

Using the HFES Virtual Fit Test (VFT) Anthropometry Tool



HUMAN FACTORS AND
ERGONOMICS SOCIETY

Features of the Virtual Fit Tool

1. Accurately represents the US civilian population
2. Allows specification of gender proportions in user population
3. Concurrently estimates accommodation on multiple variables
4. User friendly

Specifying gender proportion

A user population may include different proportions of males and females

1. The default proportion is 50 percent male and female.
2. Enter the proportion of males as a decimal fraction in the green box marked as "Fraction Male"

1	Multivariate Accommodation Test Tool			
2	Change only green cells			
3				
4	Fraction Male		0.5	between 0 and 1

The variables

You can choose measurements for any or all of the variables

1. The 5th, 50th and 95th percentile values for each measurement are given at the left of the sheet for males and females

Measures	Quantiles - Men			Quantiles - Women		
	5%	50%	95%	5%	50%	95%
Stature (mm)	1634	1758	1882	1501	1621	1741
BMI (kg/m ²)	21	28	39	20	28	43
Seated Measures						
Abdominal Extension Depth (mm)	228	290	420	212	288	424
Buttock-Knee Length (mm)	559	616	679	532	591	656
Buttock-Popliteal Length (mm)	440	486	548	420	474	529



Note

All measurements are in millimeters. Dividing measurements in millimeters by 25.4 will convert the measurement to inches.

Entering data

Enter a measurement of interest in a green cell to the right of the measurement of interest

1. Entering a measurement value in the “Low” column will tell you what percent of males and females have measurement values **GREATER** than the value you entered.
2. Entering a measurement value in the “High” column will tell you what percent of males and females have measurement values **LESS** than the value you entered

Go to the next slide to see some examples.

Entering a value in the “Low” column for Stature

Measures	Quantiles - Men			Quantiles - Women			Associated Dimension Value		Percent Accommodated		
	5%	50%	95%	5%	50%	95%	Low	High	Men	Women	Both
Stature (mm)	1634	1758	1882	1501	1621	1741	1501	0	99.8%	94.7%	97.3%

Entering the 5th Percentile value for females’ height (1501 mm) in the low column tells us and reading from the Percent Accommodated columns tells us:

1. 95 percent of females are taller than 1501 mm (59.1 inches)
2. Over 99 percent of males are taller than 1501 mm (59.1 inches)

Entering a value in the "High" column for Stature

Measures	Quantiles - Men			Quantiles - Women			Associated Dimension Value		Percent Accommodated		
	5%	50%	95%	5%	50%	95%	Low	High	Men	Women	Both
Stature (mm)	1634	1758	1882	1501	1621	1741	0	1882	95.0%	100.0%	97.5%

Entering the 95th Percentile value for males' height (1882 mm) in the high column and reading from the Percent Accommodated columns tells us:

1. 95 percent of males have a height of 1882 mm (74.1 inches) or less
2. 100 percent of females have a height of 1882 mm (74.1 inches) or less

Estimating accommodation for a range of measurements

Enter a value in both the "Low" and "High" column for Stature

Measures	Quantiles - Men			Quantiles - Women			Associated Dimension Value		Percent Accommodated		
	5%	50%	95%	5%	50%	95%	Low	High	Men	Women	Both
Stature (mm)	1634	1758	1882	1501	1621	1741	1501	1882	94.8%	94.7%	94.8%
BMI (kg/m ²)	21	28	39	20	28	43	0				

Entering the 5th percentile value for females (1501mm) and the 95th Percentile value for males' height (1882 mm) in the high column tells us:

1. A range of heights between 1501 mm (59.1 inches) and 1882 mm (74.1 inches) will accommodate 95 percent of all females and males.

Estimating multivariate accommodation

Many designs use multiple anthropometric measures.

For example, a chair seat might be designed to achieve a total of 90 percent accommodation of all intended users for three dimensions: width, depth and height range. One possible solution is:

1. The chair seat depth should be short enough to accommodate 95 percent of females' upper leg length
2. The chair seat width should be wide enough to accommodate 95 percent of females' seated hip breadth
3. The chair seat height range should accommodate 90 percent of males' and females' lower leg lengths

The concurrent accommodation on all three dimensions is shown on the next page

Estimating total multivariate accommodation

Measures	Quantiles - Men			Quantiles - Women			Associated Dimension Value		Percent Accommodated		
	5%	50%	95%	5%	50%	95%	Low	High	Men	Women	Both
Stature (mm)	1634	1758	1882	1501	1621	1741	0	0			
BMI (kg/m ²)	21	28	39	20	28	43	0				
Seated Measures											
Abdominal Extension Depth (mm)	228	290	420	212	288	424	0	0			
Buttock-Knee Length (mm)	559	616	679	532	591	656	0	0			
Buttock-Popliteal Length (mm)	440	486	548	420	474	529	420	0	98.7%	94.7%	96.7%
Elbow Rest Height, Sitting (mm)	193	242	290	192	235	281	0	0			
Eye Height, Sitting (mm)	736	802	859	686	748	805	0	0			
Forearm-Forearm Breadth (mm)	482	566	681	410	491	633	0	0			
Hip Breadth, Sitting (mm)	333	382	455	353	421	530	0	530	99.4%	94.9%	97.1%
Knee Height (mm)	508	557	606	459	504	550	0	0			
Popliteal Height (mm)	390	434	478	338	382	426	338	478	94.8%	94.8%	94.8%
Shoulder Breadth (mm)	444	498	562	387	436	524	0	0			
Thigh Clearance (mm)	138	168	204	124	150	196	0	0			
Elbow Height Above Floor Estimated (mm)	615	679	739	554	618	681	0	0			
Thigh Clearance Above Floor Estimated (mm)	540	602	662	480	536	594	0	0			
Standing Measures											
Eye Height, Standing (mm)	1517	1640	1762	1400	1512	1631	0	0			
Elbow-Fingertip Length (mm)	431	470	512	386	421	462	0	0			
Elbow Rest Height, Standing (mm)	997	1084	1177	914	1001	1090	0	0			
Foot Length (mm)	244	266	291	220	239	260	0	0			
Total Accommodation									92.8%	87.1%	89.9%

A total of 90 percent of males and females are concurrently accommodated on all three dimensions

A practice problem

A desk surface on a submarine must accommodate at least 90 percent of males and females (60:40 mix) when seated.

1. Determine dimensions for the desk width and a range of elbow heights that will **CONCURRENTLY** accommodate at least 90 percent of all intended users for both width and height adjustment.

Use these dimensions; find two or more combinations of width and height adjustability that achieve the 90 percent accommodation goal.

- ▶ Forearm-forearm breadth
- ▶ Elbow height above the floor