SUNEX® TOOLS

9701A
1/2" DR. 20-150 FT./LBS. TORQUE WRENCH

9702A
3/8" DR. 5-80 FT./LBS. TORQUE WRENCH

9703B
1/2" DR. 25-250 FT./LBS. HEAVY DUTY TORQUE WRENCH

⚠WARNING

Always read instructions before using tools • Always wear safety goggles • Not waterproof • Do not submerge this unit in any fluid • Do not use torque wrench to loosen fasteners • Do not use a "cheater bar" • This product may contain one or more chemicals known to in the State of California to cause cancer and birth defects or other reproductive harm. *Wash hands thoroughly after handling.*

SPECIFICATIONS

9701A	9702A	9703B
Torque Range ..... 20-150 ft./lbs.	Torque Range ..... 5-80 ft./lbs.	Torque Range ..... 25-250 ft./lbs.
Length ..... 18-1/4"	Length ..... 14-3/8"	Length ..... 24-1/2"
Weight ..... 3.6 lbs.	Weight ..... 2.3 lbs.	Weight ..... 6.3 lbs.

FAILURE TO OBSERVE THESE WARNINGS COULD RESULT IN INJURY

THIS INSTRUCTION MANUAL CONTAINS IMPORTANT SAFETY INFORMATION. READ THIS INSTRUCTION MANUAL CAREFULLY AND UNDERSTAND ALL INFORMATION BEFORE OPERATING THIS TOOL.

- It is the responsibility of the owner to make sure all personnel read this manual prior to using the device. It is also the responsibility of the device owner to keep this manual intact and in a convenient location for all to see and read. If the manual or product labels are lost or not legible, contact Sunex for replacements. If the operator is not fluent in English, the product and safety instructions shall be read and discussed with the operator in the operator's native language by the purchaser/owner or his designee, making sure that the operator comprehends its contents.
- To safeguard torque accuracy avoid keeping tool set at high loads for long periods of time. When finished reset back to zero.
- Do not operate without eye and hand protection (users and bystander).
- Keep body working stance balanced and firm. Do not overreach when operating the tool.
- Keep fingers and hands away from pinch point region of this tool at all times.
- Do not force tool beyond its rated capacity. Overtorqueing can cause breakage.
- Use of a "cheater bar" or leverage multipliers will result in an inaccurate reading and can possibly damage the wrench. Use of unapproved accessories could push the unit beyond its rated capacity and will void your warranty.
- Do not use torque wrench to loosen fasteners.
- The wrench should be sent in for calibration once every year or every 5,000 cycles for re-calibration.
- The wrench should be cleaned and stored properly after every use. Do not submerge this unit in any fluid.
- Wrenches should be re-calibrated if dropped or accidentally mishandled.
- The torque wrench should be "exercised" a minimum of three times at 100% of full scale before use.
- Do not remove any labels. Replace damaged labels.
- This product may contain one or more chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. *Wash hands thoroughly after handling.*
- Failure to heed these warnings may result in serious or fatal personal injury and/or property damage.

Operating Instructions • Warning Information

You have chosen one of the finest torque indicating wrenches that more than a half century of professional tool-making experience can produce. Your new wrench is a precision instrument designed to accurately measure torque. Other uses should be avoided. **It should never be used to break loose stubborn fasteners.**

Operation...

1. Balancing wrench in left hand with graduations visible, unlock knurled handle by turning lock nut counter-clockwise. See Fig. 1.

FIG. 1

FIG. 2

NOTE: Left hand thread torquing can be done with a ratchet head torque wrench by removing the ratchet wheel and inserting it so the drive plug comes out on top.

2. Set amount of torque required by turning knurled handle to read exact amount on case graduations. Example: You wish to apply 84 foot lbs. of torque to a bolt. First turn knurled handle until the graduation on the beveled edge of knurled handle is lined up with the vertical mark on the case, and is even with the 80 ft. lbs. graduation. Now turn knurled handle clockwise until the 4 lb. graduation on the beveled edge of the handle is in line with the vertical line on the case. Lock handle securely by turning lock nut clockwise. Wrench is now set at 84 ft. lbs. torque and is ready to use. See Fig. 2.
3. Install the proper socket or attachment to the square drive and apply to the object being torqued. Apply a smooth, steady pull to the handle of the wrench. When the torque applied equals the torque setting of the wrench, the wrench will automatically release. The release is distinct and unmistakable. It can be felt as well as heard. Upon release of pressure on the handle, the wrench will automatically reset itself.

CAUTION: Do not continue pulling on the wrench after pre-set torque has been reached and the wrench has released. Pressure must be taken off the handle and the wrench allowed to automatically reset itself. Continuing to apply pressure after the wrench has released will result in damage to the part being torqued by applying more than the specified amount of torque.

Your torque wrench was calibrated and tested before leaving the factory and is guaranteed to meet or exceed Federal Specifications GGG-W-00686C.

General Information...

What is a Torque Wrench?

A torque wrench is a precision measuring instrument much the same as a micrometer, vernier calipers or any other accurate measuring instrument. Its purpose is to measure or limit the amount of torque being applied at a given point.

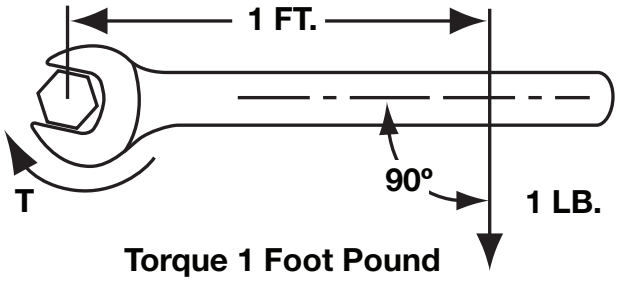
What is Torque?

Torque is a twist or the resistance to rotation. When used in reference to a bolt, torque is the resistance to turning of the bolt or nut.

How is Torque Measured?

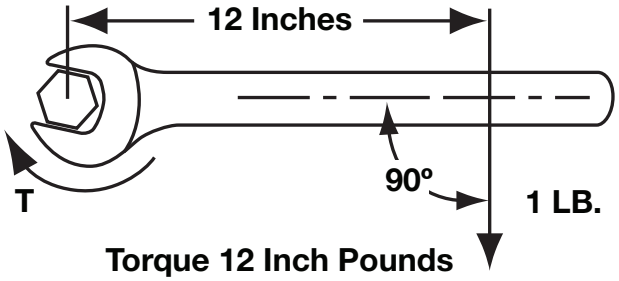
Torque is based on the fundamental law of the lever – that is – force times distance equals the torque or twist around a point.

Torque is most commonly measured in foot pounds or inch pounds. For example: If a 1-pound force is applied 1 foot from the center of the bolt, the resulting torque developed would be referred to as one foot pound of torque.



Torque 1 Foot Pound

If the distance is measured in inches, the resulting torque would be referred to as twelve inch pounds of torque.



Torque 12 Inch Pounds

What does Torque do to a Bolt?

Applying the exact amount of torque to a nut or bolt induces the correct amount of tension or elongation in the bolt that is necessary to hold the parts together. Furthermore, by applying the correct amount of torque specified to a bolt, the danger of distortion to the part or adjoining parts is eliminated.

What is Tension?

Tension is straight pull and is measured in pounds. Torque wrenches are at times referred to as tension wrenches. This is not true. Wrenches that are designed to measure or limit the amount of torque applied to a nut or bolt are definitely torque measuring instruments.

Importance of Accurate Torque

If a nut or bolt is not tightened enough, it will eventually work loose and drop off. At the other extreme, if too much torque is applied, the nut or bolt will very likely snap off. In either event an obvious failure occurred due to improper torquing of the fastener.

Metal is an Elastic Material

Every type and grade of metal has a definite limit to which it can be safely stretched or stressed. This is defined as the elastic limit of the material.

Design engineers must consider many things in selecting the correct fastener. As engines, transmissions, and machines become more complex, their design is such that maximum efficiency is dependent upon applying the correct amount of torque to the fasteners that hold component parts together. After the correct fastener and material has been chosen the design engineer establishes the exact amount to torque to be applied. This torque specification will induce a stress or elongation of the bolt of approximately 60-70% of its ultimate elastic limit.

In the case of aluminum and other soft metals, their ultimate strength often dictates the correct amount of torque rather than the strength of the steel bolts holding them together. Soft materials in joints, such as gaskets, also tends to reduce the amount of torque that normally would be applied. Too much pressure would damage or distort the material.

How Adapters Affect Torque

To understand why certain types of adapters and extensions change the amount of torque delivered at the bolt head, it should be remembered that the amount of torque produced on the bolt is the result of the amount of force applied and the length of the torque wrench, plus the length of the extension or adapter. Remember the torque law? Force x distance = torque. However, when special accessories are used that add length to the torque wrench, the setting no longer reads true and corrections must be made to compensate for any added length. Adapters or extensions may be used with a torque wrench for many reasons:

1. To adapt torque wrench to special fittings or applications; or
2. To increase or multiply torque past the capacity of the wrench; or
3. To torque fasteners in hard to reach locations.

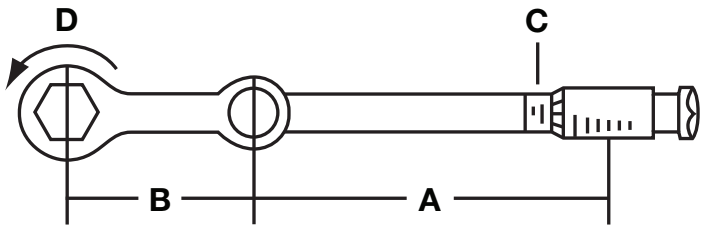
How to Compute Torque

If an adapter is attached to the square drive of a torque wrench, the wrench will not give the actual torque indicated by the setting of the handle. A simple formula however, allows you to figure out what the setting should be to deliver a predetermined amount of torque at the end of any adapter to the fastener.

Here is the formula:

$$C = D \times \frac{A}{(A + B)}$$

NOTE: The above formula applies only to torque wrenches.



How to Compute Torque (cont.)

Load must be applied at center of knurled grip when using extension.

The letters in the formula have the following meaning:

A = length of torque wrench

B = length of adapter

C = torque wrench setting

D = desired torque at end of extension

Here is a typical problem. You have an adapter that adds 6 inches to a torque wrench. You are using a torque wrench. What should the setting be to obtain 90 pounds of torque at the end of the adapter?

A = 14" *SEE NOTE

B = 6"

D = 90 foot pounds

C = unknown

$$C = D \times \frac{A}{(A + B)}, \qquad C = 90 \times \frac{14}{(14 + 6)}$$

C = 90 x .7 = 63 ft. lbs.

Your answer is a setting of 63 foot pounds on the torque wrench will give 90 foot pounds of torque at the bolt.

By using the above figures in the formula for dimension "A", an accuracy of ± 2% of the desired torque at the end of the adapter will result.

***NOTE:** For illustration purposes only. Actual measurements will vary with each model torque wrench and extension length.

Operating Instructions...

It is important to understand the following when using adapters or extensions on torque wrenches.

1. The formula given apply only to torque wrenches.
2. Load should be applied at center of hand grip.
3. Length of adapter should be measured from the center of adapter opening to center of square drive opening. Measure only distance that is parallel to torque wrench.
4. If your torque wrench reads in inch pounds, then measure in inches. If it is calibrated in foot pounds then measure in feet. Or if it is more convenient change everything to inches.

Conversion Formulas

It is often necessary or helpful to change torque readings from foot pounds to inch pounds or inch pounds to foot pounds. To convert from one specification to another it should be remembered that there are twelve inches in a foot and one foot pound of torque equals 12 inch pounds of torque. From the above, the following formulas may be used:

Foot pounds x 12 = inch pounds.

Inch pounds ÷ 12 = foot pounds.

Cm. – Kgs. ÷ 13.8 = foot pounds

Cm. – Kgs. ÷ 1.15 = inch pounds.

M/kgs. ÷ Ft. lbs x .1383

Ft. lbs. = M/ kgs. x 7.2329

Cm. – kgs. = inch pounds x 1.15

Cm. – kgs. = foot pounds x 13.8

Testing accuracy of a Torque Wrench

It is impossible to check the accuracy of a torque wrench by using another wrench.

For example: A wrench is used to tighten a bolt to 90 foot pounds. Another torque wrench is used to loosen the bolt as an accuracy test for either wrench. This is a test or comparison that is frequently performed and invariably results in an assumption that one of the torque wrenches is not calibrated correctly.

What is generally not known or understood is that the break-loose torque is considerably less than the applied torque. This means that the torque required to loosen a bolt previously tightened to 90 foot pounds would be considerably less than the 90 foot pounds of applied torque. In view of the above, it is easy to see why one of the torque wrenches could be considered inaccurate. A torque wrench should be tested on a torque wrench testing machine to determine its true accuracy.

Owner/User Responsibility...

Always follow the manufacturer's specifications whenever possible. Look for footnotes that might indicate under what conditions the torque values were established.

Any assembly held together by a number of fasteners should be tightened down a little at a time going to each fastener in turn until specified torque has been reached. A good practice to follow is to torque in three steps. First apply 3/4 of specified torque all around, then reset wrench and apply the specified amount of torque. Third step is to retorque all bolts to be sure none were missed.

Never use a torque wrench on a nut already tightened with a standard wrench or socket. For accurate torque the final turn of the nut must be done with a torque wrench.