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# THE CUT-AUT TORQUE WRENCHES ASK TO LOW TORQOE

## Georgeta Gabriela Chindlea University of Oradea, chindlea@uoradea.ro

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**Abstract:** Torque wrenches are manoskops used for the controlled tightening operation of nuts and bolts

How the propose end was to found the real torque, most important conclusion was: a normal tighten with a torque wrench with a cut-out determine important errors. This errors go from 4,1% to 18,8%, most important errors appear to the non-precision torque wrenches.

### 1. About the cut-aut torque wrenches

Torque wrenches are manoskop used for controlling tightening operations of nuts and bolts. In them structure, we found a complex mechanism formed of three levers, three bolts, one roll and one skate. When the pre-load torque wrench,M, was reached, the lever solidar with the head of the torque wrench, changes by turning round the application point, generating a noise call "declic".

The torque wrench used for this research have the next adjustement fields: 6-28Nm; 17-80Nm; 70-200Nm. For using, the torque wrench is pre-load on the stand to the value of the torque. The adjustement is, in fact, a pre-load of the principal spring, using a adjustable nut and a fixe wrench. When the pre-load torque was reached, we hear the noise generated by the leaver.

The technique and metrologyc characteristics of the torque wrench are pressented in table number 1.

				l abele 1
Meansurement	Recomanded	Maxim	The Division's	The Square Part
Field	Meansurement	Torque	Value	for Turning Round
Nm	Field.	Nm	Nm/div	mm
	Nm			
1-10	3-7	10	0,25	A(B)6,3
2-20	8-14	20	0,5	A(B)10
10-60	25-45	60	2,0	A(B)12,5
20-120	50-90	120	2,5	A(B)20
50-250	120-180	250	5,0	B25

## 2. The stand use for torque wrench calibrating

The study about the torque wrench with a cut-aut and about the pre-load torque variability were achieved using two cells: "a balance tip cell" and "a torque bar cell" in the Tribology Lab of Technologic Engineering Faculty of Brasov.

The stand precission is a result of using a special bearing (a special knife with four edges) and of using the method of pre-balanced used before the meansurement.

You can see the stand in fig.1.

Using relation 1, we can found the calibrated torque:

(1)

Where: G – is the sum of the whole weights placed on the rad's scale;

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L - is the length of the lever arm, (L = 0.476m).



Fig.1.

Using the stand and the relation 1, we can calibrate the torque wrench at the wanted value.

# 3. The calibrating methodology

For calibrating a torque wrench to a desired value, applying the upside relation, we must found the weight we have to put on the scale. The steps are:

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- Fixing the torque wrench we want to calibrate on the headwrench of the knife;
- The pre-calibrating of the mobil grup form by the wrench-knife-lever-rod, using the weights;
- Place the weight on the rod's scale;
- Regulate the torque wrench till we hear the click.

## 4. Experimental results

The meansurements were done severals days, being indicated the temperature and the humidity from the lab during the experiments. The results of the tests were sum in tables as that one you can see down side,

						Table 2
Pre-load	-		Results			
Torque			10.04.2005			
Nm	_					
	The Weight	Weight	Torque	Temperature	Humidity	Time
	Coresp.	kg	Nm	С	%	
	The Torque					
	Kg					
		2,160	10,06	18	54	11.35
		2,109	9,82	18	54	11.40
		2,138	9,96	18	54	11.45
10	2,142	2,124	9,89	18	54	11.50
		2,108	9,82	18	54	11.55
		2,106	9,81	18	54	12.00
		2,113	9,84	18	54	12.05
		2,108	9,82	18	54	12.10

Next figure show us the results obtained when we controlled the cut-aut torque wrench calibrating on the balance tip cell stand.

1	2	3	4	5	6	7	8	9	10
9,99	9,85	9,85	9,78	9,87	9,73	0	9,8	9,76	9,78

11	12	13	14	15	16	17	18	19	20
9,52	9,55	9,85	9,66	0	9,64	9,78	9,8	9,66	9,59





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The propose end of the study was to found the real tighten torque for cut-aut torque wrenchs. A normal tighten with a torque wrench with a cut-aut determine important errors (go to18,8%). This errors appear as a result of the low precision of the machanicals processing of the wrenches. If we use a high precision torque wrench, this errors are smaller (about 0,7 to 4,1%).

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