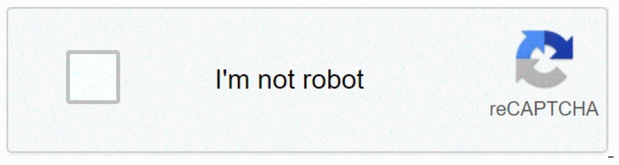

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Torque angle gauge vs torque wrench

Why do I need that wide-angle guage? BMWsAmateurRadio CyclingLinux I've seen a lot of questions about why it takes a torque angle reinforcement to tighten the head bolts on the Bimmers. Since I was curious to consider the real reasons for it, and not satisfied with That's how it's done, I researched it more. Let's hope the following explanation helps anyone who has questions about why this is done and why it's necessary. Quoting a passage I found simple and to the point (: There are three types of procedures used for torquing: pair to produce / angle to turn; torque to maximum stretching performance; and the pair to a specific pair number and I hope it's correct. Basically what it's about, is that torquing with only torque values like foot-pounds or newton-meters is at best an assumption to get the right pair. Depending on the type of fastener, the materials used for both the bolt and the part to which it is bolted, the thread cleaning, the lubrication used, the type of lubrication used, etc., the torque between two identical fasteners can vary by up to 35% (or more) with the torque wrench that has the same fit for both fasteners! Many fasteners, such as wheel bolts, water pump bolts, etc., are right there to make sure the bolt is probably tight enough, and probably not too tight. These are the bolts that are reused over and over again without any problem. Head bolts, as well as most internal motor bolts, are what are called elastic bolts (also known as torque-to-performance bolts). These are designed to be squeezed to the point where they physically begin to stretch, usually by a few thousandths of an inch. This leaves them in an elastic condition, which allows to apply clamping forces very equal to the part they are holding. When tightening one of these bolts, the torque adjustment used is designed to bring the bolt closer to the point where it begins to stretch. The torque angle reinforcement is used to put the bolt PAST the point that starts to stretch and really start stretching it. You simply cannot accurately measure this with a regular torque wrench, therefore the torque to performance/angle-to-turn method. The maximum stretching performance method does not apply here as you need A) A very accurate micrometer to measure the actual stretch of the bolt, and B) Access to both sides of the bolt, which you do not have on the bolts of the head. The torquing process is quite simple. Simply screw the bolt with a normal torque wrench. Then it will usually warm things up at rest, then let it cool again and twist again with the torque wrench. After that part is done, the cool torsion angle comes into play. The pair to which the bolts are located after the regular regular wrench just before the bolt starts to stretch. This accuracy depends, of course, on the factors mentioned above. To get the final torque AND stretch on the bolt, tighten the bolt a certain number of degrees of rotation. For this it is the guage of the torque angle, accurately measuring the degrees of additional rotation (usually accurate to a degree more or less). The reason for not reusing elastic bolts The reason is quite simple. Once you have stretched the bolt once, it never returns to its original size. This weakens the bolt, and if you try to use it again, you run the risk of breaking the bolt in two, leaving the threaded part in the block, the top in the hand and a complicated repair required. It's just not worth the risk of trying to reuse old screws. You can get replacement bolts that are not designed to stretch in the torque needed to keep the parts together. There are two good reasons to use non-elastic bolts. You want to reuse them in the future, and/or have an engine that is forced induction (745i running massive impulse, for example) or very high compression. Since the bolt is already at its maximum stretch without losing strength, you do not want to put undue strain on it from a high compression motor and take the risk of a blown head joint. There is also a good reason not to use these bolts, and stay with original OEM style elastic bolts. Non-elastic bolts require twisting after a few heat/cooling cycles (usually specified in about 5-6 cycles), and may have to twist them again anywhere every 30k to 70k miles, depending on the application. If you have a normally asperated motor, there is simply no reason to have to do the extra work when you would not normally touch the bolts again after they have been done correctly with regular OEM stretch bolts. In addition, elastic bolts tend to provide more consistent and uniform clamping pressure than solid bolts. Well, I hope you now have an understanding of what elastic bolts are, what a cool torque angle is, and why you really need one to properly tighten oem head bolts. As always, if you have any questions feel free to email me kd7olf@xmission.com. HOME This page visits the schedules. A torque wrench is a precision tool used to measure the force applied to a fastener during tightening. A visual or audio indicator indicates when torque is reached so you know when to stop applying pressure. This prevents a bolt from tightening too tightly, which can cause damage to the fastener, or lower tightening, which can lead to possible weakness to the object fixing or assembling. In some cases, such as within the automotive industry, tightening is also measured by the angle method. Measuring a torque angle is an accurate final check of the stress applied to a bolt when tightened. An angular torque wrench electronically measures electronically twisting force and angle rotation. This tool eliminates the need to use an angle or conveyor meter along with the torque wrench, and is ultimately more accurate and faster. An angular torque wrench is often used for automotive mechanical applications, when both torque and defined angle measurements are specified. Torque angle specifications must be determined, as well as the maximum torque, for the bolt you are holding. A digital reading shows both torque and angle, which can be preset. Specific angle measurements are used to determine that the bolts are equally fixed to the required angle degree. It is especially important that mechanics double check the bindings. The most accurate way to tighten the bolts is to work gradually. Tighten all bolts in rotating sequence, using one third of the required force each time. The final measurement includes the degree of rotation of the angle according to the setting specified for the closure. This is the final test of strength and reliability. I'm going to win the other two answers and tell him to do it RIGHT OR NOT. It is very important to twist the head bolts correctly. The actual preferred method for reaching the right torque is to figure out the bra stretch, not by using a torsion wrench. When torquing, you are applying a clamping load on the object that is torquing. You can get this at its most precise time by measuring the bra stretch by using a dialing indicator. It is much easier to twist the bra down using a torsion wrench and in most applications, this is a suitable method to get things done. In your case it looks like you're using torque-to-performance (T2Y) fasteners. These are (as @rpmerf) single-use fasteners (NOTE: If you could make this text blink, I would like to emphasize the point). These should be replaced once you have broken them free (this would blink as well). If you don't, the head seal will fail. The head seal is the typical place for this type of bra. The reason these bras are only good for one lap is that they are designed to go to that point of failure, but not beyond. They start to fail by giving a little or stretching. These are specific fasteners built by the manufacturer. They've done stretch engineering for you. When you apply the last grade turn, you are stretching the bolt to the tolerance you have designed on the bolt. If you get past this point, you just woo death by your engine. If you don't go far enough, you'll have a weak spot in your torsion chain that could allow deformation in the part you're trying to place especially true for a head. As rpmerf said, get the torque angle meter: If you have ever rebuilt an LS engine (among others) you have found a specification called torsion angle. Put on your simplest terms, pair replaces a maximum torque value for a bra with a specific amount of bra rotation. After setting a low reference torque, just to make sure the fastener is tight, the bra rotates a precise amount to set the end position and clamp load. If you care about following the manual and moving on, watch the previous Summit Racing video, and you're done. However, if you are curious about what is actually happening, and why torque angle measurement has become increasingly common in service manuals across the industry, then read on. Why the torque angle? First, we need to clarify a common misconception before moving forward. While many torque-to-performance fasteners used by OEMs require a torque angle measurement, the process is not specific to a T-T-Y fastener. However, it is an incredibly accurate way to stretch a bolt in a specific amount, which is absolutely critical in a torque-to-performance bra. Since we're back to basics, we're going to cover the basic purpose of a bra. A bolt is used to keep two objects together. In automotive applications, there are often specifications for the firmness with which you want the two specific parts to be held together. Too tight and runs the risk of damaging the parts or the bra itself. Too loose, and there is not enough clamp load and both parts can drip or move under load. The amount of clamp load (how tightly the bra tightens the two objects you are joining) is determined by the diameter, material, and amount of bra stretch. Since we cannot measure the actual stretch of a bolt (except for rod bolts, discussed in the linked article below) we need to find another way to measure bolt stretching. For many years, the automotive industry has used torque values to be that criterion. The thought process is, by calculating the amount of resistance to rotation, you could determine how much force was being exerted on the threads. While that remains a very effective method for determining clamp load, there may be some drawbacks and inconsistencies with the method. Here you can see a cheap torque angle meter that is used. The left leg holds the body in place, while the square drive section moves the pointer as the key is rotated. In previous articles (like this and this one) we discussed some of the complexities of the pair of fasteners. While you may get lost in herbs with them, they illustrate some of the problems with using motion resistance a bra as a measure of its stretch. Although there are dry and wet torque values to take into account the absence or presence of thread lubrication, as well as thread lubricants from companies such as ARP specifically designed to combat the drawbacks of dry threads, or threads that use 30w engine oil, the fact is that there are a large number of variables that come into play with the torque method. Introduce modern engineers who need a more accurate way to ensure an exact amount of bra stretching. How the torque angle works To explain how the torque angle works, we have to work backwards. Engineers first determine the desired clamp load for the elements. Once they know it, they can run the numbers based on the size of the bra and material to determine the bolt stretch required to achieve that clamp load. From there, it is simply a matter of taking the thread pitch of the fastener and determining how many degrees of rotation are required for the bra to stretch the desired amount. Although it seems complicated, the reality is that all large brain calculations are done by the application engineers in advance. All you have to do is be able to precisely set the pair of the first stage (which is usually relatively low, in order to be able to better withstand any variation in conditions) and then properly measure the rotation from that point forward. To achieve this, there are tools at both ends of the price spectrum, ranging from home templates made with a conveyor, marker and paper, to cheap dial gauges that fit between the ratchet and socket, to digital torsion keys with built-in angle meters. Will we see that torque angle measurements will take over the automotive industry? Probably not too soon. However, torque angle specifications are becoming more frequent, so understanding and knowing how to use them correctly will be a valuable skill in your mental toolbox. The threads of an SAE fastener are measured in threads per inch. Suppose it was a 3/8 inch bolt with a thin thread diameter. That would mean there are 24 threads per inch. If we divide one by the TPI count, we get the amount of distance the bolt travels in a rotation (.0416 inches). If engineers calculated that they wanted, say, 0.010 inches of bolt stretch beyond what is induced by the 15 lb-ft baseline, the math calculates at 86.4 degrees of torque angle. Angle.