"Click" or "Break-over"? The proper torque wrench for precision test application

2020-08

Several people believe that “finger tight’s good enough” when connecting or disconnecting coaxial connectors. Would an auto mechanic assemble an automobile engine without torquing the bolts; not a chance. If it starts, that engine is not going to operate for very long. Finger tight might work but not well.

Similarly, the correct tightening of COAX Connectors used in RF cabling applications is essential to ensure optimum performance. This is particularly important in high frequency applications and imperative in “test” applications.

The answer is the use of Torque Wrenches set to the proper size and settings. Then the question is what kind or type of torque wrench works best. In the world of torque wrenches there are several options. Regarding RF connections those options narrow down to two-“Click” or “Break-over”.

Conventional wrenches used in applications like our automobile example make an audible noise or “click” when the torque setting is reached; and, break-over style wrenches literally “break”. The break torque wrench is designed with a preset torque value. When the preset torque value is reached, it will “break” and move through a small arc about the pivot pin; thus preventing overtightening. Each type is well suited for its own specific application. And, yes, there are both “break-over” and “click” torque wrenches available for RF applications.

In all cases, the size and torque settings must be proper for the RF application otherwise the mechanical or electrical performance might be compromised. In a test environment, compromised connector performance is a true liablity. In some cases the torque setting for a qiven size connector differs based by application, normal use or VNA test. It is especially important to use a proper torque wrench when dealing with VNA testing.

Ultimately, the question is often asked, “Should we use "Click" or "break-over" torque wrench when doing VNA test?” Let's seek an answer by comparing the two.

A Comparison Test

In a recent test we compared a typical “Break-Over” and a “Click” torque wrenches. Specially, we compared the Anoison ANO TW-001 (Break-over) and the Huber+Suhner 74 Z-0-0-21 (Click) wrenches.

The test was run repeatedly and measured the value in in.lbs when removed from the box (Original observed values), after 5,000 uses and again after 10,000 uses. The measurement was perfomed using an EZ-TorQ II Torque Tester.

Below is a comparison table of the results. The lower rows show 1) the Average of the ten tests listed above; 2) the Maximum and Minimum Variances from the average and 3) the Percent of those Variances from the average. The percentage of the variances is of utmost importance; especially as accuracy tends to deteriate over extended usage. Finally, the minimum and maximum variances of all the tests is expressed in percentages.

Conclusion: Throughout the 10,000 tests, the ANO TW-001 remains within reasonable accuracy (+0.91%, -1.29%) as compared to the lesser accuracy of the Huber+Suhner 74 Z-0-0-21 (+7.65%, -7.93%). Better stability means better testing!

Considering the costs of VNA equipment and including accessories such as calibration kits, test cables, precision adapters, etc. the accuracy of a torque wrench is extremely important. The test results below demonstrate the use of a Break-over torque wrench over the “click” type is highly recommended for the precision test application.

Typical test records (Break-over vs Click)

NO.	 ANO TW-001			 74 Z-0-0-21/Ncm 100		
	Original test records	Test records after 5000 times	Test records after 10000 times	Original test records	Test records after 5000 times	Test records after 10000 times
Measured value (in.lbs)	8.14	8.19	8.16	8.79	8.92	8.57
	8.19	8.16	8.22	8.16	9.05	8.63
	8.11	8.16	8.13	9.19	9.17	8.87
	8.16	8.19	8.24	8.90	8.72	8.46
	8.13	8.22	8.20	8.28	8.17	8.28
	8.14	8.18	8.14	9.18	9.13	8.35
	8.15	8.22	8.10	9.21	8.88	8.15
	8.14	8.16	8.17	9.04	9.11	9.30
	8.15	8.25	8.24	8.60	8.43	8.73
	8.13	8.14	8.06	8.70	9.16	9.33
Average value (in.lbs)	8.144	8.187	8.166	8.805	8.874	8.667
Variance (in.lbs)	+0.046 -0.034	+0.063 -0.047	+0.074 -0.106	+0.405 -0.645	+0.296 -0.704	+0.663 -0.517
Accuracy	+0.56% -0.42%	+0.77% -0.57%	+0.91% -1.29%	+4.60% -7.33%	+3.34% -7.93%	+7.65% -5.97%
Overall Accuracy Range	+0.91% -1.29%			+7.65% -7.93%		

(Measured by EZ-TorQ II Torque Tester)