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OPERATIVE MANUAL

TorqueKAL

Release 4.6

Application Program

For the calibration of hand torque tools according to the standards ISO 6789-1 e ISO 6789-2

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Overview

WARNING

The program comes on a USB key in which resides the permanent protection of the program from any claims of piracy. The USB key must always be inserted into the PC.

System requirement

PC: Pentium III 300 MHz 128 MB RAM
Windows : 7 – 8 - 10
Minimum resolution : 1280x1024

Windows: International options

For the proper functioning of the program, you must use (.) as the decimal point regardless of the conventions of the country where this program is used otherwise several settings can cause errors in calculation. Modify or check your decimal separator setting in the Windows Control Panel.

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1.0 Introduction

The program was designed to calibrate torque tools using torque measurement devices. The calibration procedure is performed in accordance with the UNI EN ISO 6789-1 (2017) and UNI EN ISO 6789-2 (2017) standards.
It is possible to choose whether to carry out the calibration only according to part 1 of the standard or completely also according to part 2.

The calibration, according to part 1 of the standard, consists in performing five or ten measurements for each loading point normally defined at the lowest permitted torque (typically 20%), 60% and 100% of the maximum torque value of the tool in calibration (these measuring points can still be modified).

At the end of the test, the program calculates, for each loading point:
a) the average of the readings;
b) the maximum relative deviation;
and defines the conformity or not of the tool in calibration by comparing the values obtained with the maximum permissible deviation allowed.
With regard to part 2 of the standard, the program allows to perform all the required measures regarding the tests of:

- Reproducibility
- Variation due to geometric effects of the output drive of the torque tool
- Variation due to geometric effects of the interface between the output drive of the torque tool and the calibration system
- Variation due to the variation of the loading point

At the end the uncertainties W and W' are calculated as required by the standard. It is also possible to view all the partial contributions used for the calculation of W and W'.

Calibrations can be performed either through a serial connection with sample instruments or manually by entering the values from the keyboard. All certificates are subsequently printed and archived in a data base that allows you to keep the history of the calibrations performed.

It is possible to create a database of torque tools to quickly recall their characteristic data before a calibration. In addition to the calibration certificates for each individual test, it is possible to create logs (calibration archives) which allow the tests carried out by calculating the quality factors cp and cpk to be kept under statistical control.

The program manages an additional database of instruments such as DTR2, BTR2, MP10, MPxPlus (ie MP4Plus, MP2Plus, MP6Plus) and MP10Plus connected to the PC via RS232 or USB serial communication to guarantee the acquisition of the torque measurement. For each Torque Measurement Devices it is necessary to introduce all the identification data, the ACCREDIA (or equivalent) certificates and insert the different uncertainties divided by the various points of torque.

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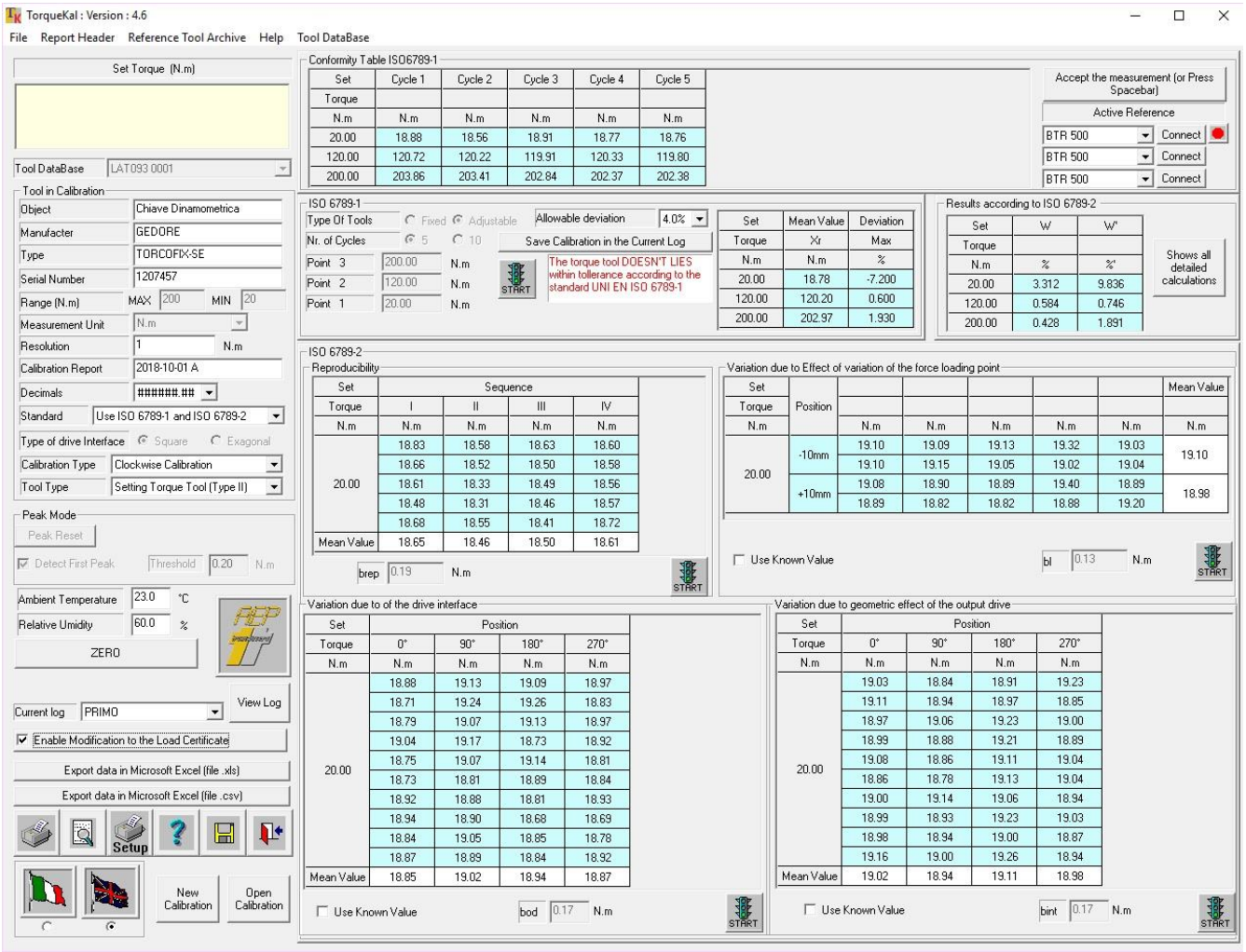
2.0 Main Menu and Main Fuctions



In the main menu you can manage the following operational functions such as:

File-> Open Certificate: this button opens the dialog to select and open a certificate among those previously saved.

File-> New Certificate: this button deletes all the data related to a previous calibration from the video.

Report Header : this button opens the page where to enter the certificate header data, the choice of logo and notes that can be inserted.

Reference Tools Archive: this button opens the page where to enter the data and the uncertainties of the sample instrument. To use this program correctly, all fields on this page must be completed.

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Tools Database: this choice allows to create an archive of tools in calibration. In this way, if the calibration of a device is repeated over time, it will be possible to recall all its characteristic data

Help: you access this manual and the Info page that provides information about the program

On the Main page other functional keys are active

Language selection: This button allows you to select the active language for the video and the report

Print Certificate: Here you have the 3 usual print, print preview and setup printer options

Save Report: allows you to save the calibration performed in a file. By default the saved data will be stored in the folder 'Certificati' inside the installation folder of the program. The name of the file created will be that of the certificate with the extension 'txt'. If a log is selected the test will be automatically appended to the log and the statistical values will be updated.

Help : with this key you can see this manual

Quit : You exit the program. If you have an active calibration the Quit button is disabled

Note
After opening a certificate from the archive, some fields will be disabled to prevent certain settings of the certificate from being modified that could invalidate the measures.

If you wish to make changes select "**Enable Modification to the Load certificate**", make the changes and press the **Save Certificate** button.

To restore the normal configuration please select the
File->New Certificate

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3.0 Serial Communication

For each torque to be calibrated, a reference instrument can be specified. The reference instrument in use must be connected to the computer through the supplied USB or serial RS232 port. The red dot indicates the active instrument. The correct reference is automatically selected during the test. It is however possible to select the single instrument through the "**Connect**" button.

In order to establish a valid communication between the PC and the sample instrument, it is necessary to correctly define the Baud Rate and the serial communication port in the window indicated below in the setting page of the sample instrument.

For instruments equipped with a USB port (for example: MP10Plus, MPxPlus, BTR2, DTR2) the Baud Rate can be set at any value.

If the PC does not have a serial input, it is possible to use RS232C➡USB adapters.

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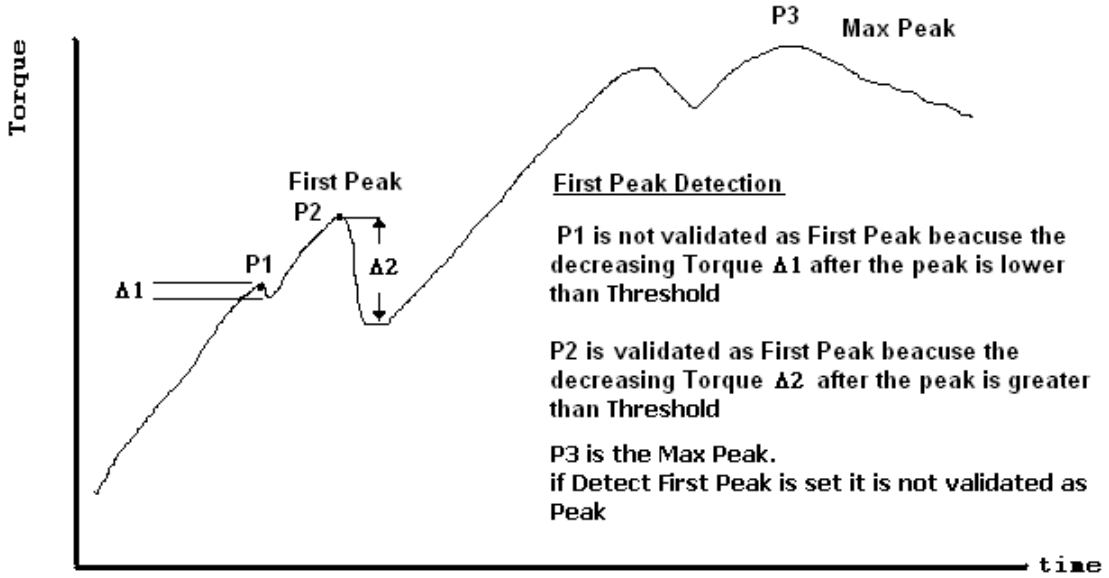
3.1 MP10Plus Indicator

The indicator MP10Plus allows communication of data extremely fast so it is not necessary to set the peak on the indicator the same way as the management of the measures is performed directly at the level of TorqueKal.

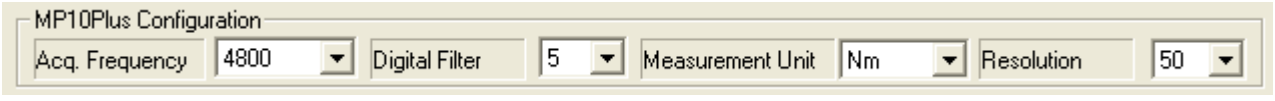
When selected MP10Plus as indicator the window to the side will appear where you can select to enable detection of the first peak and a threshold.

The meaning of the parameter threshold is described in the figure below.
It serves to distinguish the actual first peak from any invalid peak that may occur during the measurement. In the figure below the point P1 is not valid as the first peak because of the decrease in the next torque was not greater than the established threshold.

If is not enabled the detection of the first peak it will be adopted the maximum load recorded during the measurement. The peak is automatically reset when you accept the measure.
To repeat a measurement, press the Reset Peak button.



With the indicator MP10Plus is further enabled the window below to dynamically change the working parameters of the indicator and perform the **ZERO** function.



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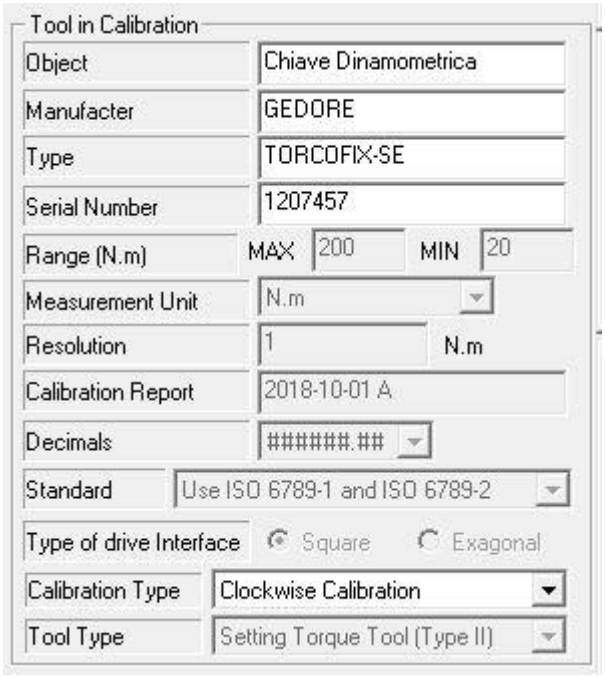
4.0 Tool In Calibration

If you have created a tool archive, simply select the tool in calibration from the list, otherwise fill in manually all the required fields



In the window dedicated to the calibration tool are introduced all its features, that will later be archived and reported on the certificate.

Object: field of general use to indicate the type of device (example "Torque wrench").
Manufacturer: indicate the manufacturer of the tool
Type: set the model of the tool.
Serial number: indicate the serial number of the tool.
Range: indicate the full scale torque of the tool in calibration. In the case of tools with adjustable torque, it is also necessary to insert the minimum use torque. **These values must always be positive.**
Units of Measure: specify the unit of measure of the tool in calibration.

If the desired unit of measurement is not found in the list, proceed as follows

1. Exit the TorqueKal Program
2. Edit the Unit.dat file located in the installation folder with a Windows Text Editor (Notepad). For each unit of measure available there are 2 lines. The first is the acronym of the unit itself and the second is the conversion factor with respect to 1 Nm.
   Enter the required information of the new unit of measure and save
3. Enter TorqueKal again and verify that the new unit of measure appears in the list.

Resolution: Set the best resolution of the tool in calibration. Attention because this value is used to calculate the uncertainty of the tool in calibration.

Calibration Certificate: Set the certificate number, this data will be printed on the calibration certificate. The calibration data will be saved in a file with this name in the "**Certificati**" folder in the program installation folder.
Being the name of a file, do not use special characters in the definition of the calibration certificate such as (the list is not exhaustive):

- < (less than)
- > (greater than)
- : (colon)
- " (double quote)

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- / (forward slash)
- \ (backslash)
- | (vertical bar or pipe)
- ? (question mark)
- * (asterisk)

Decimals: It allows to define with how many decimals to represent the setting torque value during the calibration

Standard: It is selected whether the calibration in question must be carried out according to part 1 only (UNI EN ISO 6789-1 (2017)) or completely (UNI EN ISO 6789-1 (2017) and UNI EN ISO 6789-2 (2017)).

Output drive type: select if the torque tool is a square or hexagonal type

Measurement type: select whether calibration should be performed clockwise or counterclockwise. The same certificate name can be used for both calibrations.

Tool type: Select from
- Indicator Torque Tool (type I)
- Setting Tool (type II)

For these definitions, see paragraphs 6.5.2 and 6.5.3 of the UNI EN ISO 6789-1 (2017) standard.

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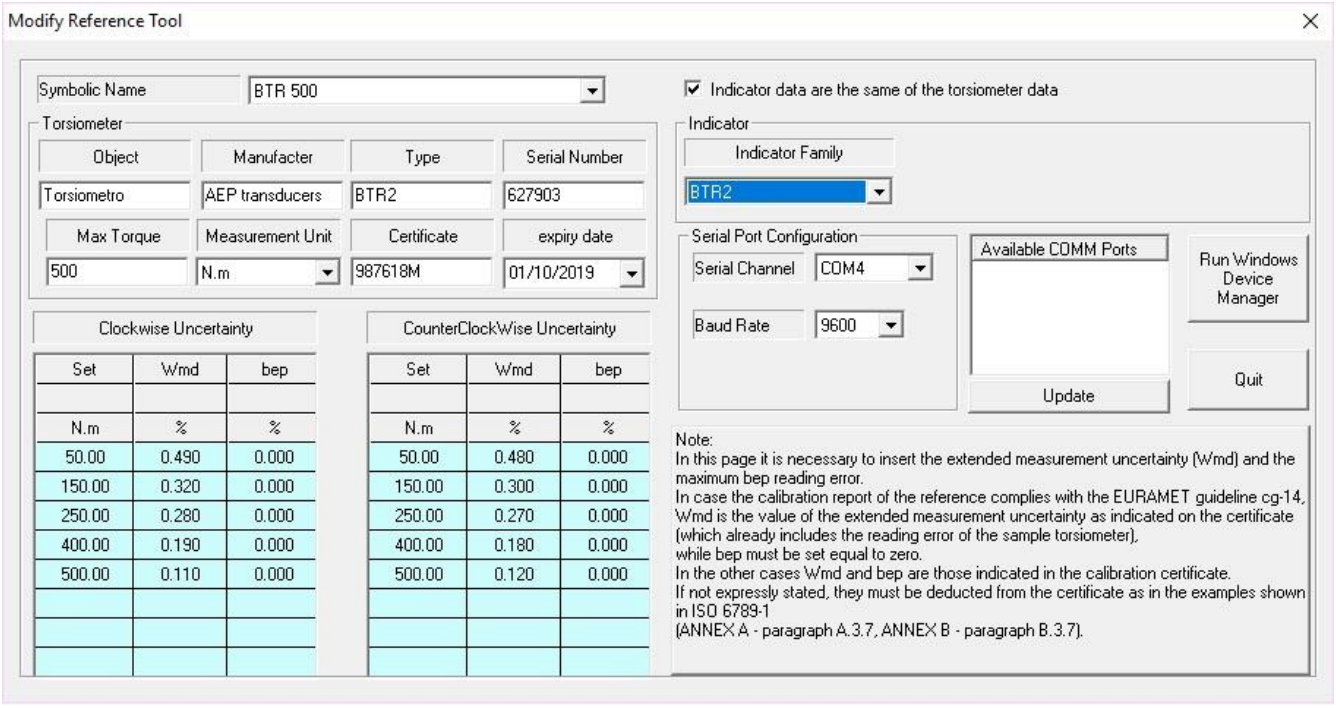
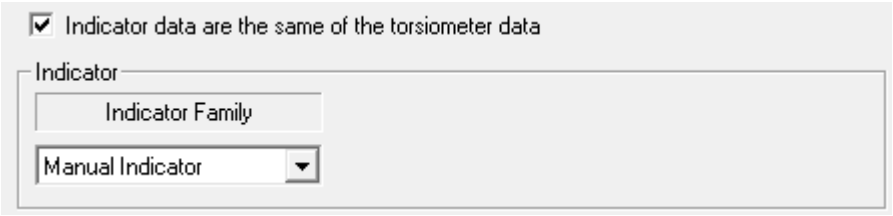
5.0 Reference Tools

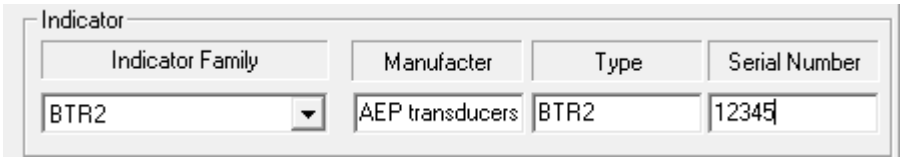


This page stores all the data related to the Reference Tools that can be used to perform the calibration. For correct operation it is necessary to correctly fill all the following fields that can be easily recovered by an ACCREDIA (or equivalent) calibration certificate.
The fields to be filled in are separated by indicator and torsiometer.



If the indicator and torsiometer are within the same instrument, select the "**Indicator data are the same of the torsiometer data**" setting.

As regards the indicator, it is necessary to define the indicator family to be connected.



In case you use an indicator not inserted in the list and of which the data will be acquired manually select "**Manual Indicator**".

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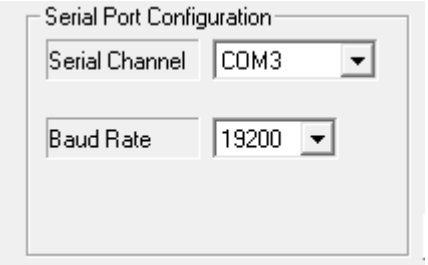
In order for communication with the instrument to be established, the correct COM channel and baud rate must be set.



For instruments equipped with USB port (example: MP10Plus, BTR2, DTR2, MPxPlus) the Baud Rate can be set to any value otherwise this value must coincide with that set inside the instrument.

The **Available COMM Ports** window allows to recognize which COMM port to select among those in the list. If you have more than one COMM port, with the indicator on, try to insert and then unplug the connected USB cable. The desired COMM port is the one that appears when the instrument is connected and disappears when the instrument is not connected.
If the window does not update automatically, press the "**Update**" button.

In the case of a separate torque meter and indicator for the indicator, it is necessary to insert further:
Manufacturer: indicate the manufacturer of the instrument (example "AEP transducers")
Type: Enter the name of the instrument (example "BTR2").
Serial number: indicate the serial number of the instrument.

For the torque meter, in addition to entering the aforementioned data, it is necessary to define:

- ***Object***: field of general use to indicate the type of instrument (example "Torsiometer").
- ***Manufacturer***: indicate the manufacturer of the torque transducer (example "AEP transducers")
  Type: Enter the name of the torque transducer (example "BTR2").
- ***Serial number***: indicate the serial number of the torque transducer.
- ***Max torque***: indicate the maximum torque of the Reference torque meter (example "100" Nm).
  Unit of Measure: unit of measurement
- ***Certificate number***: Indicate the number of the ACCREDIA (or equivalent) certificate of the instrument.
- ***Expiry Date***: Set the expiration date of the Reference instrument certificate, the program will warn the operator when the certificate expires when it is used.

In case of insertion of a new reference tool, a symbolic name will be assigned that will allow it to be easily recalled. The data entered will be stored in a file with this name in the "**Campioni**" folder of the installation folder.
Being the name of a file, do not use special characters in the definition of the calibration certificate such as (the list is not exhaustive):

- < (less than)
- > (greater than)
- : (colon)
- " (double quote)
- / (forward slash)
- \ (backslash)
- | (vertical bar or pipe)
- ? (question mark)
- * (asterisk)

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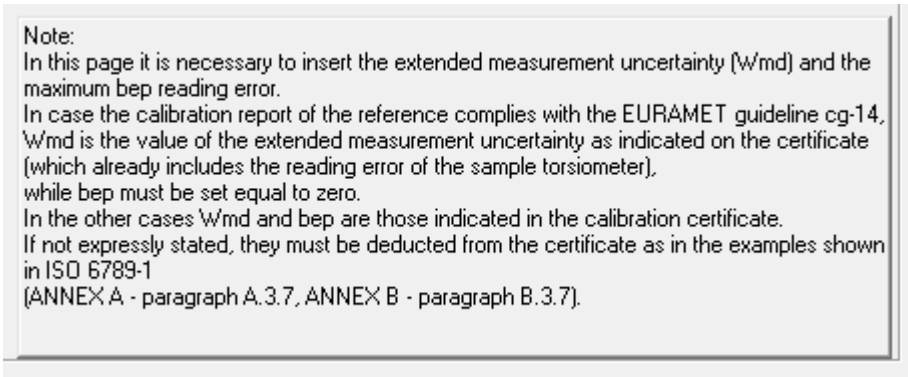
Tables uncertainties of the reference tool



Clockwise uncertainty: in this table the Operator must introduce in the first column the calibration points shown on the ACCREDIA certificate, and in the other column the uncertainty associated with each torque point in clockwise direction.
For the value of **bep** to be inserted, compare the note above
The table can accept up to 8 different torque points but the operator can set a lower number if necessary, depending on the certificate in his possession.

Uncertainty in the counterclockwise direction: in this table the Operator must introduce in the first column the calibration points shown on the ACCREDIA certificate, and in the other column the uncertainty associated with each counter-clockwise torque point.
The anti-clockwise calibration points must also be entered with the minus sign (-) (example "-10").
For the value of **bep** to be inserted, compare the note above.
The table can accept up to 8 different torque points but the operator can set a lower number if necessary, depending on the certificate in his possession.

CAUTION:

The introduction of **NOT CORRECT** data impairs the calculation of the measurement uncertainty of the tool in calibration.

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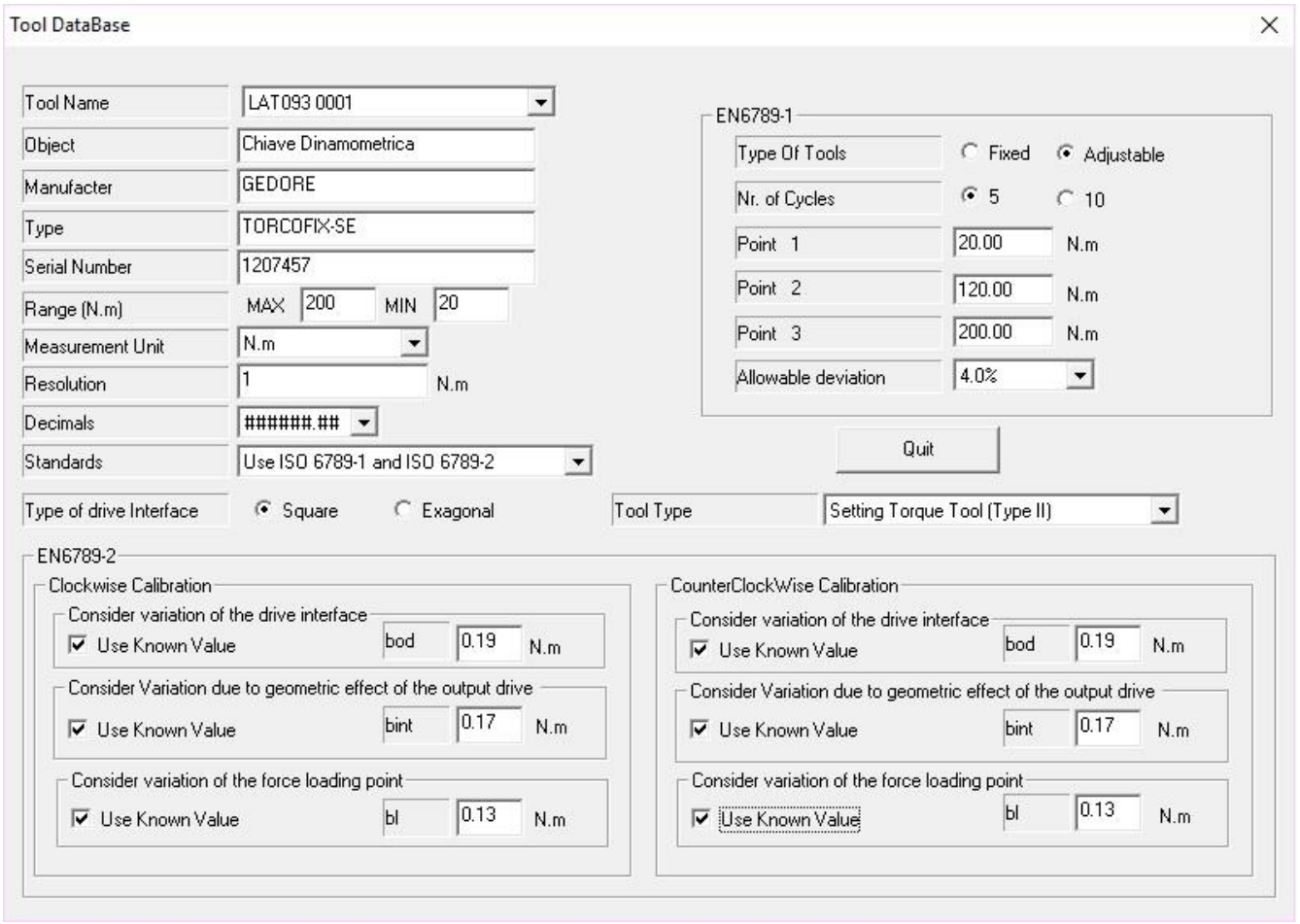
6.0 Archivio attrezzi in taratura

It is possible to define an archive of tools that can then be recalled during calibration, allowing to fill in all the fields necessary for the calibration itself.
It is advisable to use this function because if you calibrate the tools in a repetitive way all the necessary settings will be recalled simply with a click.



By inserting a new tool in the database you will be asked to assign a symbolic name to be assigned to the tool. The entered data will then be saved in the "**Dispositivi**" folder in the program installation folder. Being the name of a file, do not use special characters in the definition of the calibration certificate such as (the list is not exhaustive):

- < (less than)
- > (greater than)
- : (colon)
- " (double quote)
- / (forward slash)
- \ (backslash)
- | (vertical bar or pipe)
- ? (question mark)
- * (asterisk)

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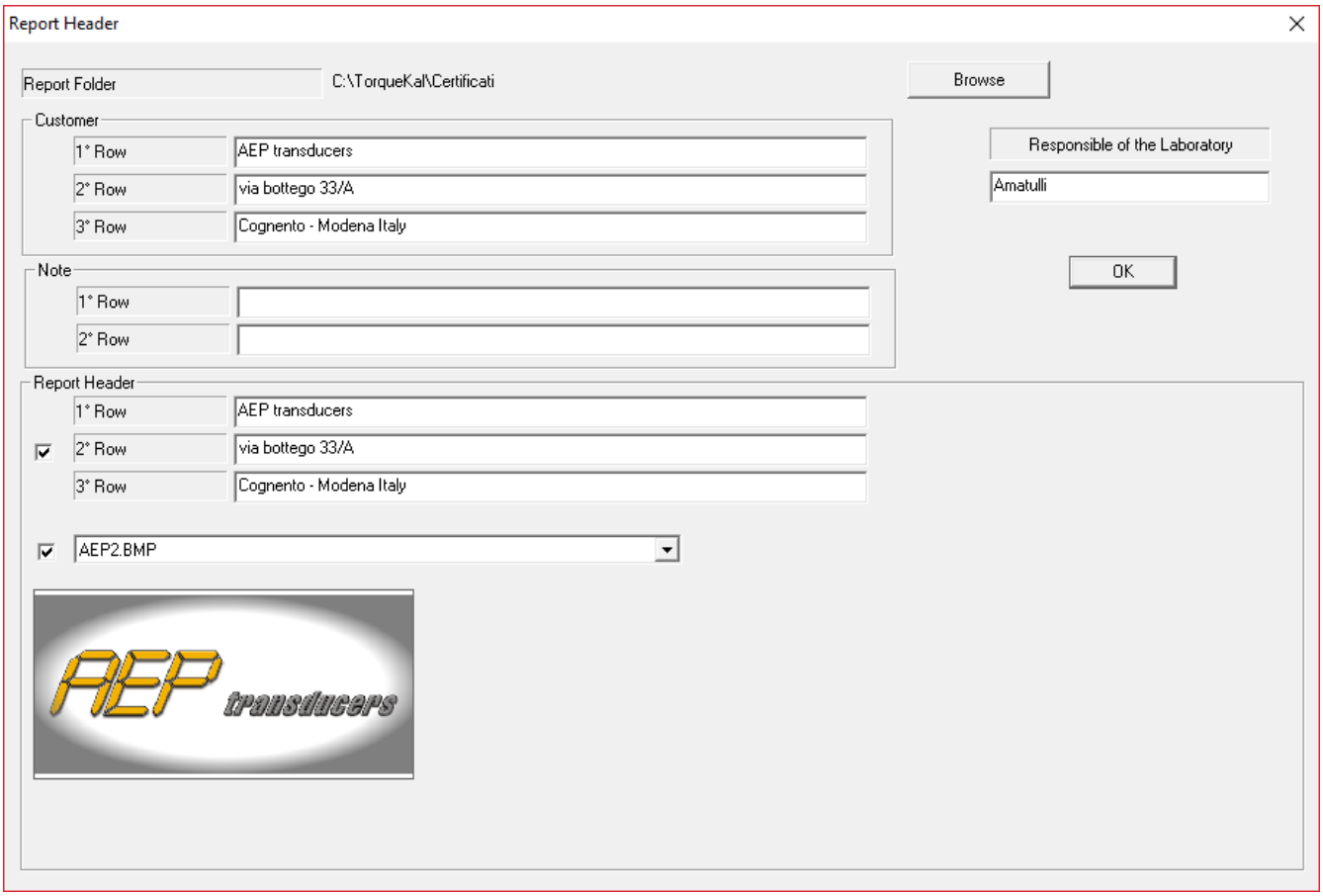
7.0 Report Header



On this page you can enter some data of interest that will be shown on the certificate to be printed.

Certified Header:

It is possible to define the header of the certificate with a customized logo, with up to 3 lines of free text or both.
By clicking on the appropriate selections beside the choices, it is possible to enable / disable the header and / or the logo.
It is possible to choose from more than one logo. Through the selection window it is possible to choose the most suitable file for the certificate to be printed.

To create new logo files, just copy the bmp file with the desired image into the **'Loghi'** folder (within the installation folder) (max size about 1500x500 points).

Every time you change files, the preview of the image will be presented on the screen

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Customer:

you can enter up to 3 lines of free text to indicate the details of the recipient of the certificate

Notes:

you can enter up to 2 lines of free text to indicate general information. (example expiry of the certificate, the name of the operator, etc.).

This text is inserted at the bottom of the certificate page.

Laboratory Manager: allows you to enter the name of the calibration manager that will be printed at the bottom of the certificate.

In this page it is also possible to define the folder for storing certificates. This folder is by default the "**Certificati"** folder located inside the installation folder.

In questa pagina è possibile inserire alcuni dati di interesse che saranno riportati sul certificato da stampare.

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8.0 Calibration Procedure

The calibration is semi-automatic because the program sets and suggests the execution sequence, but it is the operator who must correctly execute the sequence in order for the program to acquire the data correctly. The measurement of the generated torque must be read by a Reference instrument that can be connected directly to the program through the USB or RS232 port or manually. In this case the readings must be entered with the aid of the keyboard.

8.1 Calibration according to ISO 6789-1

Allowable deviation: set the permissible measuring deviation (between 4.0% and 6.0%); the allowable deviation means ± with respect to the measure.

Compare item 5.1.5 of ISO 6789-1 to determine which tools to select the maximum deviation at 4% or 6%.

In the case of an adjustable torque tool, the calibration will be performed on 3 torque values (normally placed at the maximum torque of the tool, at 60% and at the minimum torque) while for those with fixed torque, only one torque value will be performed.

For each set torque, 5 or 10 measuring points will be executed.
Compare the ISO 6789-1 standard in steps 6.5.2 and 6.5.3 to determine the number of measurement points most appropriate to the calibration being performed.

For each device in calibration it is possible to perform both the Clockwise and Anti-clockwise Calibration.

The number of measuring points (1 or 3), the permissible deviation and the position of the decimal point must be identical in the 2 calibrations.
If it is necessary to set different values in the allowable deviation or a different number of measuring points, it is advisable to create 2 certificates one for clockwise calibration and the other one for counterclockwise calibration.

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The program automatically prepares three measuring points at 20%, 60%, 100% of the maximum Torque value of the device in calibration. You can change these default settings by entering the desired values in the appropriate fields.

In the case of 1 measuring point, 100% of the maximum torque is entered as the default value

For each pair to be implemented it is necessary to define the reference tool that is to be used in the appropriate selection windows.

To carry out a calibration follow the following steps

- Couple the device in calibration with the sample torsiometer.
- Perform three loads at the maximum torque value of the device being calibrated.
- Activate the Peak function on the Reference instrument (not necessary if MP10Plus indicator is used).

Before starting the calibration, carefully fill in all the necessary fields and in particular assign a name to the certificate to be created (if this field is empty, calibration is not performed).

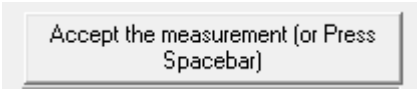
For calibrations in which a Reference instrument is used, serially press the **Start** button to begin the calibration.

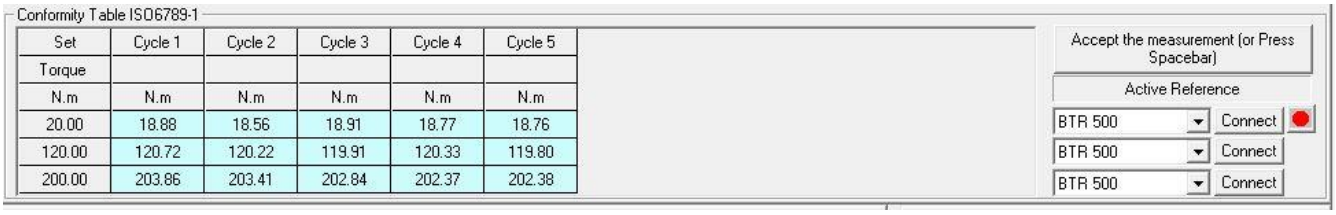
If the **Start** key is accepted, it becomes **Stop**.

A message reminds you to perform 3 preload cycles at the maximum torque of the tool.
When it is confirmed that the preloads have been executed, the box of the first measure to be made is highlighted in red.

With the instrument connected, the torque value will also be displayed in the active acquisition box, which will be displayed in red.

Pressing the space bar or the **'Accept Measure'** button.
The measurement is confirmed and the program is ready for the new measurement.





It is possible at any time to resume a measurement already made simply by clicking inside the window relating to the measurement to be taken.

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If the test is not satisfactory, do not accept the measurement and repeat the test.

Carry out the remaining tests of the first proposed measurement point in the same way, then the program will position itself on the first test of the next measurement point to be tested.

At the end of the test sequence of the last measuring point, the program will automatically calculate the Mean Value and Maximum Deviation of the tool in calibration declaring its compliance or not with the standard by comparing this value with respect to the maximum permissible deviation.

Set	Mean Value	Deviation
Torque	Xr	Max
N.m	N.m	%
20.00	18.78	-7.200
120.00	120.20	0.600
200.00	202.97	1.930

You can stop the test at any time by pressing the **Stop** button and then start again from the beginning by pressing Start.

At the end of the test it will be possible to manually modify each single measurement by clicking inside the relevant window and entering the new value.

It is also possible to manually create a calibration manually by filling in all the fields in the table.

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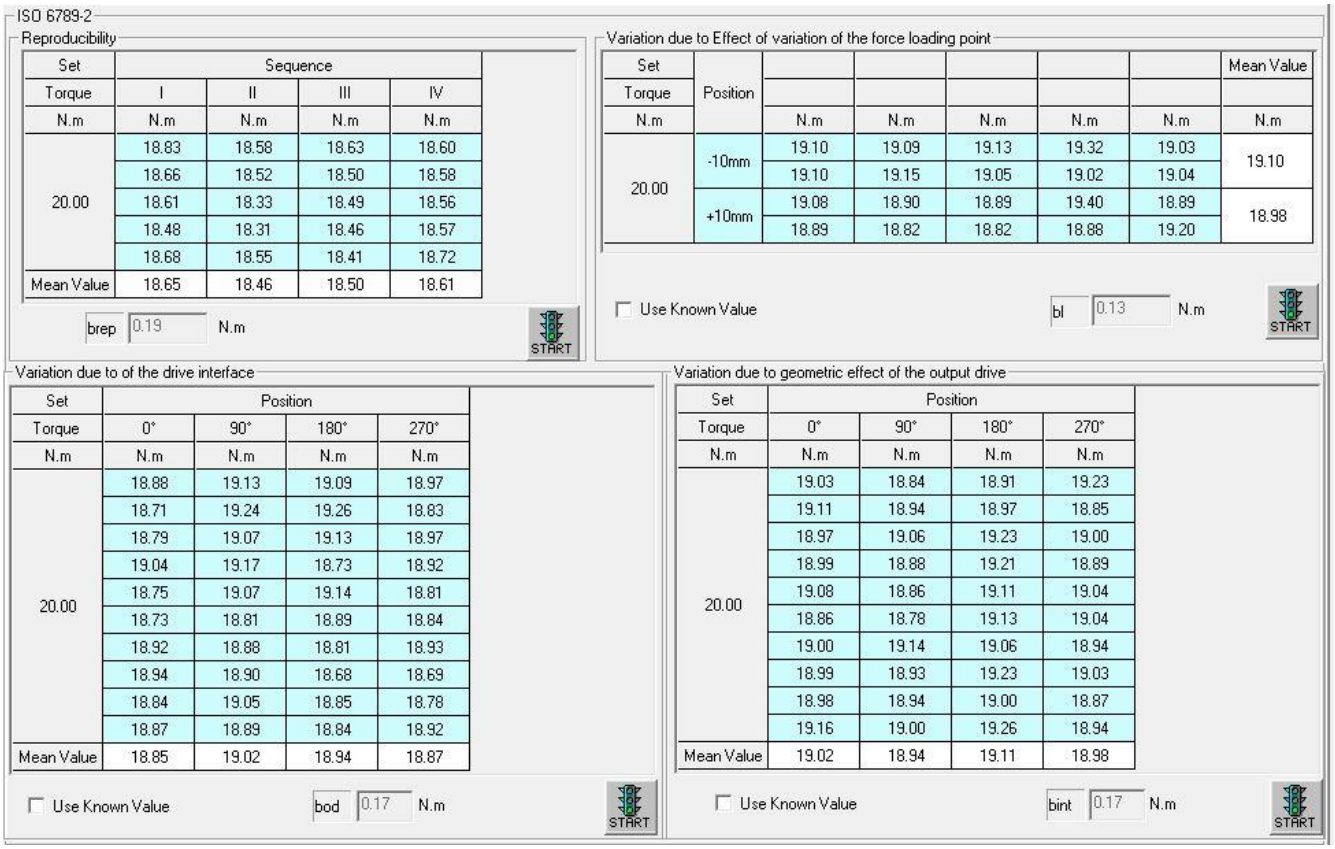
8.2 Calibration according to ISO 6789-2

As regards part 2 of the ISO 6789 standard, the program allows to perform all the required measures regarding the tests of:

- Reproducibility;
- Variation due to geometric effects of the output drive of the torque tool;
- Variation due to geometric effects of the interface between the output drive of the torque tool and the calibration system;
- Variation due to the variation of the loading point.



The calibrations are all performed at the minimum torque of use of the tool.

At the end the uncertainties W and W' are calculated as required by the standard.

A **START** key has been provided for each of the required calibrations.

Operationally, the methods for performing the calibration are identical to those followed for part 1 of the standard.

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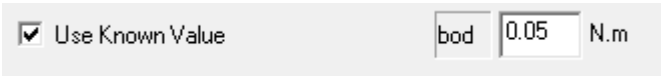
The reproducibility test refers to point 6.2.2 of ISO6789-2 standard and consists in carrying out 4 repetitions (each consisting of 5 measuring points) to the minimum set torque by removing the tool from the calibration system after each cycle of 5 readings.
At the end of the procedure the average values measured for each cycle and the $\mathbf{b_{rep}}$ value required by the standard will be calculated.

The test related to the measurement of variations caused by the attack of the key refers to point 6.2.3.2 of the standard.
Please refer to the reading of this chapter to identify the methods of execution of the test.

The calibration must be preceded by at least 5 preloads. The standard also provides for the case in which this test can not be performed.
This can happen in 2 cases

1. if you have sufficient statistical data on similar tools (to be requested from the supplier of the tool).
2. if the tool is not able to rotate

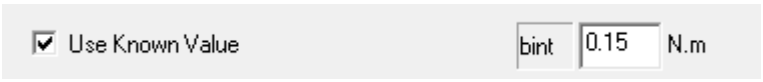
In these cases set the **Use Known Value** choice. In the first case, enter the known value in the bod box, in the second case enter 0.00



The calibration related to the measurement of the variations caused by the interface between the torque wrench adapter and the calibration system refers to the point of the standard 6.2.3.3.

Please refer to the reading of this chapter to identify the methods of execution of the test.
The calibration must be preceded by at least 5 preloads.

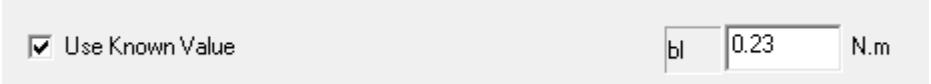
If there are sufficient statistical data on similar tools (to be requested from the supplier of the tool), the test may not be performed.
In this case click on the selection on the side and manually enter the known value of $\mathbf{b_{int}}$.



The calibration relating to the measurement of the variations caused by the point of application of the torque refers to point 6.2.4 of the standard.
The calibration must be preceded by at least 5 preloads.
The standard also provides for the case in which this test can not be performed. This can happen in 2 cases

1. if you have sufficient statistical data on similar tools (to be requested from the supplier of the tool).
2. if the tool is not affected by this effect

In these cases set the **Use Known Value** choice. In the first case, in the $\mathbf{b_l}$ box, enter the known value; in the second case, enter 0.00



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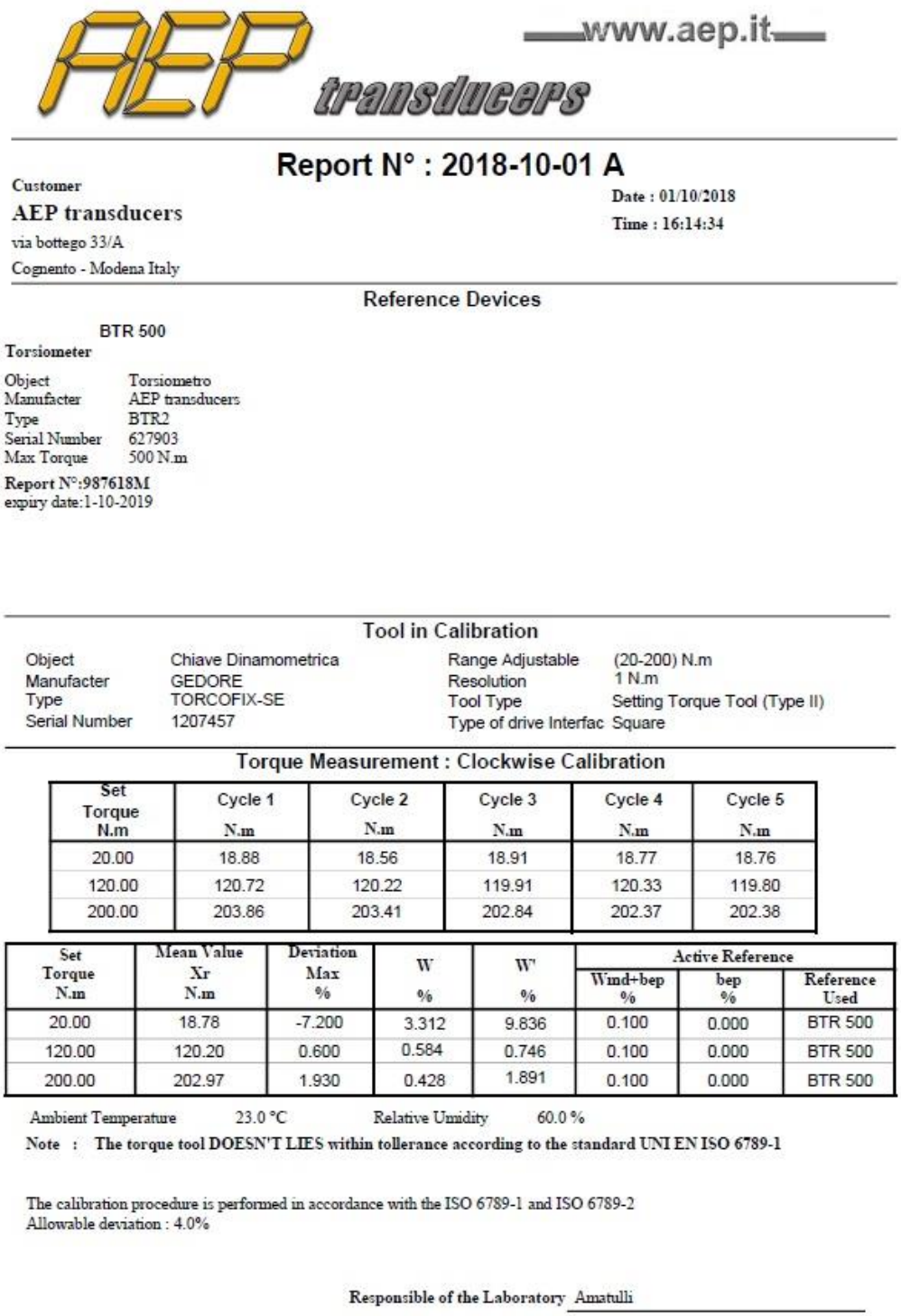
9.0 Report example

The report always refers to a single setting in clockwise or counterclockwise depending on what is displayed on the screen.



www.aep.it

Report N° : 2018-10-01 A

Customer
AEP transducers
via bottego 33/A
Cognento - Modena Italy

Date : 01/10/2018
Time : 16:14:34

Reference Devices

BTR 500
Torsiometer

Object	Torsiometro
Manufacter	AEP transducers
Type	BTR2
Serial Number	627903
Max Torque	500 N.m

Report N°:987618M
expiry date:1-10-2019

Tool in Calibration

Object	Chiave Dinamometrica	Range Adjustable	(20-200) N.m
Manufacter	GEDORE	Resolution	1 N.m
Type	TORCOFIX-SE	Tool Type	Setting Torque Tool (Type II)
Serial Number	1207457	Type of drive Interfac	Square

Torque Measurement : Clockwise Calibration

Set Torque N.m	Cycle 1 N.m	Cycle 2 N.m	Cycle 3 N.m	Cycle 4 N.m	Cycle 5 N.m
20.00	18.88	18.56	18.91	18.77	18.76
120.00	120.72	120.22	119.91	120.33	119.80
200.00	203.86	203.41	202.84	202.37	202.38

Set Torque N.m	Mean Value Xr N.m	Deviation Max %	W %	W' %	Active Reference		
					Wmd+bep %	bep %	Reference Used
20.00	18.78	-7.200	3.312	9.836	0.100	0.000	BTR 500
120.00	120.20	0.600	0.584	0.746	0.100	0.000	BTR 500
200.00	202.97	1.930	0.428	1.891	0.100	0.000	BTR 500

Ambient Temperature 23.0 °C Relative Umidity 60.0 %

Note : The torque tool DOESN'T LIES within tollerance according to the standard UNI EN ISO 6789-1

The calibration procedure is performed in accordance with the ISO 6789-1 and ISO 6789-2
Allowable deviation : 4.0%

Responsible of the Laboratory Amatulli

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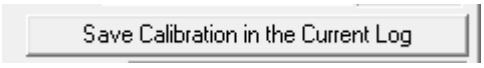
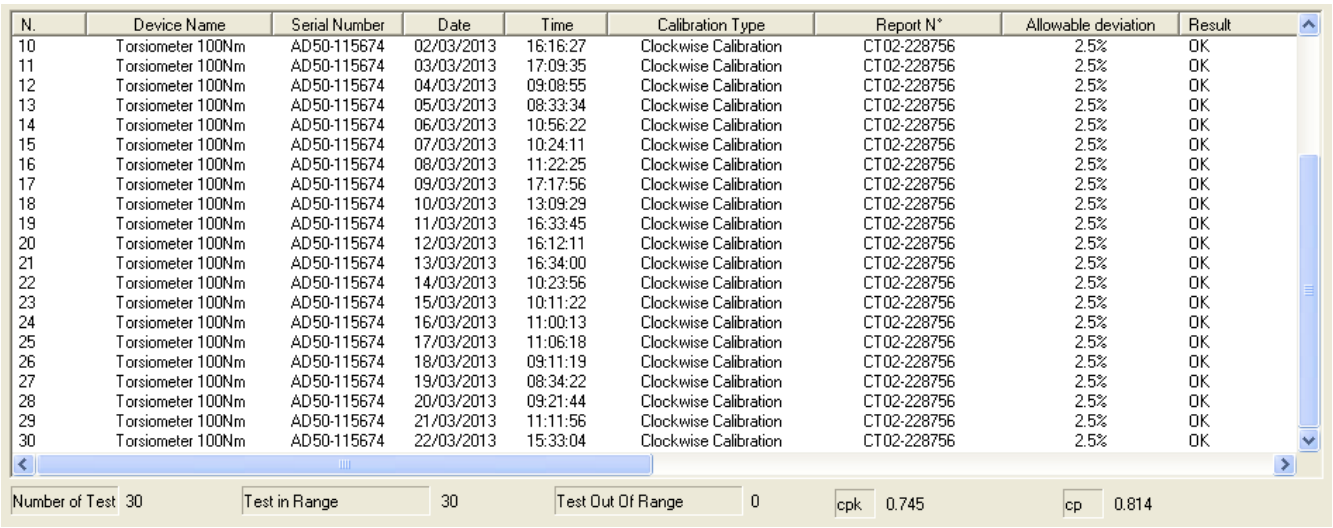
10.0 Log

A Log is a record of calibration results that are collected in order to perform statistical analysis.

The saving in the log is done manually through the button next to it and must be performed when the calibration is considered complete.

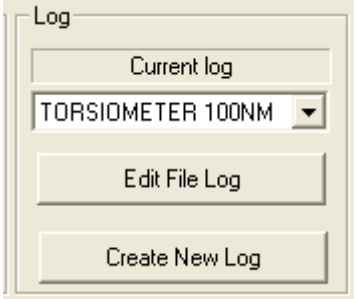




N.	Device Name	Serial Number	Date	Time	Calibration Type	Report N°	Allowable deviation	Result
10	Torsiometer 100Nm	AD50-115674	02/03/2013	16:16:27	Clockwise Calibration	CT02-228756	2.5%	OK
11	Torsiometer 100Nm	AD50-115674	03/03/2013	17:09:35	Clockwise Calibration	CT02-228756	2.5%	OK
12	Torsiometer 100Nm	AD50-115674	04/03/2013	09:08:55	Clockwise Calibration	CT02-228756	2.5%	OK
13	Torsiometer 100Nm	AD50-115674	05/03/2013	08:33:34	Clockwise Calibration	CT02-228756	2.5%	OK
14	Torsiometer 100Nm	AD50-115674	06/03/2013	10:56:22	Clockwise Calibration	CT02-228756	2.5%	OK
15	Torsiometer 100Nm	AD50-115674	07/03/2013	10:24:11	Clockwise Calibration	CT02-228756	2.5%	OK
16	Torsiometer 100Nm	AD50-115674	08/03/2013	11:22:25	Clockwise Calibration	CT02-228756	2.5%	OK
17	Torsiometer 100Nm	AD50-115674	09/03/2013	17:17:56	Clockwise Calibration	CT02-228756	2.5%	OK
18	Torsiometer 100Nm	AD50-115674	10/03/2013	13:09:29	Clockwise Calibration	CT02-228756	2.5%	OK
19	Torsiometer 100Nm	AD50-115674	11/03/2013	16:33:45	Clockwise Calibration	CT02-228756	2.5%	OK
20	Torsiometer 100Nm	AD50-115674	12/03/2013	16:12:11	Clockwise Calibration	CT02-228756	2.5%	OK
21	Torsiometer 100Nm	AD50-115674	13/03/2013	16:34:00	Clockwise Calibration	CT02-228756	2.5%	OK
22	Torsiometer 100Nm	AD50-115674	14/03/2013	10:23:56	Clockwise Calibration	CT02-228756	2.5%	OK
23	Torsiometer 100Nm	AD50-115674	15/03/2013	10:11:22	Clockwise Calibration	CT02-228756	2.5%	OK
24	Torsiometer 100Nm	AD50-115674	16/03/2013	11:00:13	Clockwise Calibration	CT02-228756	2.5%	OK
25	Torsiometer 100Nm	AD50-115674	17/03/2013	11:06:18	Clockwise Calibration	CT02-228756	2.5%	OK
26	Torsiometer 100Nm	AD50-115674	18/03/2013	09:11:19	Clockwise Calibration	CT02-228756	2.5%	OK
27	Torsiometer 100Nm	AD50-115674	19/03/2013	08:34:22	Clockwise Calibration	CT02-228756	2.5%	OK
28	Torsiometer 100Nm	AD50-115674	20/03/2013	09:21:44	Clockwise Calibration	CT02-228756	2.5%	OK
29	Torsiometer 100Nm	AD50-115674	21/03/2013	11:11:56	Clockwise Calibration	CT02-228756	2.5%	OK
30	Torsiometer 100Nm	AD50-115674	22/03/2013	15:33:04	Clockwise Calibration	CT02-228756	2.5%	OK

Are calculated:
- Number of calibration inside the log
- Number of calibration in tolerance
- Number of calibration out of tolerance
- Cp
- Cpk

Remains to the operator the choice of how to create a log
For example attach the log to the entire batch of devices or create a Log for each device, etc.



You create a log using **Create New Log** where you will be asked simply to name the new log.
Automatically lthe og created becomes the current one.
Log files are files with the extension. csv created in the Logs folder located inside the installation folder of the program.
With **Edit Log File** is possible to make a maintenance of the file to correct or change erroneous data.
Log file are text file in which each field separated by a semicolon.

They can then be imported directly from programs such as Microsoft Excel.

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The printing of the log is activated via **the Print Log** button. In the report are kept the size of columns on the screen. For which it is possible to enlarge / tighten the columns to give more space or one or the other field. To disable a column is sufficient to minimize the width of a column.

Cp e Cpk

Cp and Cpk are indices of quality statistics that are associated with a process of measurement.

The variable is kept under control is the measured deviation of each calibration
The upper (LS) and lower (LI) limits are the permissible deviation selected.

by definition

$$cp = \frac{LS - LI}{6\sigma}$$

$$cpk = Min\left(\frac{\mu - LI}{3\sigma}, \frac{LS - \mu}{3\sigma}\right)$$

where σ is the standard deviation and μ is the average of the deviation measured of the calibration inside the log