

WHAT IS TORQUE?

Torque is a known force at a known distance, described by its unit of measurement (example: 1 ft/lb equals 1 pound of force at one foot from the center of the bolt or stud in question). Torque can be described as a "turning" or "twisting" force which is used to create tension or pre-load.

WHAT IS TENSION OR PRE-LOAD?

Tension or pre-load can be described as the stretching of a bolt or stud to create a clamping force.

WHAT IS A CLAMPING FORCE?

A **clamping force** is a tendency for a fastener or an assembly to remain in compression.

WHAT ARE THE CONSEQUENCES WHEN TORQUE VALUES ARE NOT RESPECTED?

When the torque applied to a joint is too low, the nut could vibrate loose. If the torque applied to a joint is too high, compression may be lost and/or the bolt or stud may reach its yield point and break. The obvious common end result is failure. Whether in production or maintenance, there is a correct torque/tension figure for every fastening application.

DIFFERENT TYPES OF TORQUE WRENCHES

There are two types of manual torque wrenches available: **Signal type** torque wrenches, used to apply torque and **Measuring type** torque wrenches, used to measure torque.

Signal type torque wrenches: are available in adjustable and pre-set versions. Adjustable versions are set to the torque required by the operator using the scale provided on the tools. A signal is given when the torque is reached and the application is considered complete. Pre-set versions do not have a scale on the tool. The tool is set to a pre-determined torque value using a calibration system. A signal is given when the torque is reached and the application is considered complete. Pre-set tools are commonly used in production applications where torque values are repetitive and not to be tampered with.

Measuring type torque wrenches: are commonly referred to as dial indicating torque wrenches. They are used to verify torque already applied to a fastener or measure torque as it is being applied to a fastener. These tools are available with memory (slave) needles to retain the last torque measured or to signal when a desired value has been reached.

WHY SHOULD WE CALIBRATE OUR TORQUE WRENCHES?

The purpose of calibrating a torque wrench is to verify the accuracy and repeatability of the tool, and make any adjustments required to ensure that the tool meets the tolerances specified by the manufacturer. Factors such as temperature, humidity and misuse can often affect the performance of the tool and, therefore, a regular calibration schedule should be established based on your requirements and working conditions. Calibration should be considered a form of maintenance, not a repair. A calibrated torque wrench should be identified with a tamper proof sticker specifying the date it was calibrated as well as its next due date. Calibration certificates detailing the results of the calibration are available upon request.

WHAT IS A CERTIFICATE OF CALIBRATION AND WHEN/WHY IS IT NECESSARY?

The procedure for certifying a torque wrench is more in depth than that to strictly calibrate a torque wrench. When a torque wrench is calibrated, it is verified at the low and high limits of the tool's range. When a tool is certified, verifications are made at 20, 40, 60, 80 and 100 percent of the tool's range.

Furthermore, a calibration certificate provides the customer with written proof confirming the results of the calibration, giving them the traceability they may require to adhere to a given specification. A calibration certificate is necessary when a customer requires traceability beyond that offered by the calibration sticker only. Traceability is required more and more to meet quality control standards imposed by tightening specifications.

HOW TO READ TORQUE WRENCH ACCURACIES

Accuracy can be described in different ways by tool manufacturers:

- As a percentage, e.g. "2% Accuracy"**
This is normally assumed to be +/-2% of Full Scale. For example, a device reading from 40-200 ft/lbs with an accuracy of +/-2% will have a possible error margin of +/-4 ft/lbs. This is a significantly greater percentage at the lower end of the range: at 40 ft/lbs, 4 ft/lbs represents +/- 10% accuracy and not +/-2% as suggested by the Full Scale figure.
- As a number of graduations, e.g. "Accuracy, +/-1 graduation"**
Obviously, at the bottom of the range, one graduation represents 100% possible error. Percentage error decreases higher up in the range.
- As a percentage and graduations, e.g. "Accuracy +/-1%, +/-1 graduation"**
A combination of methods 1 and 2, with the resultant inaccuracy.
- As a percentage of reading, e.g. "Accuracy +/-3% of reading"**
Initially this may appear to be less accurate than claims of +/-1%, however note the "of reading" statement and realize that +/-3% applies to a reading taken anywhere within the tools range.

IDENTIFYING THE CUSTOMER'S REQUIREMENTS

1. What torque range meets the majority of applications?
2. How often will the torque wrench be used?
3. How critical is the application - is accuracy an issue?
4. Will tool have to be calibrated and/or certified on a regular basis?
5. If so, will reliable and prompt service be a requisite?
6. Based on all of the above, can the cost be justified?

PROPER USE AND STORAGE OF TORQUE WRENCHES

1. Always read instructions and warnings on tools carefully before using torque equipment.
2. Make sure that your workpiece is firmly held or fixed on a bench before commencing work. Also ensure you have a secure footing. Some torque tools have powerful springs and carelessness can cause accidents.
3. Always ensure that the "drive" part of the tool and any accessories are in line with the fastener and are of the correct size. Apply torque with a steady pull or turn of the tool. Misalignment and jerky movements will affect accuracy as well as being dangerous.
4. **Always** return a torque wrench to its lowest setting after use. Unnecessary tension on the spring in the wrench mechanism may eventually affect the tools performance.
5. Always keep equipment clean and tidily stored when not in use. Avoid dropping or using as hammer or force bar. Although sturdy, many tools have delicate mechanisms and operation can be harmed by water, dirt, oils, metal swarf, and dust getting into the tool.
6. Establish a regular calibration schedule for all your torque tools.

WHY NORBAR TORQUE WRENCHES?

- All tools are serialized and supplied with a certificate of calibration as standard. Supply of certificates from competitors is available upon request, at an additional charge.
- Models are supplied in rugged plastic carrying cases for proper storage.
- Accuracies are among industry's best most accurate.
- All tools are ergonomically designed and manufactured according to ISO standards.
- Complete parts inventory maintained across Canada offers prompt service for repair, calibration and certification.
- Self-contained handle and scale prevents dirt and oils from reaching internal mechanisms thus prolonging tool life.



FIGURES A AND B:

