

Calibration of torch wrenches: Informal document



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2 Document history

Revision	Date	Remark
0.0	28/02/2015	Basic document

3 Standardization

3.1 ISO 6789

ESTL has a measuring device for calibrating torque wrenches. This makes it possible to test an indication or breakdown torque of 10 to 1000 Nm of torque wrenches. The calibration is carried out according to **ISO 6789**. This standard describes how the accuracy of torque wrenches is tested. A distinction is made between 2 principles (types) of torque wrenches. Type I measures and visualizes the created moment. With type II, the key continues when a predetermined moment is reached.

3.2 Type I

With a torque wrench according to type I, the actual applied moment is measured and visualized by means of a scale or digital display.

There are 5 classes within type I:

- class A: torque wrench according to the torsion or bending rod principle
- class B: torque wrench in rigid housing with dial or digital display
- class C: torque wrench in rigid housing with electronic readout
- class D: torque screwdriver with dial or digital display
- class E: torque screwdriver with digital display

3.3 Type II

With a torque wrench according to type II, the desired moment is preset. If the torque wrench reaches this moment during use, the key will "click or break". There are 7 classes within this type:

- class A: adjustable torque wrench with dial or digital display
- class B: torque wrench with fixed torque
- class C: adjustable key without gradations
- class D: adjustable torque screwdriver with dial or digital display
- class E: torque screwdriver with fixed torque
- class F: adjustable torque screwdriver without gradations
- class G: torque wrench on the basis of torsion or bending rod principle

4 Calibration



4.1 Device

The calibration test does not require any operator actions that can affect the test results.



4.2 Maximum drive square

In order to avoid overloading the drive square, the following limits must be respected in accordance with ISO 6789.

Drive square [inch]	Maximum torque[Nm]
1/4	30
3/8	135
1/2	340
3/4	1000
1	2100

4.3 Precision & measurement sequences

For type I torque wrenches the maximum allowable deviations are given in the table below.

Class	Max. tolerance for a maximum measuring range (FS)	
	≤ 10 Nm	> 10 Nm
A & D	± 6%	
B, C & E	± 6%	± 4%

For type II torque wrenches the maximum permissible deviations are shown in the table below.

Class	Max. tolerance for a maximum measuring range		# measuring points
	≤ 10 Nm	> 10 Nm	
A & B	± 6%	± 4%	5x20% -> 5x60% -> 5x100%
D, E & G	± 6%		5x20% -> 5x60% -> 5x100%
C	± 6%	± 4%	10x20% -> 10x60% -> 10x100%
F	± 6%		10x20% -> 10x60% -> 10x100%



4.4 Calibration interval

- 12 months of approximately 5000 cycles is the standard calibration interval.
- After each repair, overload, misuse.

4.5 Test conditions

- 18 ° C < Temperature < 28 ° C.
- Temperature variation ± 1 ° C during calibration.
- Divergence of the torque wrench due to the applied moment: < 10 °

4.6 Execution

4.6.1 Preparation

- Type I: -correct readout position (parallax)
 - preload to FS in test direction-> zero torque wrench
- Type II: -5x preload to FS in test direction

4.6.2 Execution

- Type I: the force is applied until the torque wrench indicates the desired value.
- Type II: gradual strength building between 80% and desired value within 0.5 s and 4 s.

4.7 Analysis and reporting

4.7.1 Analysis

$$\text{Deviation As [\%]} = (x_a - x_r) * 100 / x_r$$

Where: Axle [%] calculated deviation of the torque wrench
x_a indication value of torque wrench
x_r reference value of calibration device

4.7.2 Reporting & marking

The torque wrenches are permanently marked with:

- maximum moment
- measuring unit
- direction
- name or brand of the producer
- in the case of calibration certificate: ID number (to be applied if not present)