



Extendable Goniometer

The purpose of a Goniometer is to check and adjust the bicycle saddle position through assessing the leg angles at 3 positions. By ensuring the rider has a bio-mechanically sound starting point for lower leg joint angles, the risk of injury is greatly reduced.



The scale is color coded for ease of visual reference.

Green zones are angle references for FIT KIT fitting protocols

Blue zones are references for fitters trained in the FIST fitting protocol for triathletes.

FIT KIT PROTOCOLS

Step 1:

Identify and locate the center points of:

- hip (center of head of the greater trochanter)
- knee (pivot point)
- outside of the ankle bone (lateral malleolus)

You can use body marker dots on these locations as a reference.

Step 2:

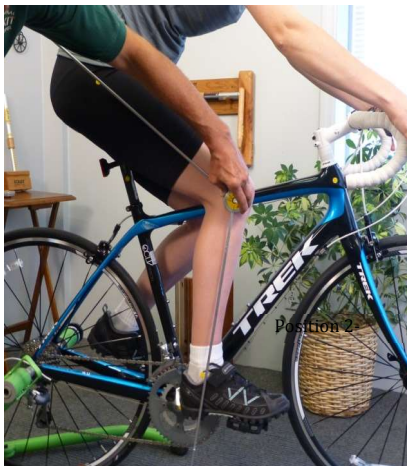
Extend the arms and place the hollow center of the Goniometer over the center of the knee, allowing the arms to extend through the body markers on the joints of the hip, and the anklebone. This will work on either the right or left leg.



Position 1:

With the crank arm even with the down tube and the foot level, the angle formed by the femur (thigh) and the lower leg should be approx. 90 degrees. (color coded green)

Less than 90?
Move seat up and/or back.



Position 2:

Set the goniometer angle to 120 degrees (outside scale, NOT color coded). With the crank arm parallel to the ground, or the 3 o'clock position with the foot level, the angle formed by the femur (thigh) and the lower leg should be approx. 120 degrees

When the lower extension of the Goniometer is positioned through the center of the anklebone, and hinge on the knee, observe the upper extension of the Goniometer to see where it lies in relation to the the center of the head of the trochater.



If the arm is above the dot, the saddle may need to be raised. As it is raised, it is also comes forward. If the arm extension is below the center of the head of the trochanter, the saddle may need to be lowered. As it is lowered, it travels back.



Position 3:

With the crank arm at the bottom of the stroke, and the foot level, the angle formed by the femur (thigh) and the lower leg should be approx. 150 degrees (outside scale – color coded green). The range is 145 – 155 degrees is the range, but better to err to more knee bend than less knee bend.



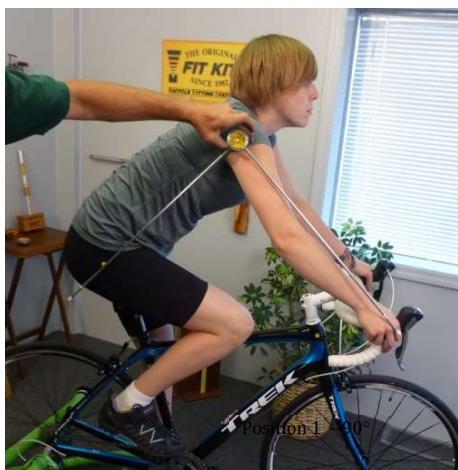
Note: bottom of stroke is with leg at maximum extension, which occurs before the pedal is at Bottom dead center.

If you want to measure this with the crank at bottom dead center, use the blue color zone range of 138-145 degrees (outer scale)

The objective is to position the saddle so that all 3 positions look acceptable.

Upper Body Position:

Position 1 (approx. 90 degrees.)



The Smart Goniometer can also be used to quickly check the upper body position, which affects the rider's reach and drop to the bars.

With the hands on the brake hoods, place the center of the Goniometer on the shoulder and one extension passing through the hip, (trochanter). The other extension should pass generally through the rider's first knuckle. Riding style and flexibility are the main determining factors in reach and drop to the bars.

This procedure should be used as a guideline only.

FIST “(Fit Institute SlowTwitch) Protocols (triathletes)

Blue Zone: 138 – 145 (35 – 42) degrees. Leg extension with crank at bottom dead center (BDC).

Blue Zone: 97 – 105 degrees. Tri position, with reference to center of bottom bracket, hip and shoulder (acromion).

Blue Zone: 42-50 degrees. Hip angle in tri position at tpo of pedal stroke. (knee – hip – shoulder).

For further information on FIST training and protocols, see https://www.slowtwitch.com/Bike_Fit/index.html