

TENSION CHECKER

INTRODUCTION

Thank you for purchasing the ZTTO TC-1 Tension Checker.

The TC-1 can measure the tension between all the spokes in the wheel, so you can conduct the average tension and the relative tension easily. It's compatible with spokes with all diameter, material, and shape.

Please Read The Instruction Before You Proceed.

SPOKE TENSION

Tension is the amount of force pulling on a wheel's spokes.

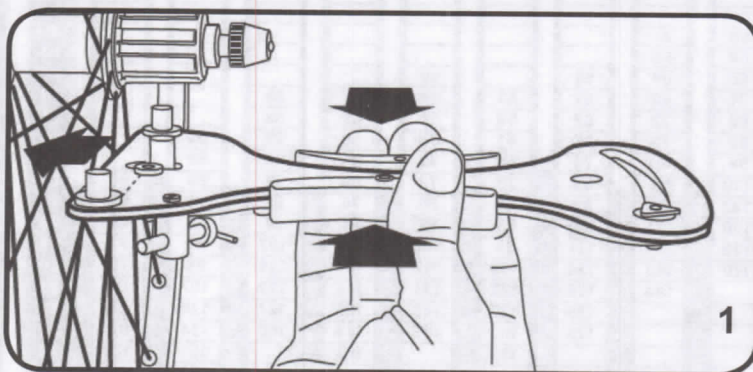
Spokes that have low tension will continue to loosen as the bike is ridden, resulting in shortened spoke life and a wheel that requires continuous re-truing.

Spokes that have too much tension can result in deforming and/or cracks near the nipple holes of the rim, around the flange of the hub, and at the wrench flats of the spoke nipple.

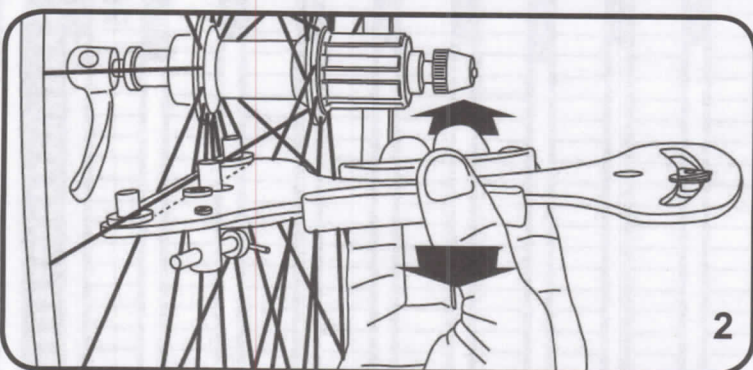
Contact the rim manufacturer to obtain a spoke tension recommendation for your wheel.

Units of the spoke tension includes kilograms force, Newtons and pounds force. One kilogram force is approximately equal to 10 Newtons or 2.2 pounds force.

BASIC OPERATION



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1. Measure the diameter of the spoke using the included spoke diameter gauge. The smallest slot the spoke fits into determines the diameter. For butted spokes, measure the narrowest portion of the spoke.
2. Hold the TC-1 horizontally (flat). Squeeze the TC-1 at the handle grips as in Picture 1. Place the spoke between the two fixed posts and the moveable post as in Picture 2. Gently release handles. **NOTE:** With butted spokes, position the posts so they rest on the narrowest portion of spoke. With aero/bladed spokes, position the posts so they rest against the wide, flat side of the spoke.
3. With the TC-1 engaged on the spoke, the pointer will be pointing to a number on the tool's graduated scale. This number is a deflection reading that is used in conjunction with the TC-1's conversion table to determine the actual tension of the spoke.
4. Using the conversion table, find the column corresponding to the material and diameter of the spoke being measured. Follow the column down to the row corresponding to the spoke's deflection reading. The number at this intersection is the actual tension of the spoke in kilograms force (kgf).

AVERAGE & RELATIVE TENSION

1. Average Tension

Take deflection readings of all the spokes on the one side of the wheel. Record these numbers. Add the recorded numbers together. Divide the sum of the recorded numbers by the number of spokes measured. This number is the average of the deflection readings. Use the conversion table to convert the average deflection reading into the average spoke tension in kilograms force. Repeat the process to another side of the wheel.

2. Relative tension

First we need to know the average tension of two side of the wheel. Multiply the average tension by 0.8 and by 1.2. The resulting two numbers will provide the acceptable 20% relative tension range. You need to adjust the spoke tension if the number do not fall in range.

IMPORTANT NOTE

The TC-1 Tension Checker is calibrated at the ZTTO manufacturing facility. Do not readjust the spring, spring adjustment screw or any other parts.

The TC-1 Tension Checker is a precision measuring instrument and should be used and stored with care. To avoid damage, it is recommended that the TC-1 be stored in it's original packaging or suspended from a bench hook. It should always be kept clean and dry.

Conversion units are listed in kilograms force (kgf). 1 kilogram force (kgf) \approx 10 Newtons(N)

| SPO |

Steel Blade Spokes