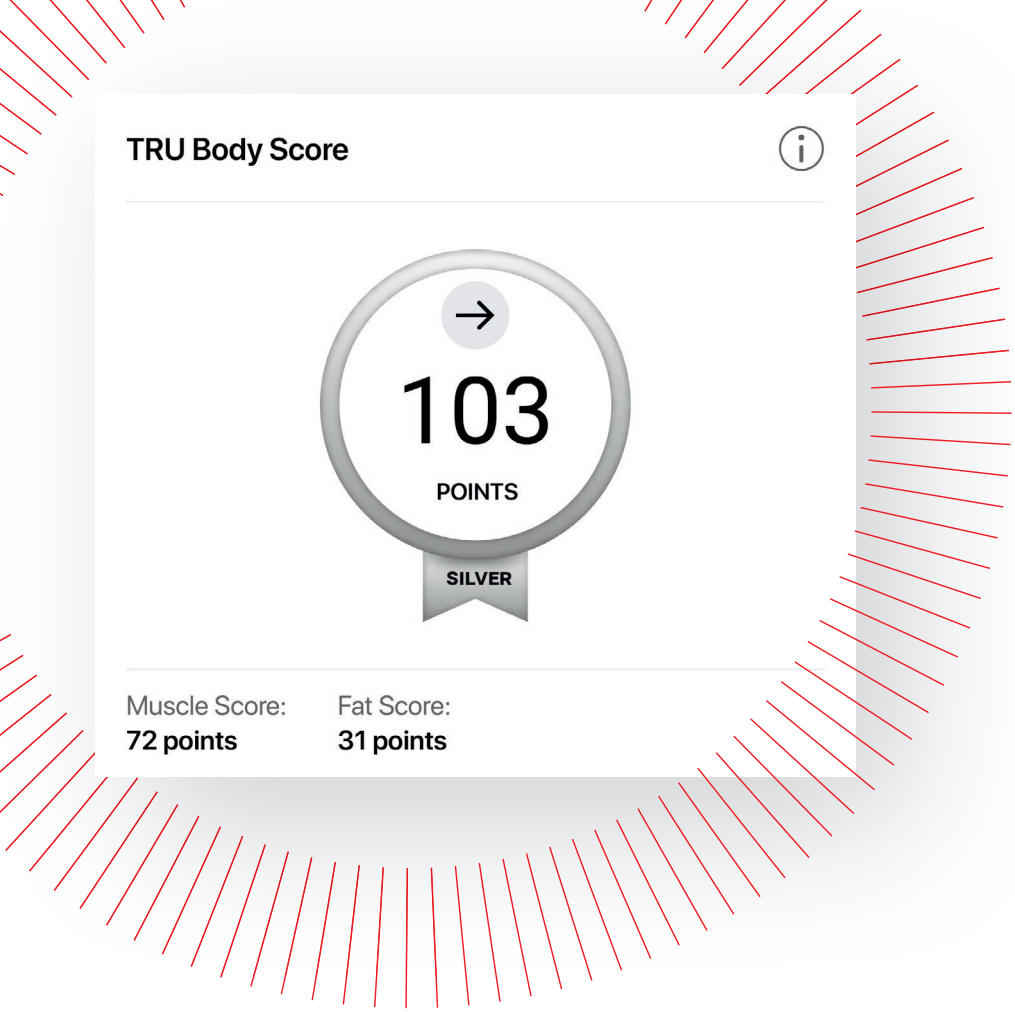
- <89 points = White means you have potential to improve
- 90-99 points = Bronze means you have potential to improve
- 100 points means you are exactly average in your own reference group (gender, age, height)
- 100-109 points = Silver means you are above average
- 110-124 points = Gold means you are above average
- >125 points = Platinum means you are in a small/elite group if you have a highly advantageous muscle to fat ratio

The Muscle Score is higher the higher the muscle mass compared to other people of the same gender, ethnicity, ethnicity, BMI, height, and age:

- Low Muscle mass in red
- Below average muscle mass in yellow
- Above average muscle mass in green

The Fat Score is higher the less fat is present (Some body fat is normal/healthy so it is limited in the upward direction) and limit values adapted to gender, ethnicity, height and age linked to BMI

- Normal to low FM% corresponds with BMI 18.5-25 kg/m² in green (normal weight category)
- Increased FM% corresponds with BMI 25-30 kg/m² in yellow (overweight category)
- High FM% corresponds with BMI >30 kg/m² in red (obesity category)



seca
Precision for health

TRU BODY SCORE 2/2

Tips for understanding this measurement:

- The RATIO is crucial here. If you lose BOTH muscle and fat together the fat score will increase (good to lose fat) but the TRU body score will not improve (not good to lose muscle).
  - Muscle Score increases: Gain muscle, lose/maintain fat.
  - Fat Score increases: Maintain/increase muscle, lose fat.
- The Percentage of reference group with higher TRU Body score is different than the point value of the score, and allows comparison between your score and others in your reference group.
- TRU Body Score is recommended in fitness/wellness settings rather than medical/weight management settings where the BCC chart is recommended.