



The selection and use of torque wrenches

Introduction

In this second of a series of articles on torque, we will consider the different types of torque wrench and discuss how to select the correct wrench for your application. Also, how to use and look after your torque wrench and the benefits of using it correctly to save money and time.

Types of torque wrench

The most common wrench is called a click wrench. It will indicate by a mechanical mechanism when a pre-set torque has been reached. The pre-set value can be set by the user, or by a Quality Control Department.



Norbar 'Professional' click torque wrench

The second most common torque wrench is used to check an already tightened bolt. It can have a mechanical or electronic sensing mechanism and can display by means of an electronic or analogue display.



Typical electronic torque wrench

There are other tools referred to as “torque wrenches”. These are powered by pressurised oil or air and are known as hydraulic or pneumatic torque wrenches. The use of these devices is more complex and will be covered in a later article.

Torque Wrench Standards

All hand tools have standards against which they should be made. In the case of torque wrenches there are four standards that are often quoted. Two are American: ANSI/ASME B107/14 and GGG 686D. One is International, ISO6789, and one is Chinese, JJG 707.

These standards define the accuracy and durability of torque wrenches. They are similar in their requirements although each one is a little bit different. The American and International standards require most torque wrenches to give a reading or “click” that is within 4% of the test equipment value. This value can be achieved when the wrench is new, but different quality torque wrenches will lose their accuracy at different rates. The standards normally call for the accuracy to be maintained for a minimum of 5000 cycles. In reality some low quality torque wrenches available on the market can last only 200 cycles before the accuracy is lost while high quality items last for 20,000 cycles or more.

Benefits of using a torque wrench

Most torque wrenches are used for tightening nuts and bolts accurately although there are also some other uses. These other uses will be discussed in another article. There are two main reasons why we use a torque wrench.

One reason is to achieve the correct level of tightness. The bolt needs to be stretched to create a clamping force on the assembly. If the torque value is too low, the assembly will not be secure. If the torque is too high, the bolt may break. The torque wrench allows the operator to tighten the bolt as the designer intended. The other reason to use a torque wrench is to be consistent on every bolt in the assembly. Used properly the torque wrench will ensure that all bolts have the same torque applied.

The effect of badly tightened bolts can be seen in lost time, money and lives. A machine stops working and takes weeks to repair. A bridge collapses. A wheel comes free from a truck and hits a car travelling in the other direction. Good quality torque wrenches do save time, money and lives.

Techniques for using a torque wrench

The largest part of the uncertainty comes from the operator. Problems will arise if the torque value cannot be set correctly. Unfortunately many wrenches have a scale that is difficult to read, or becomes worn away with use. It can also be difficult to position the cursor accurately. Some wrenches have a vernier scale to help. These will only work with one set of units. Be sure whether the vernier is designed for the N.m, kgf.m or lbf.ft scale.



The operator will also affect the torque by using the wrench too fast. The “click” wrench is designed to give a physical signal when the desired torque is reached. If the wrench is operated too quickly, the torque will go too high before the operator can stop.

With dial or electronic indicating wrenches, the operator must be able to see the dial or display. This can be difficult in applications where there is poor light or limited access. Finally the operator must apply a smooth and slow force at 90 degrees to the wrench. Side loads can alter the torque applied and may cause the wrench to slip off the bolt.

Maintenance, Checking and Calibration

Torque wrenches have moving parts and are affected by corrosion and dirt in the mechanism. They should be kept clean and in a storage box. They should not be dismantled without calibration and adjustment afterwards as dismantling and reassembly will affect the torque values.

Although considered by some to be good practice, extensive testing has clearly shown that unwinding a Norbar torque wrench to its minimum setting, hence relaxing the spring between uses, has no effect upon the wrench calibration.

However, if left for a long period of time without use, it is desirable to reduce the setting to the minimum scale value (often 20% of the maximum). The tool should never be adjusted to zero because this can adversely affect the calibration of the wrench.



If the torque wrench has not been used for a day, it should be exercised about five times before use to redistribute any grease that had dried up or been squeezed out. For safety critical or high volume applications it is common to check the wrench every day or every week.



This check makes sure that the reading is inside the allowable tolerance. It is not the same as a calibration, where the difference between the “true” value and the wrench value are compared and documented. The standards and equipment involved in calibration will be covered in the next article.

Summary

There are many different styles and qualities of torque wrench available. With the correct selection, operation and maintenance, a torque wrench can save you time and money. To make the correct decisions you may need to seek the advice of specialist torque tool provider.