User Guide

ACTA 4000

Also valid for ACTA 3000 software revision 3.x

Atlas Copco Tools and Assembly Systems

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1 Safety instructions

Important

All locally legislated rules with regard to installation, operation and maintenance shall be observed at all times.

Warning!

- When using electric products, basic precautions should always be taken, including the following:
- Read all instructions before using the product.
- Before operating the product, please make sure that the operating voltage (indicated on the type plate on the bottom of the product) is identical with the voltage of your local power supply.
- Always disconnect the product from the mains by unplugging it when replacing the battery.
- The product is equipped with an internal fan to reduce heat build-up. All the same, use the system in a location with adequate ventilation and keep it away from sources of excessive heat (radiators or other equipment that produces heat).
- Do not expose the system to excessive moisture (dripping or splashing water), and do not use it near water (near a washbasin or in a wet basement) or other liquids.
- The product should not be subjected to continuous or excessive shocks or vibration.
- For minimum electrical interference, use the product well away from possible sources of electrical noise (arc-welding equipment, etc.).
- There are no user serviceable parts inside the product. Under no circumstances should you open or attempt to repair the product. Doing so will invalidate all warranties. Refer all service needs to your local Atlas Copco Tools service personnel.

Danger of explosion if a replacement battery is incorrectly connected.

Replace only with the same or an equivalent type recommended by the equipment manufacturer.

Discard used batteries according to the manufacturer's instructions.

2 System overview

Introducing ACTA, combining tightening analysis functionality with integrated tools management and statistic process control (SPC).

This user guide describes the ACTA 4000 and ACTA 3000, revision 3.x functionality. When referring to ACTA only, the functionality is valid for both versions. Other versions of ACTA are not covered in this user guide.

2.1 ACTA functionality

ACTA is available in three different versions to cover all needs:

- Basic
- Quality Control (QC)
- Advanced Analysis (AA).

The following functionality is available in all versions of ACTA:

Function	ACTA 4000	ACTA 3000
PC connection allowing quick upgrades and PC integration through ToolsTalk QAT	USB, RS 232 and Ethernet	RS 232
Printer Port	Not available, printing capability through Report Viewer application (not yet implemented)	Yes
Analogue output for quality analysis with oscilloscope	Yes	Yes
An integrated battery	7 hours	3,5 hours
Automatic communication of calibration data from transducers at start-up	Strain-gage and amplified transducers supported	Strain-gage transducers supported
Display	Color display	Black and white display
Quick programming function for simple torque checks	Yes	Yes
Flash memory for easy upgrading	Yes	Yes
Memory	6000 tools, 48000 tool tightening operations	500 tools, 6000 tool tightening operations
ToolsTalk QAT-compatible	Yes	Yes

2.1.1 ACTA Basic

ACTA Basic is the entry level version designed for simple torque checking in a repair shop or directly on the line. ACTA Basic includes the following functionality:

- Measures torque and angle on direct driven, residual torque and pulse tools and counts the number of pulses on pulse tools
- Calculates mean values and 3σ
- Single Memory Position, i.e. only one tool
- Auto calibration and self test
- Auto set-up on Atlas Copco memory transducers
- Transducer database for non-Atlas Copco transducers

2.1.2 ACTA Quality Control

Quality Control is the next step up from Basic. It includes a database for organization and storage of tools and tool tightening operations. It also includes advanced statistical functions. In addition to the Basic features, the following is included:

- Process capability index (CM) and modified process capability index (CMK)
- Real time statistic process control (SPC)
- Databases for Tools, Measurements and History
- Print SPC for a tool or a tool tightening database
- Tool calibration

2.1.3 ACTA Advanced Analysis

Advanced Analysis is the most advanced version for graphical analysis of the tightening characteristics of various tools or joints. In addition to the Basic and Quality Control features, the following is included:

- Tightening traces with zoom-in
- Print traces, for ACTA 4000 through ToolsTalk QAT
- Trace transfer to ToolsTalk QAT

2.2 ToolsTalk QAT

With ToolsTalk QAT you have a complete tool database, tightening database and supplier database for easy storage and access to all the information you might need about your tools along with traces and

detailed statistical data. In addition, you have a complete application database for handling of tools and joints.

You are also able to attach maintenance and service instructions for all your tools and keep a record of work in progress. ToolsTalk QAT can even keep track and remind you of maintenance and service intervals. Read more in the ToolsTalk QAT section and in the ToolsTalk QAT user guide.

2.3 How to use this guide

This user guide describes how to use ACTA in conjunction with the following hardware and software.

- Transducer
- Tool
- Controller
- ToolsTalk QAT
- Report Viewer ACTA 4000 (not yet implemented)
- Deadweight equipment, ISO 5393 test joints
- Cables

For more information on these products, see the applicable user guide or product information.

The following main tasks are handled in this user guide:

Tool measurement	The tool is connected to the transducer and to ACTA, and tightening operations are done. The result is displayed and stored in ACTA. For Quick programming instructions, see sections Measuring tools.
Tool measurement with synchronization	Tool measurement when tool and controller are connected and the tightening operations are done using the configuration in the controller. The results from the controller and from the transducer are both displayed in ACTA (if RS232 or Ethernet connection is used). If using a controller-tool combination that is not connected or not compatible with ACTA, a manual synchronization is done where the configuration and the results from the controller are entered manually. For Quick programming instructions, see section Measuring controlled tools with synchronization.

Tool measurement according to ISO 5393	Standardized measurement according to ISO 5393. See section Measuring tools according to ISO 5393.
Tool calibration	If the tool needs adjustment, this is normally done through the ACTA calibration procedure where the tool software is updated. A calibration can also be done manually (screw adjustment on tool). The tool calibration can be done with or without a synchronized controller. For instructions, see section Calibrating tools and equipment.
Tool data handling	Tool data and the results of the measurements from the tightening operations are stored in ACTA. The data can be stored and handled in a number of ways. Printouts through a PC or data handling in ToolsTalk QAT can be made.
ACTA calibration	ACTA needs to be calibrated once a year. This is done in a licensed laboratory.
Transducer calibration	To calibrate a transducer, deadweight equipment is used.

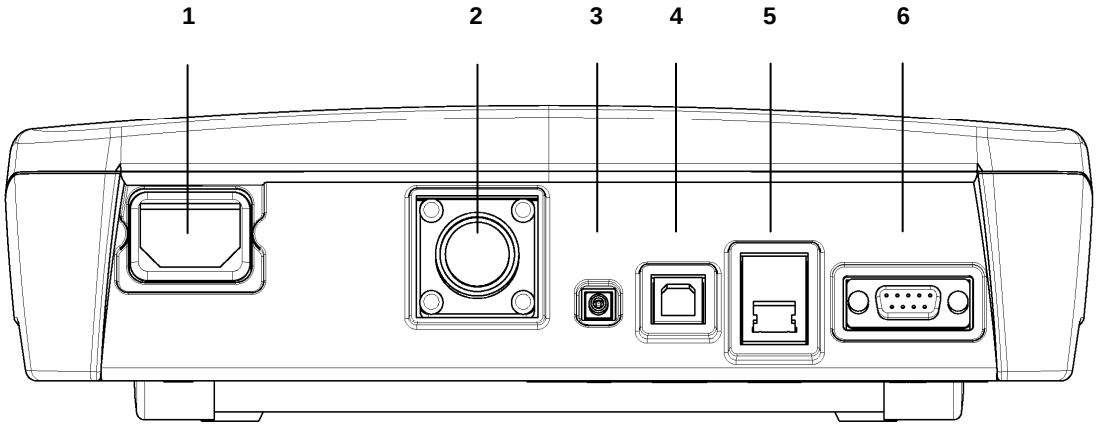
2.3.1 Revision History

The preliminary release of this user guide describes:

- Software revision 04.3.18L for ACTA 4000
- Software revision 3.18 for ACTA 3000

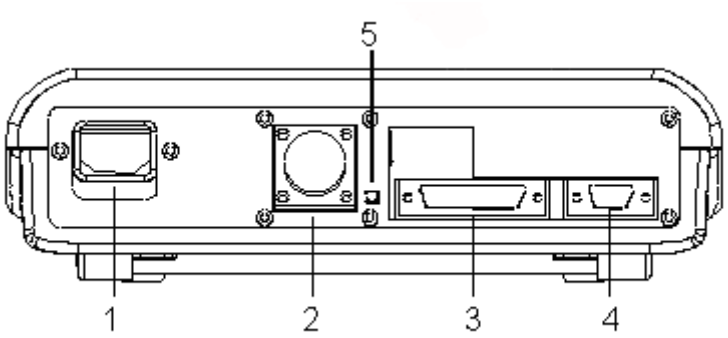
3 Interface

3.1 Back panel connectors, ACTA 4000



No	Connector	Type
1	100-240 VAC supply	Industrial standard female 3-pole power supply
2	Transducer	Industrial standard female 19-pole MS31121219S
3	Oscilloscope	Industrial standard female BNC
4	USB	Industrial standard cable type A→B
5	Ethernet	RJ-45
6	PC / BCR (Bar Code Reader)	Industrial standard female 9-pole Dsub

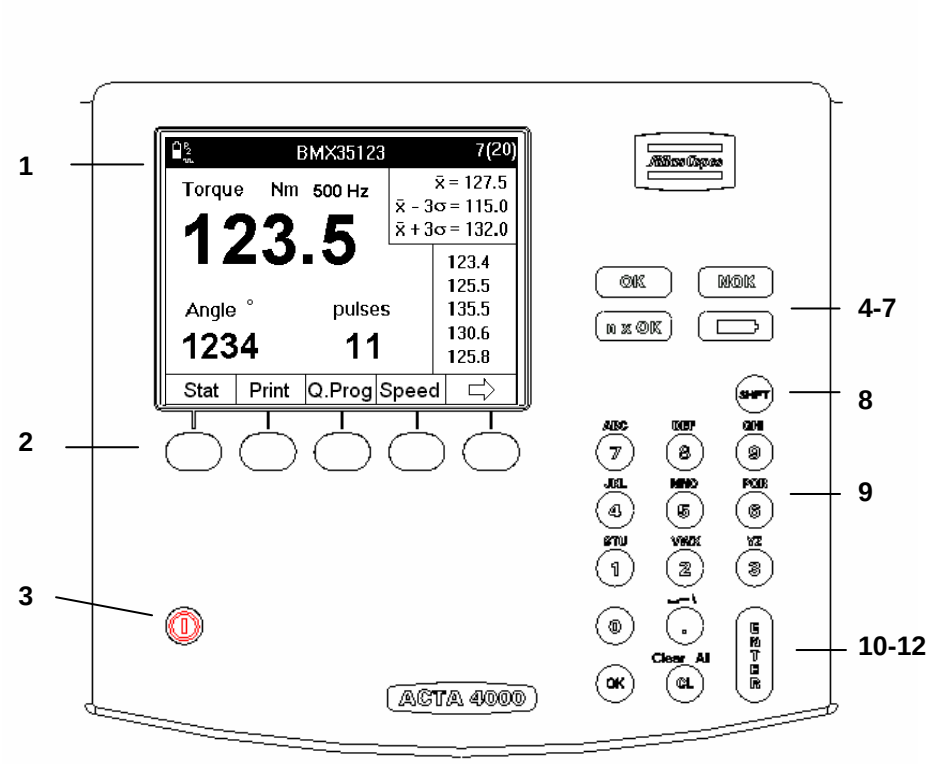
3.2 Back panel connectors, ACTA 3000



No	Connector	Type
1	100-240 VAC supply	Industrial standard female 3-pole power supply
2	Transducer	Industrial standard female 19-pole MS31121219S
3	Printer	Industrial standard female 25-pole Dsub. **ACTA 3000 should only be connected to printers conforming to IEC 950 standard.**
4	PC or BCR (Bar Code Reader)	Industrial standard female 9-pole Dsub
5	Oscilloscope	Industrial standard female BNC

3.3 Front panel

This figure shows ACTA 4000 front panel. ACTA 3000 has the same buttons and functionality, with minor differences in placement.



1 Display
2 Soft keys
3 On/Off button

4-7 Status (LED) indicators
8 SHIFT
9 Numeric keypad
10-12 Function buttons

The front panel layout is the same for all versions of ACTA 4000 or ACTA 3000. Apart from the display, it features LED indicators, soft keys and an alpha-numeric keypad.

No	Name	Description
1	**Display**	See section below
2	**Display Soft keys (Blank)**	Each key corresponds to various blocks of soft key text (programming tree menus) or arrows in the display. To configure the soft keys, see section User defined soft keys.
3	⏻ **On/Off**	To start or shut down ACTA, press the button and hold down for one second
4	**OK**	Lights up when the result of a tightening operation falls within all the specified limits. The signal is active for 10 seconds or until the next tightening operation is initiated.
5	**NOK**	Lights up when the result of a tightening operation falls outside any of the specified limits. The signal is active for 10 seconds or until the next tightening operation is initiated.

6	**n x OK**	Flashes three times when the number of tightening operations corresponds to the present number of tightening operations programmed in ACTA (Batch size)
7	**Battery**	**Red** ACTA requires charging. **Flashing green** Charging just started, 110 / 220 V on but battery not connected or something wrong with charging circuits. **Constant green** ACTA charging **Off** If 110 / 220 V connected, battery fully charged If 110 / 220 V not connected, ACTA will use the battery.
8	**SHIFT**	Pressing the shift button activates the alphabetical signs above each numeric key. Keep pressing the numeric key to find the desired alphabetical sign
9	**Keypad**	Numeric keypad. Use **SHIFT** to activate alphabetical signs
10	**OK**	OK is used to activate inputs in the programming blocks
11	**Cl**	The clear button is used to erase old values in the programming blocks or to delete the latest result of the current tightening measurement.
	SHIFT,Cl	Pressed in succession (but not at the same time), one of the following occurs: All results of the current tightening torque measurements are erased When editing data, all data is removed from an input dialog box
12	**ENTER**	**ENTER** is used to select an option and verify inputs in the programming blocks

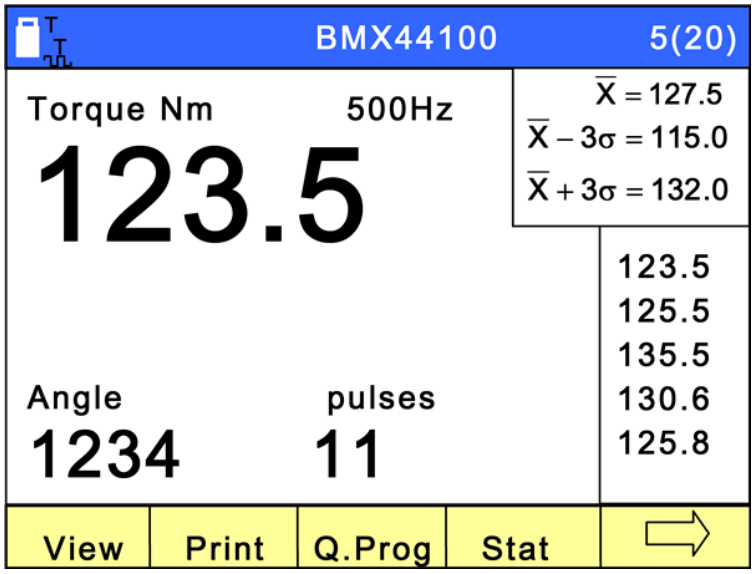
3.3.1 Display

ACTA features a large back-lit 72 x 96 mm display with a dialog box-like interface to allow accurate measurement readings and simple usage. ACTA 4000 has a color display, ACTA 3000 has a black and white display.

ACTA also features a power-save function that deactivates the back-lighting on the display if it is not used for 30 seconds. This is to save the battery and works only when ACTA is powered from the battery.

The display normally shows the **Measurement** dialog box. Depending on the current task, the following displays are available:

- Measurement dialog boxes
- Calibration dialog boxes
- Pull-up menus
- Input dialog boxes
- Result windows



Result header with battery status, communication symbol, tool or application name, and number of tightenings (in batch)

Measurement dialog box with torque and angle results, statistical results and last five tightenings. This figure shows the basic view

Menu blocks representing programming tree functions, arrows, or user defined options. Controlled by the **soft keys**

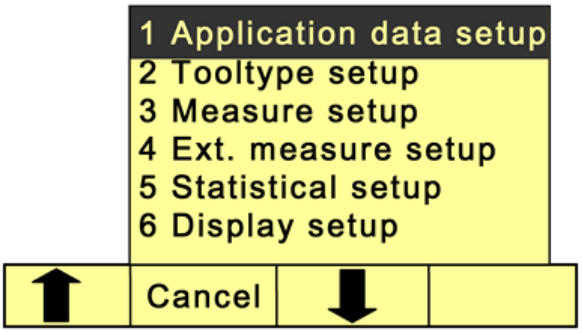
3.3.2 Menu Blocks

The **Menu blocks** are located at the bottom of the display.

Each **soft key** is used to select a menu block. The arrows are used to scroll through the menus.

3.3.3 Pull-up menus

When selecting a menu block with more than one function, a dialog box appears on the display.



A pull-up menu lists the options under a specific menu block. The figure shows the pull-up menu from the **Programming** menu block

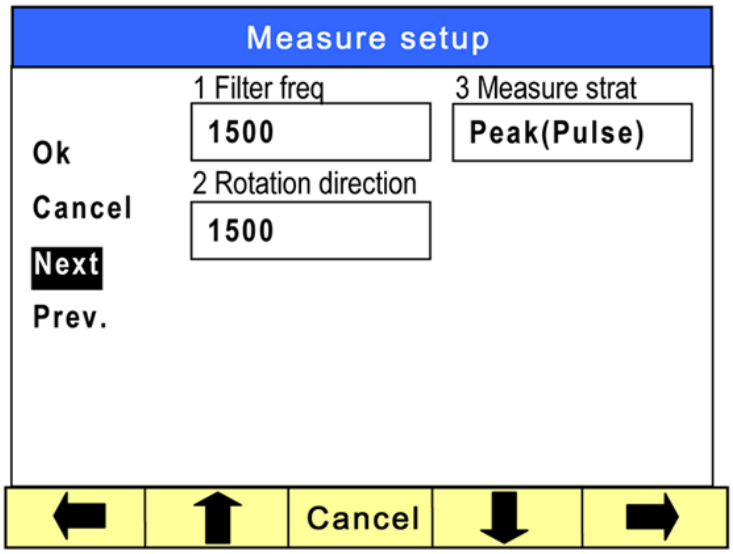
To select an option, do one of the following:

- Highlight it by scrolling up or down using the soft keys under the arrows. Then press **ENTER**.
- Press the digit on the numeric keypad that corresponds to the desired option.

3.3.4 Input dialog boxes

An input dialog box appears if the option you have selected requires specific parameters to be set.

Opening data boxes



To access the data boxes, do one of the following:

- Highlight it by scrolling up or down using the soft keys under the arrows. Then press **ENTER**.
- Press the digit on the numeric keypad that corresponds to the field.

The box opens.

Entering data

To enter data, do the following:

- If the data field is writable, use the numeric keypad. For alphabetical signs, press **SHIFT** prior to the numerical key representing the desired letter or symbol. Press **ENTER** to confirm and exit the data field.
- If the data field has a selection list, do one of the following:
    - Use the soft keys under the arrows to highlight the desired parameter. Press **ENTER** to confirm and exit the data field.
    - Press the digit on the numeric keypad that corresponds to the desired parameter to confirm and exit the data field.

When all data in the dialog box is correctly filled in, do one of the following:

- Highlight **OK** on the display and press **ENTER** to confirm and exit the dialog box
- Press **OK** on the numeric keypad to confirm and exit the dialog box

To exit a dialog box without making any changes, do one of the following:

- Highlight **Cancel** in the display and press **ENTER**
- Press the **Cancel** soft key

The changes are discarded and the **Measurement** (or other default) dialog box is displayed again.

Navigating in the dialog boxes

The **Next** and **Prev**. choices, when present, let you navigate to the next dialog box in the current pull-up menu without returning to the **Measurement** dialog box. When leaving the dialog box using **Next** or **Prev**., ACTA asks if you want the changes to be saved or not.

4 Getting started

This section describes how to get started and configure ACTA.

4.1 Out of the Box

When purchasing ACTA 4000, any version, the following is included:

- VAC Power Supply Cable
- User guide and Product Information
- Calibration certificate
- USB cable

Please save the calibration certificate, as it is required ID for future service of your ACTA.

To access the functionality described in this user guide for an ACTA 3000, an upgrade package is needed. Contact your Atlas Copco representative for details.

4.2 Installation

ACTA is a standalone portable product. No particular installation is necessary. Simply follow the safety instructions and observe the following recommendations:

1. Place ACTA on a firm and flat surface or hold it securely in your hand.
2. Connect your Atlas Copco memory transducer.
3. Connect the power supply cable.
4. Start ACTA by pressing **On** button until the buzzer beeps.

The first time you charge the battery, please charge it for 12 hours and then use ACTA on battery mode until the battery is completely discharged.

4.3 Startup

When you start ACTA, the following appear in the display:

1. Atlas Copco logo flashes up briefly.
2. The **Measurement** dialog box appears.
3. The **Calibration** dialog box flashes up briefly (if an Atlas Copco memory transducer is connected).
4. The **Measurement** dialog box resumes.

ACTA initializes and performs a self-test. The **Calibration** dialog box appears to indicate that ACTA is communicating with the Atlas Copco memory transducer and performing an automatic setup. It reads the transducer's serial number and calibration data, which it stores in its memory.

ACTA can work with most major transducer types. If you use an Atlas Copco non-memory transducer or a different brand, see section Technical specifications on how to set up your transducer before continuing.

4.4 Using Quick programming

This section focuses on how you can start measuring in minutes with the Quick Programming function using Atlas Copco Torque/Angle memory transducers. The quick programming functions automatically make advanced programming for you.

All versions of ACTA feature a Quick Programming function that allows you to set up a measurement session without extensive programming knowledge. ACTA performs the programming operations for you. It is ideal with ACTA Basic or for quick and simple torque checks.

For information on the settings used by **Q.prog** see section Default Setup, Q-prog.

The quick programming menu has three basic options:

- Tool measurement programming, four different tool types
- Synchronization with controller
- Tool measurement according to standard ISO 5393

This section describes how to get started and perform Tool measurement without and with synchronization. For information on tool measurement according to standard ISO 5393, and for complete description of the menu items, selections and views, see the corresponding section in this User Guide.

4.4.1 Measuring tools

To measure a tool using quick programming, do the following:

1. Ensure that the transducer and tool are connected. To view tool/Pset in the **Result header**, open **Conf>Interface>User** and set **Show Pset** to **On**.

2 Select menu block **Q.prog**

3. Select the correct tool and press **ENTER**.

1 Direct driven	Used when testing direct driven tools dynamically.
2 Pulse	Used when testing pulse tools dynamically.
3 Wrench	Used when checking installed torque in an already tightened joint.
4 Click wrench	Used when checking the release torque on a click wrench.

4. Select **OK** to use default programming.
   - If **Pulse** is selected, type the filter frequency in the dialog box
   - If **Wrench** is selected, select **Peak(DD)** or **Static installed torque** in the dialog box.

   For more information about strategies, see section Measuring strategies.

5. Do the tightening operations.

   The result is displayed in the **Measurement** dialog box after each tightening.

6. Save and print the result.

   Evaluate, and if applicable, calibrate the tool. See section Calibrating tools and equipment.

4.4.2 Measuring controlled tools with synchronization

When using **Synchronize,** ACTA is programmed to measure the torque in the same way as the controller. After each tightening operation, ACTA reads the tightening values directly from the controller and from the transducer, and stores them in the memory.

1. Connect ACTA and controller. To view tool/Pset in the **Result header**, open **Conf>Interface>User** and set **Show Pset** to **On**.

   Note! Depending on controller, a female or male converter can be needed to connect to the female RS 232 connector on ACTA .

2. Select menu block **Q.prog**.

3. Select **Synchronize** and press **ENTER**.

4. Select controller.

1 None	Select tool type and insert input target torque.
2 Other controller	For pulse tools, also insert filter frequency For wrenches, select measurement strategy **Static installed torque** or **Peak(DD)**.
3 Focus2000/PF2000	Select **RS232** as type of communication.
4 DS/DL	For Focus2000/PF2000 with RS232 Communication, enter unit ID when requested.
5 PF3000/PF4000	Select **RS232** or **Ethernet** as type of communication.
6 PowerMACS	

5. Do the tightening operations.

   The results from the controller and the transducer are displayed in the **Measurement** dialog box after each tightening. The controller display shows only the controller result.

   Note: The DS/DL controller does not send a value as the torque tuning is made against the controller target value.

6. Save and print the result.

   Evaluate, and if applicable, calibrate the tool. See section Calibrating tools and equipment.

References

- For details on Statistics and calculation of the parameters, see section Guide to statistics.
- For instructions on how to calibrate, see section Calibrating tools and equipment
- For information about printouts, see section Printouts from ACTA
- For explanation of all menu items, see section Programming ACTA

5 Programming ACTA

This section shows the programming tree for ACTA Basic, Quality Control and Advanced Analysis, displaying the full functionality of each version.

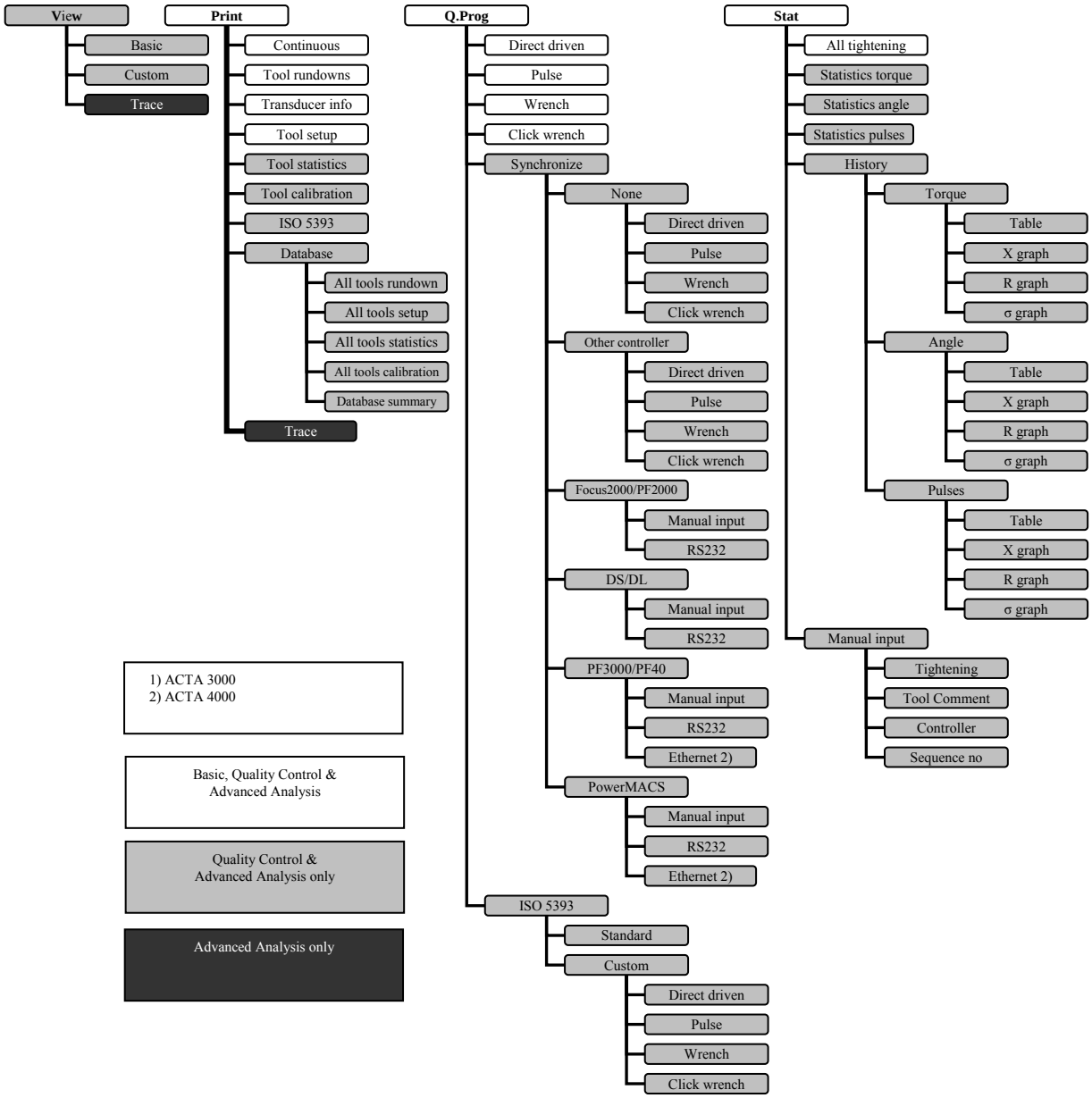
The section explains how to use the different functions and parameters of the programming tree to program your ACTA. If your ACTA version does not feature a specific menu block (depending on its functionality), simply skip that menu block and continue with the next one.

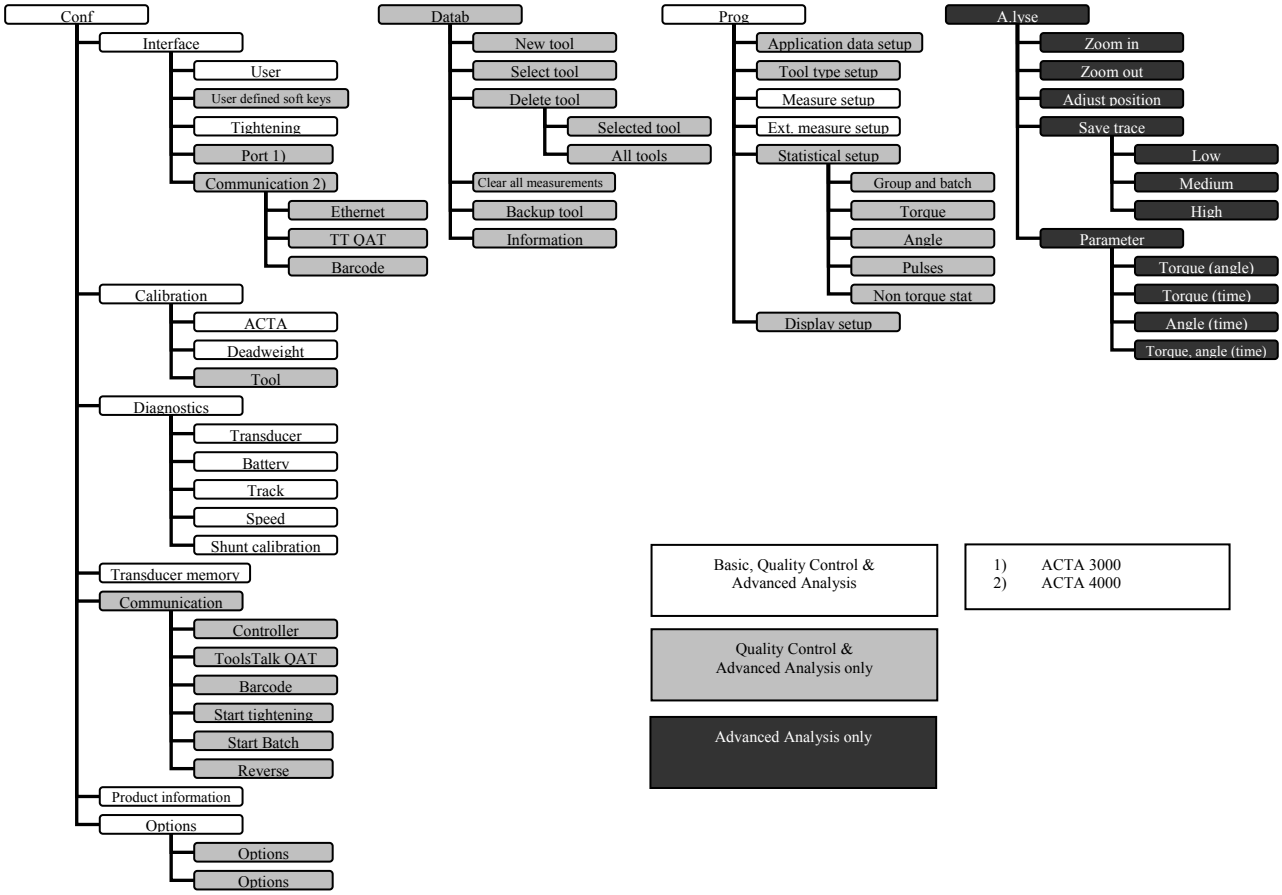
For information on how to navigate through the programming tree, how to find and select specific functions (parameters) and how to input values, see section Interface.

The subchapters present the menus in the same order as in the programming tree.

A shading makes it easy to distinguish between the variants.

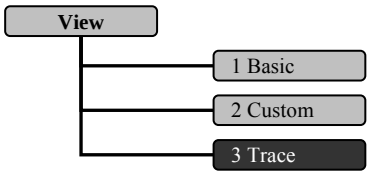
When the programming tree differs between ACTA 3000 and ACTA 4000, this is indicated.


View
Basic
Custom
Trace
Print
Continuous
Tool rundowns
Transducer info
Tool setup
Tool statistics
Tool calibration
ISO 5393
Database
All tools rundown
All tools setup
All tools statistics
All tools calibration
Database summary
Trace
Q.Prog
Direct driven
Pulse
Wrench
Click wrench
Synchronize
None
Direct driven
Pulse
Wrench
Click wrench
Other controller
Direct driven
Pulse
Wrench
Click wrench
Focus2000/PF2000
Manual input
RS232
DS/DL
Manual input
RS232
PF3000/PF40
Manual input
RS232
Ethernet 2)
PowerMACS
Manual input
RS232
Ethernet 2)
ISO 5393
Standard
Custom
Direct driven
Pulse
Wrench
Click wrench
Stat
All tightening
Statistics torque
Statistics angle
Statistics pulses
History
Torque
Table
X graph
R graph
σ graph
Angle
Table
X graph
R graph
σ graph
Pulses
Table
X graph
R graph
σ graph
Manual input
Tightening
Tool Comment
Controller
Sequence no
1) ACTA 3000
2) ACTA 4000
Basic, Quality Control &
Advanced Analysis
Quality Control &
Advanced Analysis only
Advanced Analysis only



5.1 View

The **View** function allows you to switch between the **Measurement** dialog boxes available in your version of ACTA. There are up to three different measurement dialog boxes depending on ACTA version.



1 Basic	The **Basic** dialog box is the standard view in ACTA
2 Custom **3 Trace**	The **Custom** and **Trace** measurement dialog boxes are available in ACTA Quality Control and Advanced Analysis only.

The dialog box remains constant until you repeat the operation above and select another **Measurement** dialog box. See section Measurement results for details on Measurement display dialog box appearance.

The menu block setup changes to match the functionality of the measurement display dialog box.

5.2 Print menu

The printing feature is different in ACTA 3000 and ACTA 4000. Go to the applicable section below.

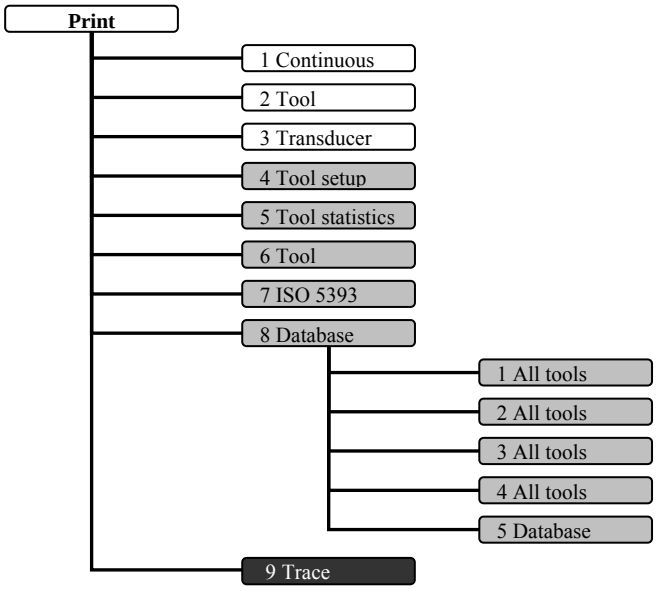
ACTA 4000

To be able to print reports from ACTA 4000, Report Viewer ACTA 4000 software must be installed on a PC and ACTA connected to it through the USB port. The report selected in ACTA is printed on the printer that is set up from the PC.

ACTA 3000

ACTA 3000 must be connected to a printer through the printer port.

Print menu, ACTA 3000 and ACTA 4000



1 Continuous

Starts a printout of the tightening result after each tightening operation. The printout is in the form of a list. To stop continuous printing, press the **Print** soft key again. The **Continuous** list member is now replaced by **Abort continuous**. Select **Abort continuous** and the printout ends (a footer and form feed is printed).

2 Tool rundowns

Prints all tightening operations for selected tools.

3 Transducer info

Prints transducer info for connected transducers.

4 Tool setup

Prints the setup for selected tools.

5 Tool statistics

Prints statistics for selected tools.

6 Tool calibration

Prints a calibration report for selected tools. A tool calibration should have been performed prior to the printout.

7 ISO 5393

Prints ISO 5393 calibration report. An ISO 5393 calibration must have been performed prior to the printout.

8 Database

Select submenu:

1 All tools rundowns	Prints all tightening operations for all tools.
2 All tools setup	Prints the setup for all tools.
3 All tools statistics	Prints statistics for all tools.
4 All tools calibration	Prints a calibration report for all tools. A tool calibration should have been performed for all tools prior to the printout.
5 Database summary	Prints a summary of all tools.

9 Trace

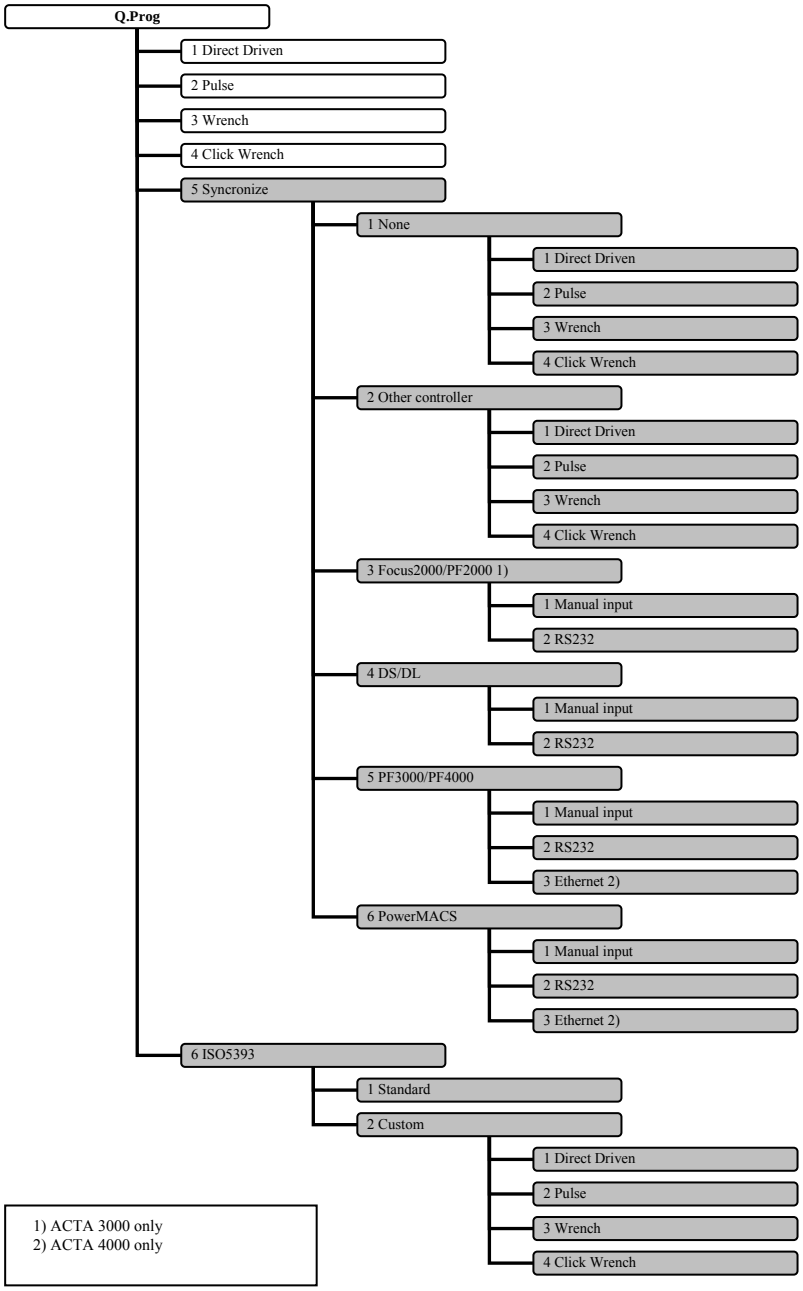
Prints a trace of the last tightening operation. For ACTA 4000, ToolsTalk QAT must be used.

To terminate a printout in progress, press menu block **Abort**.

See section Port for print settings, and section Printouts from ACTA for examples of the printout reports.

5.3 Quick Programming (Q.Prog.)

For programming instructions, see section Using Quick programming.



5.3.1 Quick programming tools

The following tools are available from the menu.

1 Direct Driven Selected if a direct driven tool is tested.

2 Pulse Selected if a pulse tool is tested.

3 Wrench Selected if a wrench is tested.

4 Click Wrench Selected if a click wrench is tested.

5.3.2 Synchronize

Synchronization is a method where ACTA is programmed to measure the torque in the same way as the controller. The following controllers are available.

For information on the synchronization procedure, see section Measuring controlled tools with synchronization.

1 None Selected when no controller is connected and the value is entered manually.

1 Direct driven	Used when testing direct driven tools dynamically.
2 Pulse	Used when testing pulse driven tools dynamically.
3 Wrench	Used when checking installed torque in an already tightened joint.
4 Click wrench	Used when checking the release torque on a click wrench.

2 Other controller Selected when a non-Atlas Copco controller is used.

For tool type, see above.

3 Focus2000/PF2000 (only ACTA 3000) Type of controller.

1 Manual input	Used if no connection is possible
2 RS232	Normally used for direct communication with controller

4 DS/DL Type of controller. For type of input, see PF2000.

5 PF3000/PF4000

Type of controller. For type of input, see below.

1 Manual input	Used if no connection is possible.
2 RS232	Normally used for direct communication with controller
3 Ethernet	Communication through a network

6 PowerMACS

Type of controller. For type of input, see PF3000/PF4000.

5.3.3 ISO 5393

ISO 5393 is a standard performance test method.

For information on the procedure, see section Measuring tools according to ISO 5393.

1 Standard

The standard programming is used. Type tool name and press **ENTER**.

2 Custom

For custom programming. Select tool:

1 Direct driven	Direct driven tools.
2 Pulse	Pulse tools
3 Wrench	Wrench
4 Click wrench	Click wrench

Enter tool name and press **ENTER**.

Enter number of tightening operations and press **ENTER**.

5.3.4 Measuring tools according to ISO 5393

ACTA supports capability studies of direct driven tools according to the ISO 5393 standard performance test method for threaded fasteners. It is valid for tools which apply torque continuously. It is not applicable for tools that advance fasteners in discontinuous increments where the static friction of the joint is overcome at each increment. Examples of non-applicable tools are impact wrenches, ratchet wrenches and wrenches with ratcheting clutches.

The study is performed on test joints having controlled torque rates, one joint with high torque rate and one joint with low torque rate. The torque rate range must correspond to the torque rate range found in actual applications encountered by the tool. This is important for the test to yield a satisfactory evaluation of the tool performance in its working conditions. For details and technical specifications on the test joints, contact the International Organization of Standardization (ISO).

Performing ISO 5393 capability study

1. Ensure that the test joints are set up and that the transducer and tool are connected. To view tool/Pset in the **Result header**, open **Conf>Interface>User** and set **Show Pset** to **On**.

2. Select menu block **Q.prog**.

3. Select **ISO 5393** and press **ENTER**.

4. Select **Standard** or **Custom** and press **ENTER**.

   If **Standard**, enter a tool name and press **ENTER**.

   If **Custom**, select tool, select number of tightening operations and (if applicable) measure strategy in the dialog boxes that appear.

5. Type tool name and press **ENTER**.

6. A dialog box with the following text appears:
   (The number of tightenings can be other than 25 according to **Custom** programming)

```
Make 25 tightening each on:
* Hi torque soft joint, Pset HiSo
* Hi torque hard joint, Pset HiHa
* Low torque soft joint, Pset LoSo
* Low torque hard joint, Pset LoHa
Then, evaluate statistics and print report
Press ENTER to Continue
```

7. Make the required tightening operations. The routing function selects new Pset when required.

   To select tool and Pset manually, open **Datab>Select tool** and select the combination of tool and Pset. Press **ENTER** to confirm.

   The result is displayed in the **Measurement** dialog box after each tightening.

8. Save and print the result.

   Evaluate, and if applicable, calibrate the tool. See section Calibrating tools and equipment.

Viewing ISO 5393 calibration results

The tightening and result of the ISO 5393 calibration is stored in the database within the four tools used.

To see the result in ACTA (only torque and angle):

- Open **Stat>Statistics torque>right arrow/left arrow** to view the **ISO5393 statistics torque** dialog box and **Stat>Statistics angle>right arrow/left arrow** to view the **ISO5393 statistics angle** dialog box.

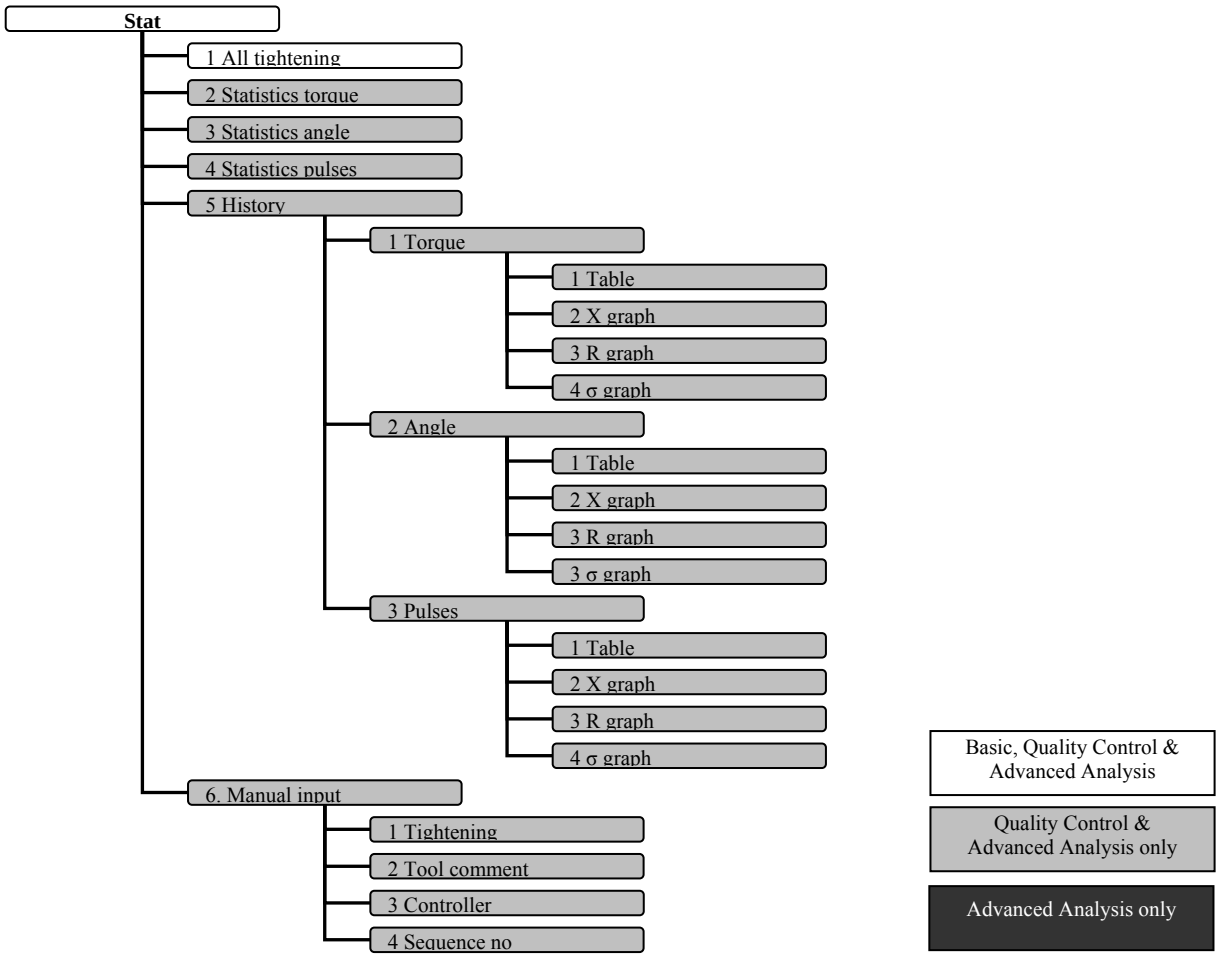
To see the complete result, do the following:

- Print the result by selecting **Print>ISO 5393**.
- Transfer the data to a PC with ToolsTalk QAT.

5.4 Statistics (Stat.)

ACTA can save and provide torque, angle and number of pulses for each measured tightening operation performed with a tool. In addition to this, the QC and AA versions can calculate and supply detailed statistics of all the tightening operations saved in the database for each specific tool.

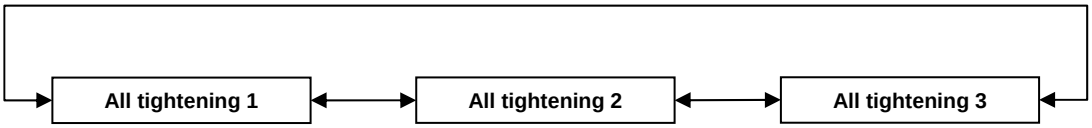
Below you will find descriptions of the statistic capabilities of each version. For more information, see section Guide to statistics.



You can investigate the statistics for any tool in your database with saved tightening operations. Set your parameters for the calculations in menu block Prog>Statistical setup.

5.4.1 All tightening

This window is actually a chain of three windows, displaying statistics on all tightening operations of the selected tool. Use the soft key arrows to navigate through your tightening statistics. The right/left arrows change statistical window as shown below. Press **Cancel** to leave window.



The tightening operations are displayed with the first tightening operation shown on top.

If any parameter flashes it indicates that its result is outside the limits specified in menu block Prog>Statistical setup

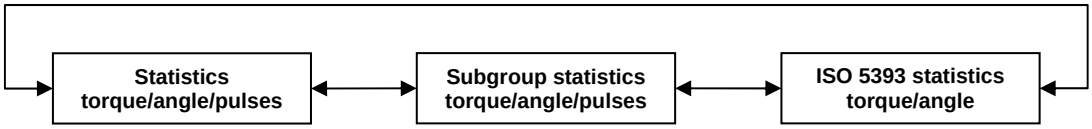
	Menu item	Description
All tightening 1	**Nr**	Tightening number
	Torque	Measured torque
	Angle	Measured angle
	Pulses	Measured no of pulses

	Menu item	Description
All tightening 2	**Nr**	Tightening number
	Torque	Measured torque
	C Trq	Controller torque
	Diff	Difference between measured torque and controller torque

	Menu item	Description
All tightening 3	**Nr**	Tightening number
	Angle	Measured angle
	C Ang	Controller angle
	Diff	Difference between measured angle and controller angle

5.4.2 Statistics torque, Statistics angle and Statistics pulse

These windows are also built up of a chain of windows. They display statistics on torque, angle or number of pulses depending on which was chosen in the pull-up menu. Each statistical parameter is calculated on all measured tightening operations saved during the measurement session for the specific tool. The right and left arrows change statistical window as shown below. Press **Cancel** to return to the measurement dialog box.



The ISO 5393 statistics window is only present for ISO 5393 tools and only for torque and angle.

If any parameter flashes it indicates that its result is outside the limits specified in menu block Prog>Statistical setup

The **Statistics torque/angle/pulses** window contains the following information, calculated on all tightening operations in the tool.

Window	Menu item	Description
Statistics torque/angle/pulses	**No**	Number of tightening operations.
	Min	Min. torque/angle/no of pulses
	Max	Max. torque/angle/no of pulses
	X-bar	Mean torque/angle/no of pulses
	R	Range of torque/angle/no of pulses
	CR	CR Capability index for torque/angle/no of pulses
	CM	CM Capability index for torque/angle/no of pulses
	CMK	CMK (modified capability index) for torque/angle/no of pulses
	σ	Standard deviation for torque/angle/no of pulses.
	X-3σ	Negative confidence interval for torque/angle/no of pulses.
	X+3σ	Positive confidence interval for torque/angle/no of pulses.
	Var.	Variance for torque/angle/no of pulses.
	Mean Diff	Mean difference in per cent between torque/angle/no of pulses and controller torque/angle/no of pulses.

This window is present if at least one (1) subgroup exists.

Window	Menu item	Description
Subgroup statistics torque/angle/pulses	**X-bar min.**	Minimum mean torque for subgroups.
	X-bar max.	Maximum torque/angle/no of pulses for subgroups.
	R min.	Minimum torque/angle/no of pulses R (range) for subgroups.
	R max.	Maximum torque/angle/no of pulses R (range) for subgroups.
	X-bar last	Mean torque/angle/no of pulses for the last subgroup.
	R last	Torque/angle/no of pulses R (range) for the last subgroup.
	CAM	CAM value for Torque/angle/no of pulses. **At least six (6) subgroups must be in existence for the CAM value.**

ACTA supports testing motor driven tools according to the ISO 5393 standard. This information window is only accessible when the selected tool is created from an ISO 5393 calibration. It contains:

Window	Menu item	Description
ISO 5393 statistics torque/angle	**Comb mean torque**	Combined mean torque
	Mean shift	Mean shift
	Comb torque scatter	Combined torque scatter
	Comb angle scatter	Combined angle scatter

See section ISO 5393 calculations for more information.

The parameters presented in this window are based on the active tool and the corresponding hard/soft joint tool. That is, if the selected tool is the Low Torque, Hard Joint tool. The tools making up the statistics here are the two Low Torque tools (Hard joint and Soft Joint). In the same way The Hard/Soft joint tools with High Torque make up their ISO 5393 statistics window.

5.4.3 History

Together with the programming parameters and tightening operations, history parameters are also included in the statistics database.

Each time all tightening operations are removed from a tool by means of **shift, Cl** or **Database>Clear all measurements,** ACTA calculates new X (mean), R (range) and σ (standard deviation) values and saves them in the history memory.

The shift-clear combination clears all tightening operations of the selected tool, while Datab>Clear all measurements clears all tightening operations of all tools.

Each tool has its own history memory with space for the last five X, R and σ values. The history of torque, angle and no of pulses can be studied in four different windows as described below.

Prerequisite

When studying the History database all information you see is specific to the current tool selected in your ACTA from the tool database. In order to see any information you must have at least one measurement session transferred to the history database from the current tool.

1 Torque

View torque statistics for selected tool

Menu item	Description
1 Table	Displays the date of the transfer and the X, R and σ values. Each row represents a measurement session.
2 X graph	Displays the date of the transfer and the X value. Each column represents a measurement session.
3 R graph	Displays the date of the transfer and the R value. Each column represents a measurement session.
4 σ graph	Displays the date of the transfer and the σ value. Each column represents a measurement session.

2 Angle

View angle statistics for selected tool. For details, see above.

3 No of pulses

View pulse statistics for selected tool. For details, see above.

Updating the History database

Let us assume that you have completed a measurement session of 20 measurements (tightening operations). You have studied the statistical data in the Statistics database and now wish to transfer X, R and σ data to the History database.

1. Press **SHIFT** and then **Cl**, or select **Datab>Clear all measurements**
2. A dialog box appears briefly with the message: **Wait Clearing all tightening**
3. Your measurement dialog box returns; indicating that your Statistics database is cleared and your X, R and σ data for this measurement session is now transferred to your History database.

To exit the information window, press **Cancel**.

5.4.4 Manual Input

This function allows you to enter manual measurement values, including Torque, Angle and Pulses, in to your ACTA.

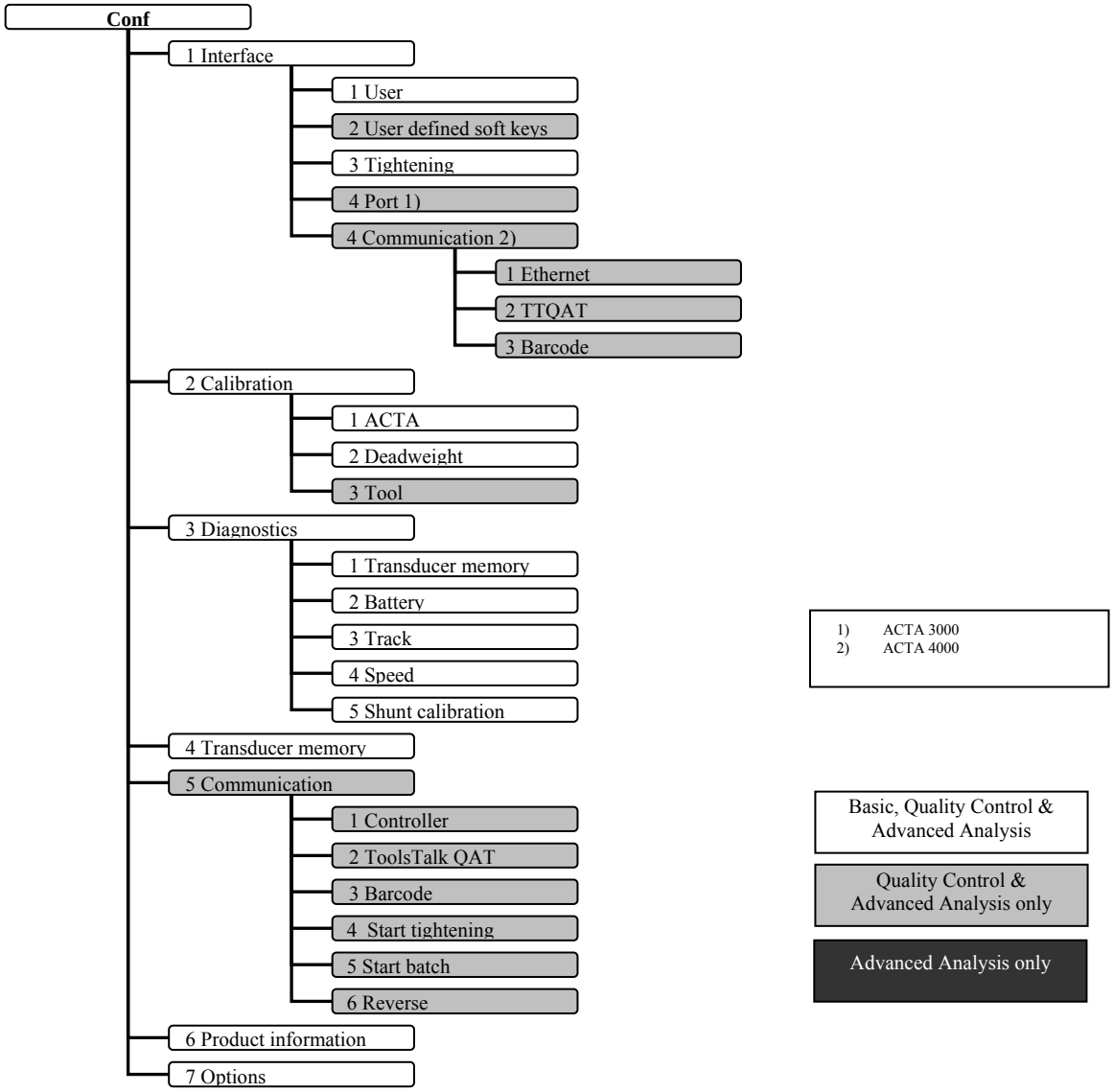
This is useful where it may be difficult to access an application on the line with a transducer connected to ACTA. You can therefore record the measurements with a digital torque wrench and then enter them manually in ACTA.

The measurements will be regarded as real measurements by your ACTA but in ToolsTalk QAT it will be noted that the measurements are manually entered.

Menu item	Description
1 Tightening	The tightening input window lets you manually enter tightening values. **Torque**, **Angle** and **Pulses** should be specified.
2 Tool comment	This opens the **Enter tool comment** field for you to enter a comment concerning a tool. For example, if the tool is moved from position or damaged. This information can be handled further in ToolsTalk QAT.
3 Controllers	The controller input window lets you specify controller torque and controller angle for the last tightening operation in the **C-torque** and **C-angle** fields. The old controller value is displayed in the input field.
4 Sequence no	This opens the **Enter sequence number** field letting you specify next sequence number.

5.5 Configuration (Conf.)

In the configuration menu block, parameters customizing your ACTA to match your demands and requirements are set up.



5.5.1 Interface

In the user interface dialog box, user specific interface options are set. The following parameters and alternatives exist.

User

The following items are available:

Menu item	Description
1 Backlight	Allows you to select display backlight on or off. When ACTA is battery powered, the energy saving function is active.
2 Contrast	With this function you can adjust the contrast on the display.
3 Language	Allows you to select a language. You can choose English, German, French, Spanish, Italian, Swedish, Portuguese, Polish, Czech or Japanese.
4 Password	Allows you to set a password. You will be asked for the password when you turn on your ACTA. Leaving this parameter empty means that no password is required when you turn on ACTA.
5 User ID	The User ID is used to track which user performed a tightening. If set to Startup, the user will have to enter User ID on startup of ACTA. If set to Manually it can be set via User defined soft keys.
6 Result header	Allows you to set header presentation in the measurement dialog. Possible values are Tool name, Application Name, and Both (tool name/application name)
7 Show Pset	Turns on/off representation of Pset. If on, the Pset name will be presented with the Tool/Application names in tables and menus.

User defined soft keys or shortcuts

ACTA Advanced Analysis and Quality Control program trees can be customized to match your specific needs by adding functions as new Menu blocks in the bottom of the Measuring Dialog Box. Most of the functions are present in the original program tree, but some are accessible as a user defined soft key only.

The user defined soft key dialog lets you set up to eight shortcuts to functions from the selection below.

Menu item	Description
Manual input	Stat > Manual input
Manual tight	Stat > Manual input > Tightening
Tool comment	Stat > Manual input > Tool Comment
Seq no.	Stat > Manual input > Sequence number

User	Manually input User ID (4 characters) responsible for each tightening until next time user function is called. Conf > Interface > User > User ID > manually
Deadweight calibration	Conf > Calibration > Deadweight
Tool calibration	Conf > Calibration > Tool
Track	Conf > Diagnostics > Track
Speed	Conf > Diagnostics > Speed
Shunt calibration	Conf > Diagnostics > Shunt Calibration
Communication	Conf > Communication
New tool	Datab > New tool
Select tool	Datab > Select tool
Select tool in appl.	Opens Select tool dialog with all tools in application present.
Select application	Open a dialog box which lets you select application.
Select zone	Opens a dialog which lets you select zone.
Select pset	Opens a dialog which lets you select Pset
Save trace	A.lyse > Save trace
Parameter	A.lyse > Parameter
Stat all	Stat > All tightening
Stat torque	Stat > Statistics torque
Stat angle	Stat > Statistics angle
Stat pulse	Stat > Statistics no of pulses
Pass tightening	Skip tightening and move on to the next
Zone result	Opens the Zone result window. See 7.4 Zone result window. This is a valid choice only when zone is finished.

Tightening

In the tightening interface dialog box, options regarding the tightening operations are set.

1 Default torque unit

In Basic ACTA, this sets the units for the torque.
Options: Nm, ozf.in, lbf.in, lbf.ft, kgf.m and kgf.cm.
In QC and AA ACTA: This setting is used in Quick Programming.

2 Default pulses unit

In Basic ACTA, this sets the units for the pulse.
Options: Number of and Hz.
In QC and AA ACTA: This setting is used in Quick Programming.

3 Buzzer

Allows you to set/select the functionality of the buzzer signal

Options: Off, Each tightening operation, Nok tightening, Batch complete, New tool, Torque > min.

Nok tightening means that the buzzer is triggered if the tightening value is outside the limits programmed in Statistical setup under Program menu block. (**Prog>Statistical setup>torque/angle/pulses**).
Torque > min means that the buzzer is triggered when the torque during a tightening operation rises above the torque min. limit (**Prog>Statistical setup>Torque>Torque Min**).

4 Date

Here you input the current date manually. Note: This is updated automatically when connecting to ToolsTalk QAT.

5 Time

Here you input the current time manually. Note: This is updated automatically when connecting to ToolsTalk QAT.

6 Torque value

Allows you to set the number of digits displayed in the torque value. You can choose between 3, 4 or 5 digits.

7 Routing

Allows ACTA to select the next tool in your Database automatically when you have completed a batch with the current tool.
Options: Off, Tool, Job
See the About Routing section below for details on routing.

8 New seq nr

Sets ACTA to ask for a new sequence number.

A new sequence number question may be asked automatically after a completed tightening operation. Whether or not this question is displayed depends on the parameter selected.

The sequence number is entered from the keypad or with a barcode reader. Barcode communication must be initiated before input from the barcode reader is possible.

Options: Off, Tool, Job, Always

Menu item	Description
1 Off	No new sequence number needs to be input after a complete tightening operation when Off is selected.
2 Tool	When the Tool parameter is selected, a question will be displayed automatically each time a new tool is selected.
3 Job	When Job is selected, a question will be displayed automatically each time a new tightening operation is selected for the tool. See Job routing above.
4 Always	When Always is selected, a question will be displayed automatically after each completed tightening operation.

9 Zone result

Show Zone result when zone completed. Off/on.
With Zone result active, ACTA lets you keep track of larger groups of tools and applications. When a zone is completed, a check is performed to see if any of the tightening or batches within the zone failed. See section Zone result window for details on the window. Zones are managed in ToolsTalk QAT. For more details on zones, see ToolsTalk QAT documentation.

0 Save trace always

Store trace in database after each tightening.
Options: Off, Low, Medium, High
Low, Medium and High refer to screen resolution. See Save trace in Analyse section for details.

About Routing

The Routing function set in the Tightening interface dialog box causes ACTA to select the tool for the next tightening operation automatically. The flow of tools in the Tool Database list is managed by ToolsTalk QAT.

Tool routing

When tool routing is selected and the selected tool has a full batch of tightening operations, the next tool in the list will be selected automatically. A full batch is obtained when the number of tightening operations in the tool equals Batch size (Prog.4,1,1). See figure below for the tool selection order.

Tool	Batch size	Tightenings 1	2	3	4
BMX495	2				
TUZ396	3				
RTN699	4				
MBU401	1				
TSX112	2				

Job routing

Job routing works on application name. The ACTA loops through all the applications Psets until all Psets have full batches of tightening operations. A full batch is obtained when the number of tightening operations in the tool equals Batch size (Prog.4,1,1). See figure below for the tool selection order.

Application name	Pset	Batch size	Tightenings 1	2	3	4
BMX495	None	2				
RTN691	1	3				
RTN691	8	4				
RTN691	2	2				
TSX312	1	2				
TSX312	2	3				
KLT658	7	2				
BGT618	None	3				

Port (ACTA 3000 only)

This is where you set your printer and communication preferences.

1 Printer protocol

Here you select the protocol that suits your printer.

ACTA 3000 can communicate with some of the printers on the market using one of the following protocols: Epson, IBM and PCL3. When purchasing a printer for ACTA, check that it can handle one of these protocols.

2 Paper size

Here you select the paper format for printing. A4 or Letter.

3 Color

Color printer is currently not available.

4 Baudrate

Default 115200. Not possible to change.

It is important that the Baudrate parameter is configured identically in both ACTA and ToolsTalk QAT

5 Flow control

Here you can select your flow control, or handshake, to be used when communicating through the serial port.

Options: Hardware and Xon/Xoff.
Preferred setting for ToolsTalk QAT is Hardware

It is important that the Flow control parameter is configured identically in both ACTA and ToolsTalk QAT.

6 Barcode position

Here you set the start position for the sequence number in the string read by the Barcode reader.

For details on port settings for Barcode reader, see section Bar Code Reader.

7 Barcode length

Here you set the number of characters that are to be used from the read Bar code for the sequence number. The sequence number starts in the position set by Barcode position.

Communication (ACTA 4000 only)

This is one of the two places where communication preferences are set.

1 Controller	Sets up for communication with a controller.
2 TTQAT	Sets up for communication with ToolsTalk QAT
3 Barcode	Sets up for communication with a barcode reader.

5.5.2 Calibration

From this pull-up menu calibrations are executed. The following calibrations are available:

1 ACTA	Calibration of ACTA. See section Calibrating tools and equipment for details
2 Deadweight	Calibration with deadweight equipment. See section Calibrating tools and equipment for details
3 Tool	Calibration of tool. See section Calibrating tools and equipment for details

5.5.3 Diagnostics

This pull-up menu gives access to diagnostic windows. It also contains dialog boxes for continuous measurement and shunt calibration.

1 Transducer

This opens the Transducer diagnostics windows. It is a double window information dialog. The ← and → soft keys toggle between the windows. They contain information on:

ACTA 3000 **Transducer window 1**	**ACTA 4000** **Strain gage**
Refbox calibration result	Refbox calibration result
Low gain z-ofs comp	Low gain comp
Low gain span comp	High gain comp
High gain z-ofs comp	Transducer z-ofs comp
High gain span comp	Transducer span comp
Transducer z-ofs comp	Long term z-ofs comp
Transducer span comp	Range CW
Long term z-ofs comp	Range CCW
ACTA 3000 **Transducer window 2**	**ACTA 4000** **High voltage**
Measurement range	High voltage
CW	Calibration result
CCW	Positive gain comp
	Negative gain comp
	Z-ofs comp
	Transducer z-ofs comp
	Long term z-ofs comp
	Range CW
	Range CCW
	ACTA 4000 **Gyro**
	Calibration result
	Gain comp
	Transducer z-ofs comp
	Long term z-ofs comp

The high/low gain refers to sensitivity 0.59mV/V and 2.0mv/V respectively.

2 Battery

Opens the battery information window displaying information on battery status and shows whether the main current is connected.

3 Track

The Track dialog box measures torque and angle continuously. It displays current torque and angle. The **Reset** soft key resets the angle. The **Store** soft key stores the values just like an ordinary tightening in the selected tool. The **Cancel** soft key exits dialog.

4 Speed

If you are using a transducer that features an angle encoder you can measure the peak and track speed of your tools, both free speed and during a tightening operation. The **Speed** dialog displays the track speed continuously along with the peak speed detected. Note the difference in track speed during a tightening operation. The **Reset** soft key will set the peak speed to zero. **Cancel** is used to exit window.

5 Shunt calibration

When you apply a new transducer or switch ACTA on, ACTA always performs a shunt calibration. However, you may sometimes want to perform an extra shunt calibration, perhaps when the first calibration failed because there was a load on the transducer during calibration. Then select **Shunt calibration** in the **Conf.>Diagnostics** menu to perform a new shunt calibration.

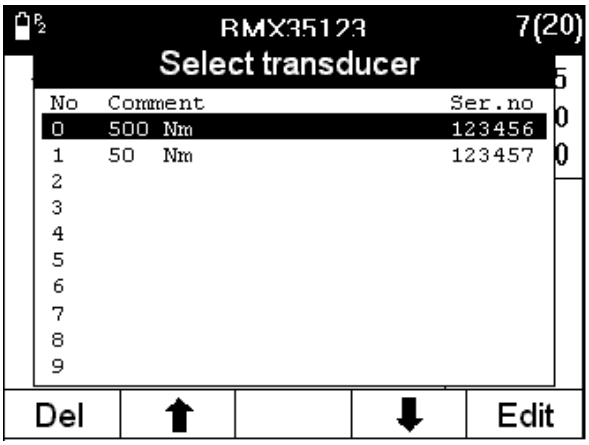
If you are not using an Atlas Copco Tools IRTT transducer with memory, read the section below for setup instructions.

Setting up your non-Atlas Copco memory type transducer

By selecting **Shunt calibration** in the **Conf>Diagnostics** menu or by connecting a new transducer, a transducer database selection dialog box is displayed, see figure below. This dialog box consists of a list of 10 positions.

Each position is capable of holding a set of transducer data. Displayed for each position is:

- **Number**
- **Comment**
- **Serial number**



To select a position, use the up and down arrows to navigate in the list or use the number keys. Press **ENTER** when ready. The **Del** key removes the transducer from the list. To edit a position, press **Edit**. A dialog box then pops up with the following contents:

This process is not identical in ACTA 3000 and ACTA 4000. The example shows ACTA 3000.

Sensitivity	The sensitivity to 0.59, 0.8, 1.2, 1.475 or 2.0 mV/V. 2.0mv/V is most common for strain gage transducers.
Calibration torque	The calibration torque of the transducer.
Angle encoder	Angle encoder resolution. A value of 0 means no encoder.
Comment	A string defining the transducer (displayed in list).
Serial number	The serial number of the transducer (displayed in list).

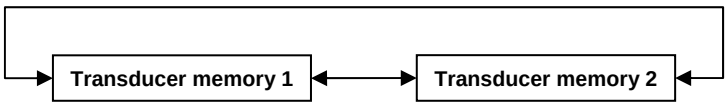
Use this dialog box to set the parameters to the correct value for the transducer used. This information should be found on the label of the transducer. If it is missing, contact the manufacturer.

To exit use the **OK** button or use the arrow keys to highlight **OK** field and press **ENTER**. The parameter values will be saved in the selected position.

The transducer database is saved in non-volatile memory and the information is kept intact during power off.

ACTA 4000 handles amplified transducers by shutting off the internal amplifier. ACTA 3000 can NOT handle amplified transducers.

5.5.4 Transducer memory



The transducer memory information is shown in two dialog boxes. To change between the two dialog boxes use the right and left arrow soft keys. They are displaying the data received from an Atlas Copco memory transducer if such is connected to ACTA.

This information is not identical in ACTA 3000 and ACTA 4000.

The information displayed is calculated on all tightening operations in the tool.

Transducer memory 1	**Type**	Type of transducer
	Serial number	
	Sensitivity	
	Calibration torque	
	Torque span	Expressed in % of Calibration torque
	Angle encoder	Yes or No
	Nr of measurements	Number of tightening operations
Transducer memory 2	**Calibration source**	
	Next cal.date	
	Last update	
	Signature	
	Comment	

When an Atlas Copco transducer with memory is connected to ACTA, a check of the next calibration date is performed:

If there are less than 30 days to the next calibration date, a message dialog box appears telling the operator that the transducer needs to be calibrated before the next calibration date.

If the next calibration date has passed, a message dialog box appears telling the operator that the transducer needs to be calibrated.

5.5.5 Communication

In this pull-up menu choice of communication is made. From here you can also control ACTA 4000 when performing automatic calibration.

1 Controller	Sets up for communication with a controller.
2 ToolsTalk QAT	Sets up for communication with ToolsTalk QAT.
3 Barcode	Sets up for communication with a barcode reader.
4 Start Tightening	Used in automatic calibration when ACTA controls tightening operations. Performs tightening. See below for more information.
5 Start Batch	Used in automatic calibration when ACTA controls tightening operations. Performs complete tightening batch. See below for more information.

6 Reverse

Used in automatic calibration when ACTA controls tightening operations. Reverses tightening by 90°. See below for more information.

Start tightening, Start Batch and Reverse.

ACTA can be used to carry out an automatic calibration of the Atlas Copco PowerMACS and Power Focus 3000/PF4000.The user just sets up the appropriate parameters and lets ACTA do the job. The Start batch, start tightening and reverse functions are used when performing such a calibration. These menu entries are only visible when ACTA is set up for such an automatic calibration See Automatic calibration for instructions.

5.5.6 Product information

Information shown in this dialog box is:

ACTA 3000	ACTA 4000
ACTA serial number	ACTA serial number
ACTA mode	ACTA mode
HW revision	HW revision
SW revision	SW revision
Cal date mV/V	Cal date mV/V
Next cal. Date mV/V	Next cal. Date mV/V
	Cal date V
	Next cal date V
	Cal date gyro
	Next cal date gyro

When ACTA is powered up, a check of the next calibration date is performed:

If there are less than 30 days to the next calibration date, a message dialog box appears telling the operator that ACTA needs to be calibrated before the next calibration date.

If the next calibration date has passed, a message dialog box appears telling the operator that your ACTA needs to be calibrated.

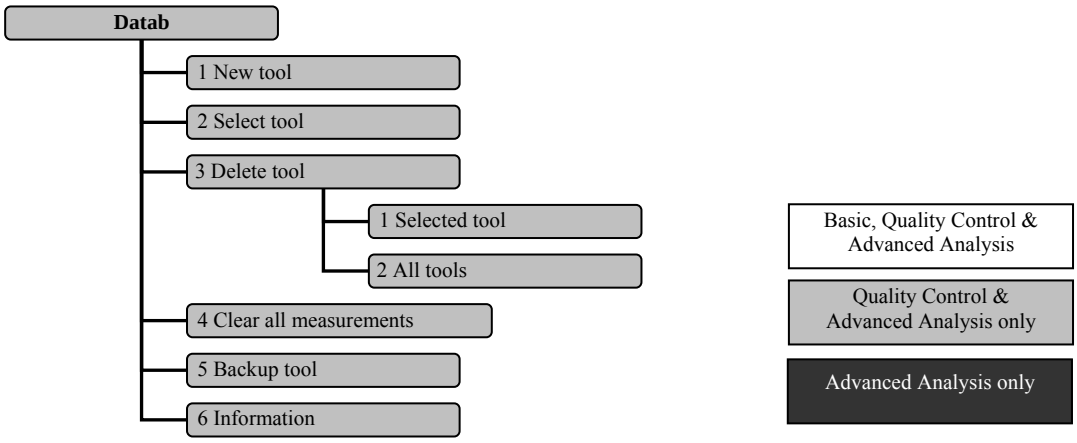
5.5.7 Options

The options are customer specialized features that can be enabled in ACTA 4000.

They are not described in this manual. For further information, please contact your Atlas Copco representative.

5.6 Database (Datab)

Under the **Datab** menu block, the Quality Control and Advanced Analysis versions feature a tool database where you can organize tools as well as measurement data for each tool.



5.6.1 New tool

This function creates a new tool in the database. ACTA copies all settings of the current tool to the new tool you have created and then automatically selects and displays the new tool. Note how the tool ID on the top border of the display has changed to the new tool ID. All measurements made now will be linked to the new tool.

5.6.2 Select Tool

This function is used to select which tool in ACTA database to perform tightening on. Scroll in the list using the soft key arrows, or use the search engine situated above the list. Use the keypad to write the sought after tool ID in the box, and ACTA continuously searches for the tool in the database. Tools starting with the entered letters are highlighted.

Use the **ENTER** key to validate your choice and ACTA returns to the measurement dialog box. Your tool selection is confirmed by its tool ID now being displayed at the top in the frame of the measurement dialog box. This tool will be the one you measure until you select another tool.

It is not possible to measure tightening operations with a backup tool. See section Backup tool.

5.6.3 Delete Tool

This lets you delete either the selected tool or all tools from the database. The tools are deleted along with their tightening.

Make sure you select the tool up for deletion prior to performing delete selected tool.

It is not possible to delete the default tool.

The delete all tools choice will delete all tools and all tightening from the database. Only an empty default tool will be left.

5.6.4 Clear all measurements

This function allows you to delete all measurement data for all your tools in the database.

This will not delete but update your historic statistical measurement data under the Hist menu block.

Any Tool Calibration reports or Deadweight reports in the database will be deleted by this action!

5.6.5 Backup tool

This function allows you to create a copy of the selected tool, including all the tightening operations and history data. This function is used when you have noticed that a tool needs to be adjusted, for example, and you want to save your existing tightening operations for history data.

A confirmation dialog box appears asking **Are you sure?** The backup tool is named with its existing name and the extension **[#]**.

For example:

BMX123 ------> BMX123[0] (first backup).

BMX123 ------> BMX123[1] (second backup).

It is not possible to measure with a backup tool.
It is not possible to create a new tool from a backup tool.
It is not possible to make a backup of a backup tool.
After a backup, all tightening in the original tool are removed.

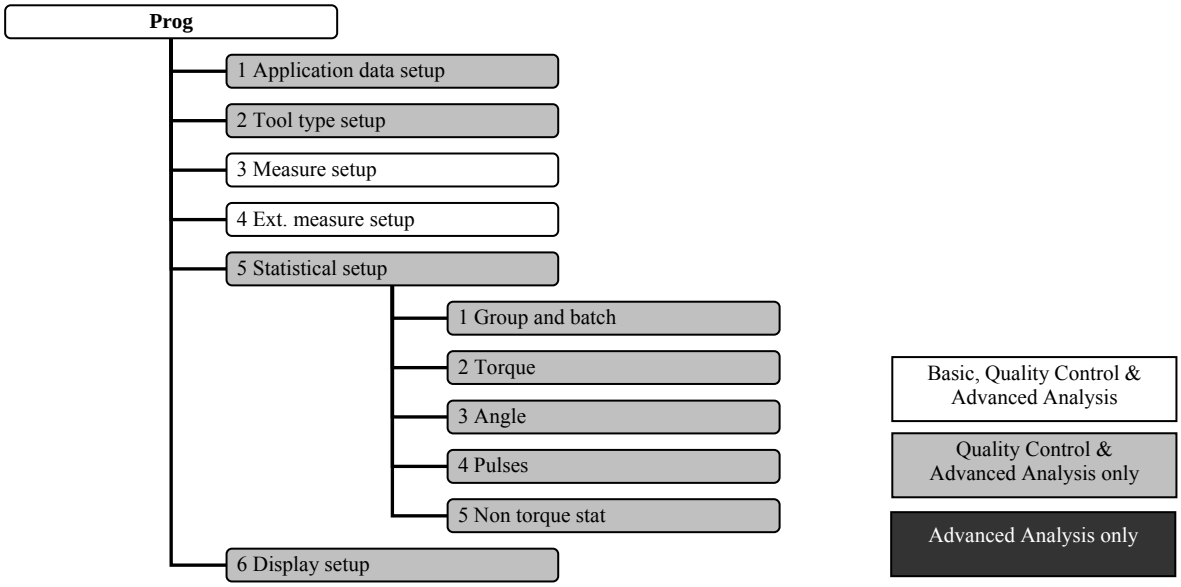
5.6.6 Information

This window displays information concerning the database.

Menu item
Nr of tools in database
Nr of tools with tightening
Nr of deadweight reports
Free memory
Total memory

5.7 Program (Prog.)

This is the menu block containing the programming tree for all measurement parameters and the statistical parameters for your database. The programming performed here can also be carried out using ToolsTalk QAT. See the ToolsTalk QAT manual for instructions.



In ACTA QC and AA all definitions of the parameters set in the program menu block are specific for the selected tool only. However, since ACTA QC and AA contain a database, you can create and save as many tool profiles as the memory capacity allows.

ACTA Basic does not have a database. Therefore, all the definitions of the parameters here are specific for the only tool available.

5.7.1 Application Data Setup

Here, parameters regarding names and target torque/angle are set. The parameters are listed below.

1 Tool ID	The tool name. This is read only and set on tool creation or in ToolsTalk QAT.
2 Application name	The Application name
3 Pset name	The Pset name. This is read only and set on tool creation or in ToolsTalk QAT.
4 Zone name	The Zone name
5 Target torque	Specify the target torque. The target torque is used whenever the controller mode is set to ACTA. This is the case in Multistage measurement strategy or in Peak measurement strategy with ACTA as controller. The ACTA will make the tool tighten to this value.
6 Target angle	Specify the target angle used in the Multistage measurement strategy. See section Multistage.
7 Target	If the selected tool is a non torque tool, the **5 Target torque** and **6 Target angle** menu entries above are replaced with only one, named **Target**. Here the non torque target is specified.

5.7.2 Tooltype setup

Here you set up parameters concerning tool and controller type. The parameters present are listed below.

Controller

This parameter defines which type of controller to use for tightening operations.

None	**None** is used for handheld or non-controlled tools, like a not transducerized air tool for example.
Other controlle	Used for unknown or unsupported controlled tools. Manual input of controller tightening values will be required.
PF2000/PF2000	Used for Focus 2000 and Power Focus 2000 controlled tools. If selected, the controller tightening values are stored after each tightening Note: ACTA 3000 only.
DS/DL	Used for DS/DL controlled tools. Only setup parameters are transferred to ACTA, no tightening results.
PF3000/PF4000	Used for Power Focus 3000/4000 controlled tools. If selected, controller tightening values are automatically received from the controller after each tightening. No tightening values are read from controller if model (see below) is set to Tensor DS. Connection must be Ethernet or RS232.
Power Macs	Used for Power Macs controlled tools. If selected, controller tightening values are automatically received from the controller after each tightening operation. Connection must be Ethernet or RS232.
Peak Torque	Used to add a Peak torque measurement when using “Static installed torque” measurement strategy. See section Static installed torque for more information.

Calibration torque

This input is the calibration torque of the tool.

Torque tuning

Used in DS/DL tool for the torque tuning factor. Also used for PF3000/PF4000 with tool model Tensor DS/DL.

Communication

Used to select the type of communication.

Options: Manual input, RS232, Ethernet (ACTA 4000 only).

When selecting Manual input, the user is asked for controller torque and controller angle in input fields after each tightening operation. When RS232 is selected, controller tightening values are automatically read from the controller after each tightening operation.

Parameter set

This parameter defines which of its own Psets the controller will use internally. This is set for F2000/PF2000 (ACTA 3000 only), DS/DL and PF3000/PF4000 controlled tools. If set to zero, the controllers selected Pset is used.

Cell ID/Unit ID	Used when controller is PF3000/PF4000 to select Cell ID and when Focus2000/PF2000 (ACTA 3000 only) to select Unit ID.
Channel	Used when controller is Focus2000/PF2000 (ACTA 3000 only) and PF3000/PF4000 to select channel within cell/unit.
Model	Used when controller is PF3000/PF4000 to select tool model. You can choose between Tensor S/ST and Tensor DS/DL.

The choice of Controller type determines which parameters can be set. The other parameters are hidden.

5.7.3 Measure setup

In the measurement setup dialog box, the following settings are available. See section Measure strategy parameters for more information.

1 Filter freq	Filter frequency is the frequency used for filtering out noise from the transducer signals. Enter a numeric (Hz) value manually.
2 Rotation direction	Choose between clockwise (CW), counterclockwise (CCW) or both.
3 Measure strat	Select measure strategy used. More information on measure strategy is found in section Measuring strategies.
4 Control Mode	Select if the Controller or ACTA controls the tightening. Valid for PF or PowerMACS when communication is set to RS232 or Ethernet.

The choice of Controller type determines which parameters can be set. The other parameters are hidden.

5.7.4 Ext. Measure Setup

In the extended measurement setup dialog box a number of parameters are set to customize the measurements to your preference. Graphical representations of these parameters are presented in the Measuring strategies section.

The parameters are:

1 Cycle start

The torque level at which the tightening cycle begins. Enter a numeric torque value manually.

2 Cycle complete

The torque level at which the tightening cycle ends. Enter a numeric torque value manually.

3 Start angle

The torque level at which the angle measurement begins. Enter a numeric torque value manually.

4 Measure angle to

Selects angle complete measurement criteria. You can choose between:

1 Peak torque	The angle is measured between Angle start and the measured peak (max.) torque in the tightening operation.
2 Peak angle	The angle is measured between Angle start and Cycle complete in the tightening operation.
3 Cycle complete	The angle is measured between Angle start and Cycle complete in the tightening operation.
4 End time	The point in time where end time period ends. See figures in section Measuring strategies

5 Measure delay time

This delay prevents spikes during rundown to affect the result. The ACTA is inactive during this period after cycle start. You input a numeric (ms) value manually.

6 Reset time

A time after cycle complete when ACTA is inactive. This is used to filter out spikes that come after tightening and does not affect the tightening result. Enter a numeric (ms) value.

7 End time

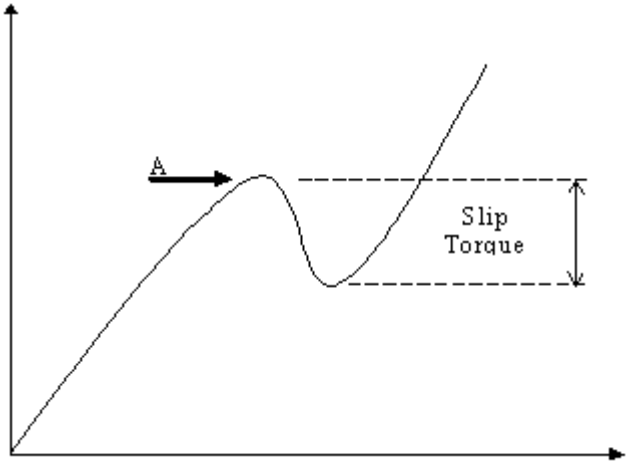
The time ACTA waits after the Cycle Complete level before the tightening cycle is considered to have ended. This delay time is necessary for the two-stage strategy and for pulse tools. Enter a numeric (ms) value manually.

8 Slip torque

The Slip Torque that you program in ACTA is the decrease in torque that is necessary for ACTA to consider that the highest torque is reached. As soon as ACTA detects a decrease in torque equal to or greater than the Slip Torque level, ACTA saves the highest torque before the decrease.

The torque level that is measured and displayed on ACTA is the maximum torque achieved before slip torque is reached. In the example below the highest torque is in point A.

The slip torque parameter is only visible and used when **Prog>Measure setup>Measure strat** is set to **Break away**.



When all parameters have been set according to your preference, highlight OK and press (enter) or simply press the OK button on the keypad.

5.7.5 Statistical setup

In this menu, the statistical setup is made. For more information, see section Guide to statistics.

Group and Batch

In this dialog parameters regarding subgroups and batches are set. For more information on batch result representation, see section Batch Result window.

1 Batch size

This is where you define the batch size to be used when performing measurements with ACTA. The selected batch size is visible in the top right corner of the measurement dialog box, inside the parentheses next to the number of tightening.

2 Subgroup size

This is where you define the size of the subgroup used for the SPC (statistic process control) calculations.

3 Subgroup frequency

Here is where you define the frequency with which the subgroups are stored in ACTA and used for the SPC analysis.

Enter	Result
1	store all tightening operations
2	store every second subgroup
3	store every third subgroup

Example: Subgroup size = 5 and Subgroup frequency = 3. ACTA then stores the first 5 tightening operations and then skips 10 tightening operations, stores the next 5 tightening operations, skips 10 and so on.

4 Batch result

Here, after the first completed batch, you can activate ACTA to display the batch result before the next batch can be initiated. The batch result tells you whether the batch is OK or if any torque and/or angle value is outside the specified limits. See also chapter Batch Result window.

When all parameters have been set according to your preference, highlight **OK** and press **ENTER** or simply press the **OK** button on the keypad.

Torque

Here you define the statistical measurement criteria's for torque limits that ACTA must use for the statistical calculation for this tool. Parameters to set are:

1 Torque min.

Here is where you define the minimum torque limit for each measurement.

2 Torque max.

Here is where you define the maximum torque limit for each measurement.

3 Torque LCLx

Here is where you define the lower control limit for each subgroup x-bar value.

4 Torque UCLx	Here is where you define the upper control limit for each subgroup x-bar value. See the Statistics chapter for more information.
5 Torque LCLr	Here is where you define the lower control limit for each subgroup range values. See the Statistics chapter for more information.
6 Torque UCLr	Here is where you define the upper control limit for each subgroup range value. See the Statistics chapter for more information.
7 Torque CM >	Here is where you define the minimum allowed CM (machine capability index) value. Values below this minimum value will initiate statistical alarms.
8 Torque CMK >	Here is where you define the minimum allowed CMK (modified machine capability index) value. Values below this minimum value will initiate statistical alarms.
9 Torque CAM >	Here is where you define the minimum allowed CAM value. Values below this minimum value will initiate statistical alarms.
0 Torque mean diff <	Here is where you define the maximum allowed mean difference in per cent between torque and controller torque.

When all parameters have been set according to your preference, highlight **OK** and press **Enter** or simply press the **OK** button on the keypad. Torque setup is now completed and saved and the pop-up dialog box disappears.

Angle

In this dialog you define the statistical measurement criteria's for angle limits that ACTA shall use for the statistical calculation for this tool. Parameters to set are:

1 Angle min.	Here is where you define the minimum angle limit for each measurement.
2 Angle max.	Here is where you define the maximum angle limit for each measurement.
3 Angle LCLx	Here is where you define the lower control limit for each subgroup x-bar value.
4 Angle UCLx	Here is where you define the upper control limit for each subgroup x-bar value.
5 Angle LCLr	Here is where you define the lower control limit for each subgroup range values.
6 Angle UCLr	Here is where you define the upper control limit for each subgroup range values.

7 Angle CM >	Here is where you define the minimum allowed CM value. Values below this minimum value will initiate statistical alarms.
8 Angle CMK >	Here is where you define the minimum allowed CMK value. Values below this minimum value will initiate statistical alarms.
9 Angle CAM >	Here is where you define the minimum allowed CAM value. Values below this minimum value will initiate statistical alarms.
0 Angle mean diff <	Here is where you define the maximum allowed mean difference in per cent between torque and controller torque. See chapter 11 Guide to statistics for more information.

When all parameters have been set according to your preference, highlight **OK** and press **ENTER** or simply press the **OK** button on the keypad.

Pulses

In this dialog statistics settings for pulse measurements are defined. Parameters to set are:

1 Pulses min.	Here is where you set the minimum number of pulses for the measurement
2 Pulses max.	Here is where you set the maximum number of pulses for the measurement.

When all parameters have been set according to your preference, highlight **OK** and press **ENTER** or simply press the **OK** button on the keypad.

Non torque stat

In this dialog you define the statistical measurement criteria's for result limits that ACTA shall use for the statistical calculation for this tool when no defined measurement is configured. A prerequisite for this dialog box to appear is that the measure strategy is set to **none**. Parameters to set are:

1 Result min.	Here is where you define the minimum limit for each measurement.
2 Result max.	Here is where you define the maximum limit for each measurement.
3 Result LCLx	Here is where you define the lower control limit for each subgroup x-bar value.
4 Result UCLx	Here is where you define the upper control limit for each subgroup x-bar value.
5 Result LCLr	Here is where you define the lower control limit for each subgroup range values.

6 Result UCLr

Here is where you define the upper control limit for each subgroup range values.

7 Result CM >

Here is where you define the minimum allowed CM value. Values below this minimum value will initiate statistical alarms.

8 Result CMK >

Here is where you define the minimum allowed CMK value. Values below this minimum value will initiate statistical alarms.

9 Result CAM >

Here is where you define the minimum allowed CAM value. Values below this minimum value will initiate statistical alarms.

When all parameters have been set according to your preference, highlight **OK** and press **Enter** or simply press the **OK** button on the keypad.

5.7.6 Display setup

The ACTA QC and AA have a custom measurement display dialog box which is selected under the **View** menu block. This dialog box is customized under the **Display setup.**

The custom measurement display of ACTA QC and AA is individual for each tool. You choose to display for each tool what is interesting to see for this specific tool.

The parameters and their effect in the custom measurement dialog are presented below.

1 Parameter 1

This parameter is shown in the top left part of ACTA custom measurement display. Here you set which value to be shown as parameter 1.

1 None	The field remains empty
2 Torque	Torque is displayed
3 Angle	Angle is displayed
4 Pulses	Number of pulses is displayed
5 C torque	Controller torque value
6 C angle	Controller angle value

2 Stat parameter 1

These parameters are displayed in the top right part of ACTA custom measurement display. They show real-time statistical calculations on your selection in Parameter 1.

X, σ	Mean and sigma for parameter
R, None	Range for parameter
X-3σ, X+3σ,	Negative and positive confidence interval for parameter
Min., Max.	Min. and max. values for parameter
Var., Diff. %	Variance and difference in per cent between parameter and the controller value for parameter. Diff% only valid for angle & torque measurements.
CM, CMK	CM and CMK for parameter.
X last, R last	Last group X-bar and last group range for parameter 1. Displayed only when there is at least one full group.
CAM, None	CAM for parameter 1. Displayed only when there are at least 6 full groups.
Contr., Diff.	Controller value and difference between parameter and the controller value for parameter. Only valid for angle & torque measurements
None, None	No statistical parameters are selected.

3 Torque unit

Sets the units used for the torque in this tool.
Options: Nm, ozf.in, lbf.in, lbf.ft, kgt.m, kgf.cm

4 Parameter 2

This parameter is displayed on the left below Parameter 1 of ACTA **Custom measurement** display. Same parameter choices as **Parameter 1**.

5 Stat parameter 2

This parameter is displayed on the right in ACTA custom measurement display, below the statistical field for **Parameter 1**. This parameter displays real-time statistical calculations on your selection in Parameter 2. See **Stat parameter 1** for options.

6 Pulses unit

Sets the units used for the pulse in this tool.

Options: Number of, Hz

7 Comments row 1

In the lower part of ACTA custom display dialog box there are two rows for comments. These two rows are configured separately and you can enter your own free text of maximum 20 characters for each row or choose from pre-defined options in ToolsTalk QAT. See the ToolsTalk QAT user guide for detailed information.

8 Comments row 2

See **Comments row 1**

When all parameters have been set according to your preference, highlight **OK** and press **ENTER** or simply press the **OK** button on the keypad.

If only one parameter is selected, two pairs of statistical parameters can be selected for that parameter in the Custom measurement display. For example:

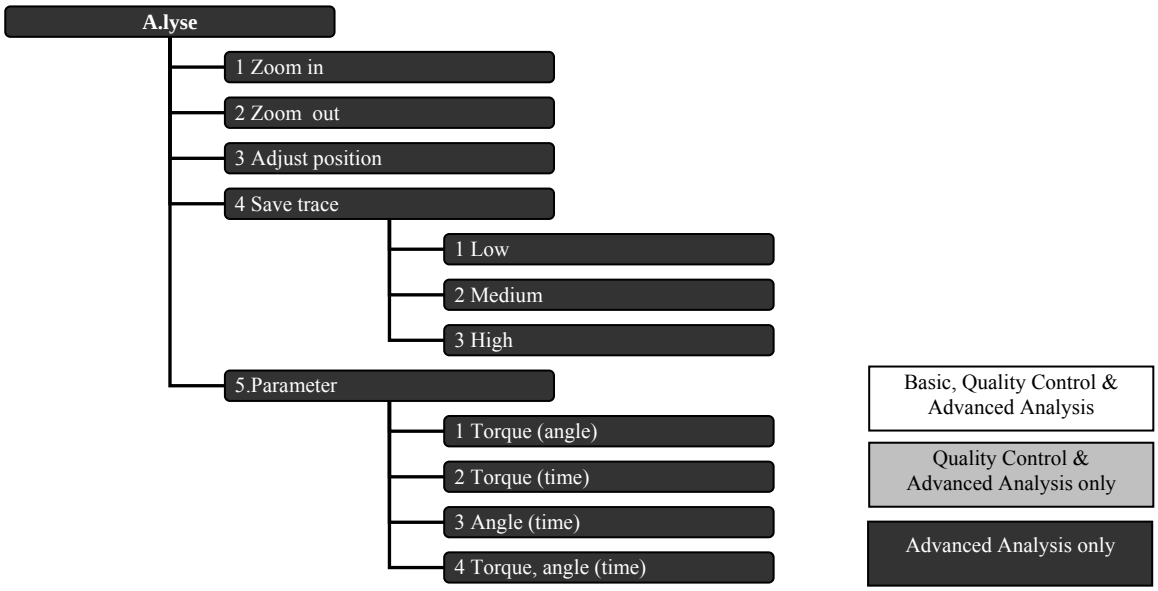
- Parameter 1 = Torque
- Parameter 2 = None
- Statistical parameter 1 = X, σ
- Statistical parameter 2 = Min., Max.

This setup will display the statistical parameters X, σ, min and max for torque in the Custom measurement display.

5.8 Analyse (A.lyse)

This function allows you to zoom in on sections of your measurement curves for closer study. Here you also can adjust the torque by changing the torque arrow position.

Set **View>Trace** to display the **A.lyse** menu item.



5.8.1 Zoom in and zoom out

This function zooms in to the area shown by the rectangle visible after selecting **Zoom in**. Use the soft key arrows to position the rectangle on a specific area of the measurement curve. Then press **ENTER**. The area representing the rectangle now represents approximately the full display and the increments on the Y and X axis change accordingly. To zoom further, simply select **Zoom in** once again. You can zoom in on a specific area on the trace up to five consecutive times.

When selecting **Zoom out**, the original measurement curve returns.

5.8.2 Adjust position

This function is used to tune the measured value for the tightening. It lets you shift the position of measured point along the tightening graph. When **Adjust position** has been selected, use the soft key arrows so move the cursor along the tightening graph to the desired measurement point. Confirm the new values by pressing **ENTER**. Now, the tightening is saved with the new values. To exit the adjust position function without changing measurement values, simply press **Cancel**. The adjusted tightening will be marked as a manual input when transferred to ToolsTalk QAT.

5.8.3 Save trace

To save a trace in the database, select one of the resolution options in the **Save trace** pull-up menu. Low, medium and high refers to which resolution the trace is saved in. The table below show approximately how large a trace with given resolution is, given in fractions of the entire database.

Resolution	Approximate memory space required (fraction of database total memory)
1 Low	1/128
2 Medium	1/32
3 High	1/8

Upload of the tool database to ToolsTalk QAT also uploads the saved trace information.

5.8.4 Parameter

This pull-up menu will let you select desired graph parameters. They are used when displaying graphs in the trace measure dialog. When selecting a graph mode parameter, ACTA uses this selection as standard until another graph mode parameter setting is performed. The modes available are:

Menu item	Description
1 Torque(angle)	Torque over angle
2 Torque(time)	Torque over time
3 Angle(time)	Angle over time
4 Torque, angle(time)	Torque and angle over time

6 Measuring strategies

In the previous section we explained how to program your ACTA. Now let us look at examples of different measuring strategies. Below you can see how the measurement parameters in the **Prog** (program) menu block can be applied when measuring different tools.

6.1 Measure strategy parameters

Parameter	Description
Peak Value	The maximum torque level detected during the tightening cycle.
Installed Torque	The torque value saved when strategy is **Static installed torque**
Filter Frequency (Not Shown)	This is the cut of frequency applied to the torque signal. It is used to remove unwanted noise. When using pulse tools this frequency is used to tune the result to match value obtained with a wrench.
Tightening Cycle (Not Shown)	Represents a complete measurement. It is defined as the interval from cycle start to the end of end time
Angle	Is the actual angle that is to be presented on the display
Cycle Start	The torque level at which the tightening cycle begins.
Cycle Complete	The torque level at which the measurement is considered to be complete. It must be lower than cycle start.
Start Angle	The level, expressed as torque, when angle measurement starts. **Start angle** should be equal to or higher than **Cycle start**.
Measure delay Time	The time after **Cycle start** during which no signals are measured. This allows ACTA to ignore initial torque spikes.
Reset Time	A time after **Cycle complete** during which no signals are measured. This allows ACTA to ignore clutch noise.
End Time	The time after **Cycle complete** when, if the torque level again climbs above the **Cycle start** level, the tightening cycle will continue. If the torque level does not climb above **Cycle start** during this time, the cycle is completed

Slip Torque	The negative step required to start measurement of the breakaway level.
Min. Torque	The minimum torque allowed for an accepted tightening operation on the current application. Relates to the application, not the tool.
Max Torque	The maximum torque allowed for an accepted tightening on the current application. Relates to the application, not the tool.
Min. Angle	The minimum angle allowed for an accepted tightening operation on the current application. Relates to the application, not the tool.
Max. Angle	The maximum angle allowed for an accepted tightening operation on the current application. Relates to the application, not the tool.
Angle complete	**Angle complete** selection selects the criteria for measuring the final angle.
Min. no. of Pulses	The minimum number of pulses allowed for an accepted tightening operation on the current application. Relates to the application, not the tool.
Max. no. of Pulses	The maximum number of pulses allowed for an accepted tightening operation on the current application. Relates to the application, not the tool.

6.2 Available measuring strategies

To open the measuring strategies dialog box, do the following:

1. Select **Prog>Measure setup>Measure strat**.
2. Select a measuring strategy. For more information, see the following sections.

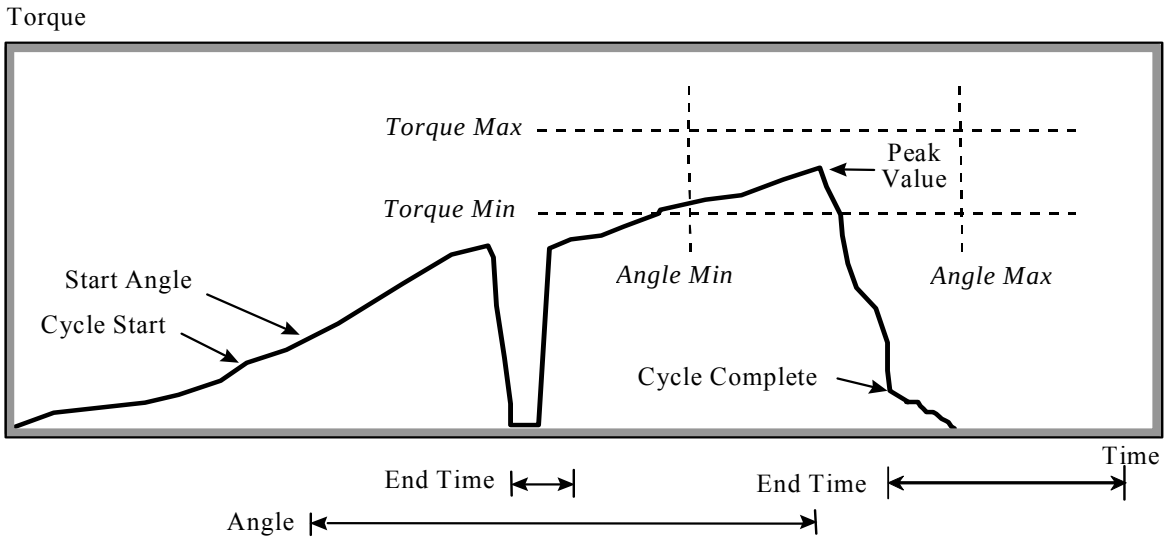
The curves displayed below do not fully represent actual tightening curves. Their shapes are relevant only to illustrate the Program measurement parameters

The point where the angle is measured can be set to peak torque, max angle or cycle complete. This is valid for all measure strategies.

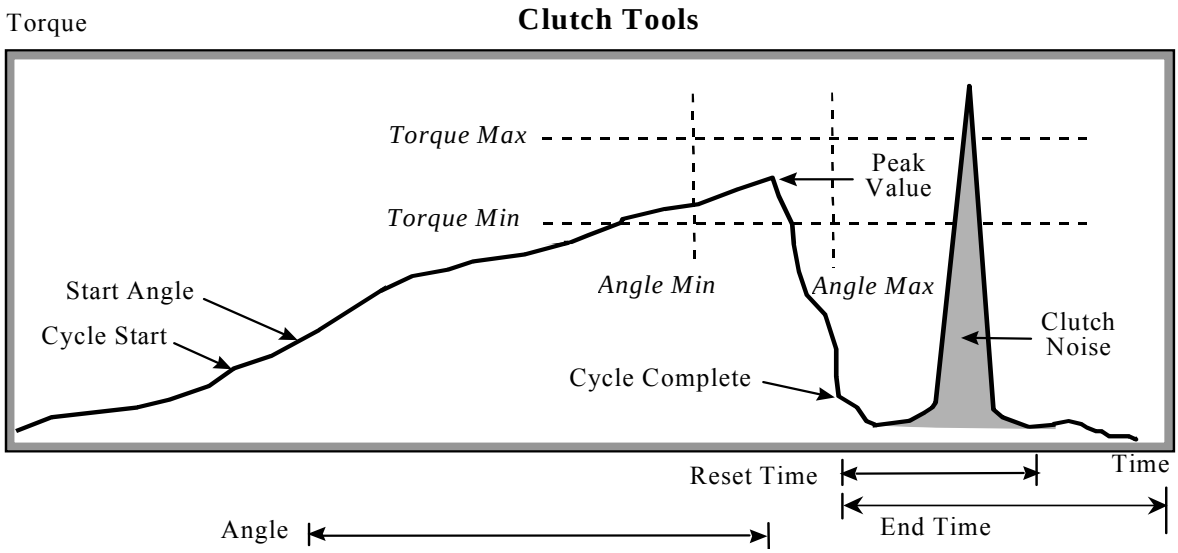
The parameters in the figures in this chapter are explained closer in Measure strategy parameters.

6.2.1 Peak(DD)

The **Peak(DD)** measure strategy is the default measure strategy and is used to measure the tightening peak torque for direct driven tools, but can also be used for wrenches. The meaning of the parameters set in the **Prog** menu block is shown in the figures below.

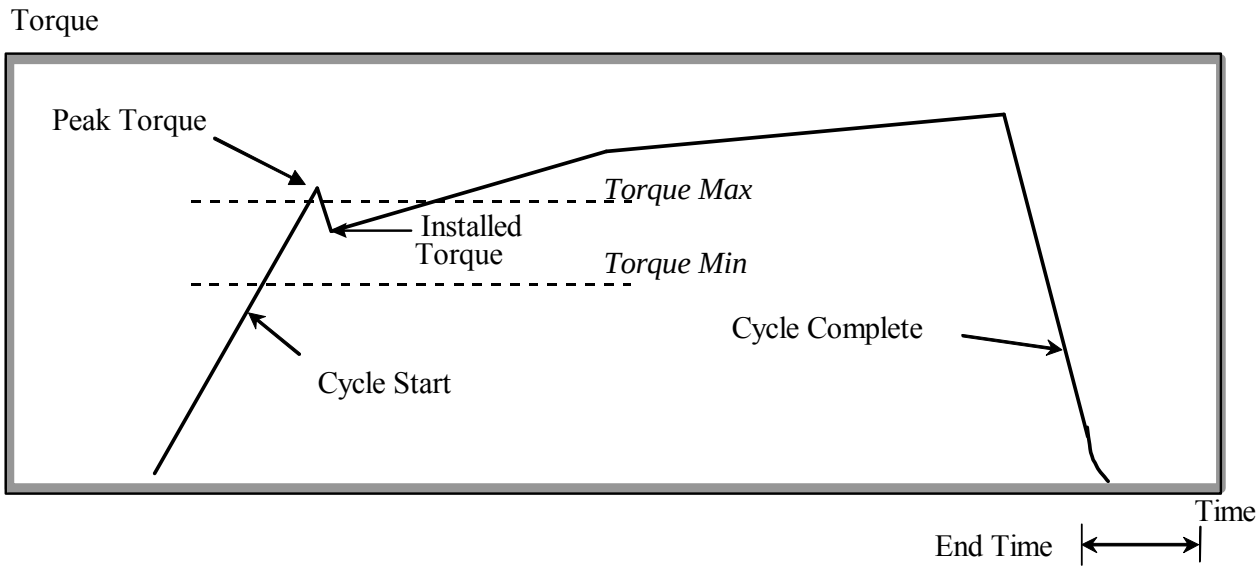


When measuring on clutch tools, the clutch noise can cause measurement errors. To avoid such unwanted effects, the parameter reset time is set as in figure below. During this reset time after cycle complete, ACTA is inactive and the clutch noise is ignored.



6.2.2 Static installed torque

When making post assembly control tightening with a wrench, the static installed torque measuring strategy is preferred over peak torque measuring strategy. The ACTA finds the correct installed torque automatically, without the user having to stop the tightening at the exact correct moment. Just pull the wrench smoothly with a constant angular velocity until the bolt head moves and ACTA take care of the analysis in line with what is shown in the figure below.

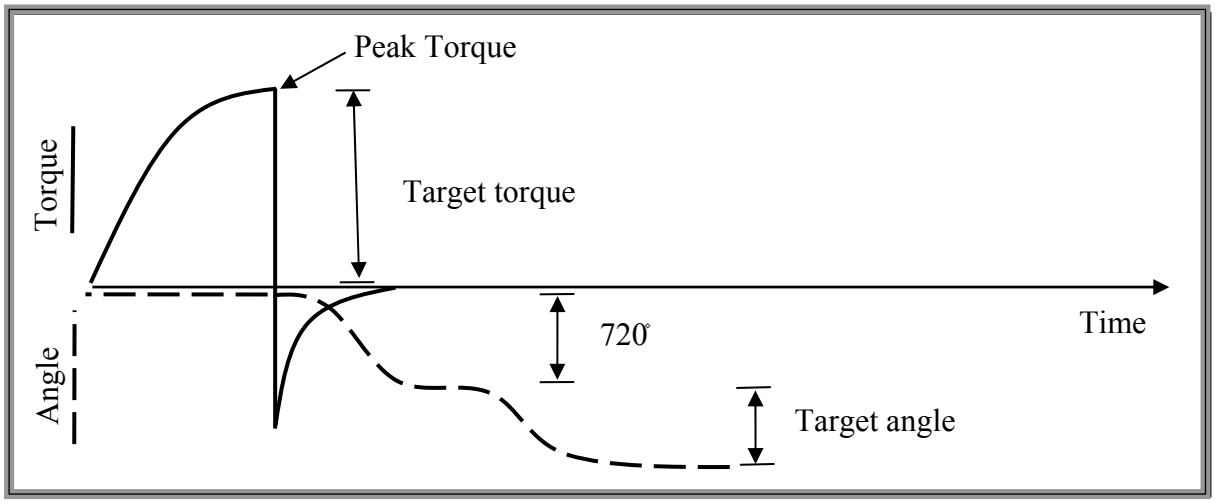


To measure the peak value also in this strategy, set controller to Peak torque. If done, ACTA will store the peak value as the Controller Torque. Torque limits control will be performed on this peak value as well, flagging the tightening as "bad" if outside limits. This can be used to be sure the maximum torque for the application has not been exceeded during the wrench check.

6.2.3 Multistage

The multistage measurement strategy is used in some calibrating situations when ACTA is controlling the tightening. It will measure the angle and torque independently to avoid influence of timings in torque measurements. The strategy can be used with PowerFocus3000/PF4000 and PowerMACS. The multistage measurement follows the scheme below.

The multistage measurement strategy demands RS232 or Ethernet communication between ACTA and controller.



To use the multistage strategy, do the following:

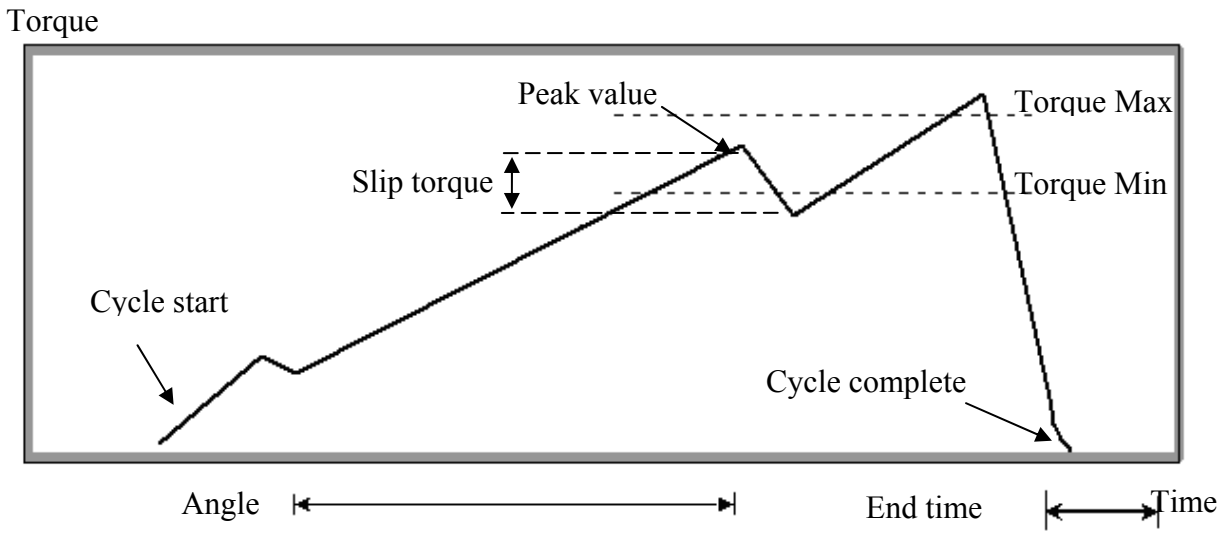
1. Tighten joint forward until target torque is reached. The torque values measured by ACTA as well as the controller torque are stored.
2. Smoothly reverse joint 720 degrees.
3. Reverse target angle degrees while measuring angle. Store ACTA and controller angle value.

ACTA performs the algorithm above automatically on each tightening operation!

This technique measures angle when the fringes are exposed to far less torque. This increases the precision of the angle measurement. The Multistage measurement strategy is solely used on test joints since it leaves the joint untightened.

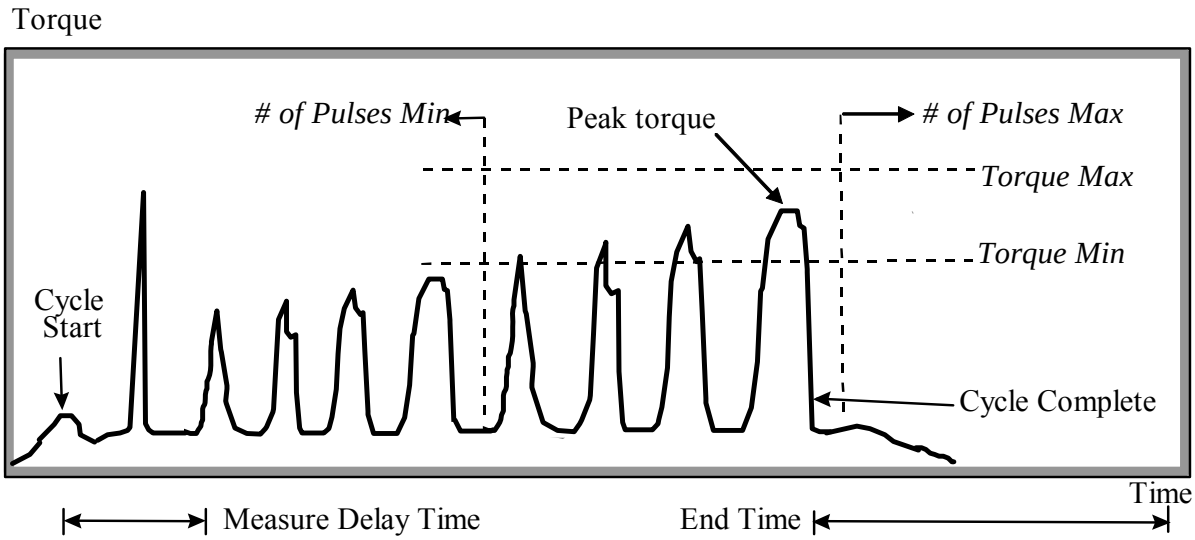
6.2.4 Break away

This measure strategy is used when doing inline measurements on a click wrench. Note the parameters shown in the picture below. The strategy stores the peak torque achieved before the slip torque decrement.



6.2.5 Peak (Pulse)

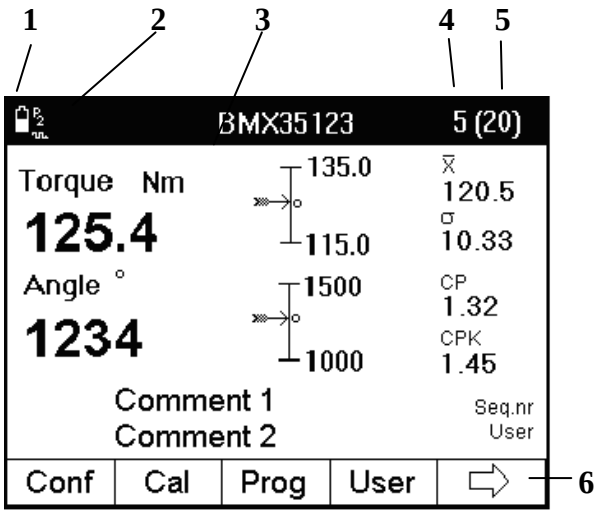
When measuring peak torque and number of pulses on pulse tools this measurement strategy is used. ACTA measures Peak torque as well as number of pulses/Pulse frequency.



7 Measurement results

The measurement dialog box is your active dialog box during measurements, displaying your results. There are three different dialog boxes, depending on configuration. A number of parameters and menu items are common.

7.1 Common parameters



The result dialog boxes have a number of common parameters.

See the table below for a description.

No	Display	Description
1	Battery symbol	This indicates how much power there is left in the battery. When the battery indicator is all white the battery is fully charged and when the battery indicator is all black the battery has less than 8% of a full charge left. See Battery for charging details.

No	Display	Description
2	Communication symbol Note: The Communication symbol is shaded grey when no communication is possible. When the communication is active, the symbol turns white.	The symbol states which communication mode ACTA is in. It is set in the **Prog>ToolType** setup window. T ToolsTalk communication. P2 Focus 2000 / Power Focus 2000 communication. DS DS/DL serial communication. P3 Power Focus 3000/PF4000 serial communication. BC Bar-code communication. PM Power Macs communication.
3	Name	Tool or application name
4	Number of tightening operations	The number of tightening operation, which have been performed. In ACTA Advanced Analysis and Quality Control, the batch size is shown inside parenthesis if it is non zero.
5	Batch size	Number of tightenings for a complete measurement, set by the operator. When completed a signal (three flashes on n x OK LED) is issued.
6	Soft keys	The soft key text represents the main menus of current programming tree and is operated by the 5 buttons located below the display. Each soft key field displays the functionality of each button.

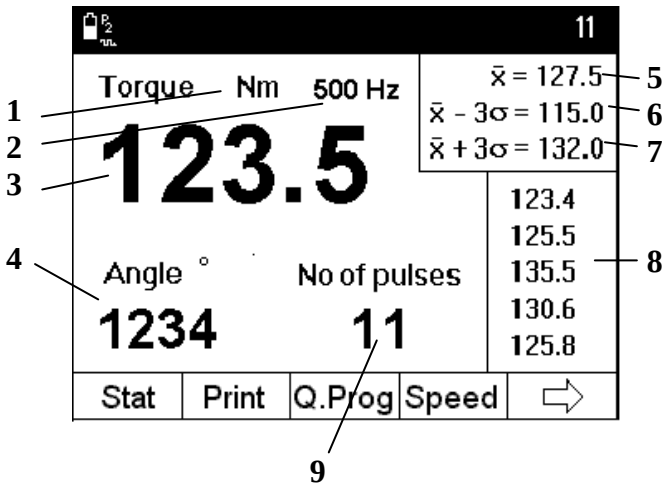
7.2 The Measurement dialog boxes

There are up to three different measurement dialog boxes depending on ACTA version. The **Basic** dialog box is the standard view in ACTA Basic. It is also available in the Quality Control and Advanced Analysis versions under the View menu block. The **Custom** and **Trace** measurement dialog boxes are available in ACTA Quality Control and Advanced Analysis only.

The bottom row on each measurement dialog box also displays the head parameters of the programming tree organized in menu blocks. Each measurement dialog box has its own functionality and therefore its own programming tree (menu block) setup.

During measurements it is possible to switch between the Basic, Custom and Trace dialog boxes at any time.

7.2.1 Basic Measurement dialog box

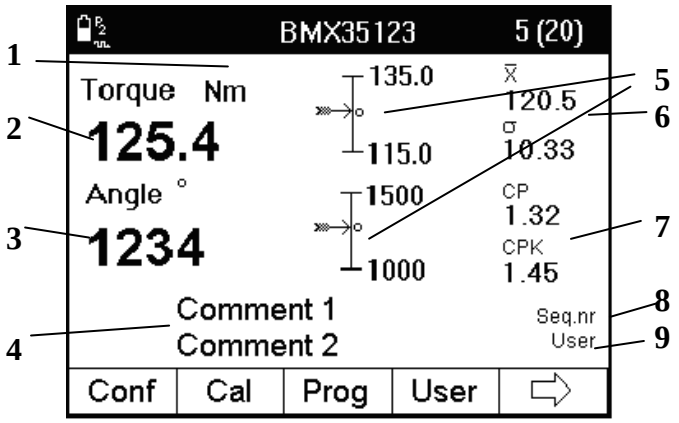


The Basic Measurement Dialog box

This is the standard dialog box on ACTA Basic. It is also available on the Quality Control and Advanced Analysis versions by selecting it under menu block View.

No	Display	Description
1	Unit	The unit for torque, (engineering unit).
2	Filter frequency	Filter frequency, visible for pulse tools only.
3	Measured torque	Measured torque
4	Measured parameter 2	Measured angle. If no angle signal then this field is empty.
5	X bar	The average value of all the measurements that have been performed. Located in the memory.
6	Confidence interval neg.	The lowest possible value with a confidence of more than 99 %.
7	Confidence interval pos.	The highest possible value with a confidence of more than 99 %.
8	Last five tightening operations	The last tightening operations entered in the memory. With each new tightening operation the result is displayed at the top and the old results are scrolled down. When the memory is empty this field is empty.
9	Number of pulses	If a pulse-tool is selected, this field shows the number of pulses for the last tightening operation. If Hz is displayed after “No of pulses” pulse frequencies are displayed. If not a pulse tool this field is empty.

7.2.2 Custom Measurement dialog box

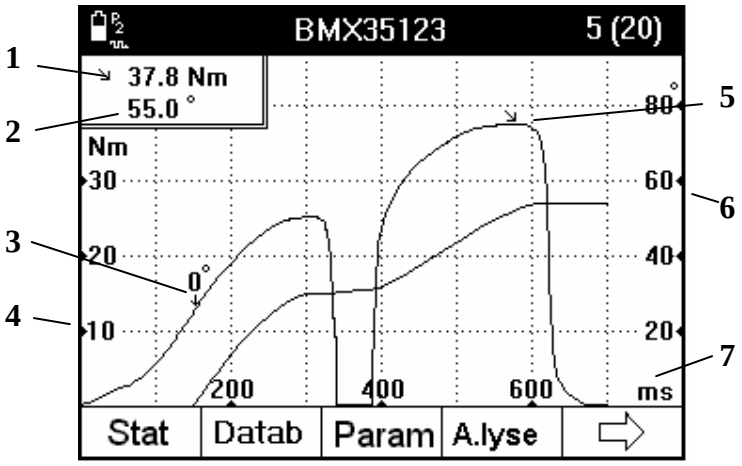


The Custom Measurement Dialog Box

In addition to the Basic Dialog box, ACTA Quality Control and Advanced Analysis also feature a Custom Display Dialog Box as seen above. This dialog box can be customized to display instant specific statistical data and you can also add your own comments.

No	Display	Description
1	Unit	The unit for torque, (engineering unit).
2	Measured parameter 1	Measured torque
3	Measured parameter 2	Measured angle. If no angle signal then this field is empty.
4	Comments	Comment to the selected tool. Two rows with a maximum of 20 characters in each.
5	Position of the last torque and angle measurement	The arrow indicates where the value is located between the min and the max value for the selected tool. When a value falls outside a max or min limit, the arrow is at the top or bottom respectively and flashing.
6	Statistical parameter 1	A selectable statistical parameter for parameter 1 (torque).
7	Statistical parameter 2	A selectable statistical parameter for parameter 2 (angle).
8	Sequence number	Sequence number, visible if defined.
9	User	User, only visible if defined.
	Filter frequency	Filter frequency, visible for pulse tools only (not visible in this figure).
	Number of pulses	If a pulse-tool is selected, this field shows the number of pulses for the last tightening operation. If Hz is displayed after No of pulses, pulse frequencies are displayed. If not a pulse tool this field is empty. (Not visible in this figure).

7.2.3 Trace Measurement dialog box



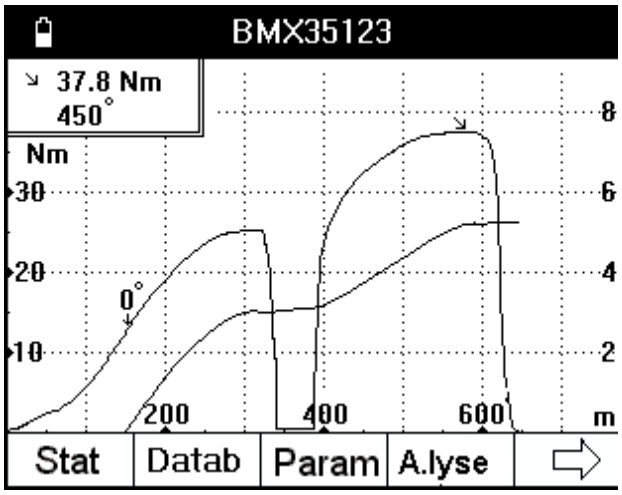
Trace measurement dialog box

In addition to the Basic and Custom Display dialog box, ACTA Advanced Analysis also features a Trace display dialog box. This dialog box displays measurements graphically according to your preference.

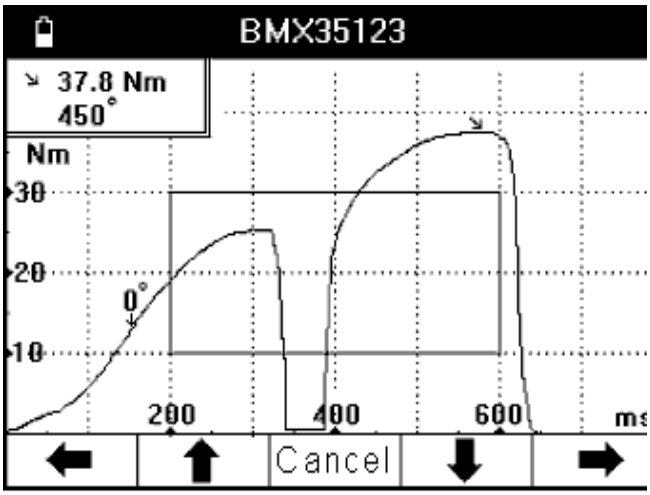
No	Display	Description
1	Peak torque	The highest torque value during the tightening operation. When the result is outside the acceptance interval, the text flashes.
2	Measured angle	Angle outside the accepted interval flashes in the same way as the torque.
3	Angle start point	This is the torque level, defined in the configuration, where the angle starts to count.
4	Scale Y-vice left	The values and unit for the Y-scale.
5	Peak point	The level where the torque is at maximum and where it stops to count.
6	Scale Y-vice right	Angle information when parameter includes torque and angle (time).
7	Scale X-vice	The values and unit for the X-scale.

The Trace Display Window can easily be configured to display traces of Torque and Angle, Torque and Time or, as shown below on the left, Torque and Angle over Time.

The Trace Display Window also features a Zoom-in function. If it is necessary study an area of the tightening operation curve in detail, it can be zoomed-in up to five consecutive times. See section Programming ACTA, menu block **Param** (Parameters) for instructions.



Torque and Angle over Time Graph



Zooming in a Trace Graph

7.3 Batch Result window

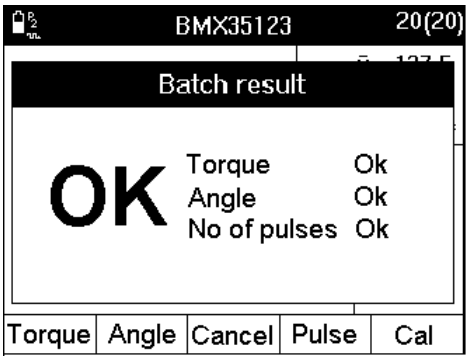
As explained in Programming ACTA, under menu block **Prog**, Programming, you have a choice of activating **Batch** on ACTA Quality Control and Advanced Analysis versions.

In practice, this function will cause ACTA to check and provide a statistical status on Torque, Angle (and Pulses) after a specific number of measurements - your specified batch. This is what your ACTA then checks.

You have to set limits for the above parameters for this to work. Set your limits in Statistical setup in Prog menu block

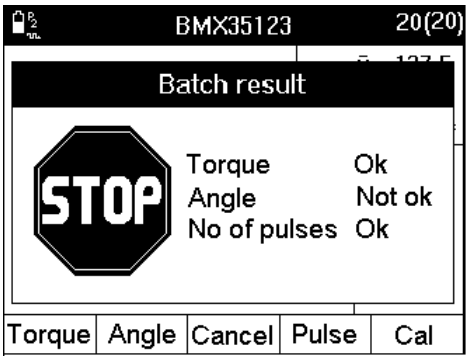
Within Limits

If results are within limits, this window will pop up on your ACTA QC or AA after you have completed your specified batch. If there is no angle encoder in the transducer, no angle information will be given.



Outside Limits

If any result is outside the limits, this window will pop up on your ACTA QC or AA after you have completed your specified batch.

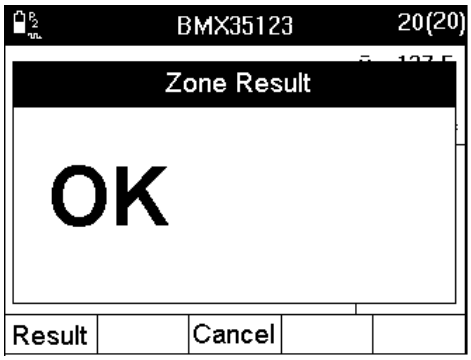


The menu blocks:

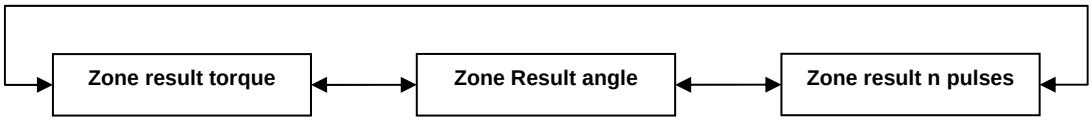
Menu item	Description
Torque	Selecting this opens the Statistics torque dialog box normally accessed from menu block **Stat>Statistics torque**
Angle	Selecting this opens the Statistics angle dialog box normally accessed from menu block **Stat>Statistics angle**
Cancel	This closes the batch result window
Pulse	Selecting this opens the Statistics pulses dialog box normally accessed from menu block **Stat>Statistics pulses**
Cal	Selecting this opens the Non controlled tool calibration dialog box normally accessed from menu block **Conf>Calibration>Tool**

7.4 Zone result window

When a zone is finished, the zone result window will pop up if the zone result is turned on in the tightening interface dialog (**Conf > Interface > Tightening**). The zone result is OK if all batches and tightening within the zone are OK.



The result soft key shows a listing of all tools in the zone. This window is a chain of windows scrolled in by using the right- and left arrow soft keys as below.



Each window lists results for the tools for zone. Select a tool and press **ENTER** to access the Statistics torque-, Statistics angle- and Statistics pulse windows for each tool.

8 Calibrating tools and equipment

The Calibration menu has three options, ACTA, Deadweight (for calibration of transducers) and Tool. Calibration of ACTA is done is a certified laboratory. A certificate is issued after ACTA calibration.

8.1 Tool calibration

The tool calibration is used to control how well a tool, a controller-tool combination or equivalent corresponds to a transducer.

The tool calibration function makes a backup tool containing a tool calibration report for uploading to ToolsTalk QAT. The report is delivered to ToolsTalk QAT as a PDF sheet identical to the tool report printout.

8.1.1 Setting up ACTA for calibration

When using a controlled Atlas Copco Tool:

1. Connect ACTA and the controller (Power Focus, DS/DL or PowerMACS) with the serial cable or, for ACTA 4000, Ethernet connection.
2. Synchronize by pressing **Q.Prog>Synchronize** and select tool. Complete the dialog as requested.

All tools:

3. If the connected tool does not exist in the ACTA database, create a new tool with **Datab>New tool**.
4. Ensure that the parameters in **Prog>Tooltype setup** are correct. See section Tooltype setup for details.
5. Select custom window by pressing **View>Custom.**
6. Open the tool database for the tool connected by selecting **Datab>Select Tool**. Press **SHIFT** and then **Cl** to remove all current tightening data and update the **History** database for the tool.
7. Attach the transducer to the tool and wait a few seconds for the shunt calibration.
8. Make the tightening operations, 25 is recommended.

The result is displayed in ACTA.

If running an Atlas Copco controller, both transducer torque and controller torque appear automatically on the ACTA window.

If running a controller tool from another manufacturer, ACTA asks for the controller values.

8.1.2 Evaluating and adjusting

1. Open the calibration dialog box by pressing **Conf>Calibration>Tool** or **Cal** in the **Batch result** window. On the display you now see the result from your tightening.

To adjust the tool, press the correct soft key. Depending on type of tool-controller (including non-controlled tool), it is the **Edit** or the **Store** key. Note that this adjustment is called **torque tuning**, **calibration torque** or **scale factor**. See section

2. Calibration dialog boxes for more information.

3. If you do not have direct communication with a controller, then press **Store** to indicate that you have changed the calibration torque or trimmed the Torque Tuning factor or adjusted the tool in another way. Confirm the creation of a back-up tool.

4. Manually change the tool, if applicable.

The result from this calibration is two tools in the ACTA database:

One tool with the original name and a second tool, placed at the end of the database, with the original tool ID and the extension [0].

Both tools can be printed out and the data from both tools will be transferred to the same tool in the ToolsTalk QAT database.

Doing a second calibration

If you have updated the tool, a second calibration is strongly recommended.

1. Make a backup by selecting **Database>Backup tool**. This is done automatically if stored.

2. Make the same number of new tightening operations as done before.

3. Check the result with the calibration window: **Conf>Calibration>Tool**.

If the result is satisfactory, press **Cancel**. If not, make a new adjustment of the tool.

8.1.3 Automatic calibration

When calibrating fixtured tools with a Power Focus or Power MACS controller, the tightening operations can be controlled automatically by ACTA through the RS232, or Ethernet if ACTA 4000, connection. To perform such a calibration, do the following.

This method is for fixtured applications only. See the controller manual for details on how to set up the tool not to be activated by the trigger!

1. Assemble spindle and transducer in such a way that tightening operations can be performed automatically.
2. Enable ACTA communication on controller and connect it to the ACTA serial port or through Ethernet.
3. Delete all tightening in tool. This is important to achieve correct results!
4. Synchronize ACTA for communication with controller.
   Q.prog>Synchronize>PF3000/PF4000/PowerMACS>RS232/Ethernet.
5. Select spindle, target torque and batch size in the dialogs presented.
6. Select **Conf>Communication>Start Batch**. This triggers ACTA to perform multistage measurements on each tightening in batch automatically. ACTA uses the Multistage measuring strategy.

If, for some reason, the user wishes to perform one tightening at a time, simply select start tightening for each one instead of start batch.

7. Check the result in the all tightening statistics windows, **Stat>All tightening** or in a printed report **Print>Tool calibration**.
8. To adjust the tool according to the performed calibration tightening series, follow the same procedure as for any other tool. See section Evaluating and adjusting the tool.

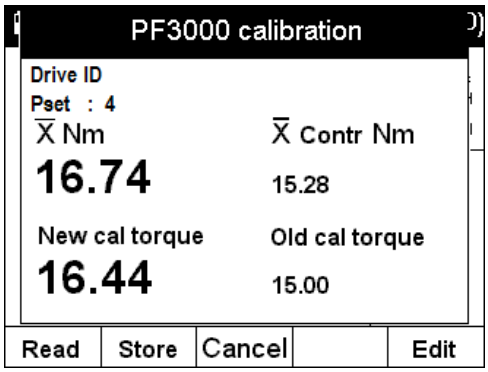
The Conf>Communication>Reverse function reverses 90°.

8.1.4 Calibration dialog boxes

The calibration dialog box is controller dependent. The type of controller is set in **Prog>Tooltype setup**.

Power Focus calibration

For tools controlled by any Power Focus´controller, the following dialog box appears when calibrating. For Tensor DS/DL tools, see section DS/DL calibration.



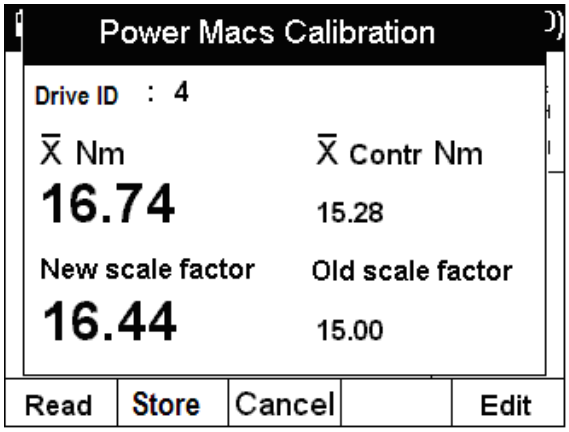
Display text	Comments
Drive ID	Controller identification
P-Set	Parameter set used. Pset is created in ToolsTalk QAT, otherwise not displayed
X bar	Mean torque value.
X bar Contr	Mean controller torque. Values are manually entered or read from controller. Manually entered if communication not set up to controller.
New cal torque	$Newcaltorque = Oldcaltorque \cdot \frac{Xbar}{XbarContr}$
Old cal torque	Old calibration torque. (Automatically read from PF)

Soft key	Comments
Read[1]	Read values from controller.
Store[2]	Save tool calibration report in the database. Tightening operations are stored in a backup tool. Save back-up tool question asked. Printout question is asked.
Cancel	Close window.
Edit	Change the calibration torque.

[1] Only if RS232 or Ethernet communication is selected. Not PF 2000
[2] Only if Manual input communication is selected.
For PF 2000, **Done** does not store in database or make backup tool.

Power MACS calibration

For tools controlled by PowerMACS controller, the following dialog box appears when calibrating.



Display text	Comments
P-Set	Parameter set used. Pset is created in ToolsTalk QAT, otherwise not displayed
X bar	Mean torque value.
X bar Contr	Mean controller torque. Values are manually entered or read from controller. Manually entered if communication not set up to controller.
New scale factor	New calculated scale factor for controller.

$$NewScaleFactor = OldScaleFactor \cdot \frac{Xbar}{XbarContr}$$

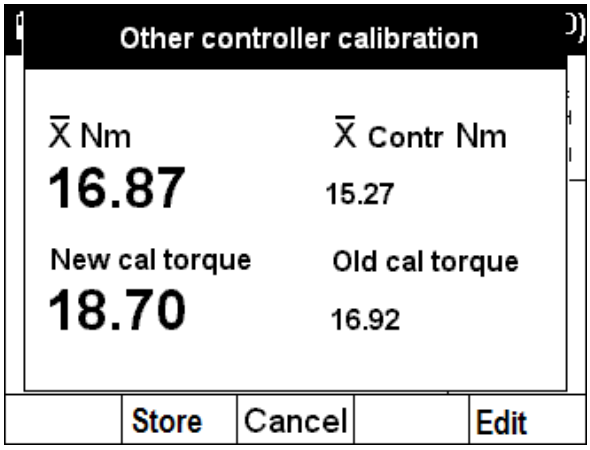
Old scale factor	Old scale factor in controller. Read from PowerMACS.

Soft key	Comments
Read[1]	Read values from controller.
Store	Mark tightening operations as used in calibration. Save back-up tool question asked. Printout question is asked.
Cancel	Close window.
Edit	Change the new scale factor.

[1] Only if RS232 or Ethernet communication is selected.

Other controller calibration

Use **Other controller** to calibrate for unknown or unsupported controlled tools. The controller torque values must be entered manually. A new calibration torque is calculated and can be stored in the tool.



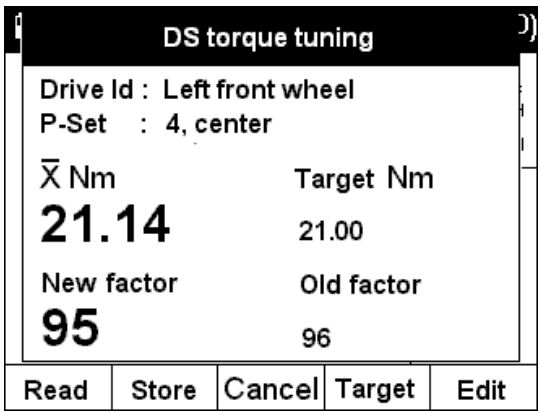
Display text	Comments
X bar	Mean torque value.
X bar Contr	Mean controller torque. The controller torque values are entered manually.
New cal torque	New calculated calibration torque for controller.

$$Newcaltorque = Oldcaltorque \cdot \frac{Xbar}{XbarContr}$$

Soft key	Comments
Store	Mark tightening operations as used in calibration. Printout question is asked.
Cancel	Close window.
Edit	Change the calculated calibration torque.

DS/DL torque tuning

For tools controlled by DS/DL controller, the following dialog box appears when calibrating.



Display text	Comments
Drive ID	Controller identification
P-Set	Parameter set used
X bar	Mean torque value.
Target	Target torque for controller.
New factor	New calculated factor for tool. $$Newfactor = \frac{Target}{Xbar} \cdot Oldfactor$$
Old factor	Old factor value in tool.

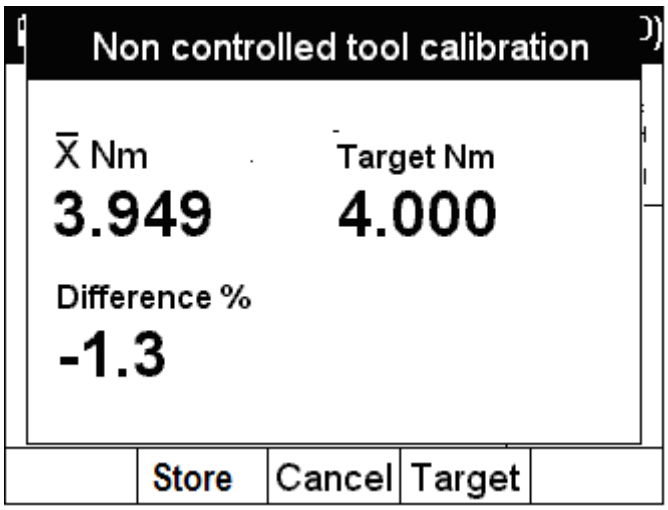
Soft key	Comments
Read[1]	Read old factor from controller/tool.
Store[2]	Save new calculated factor in controller. Tightening operations are marked used in calibration. Printout question is asked.
Done[3]	Mark tightening operations as used in calibration. Printout question is asked.
Cancel	Close window.
Target	Update target torque.
Edit	Change the calculated factor.

[1] Only if RS232 communication is selected.
[2] Only if RS232 communication is selected.
[3] Only if Manual input communication is selected.

A DS/DL tool can not be calibrated in the words true meaning. Instead, the torque tuning factor is changed uniquely for each Pset within the controller.

Non-controlled tool calibration

Use **None** to calibrate manual tools and tools without a display. See figure below.



Text on display	Comment
X bar	Mean torque value.
Target	Target torque for tool.
Difference %	Difference in percent.

$$Difference\% = \frac{Xbar - Target}{Xbar} \cdot 100$$

Soft key	Comments
Store	Mark tightening operations as used in calibration. Save back-up tool question asked. Printout question is asked.
Cancel	Close window.
Target	Update target torque for tool.

8.2 Calibrating Transducers with ACTA

ACTA has a built-in feature that allows calibration of transducers using the deadweight method.

When performing this task, the use of certified dead-weight equipment (arm and weight) is needed.

In addition, if an Atlas Copco memory transducer is used and calibrated by means of the above method, it is possible to download the new calibration value to the memory of the transducer directly from ACTA.

1. Place the transducer you wish to calibrate in the deadweight equipment.
2. Connect the transducer to ACTA.
3. Select transducer calibration by selecting **Conf>Calibration>Deadweight**. Press **ENTER**.

4. Confirm the settings in the dialog box by selecting **OK** on the keypad or highlighting the **OK** menu block and then pressing **ENTER**.

A **Deadweight calibration** window appears with the following text:

Number of load points	This is your current status of the number of full measurements for your calibration.
No load on transducer	Gives the required torque status of the transducer
Measured value (mV/V)	This refers to the numeric value below and represents your measured mV/V value under the current load on the transducer.
(Numeric value)	

Below this window, three new menu blocks appear with functionality specific for the calibration process:

Store	**Lin.ch**	**Cancel**

8.2.1 Calibration

You will now measure and record the mV/V value of the transducer at least three consecutive times. Three measurements is the minimum recommended number of reference points.

Each measurement includes a mV/V checkpoint without any torque applied over the transducer and one checkpoint when a specific torque level is applied over the transducer using the deadweight equipment.

These measurement results or calibration checkpoints serve as the basis on which ACTA calculates a calibration value, which is then compared with the transducer's current calibration value.

1. In the **Deadweight calibration** window press the **Store** menu block to save the first checkpoint (mV/V value) with no load on the transducer.

The first checkpoint without load is saved and you can see that row number 2 in the **Deadweight calibration** window changes and now reads: **Load on transducer**.

2. Apply torque to the transducer using the deadweight equipment. As you apply torque you can see that the mV/V value changes – it increases.
3. When the load is stable, press the **Store** menu block again.
4. A small pop-up window appears asking you to enter the torque value from the previous step manually. Press **ENTER**.

The first checkpoint with load is saved and you can see that rows 1 and 2 in the **Deadweight calibration** window change and now read: **Number of cal points 1** and **No Load on transducer** respectively.

5. Remove applied torque on the transducer.

You have now completed the first full reference mV/V measurement for this transducer, both at rest and at a specific torque value.

6. Repeat the procedure at least two more times.

When you have done this the **Deadweight calibration** window should display **Number of cal points 3** confirming that three full reference mV/V measurements have been completed.

8.2.2 Linearity check

When the above calibration measurement values have been recorded and saved, perform a linearity check to see how consistent the transducer is.

A full linearity measurement or checkpoint includes a mV/V checkpoint without any torque applied over the transducer and a checkpoint when a specific torque level is applied over the transducer using the deadweight equipment.

The linearity check is not used for calculating the new calibration value. It is just used to check the transducer linearity.

1. Measure and record the mV/V value of the transducer (2) two consecutive times according to the procedure in the Calibration section above.

No. of cal points -> No. of lin points.

2. Press the L**in.ch** menu block. The **Deadweight measurement** window displays the following:

Number of cal points	This is your current status of the number of full linearity checks for your calibration.
Load on transducer	Gives you the torque status of the transducer
Measured value (mV/V)	This refers to the numeric value below and represents your measured mV/V value under the current load on the transducer.
(Numeric value)	

Below this window, three new menu blocks appear with functionality specific for the linearity check process:

Store	**Lin.ch**	**Cancel**

3. Place the transducer on your joint and then apply torque to the transducer using the Deadweight equipment. As you apply torque you can see that the mV/V value changes – it increases.
4. When the torque is stable, press **Store**.
5. A small pop-up window appears asking you to enter the torque value from the previous step manually. Press **ENTER**.

The first checkpoint with load is now saved and you can see that row number 1 and 2 in the **Deadweight calibration** window changes and now reads: **Number of cal points 1** and **Load on transducer** respectively.

You have now completed the first full linearity check measurement for this transducer, both at rest and at a specific torque value.

6. For additional calibration points, repeat steps 3-5.

If additional calibration has been performed, the **Deadweight calibration** window displays **Number of cal points 3** confirming that three full linearity check measurements have been completed.

8.2.3 Saving and printing the new calibration value

1. In the **Deadweight calibration** window, press menu block **Ready**.
2. In the next dialog box, press **OK** to confirm a printout of a full calibration report of the above process.

The **Deadweight calibration** window now displays the old (current) calibration value of the transducer and the new (now measured) calibration value.

3. To save the new calibration value, press **OK**. This is possible if you use an Atlas Copco memory transducer. If the transducer is not an Atlas Copco memory transducer, press **Cancel**.
4. If a new calibration value is entered, then enter your signature and the next calibration date when prompted to. The values are then transferred to the transducer memory.

After this you have finished calibrating your transducer and the measurement window on ACTA is displayed. Remember to mark the new calibration value on your transducer.

The deadweight calibration report is stored in ACTA database. When uploading data to ToolsTalk QAT, this report is automatically transferred to the ToolsTalk QAT database as a PDF document.

8.3 Calibrating ACTA

To calibrate ACTA, we recommend contacting your local Atlas Copco Tools representative. ACTA calibration must be done in a certified laboratory. A certificate is issued after a calibration.

For ACTA calibration, a traceable calibrated reference transducer box with cable is needed, part no. 4222 0270 85.

Carry out ACTA reference transducer box calibration by selecting **Conf>Calibration>ACTA**. When calibrating, follow the information windows that are displayed.

If there are less than 30 days to the next calibration date, a message window appears telling the operator that ACTA should be calibrated before the next calibration date. If the next calibration date has passed, a message window appears telling the operator that ACTA should be calibrated.

If a complete system calibration is carried out without transducer box, the calibration date can be changed by selecting System calibration performed in the dialog presented in Conf>Calibration>ACTA. This action demands a password unique to each ACTA. To receive this password, contact your Atlas Copco representative.

9 Printouts from ACTA

As explained under the **Print** menu block in the Programming ACTA section, ACTA features vast print capabilities. This section shows examples of printouts.

Color printout is currently not available

9.1 Continuous report

```
CONTINUOUS REPORT

Tool Identity: AB735
      Number   Torque   Angle    Pulses      Status       Date         Time
               Nm       deg
      1        75.4     185      12          OK/OK/OK     JUN 26 2000  09:57.23
      2        76.7     155      13          OK/OK/OK     JUN 26 2000  09:57.50
      3        75.1     169      34          OK/OK/HIGH   Jun 26 2000  09:58.15

Tool Identity:BB515
      Number   Torque   Angle    Pulses      Status       Date         Time
      1        100.3    48                   OK/OK/ -     JUN 26 2000  10:13.20
      2        101.8    50                   OK/OK/ -     JUN 26 2000  10:13.42
      3        99.4     47                   OK/OK/ -     JUN 26 2000  10:14.12
      4        100.3    52                   OK/OK/ -     Jun 26 2000  10:14.37
      5        66.1     32                   LOW/LOW/ -   Jun 26 2000  10:15.08
      5        - REMOVED -
      5        104.1    56                   OK/OK/ -     Jun 26 2000  10:15.27

Tool Identity:AC125
      Number   Torque   Angle    Pulses      Status       Date         Time
               (Nm)     (deg)
      138      245.1                         OK/ - / -    JUN 26 2000  13:15.10
      139      299.7                         HIGH/ - / -  Jun 26 2000  13:15.24
      140      256.3                         OK/ - / -    Jun 26 2000  13:15.38

Tool Identity:
      Number   Torque   Angle    Pulses      Status       Date         Time
               (Nm)     (deg)
      1        31.4     23                   OK/OK/ -     Jun 26 2000  14:13.07
      2        25.5     22                   OK/OK/ -     Jun 26 2000  14:13.45
      3        13.5     12                   OK/OK/ -     Jun 26 2000  14:33.59


TEST PERFORMED BY:             AJN



APPROVED BY:                   ..........................................
```

9.2 Tool Rundowns

RUNDOWN REPORT 1(1)

Tool Identity	Date	Time
AB735	Jan 28 2000	09:33.12

COMMENT ROW 1
COMMENT ROW 2

	Torque	Angle	No. of pulses
MEAN	74.79 Nm	164.3 deg	9.333
MEAN - 3 SIGMA	61.72 Nm	136.4 deg	2.853
MEAN + 3 SIGMA	87.86 Nm	192.2 deg	15.81
SIGMA/MEAN	0.058	0.057	0.231
Range	19.3	30	8
Range %	38.6	9	80
CMK	0.55	5.00	34.00 FAILED

CMK TORQUE IS LESS THEN THE LIMIT OF 1.33

Number	Torque Nm)	Angle deg)	Pulses	Status	Date	Time
15	71.00	166.0	8	OK/OK/OK	Jan 28 20000	9:33.12
14	72.20	167.0	7	OK/OK/OK	Jan 28 2000	09:29.45
13	70.40	166.0	9	OK/OK/OK	Jan 28 2000	09:24.53
12	76.10	169.0	10	OK/OK/OK	Jan 28 2000	09:20.45
11	85.40	168.0	11	HIGH/OK/OK	Jan 28 2000	09:19.12
10	74.20	159.0	12	OK/OK/OK	Jan 28 2000	09:17.16
9	74.00	160.0	9	OK/OK/OK	Jan 28 2000	09:15.51
8	66.10	141.0	4	LOW/LOW/LOW	Jan 28 2000	09:14.25
7	73.20	160.0	12	OK/OK/OK	Jan 28 2000	09:12.12
6	79.30	166.0	12	OK/OK/OK	Jan 28 2000	09:10.12
5	75.30	165.0	11	OK/OK/OK	Jan 27 2000	11:31.42
4	77.50	168.0	9	OK/OK/OK	Jan 27 2000	11:15.32
3	75.10	169.0	9	OK/OK/OK	Jan 27 2000	10:59.33
2	76.70	155.0	8	OK/OK/OK	Jan 27 2000	10:57.41
1	75.40	185.0	9	OK/OK/OK	Jan 27 2000	10:55.11

TOOL COMMENT Replace cable

TEST PERFORMED BY: AJN

APPROVED BY

9.3 Transducer Info

```
TRANSDUCER MEMORY REPORT

Transducer serial number         Date       Time
20529      Jan 28 2000           10:55.12


TRANSDUCER TYPE          IRTT
                         With angle encoder
CALIBRATION TORQUE       173.8 Nm
SENSITIVITY              2.0 mV/V
TORQUE SPAN              100 %
                         347.6 Nm
CALIBRATION DATE         Mar 08 1999
CALIBRATION SOURCE       ACTA 4000
                         S/N: 123456
NEXT CALIBRATION DATE    May 10 2000
NUMBER OF MEASUREMENTS   15842
ANGLE ENCODER            180 pulses/rev
MESSAGE 1                AB1345
MESSAGE 2
```

9.4 Tool Setup

```
TOOL SETUP                                                          1(1)

Tool identity                Date             Time
AB735                        Jun 28 2000      10:55.12

APPLICATION NAME             Rearview mirror
PARAMETER SET NAME           2
ZONE NAME                    B21

TARGET TORQUE                75.00  Nm
TARGET ANGLE                 234    deg
CALIBRATION TORQUE           75.00  Nm
CONTROLLER                   PF3000/PF4000
COMMUNICATION                RS232
PARAMETER SET                0
CELL ID                      0
CHANNEL                      0
MODEL                        Tensor S/ST
FILTER FREQUENCY             500 Hz
MEASURE STRATEGY             Peak
DIRECTION OF ROTATION        CW
CYCLE START                  15.00 Nm
CYCLE COMPLETE               8.000 Nm
START ANGLE                  10.00 Nm
ANGLE COMPLETE               Peak torque
MEASURE DELAY TIME           0 ms
RESET TIME                   10 ms
END TIME                     500 ms

                     Torque                Angle            No. of pulses
MIN                  70.00 Nm              100.0   deg      30
MAX                  80.00 Nm              150.0   deg      35
LCLx                 73.00 Nm              0.0     deg
UCLx                 77.00 Nm              9999    deg
LCLr                 0.000 Nm              0.0     deg
UCLr                 5.000 Nm              9999    deg
CM >                 80.00                 0.000
CMK >                1.330                 0.000
CAM >                2.000                 0.000
MEAN DIFFERENCE<     6.000 %               10.00 %

BATCH SIZE                   5
SUBGROUP SIZE                5
SUBGROUP FREQENCY            0
BATCH RESULT                 On
MEASURED PARAMETER 1         Torque
MEASURED PARAMETER 2         Angle
STATISTIC PARAMETER 1        X, S
STATISTIC PARAMETER 2        None, None
COMMENTS ROW 1               USE INLINE TRANSDUCER
COMMENTS ROW 2               NUMBER 3 FROM AC
```

9.5 Tool Statistics

```
STATISTICAL REPORT                                                  1(2)

Tool identity       Date           Time          to Date       Time
AB735               Jun 28 2000    10:55.27      Jun 28 2000   11:31.12

Min torque          = 70.00 Nm     Max torque                  = 80.00 Nm
Min angle           = 150.0 deg    Max angle                   = 200.0 deg
Min no. of pulses   = 5            Max no. of pulses           = 15

Comments:
USE INLINE TRANSDUCER
NUMBER 3 FROM AC


Total rundowns 15
                      Torque         Angle              No. of pulses
% HIGH REJECTS        6.00           0.00               0.00
% LOW REJECTS         6.00           6.70               6.70
% OK                  86.7           93.3               93.3
MAX VALUE             85.40 Nm       185.0 deg          12
MIN VALUE             66.10 Nm       141.0 deg          4
MEAN                  74.79 Nm       164.3 deg          8.700
RANGE                 19.60 Nm       44.00 deg          8.000
SIGMA                 4.357 Nm       9.300 deg          5.100
MEAN - 3 SIGMA        61.72 Nm       136.4 deg          -6.300
MEAN + 3 SIGMA        87.86 Nm       192.2 deg          18.80
CR                    2.610          1.110              0.120
6 SIGMA               26.14 Nm       55.80 deg          27.00
CM                    0.380          0.900              1.500
CMK                   0.370          0.500              2.800
VARIANCE              17.47 %        16.99 %            69.44 %
% DIFFERENCE          5.000 %        ---                ---

                         Subgroup statistics
X-BAR                 75.00 Nm       167.2 deg          5.000
GROUP RANGE           15.00 Nm       30.00 deg          4.000
CAM                   ---   Nm       ---                ---
X-BAR MAX             76.00 Nm       168.4 deg          7.800
X-BAR MIN             73.40 Nm       157.2 deg          5.800
GROUP RANGE MAX       15.00 Nm       30.00 deg          4.000
GROUP RANGE MIN       2.400 Nm       3.000 deg          3.000

SUBGROUP SIZE          5
NUMBER OF SUBGR        3
```

STATISTICAL REPORT 2(2)

Tool identity	Date	Time	to Date	Time
AB735	Jun 28 2000	10:55.27	Jun 28 2000	11:31.12

History	Torque			Angle			No. of pulses		
Date	Mean	Range	Sigma	Mean	Range	Sigma	Mean	Range	Sigma
Jun 28 2000	74.79	19.30	4.357	164.3	44.00	9.300	9.333	8.000	2.160
May 27 2000	73.23	14.37	3.987	163.2	38.00	8.700	9.127	7.000	2.100
Apr 21 2000	74.79	19.30	4.357	164.3	44.00	9.300	9.333	8.000	2.160
Mar 23 2000	73.23	14.37	3.987	163.2	38.00	8.700	9.127	7.000	2.100
Feb 27 2000	74.79	19.30	4.357	164.3	44.00	9.300	9.333	8.000	2.160
Jan 22 2000	73.23	14.37	3.987	163.2	38.00	8.700	9.127	7.000	2.100

TEST PERFORMED BY: AJN

.....

APPROVED by .....

9.5.1 All Tool Rundowns

See the previous report for one tool.

9.5.2 All Tool Set-ups

See the previous report for one tool.

9.5.3 All Tool Statistics

See the previous report for one tool.

9.6 Tool calibration

```
TOOL CALIBRATION REPORT            Date Jan 28, 2006                    1(2)
                                   Time 07:00:15
CALIBRATION OBJECT                              Serial Number
            Tool                                         1234
            Drive                                       12434

REFERENCES
            ACTA 4000                                  047001
            Transducer                                  34539

Number       Tool            Reference       Difference      Difference
             (Nm)            (Nm)            (Nm)            (% of MV)
1            15.77           15.20           0.575           3.64
2            15.83           15.20           0.631           3.99
3            15.90           15.20           0.702           4.42
4            15.87           15.30           0.572           3.60
5            15.85           15.20           0.654           4.12
6            16.05           15.80           0.254           1.58
7            15.97           15.20           0.766           4.80
8            16.02           15.40           0.619           3.86
9            15.78           15.20           0.575           3.65
10           15.69           15.10           0.589           3.75
11           15.98           15.20           0.777           4.86
12           15.80           15.10           0.701           4.43

Torque       (Nm)            (Nm)            (Nm)            (%)
MAX          16.05           15.80           0.777           4.86
MIN          15.69           15.10           0.254           1.58
MEAN         15.88           15.26           0.618           3.89   PASSED
RANGE        0.365           0.700           0.523           3.28
STD          0.111           0.188           0.135           0.85

MEAN TORQUE DIFFERENCE 3.89% IS WITHIN LIMIT 5%

USED TOOL CALIBRATION VALUE         17.02 Nm
NEW TOOL CALIBRATION VALUE:         17.61 Nm  UPDATED:       YES



TOOL CALIBRATION REPORT            Date Jan 28, 2006,                   2(2)
                                                                   Time 07:00:15


Angle        (degrees)       (degrees)      (degrees)        (%)
MAX          108.5           105.3           5.5             5.2
MIN          95.5            85.2            -3.5            -4.1
MEAN         101.3           98.3            1.1             1.1    FAILED
RANGE        13              20.1            9               44.8
STD          5.5             7.2             1.2             16.7

MEAN ANGLE DIFFERENCE 1.1% IS OUTSIDE LIMIT 1%
```

```
COMMENT           Tool ok

PERFORMED BY:      AJN

SIGNATURE




STD  Standard deviation                  MV   Measured Value
```

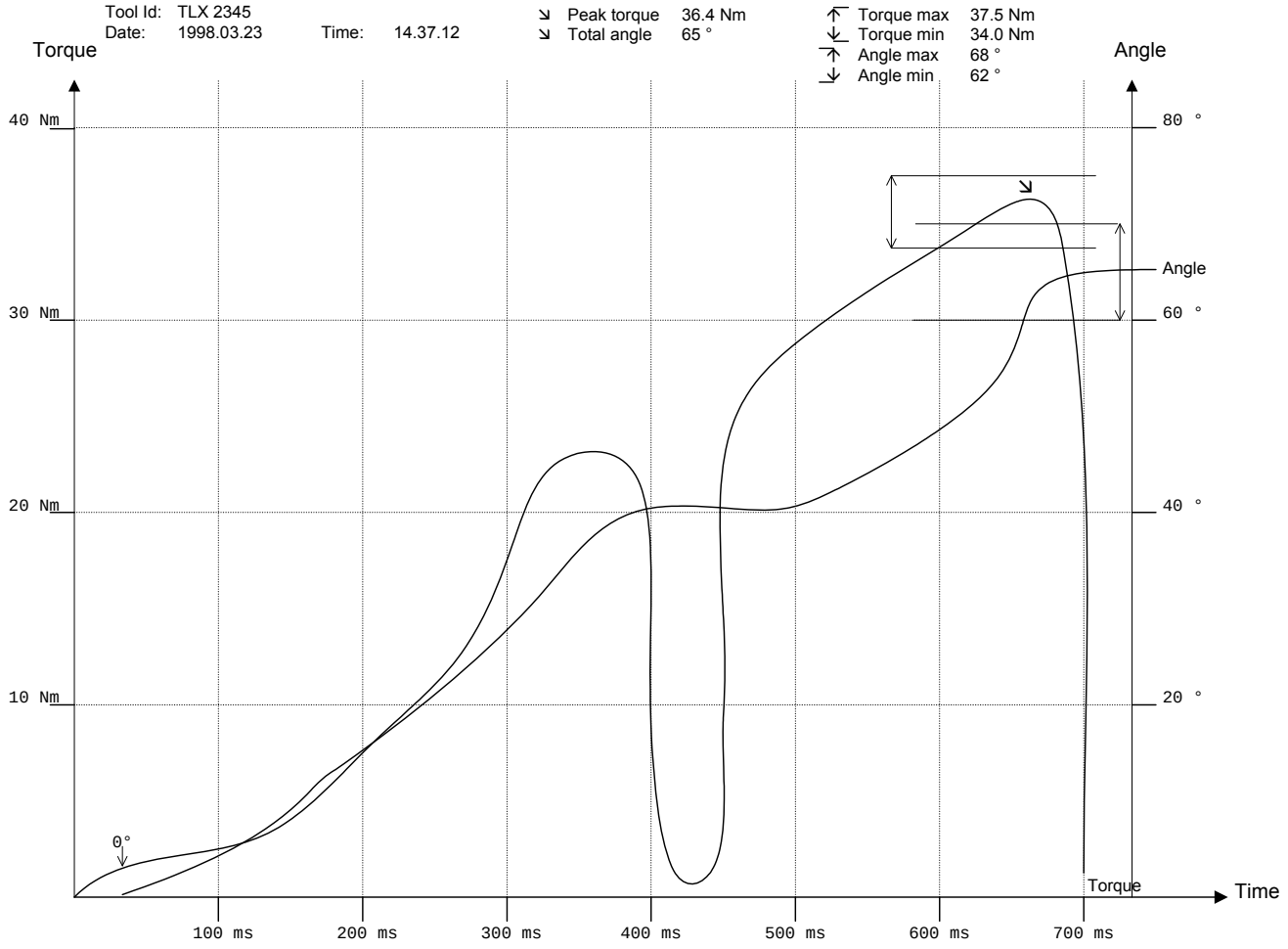
9.7 Database Summary

```
DATABASE TOOL SUMMARY REPORT

No. of tools     Date              Time
11               Jan 30, 2000      10:55

no.  Identity    Tooltype          No.      Date            Time
1    AB735       Direct driven     15       Jan 28, 1996    09:33.12
2    AB737       Direct driven     23       Jan 28, 1996    14:11.13
3    AB739       Direct driven     25       Jan 28, 1996    11:22.14
4    AB740       Direct driven     0
5    AB741       Direct driven     1        Nov 01, 1995    19:54.22
6    AC001       Pulse             15       Jan 28, 1996    13:52.32
7    AC023       Pulse             15       Jan 29, 1996    09:00.54
8    ACDF244     Pulse             13       Jan 27, 1996    19:30.55
9    H45         Residual torque   0
10   H46         Residual torque   0
11   H47         Residual torque   54       Jan 01, 1996    13:15.16
```

9.8 Trace


Tool Id: TLX 2345
Date: 1998.03.23
Time: 14.37.12
Peak torque 36.4 Nm
Total angle 65 °
Torque max 37.5 Nm
Torque min 34.0 Nm
Angle max 68 °
Angle min 62 °
Torque
Angle
40 Nm
30 Nm
20 Nm
10 Nm
80 °
60 °
40 °
20 °
Angle
0°
Torque
Time
100 ms
200 ms
300 ms
400 ms
500 ms
600 ms
700 ms

9.9 Deadweight calibration report

```
1(1)
TRANSDUCER CALIBRATION REPORT

Transducer serial number  Date             Time
20529                     March 28, 1999   10:55.12

ACTA SERIAL NUMBER        1234567890

OTHER EQUIPMENT



PREVIOUS CALIBRATION DATE Sept 08, 1998

TRANSDUCER TYPE           IRTT WITH ANGLE ENCODER
SENSITIVITY               2.0 mV/V

CALIBRATION INPUT         No Load            Cal point        Cal value
                          Nm)   (mV/V)       (Nm)   (mV/V)    (Nm)
                          0     -0.05        175    1.98      172.4
                          0     -0.02        175    1.95      177.7
                          0     -0.05        175    1.91      178.6
STANDARD DEVIATION                                            2.74

LINEARITY CHECK           True value         Measured value   Unlinear
                          (Nm)               (Nm)             (%)
                          87                 89.8             +1.59
                          132                130.3            -0.97
STANDARD DEVIATION                                            1.32

OLD CALIBRATION VALUE     173.8 Nm
NEW CALIBRATION VALUE     176.1 Nm      SAVED IN TRANSDUCER   ...     ....
                                                              YES      NO


NEXT CALIBRATION DATE     ..........................................


ADDITIONAL INFORMATION    ..........................................

                          ..........................................

                          ..........................................
```

9.10 ACTA Calibration report

```
ACTA CALIBRATION REPORT                                                 1(1)

ACTA serial number         Date          Time
047001                     Jun 21 2000   10:55.12

PREVIOUS CALIBRATION DATE  Mar 08 1999

REFERENCE BOX NUMBER..................... 1234

OTHER EQUIPMENT.....................................................

....................................................................



CALIBRATION RESULT         OK

ADJUSTMENT 0.59 mV/V
    OFFSET COMP            0.05 %
    GAIN COMP              0.25 %

ADJUSTMENT 2.0 mV/V
    OFFSET COMP           -0.11 %
    GAIN COMP              0.44 %

NEXT CALIBRATION DATE      Jun 21 2001


ADDITIONAL INFORMATION..............................................

....................................................................

....................................................................


THE REFERENCE BOX IS TRACEABLE CALIBRATED.

THIS REPORT DOCUMENTS THE TRACEABILITY TO NATIONAL STANDARDS FOR ALL
EQUIPMENT USED FOR THE CALIBRATION.


SIGNATURE

...........................
```

9.11 ISO 5393 Calibration report

ISO 5393 REPORT
1(1)

Tool identity	Date	Time	to	Date	Time
Iso tool 1	Aug 23 2006	10:18.31		Aug 23 2006	10:24.32

Manufacturer:..... Model:.....

Manufacturer:..... Type of tool:.....

		High Torque		Low torque	
		Soft	Hard	Soft	Hard
Total rundowns		25	25	25	25
STIFFNESS	(Nm/rev)	11.52	20.1	5.92	17.34
MEAN FROM 0	(deg)	151.2	122.4	193.2	145.3
MEAN	(Nm)	15.29	14.88	15.08	15.34
RANGE	(Nm)	0.987	1.126	1.124	1.232
SIGMA	(Nm)	0.328	0.368	0.346	0.298
MEAN – 3 SIGMA	(Nm)	14.31	13.78	14.04	14.45
MEAN + 3 SIGMA	(Nm)	16.27	15.98	16.11	16.24
6 SIGMA	(Nm)	1.965	2.206	2.076	1.790
6 SIGMA	(%)	12.85	14.82	13.77	11.66
COMB. MEAN TORQUE	(Nm)	15.03		15.14	
MEAN SHIFT	(Nm)	0.412			0.268
COMB. TORQUE SCATTER	(Nm)	2.497			2.201
COMB. TORQUE SCATTER	(%)	16.62			14.54

Torque scatter capability over the whole range (%) 16.62

Tested in accordance with ISO 5393

TEST PERFORMED BY: 6533

.....

APPROVED BY: .....

10 ToolsTalk QAT

ToolsTalk QAT software creates a convenient and user-friendly complete quality management tool. It keeps your tools, your tightening operation database and supplier database organized all in one place.

Use ACTA with ToolsTalk QAT software to have a complete quality management tool at your service or your complete ISO 9000 under one icon in your PC. For more information, see ToolsTalk QAT User Guide.

Function	Description
Tool Database	The tool database allows you to organize and sort all your tools by ID number, type, model, torque range and more. You also have a search function for even more convenience.
Applications database	This function helps you to organize tools and controllers used in for example a part of a car assembly.
Zone management	This function helps you organize for example applications and tools used in a line or a geographical zone.
Tightening database	In the tightening database you can save all your tightening operations, organize and sort your tightening operations by tightening ID number, date, time, torque and angle values and more. A search function is also included.
Supplier database	In the supplier database you can enter the names of your contacts, companies, phone and fax numbers and e-mail addresses.
Traces and statistics	Study tightening operations by graphical rundown displays. You also have a powerful zoom in function at your disposal for in depth analysis. ToolsTalk QAT keeps track of your tightening operation results and can at any point calculate and provide you with detailed statistical results of all tightening operations or selected tightening operations performed and saved by any of your tools.
Service and calibration reminders	Every time you start ToolsTalk QAT you can have it display all the tools that need calibration and preventive maintenance. Just set the preferences when creating each tool and ToolsTalk QAT will then do the rest.

11 Guide to statistics

All measurements are subject to some uncertainties. Even if all systematic sources of uncertainty are identified and eliminated, randomness remains inevitably inherent. In most measurements, as the number of observations increase, a relatively large number of observations will be found close to the mean value. As the number of observations the approaches infinity, their distribution approaches a continuous curve hereafter referred to as the normal distribution.

Figure 1 illustrates two sets of observations with the same mean value and an equal number of observations. High precision measurements have small deviations from the mean. The observations of a low precision measurement will have relatively few observations close to the mean.

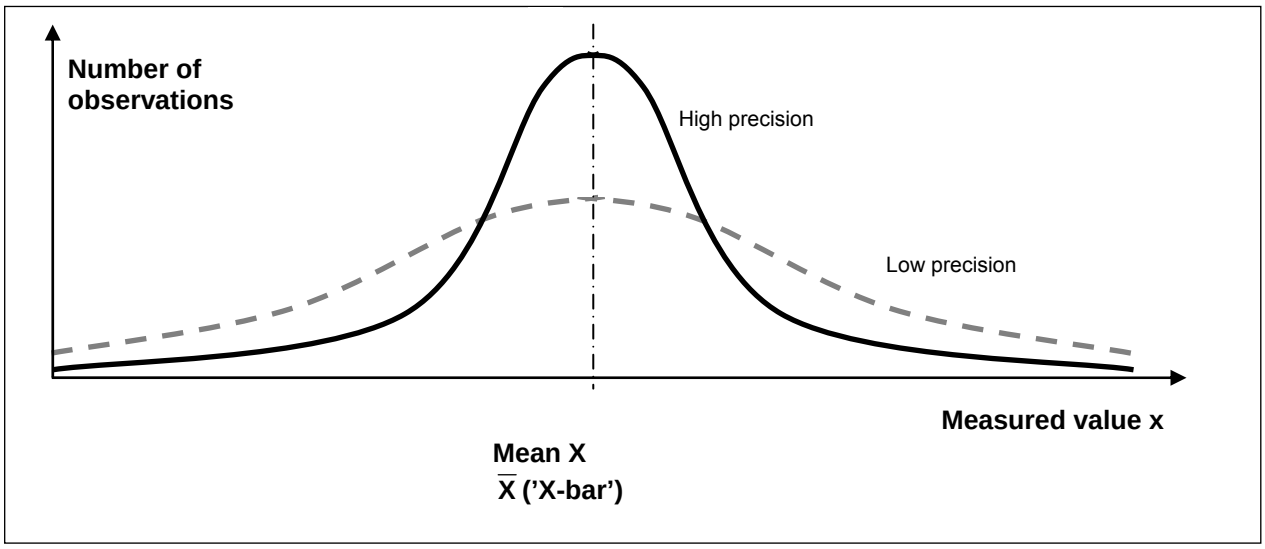


Figure 1 Two normal distributions

11.1 Principal definitions

Table 1 shows the following parameters that define a normal distribution:

Symbol	Meaning
x_i	Individual measurement (lower case x)
n	Number of individual measurements in a group
i	Index digit of a group
$\overline{X}$ X-bar	Mean value for a group (upper case X)
σ_x	Standard deviation (average uncertainty) in a series of x
$\sigma_{\overline{X}}$	Standard deviation of a group mean an X-bar

Table 1 Normal distribution parameters

The arithmetical mean value of a group of individual measurements $x_1, x_2, x_3, \ldots, x_n$ is hereafter referred to as group mean or X-bar and is defined by Equation 1:

$$\overline{X} = \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$$

Equation 1 X-bar

The geometrical mean (always a positive number) of individual deviations from a group average is given by the standard deviation for that group. It is defined by Equation 2:

$$\sigma_x = \sqrt{\frac{(x_1 - \overline{X})^2 + (x_2 - \overline{X})^2 + (x_3 - \overline{X})^2 + \ldots + (x_n - \overline{X})^2}{n - 1}}$$

Equation 2 Standard deviation

As the number of observations is increased for a mean, its uncertainty is decreased. The meaning of standard deviation for an X-bar refers how well determined that X-bar is. This is defined by Equation 3:

$$\sigma_{\overline{X}} = \frac{\sigma_x}{\sqrt{n}}$$

Equation 3 Standard deviation of a mean

The statistics enables us forecast to reproducibility. The integral value of the normal distribution (not defined in this manual) equals the probability of making future observations in any interval of x.

The normal distribution is defined for all x, but within the context of Process Variation we only consider a finite interval of x from −3σ to +3σ centered on the mean. It is hereafter symbolized by 6σ and referred to as Six-Sigma since it spans the interval of six sigma x.

The probability of making future tightening operations within the interval from −3σ to +3σ is 99.73 %. Figure 2 illustrates that and other intervals:

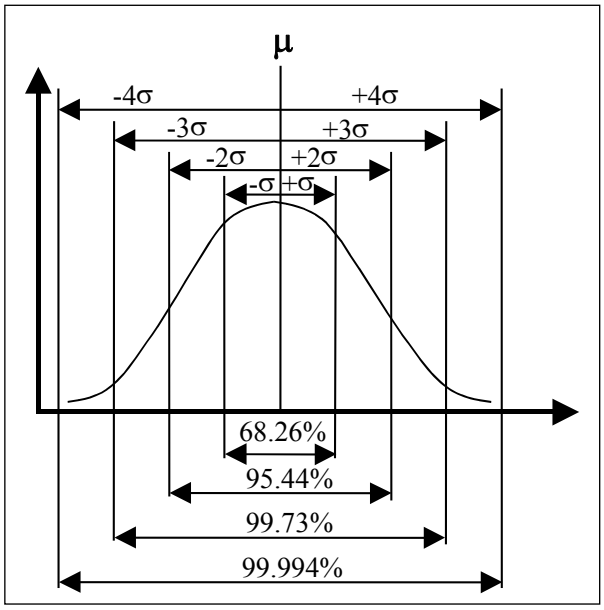


Figure 2 Sigma and the normal distribution

11.2 Control charts

The calculation procedures (algorithms) used in Statistical Process Control (SPC) and Measurement System Analysis (MSA) are designed to spot deviations from the normal distribution.

An important tool for statistical process operations is the control chart. The idea is to control industrial processes by measuring one or several parameters that indicate the quality of the process outcome.

If the process is undisturbed, the variations will follow the normal distribution due to inevitable randomness. If extra variations occur, it indicates a problem in the industrial process.

Trends can also be detected in a control chart. For example, several X-bar points on the same side of the centre line may indicate tool wear.

Symbol	Meaning
N	Number of individual measurements in the complete set (all groups)
n	Group size, number of individual measurements in group
P	Number of groups P=N/n, disregard remainder unless for calculating Centre Line
$\overline{X}$	X-bar; mean of a group of individual measurements (upper case X)
j	Index digit of a series of groups
$\overline{\overline{X}}$	Centre Line, mean value of all N samples (Equation 7)
R	Range; difference between maximum and minimum x_i in a group
$\overline{R}$	R-bar; mean of a series of ranges

Table 2 R and X-bar control chart parameters

11.2.1 Control charts example

Two common control charts are:

- Range (R) chart, for examining the variation of a process
- Group average (X-bar) chart, for examining the level of a process

All processes have an inherent and unavoidable randomness. We therefore expect measurements to be distributed as the normal distribution predicts if both process and measuring is sound.

Assume, for example, a process with a target value of 75 for a parameter. Figure 3 shows an example plot of N=100 measurements. This type of plot offers very little conclusive information.

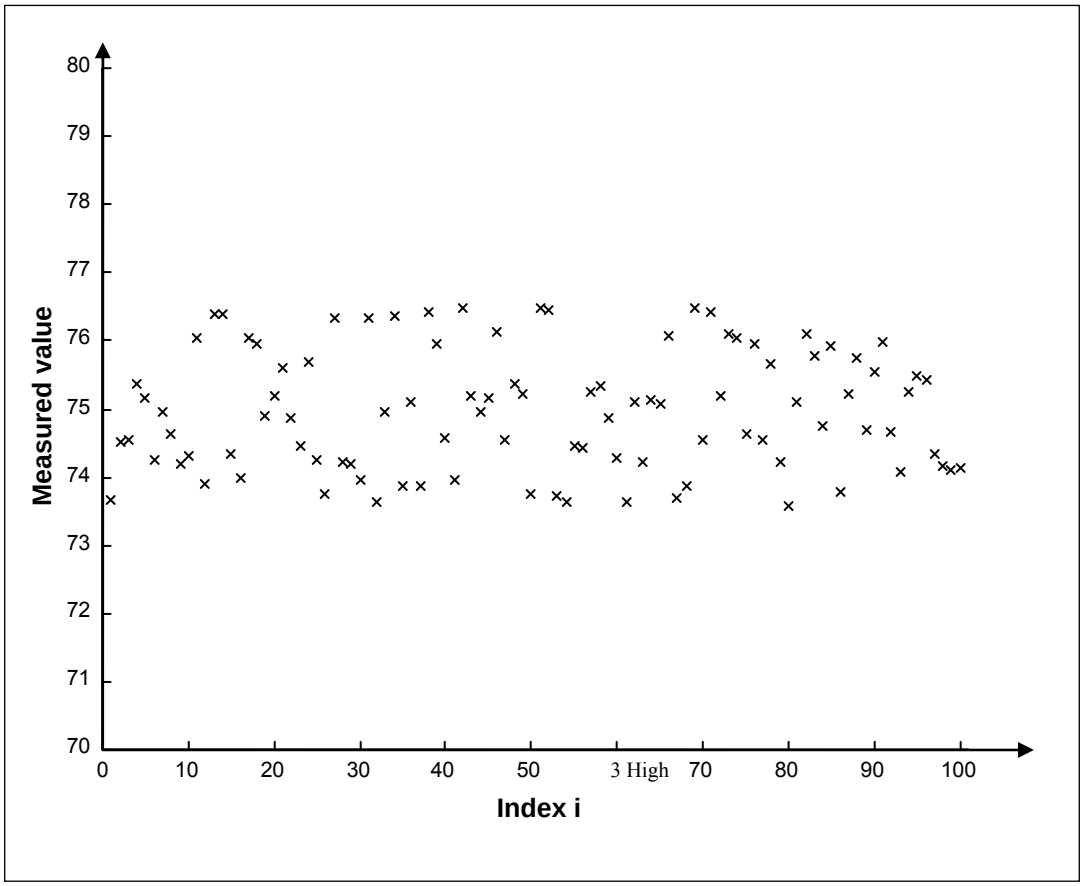


Figure 3 N=100 individual measurements of target value 75

Individual measurements can be divided into groups and the absolute spread in each group can be calculated and referred to as Range. The Range chart is used for examining the variation in a set of measurements. The acceptable interval for Range is defined by Equation 5 and Equation 6, its coefficients D_3 and D_4 are found in section 11.2.2.

$$\overline{R} = \frac{R_1 + R_2 + R_3 + ... + R_P}{P}$$

Equation 4 Average range

$$UCL_R = D_4\overline{R}$$

Equation 5 Upper Control Limit for Ranges

$$LCL_{\overline{R}} = D_3\overline{R}$$

Equation 6 Lower Control Limit for Ranges

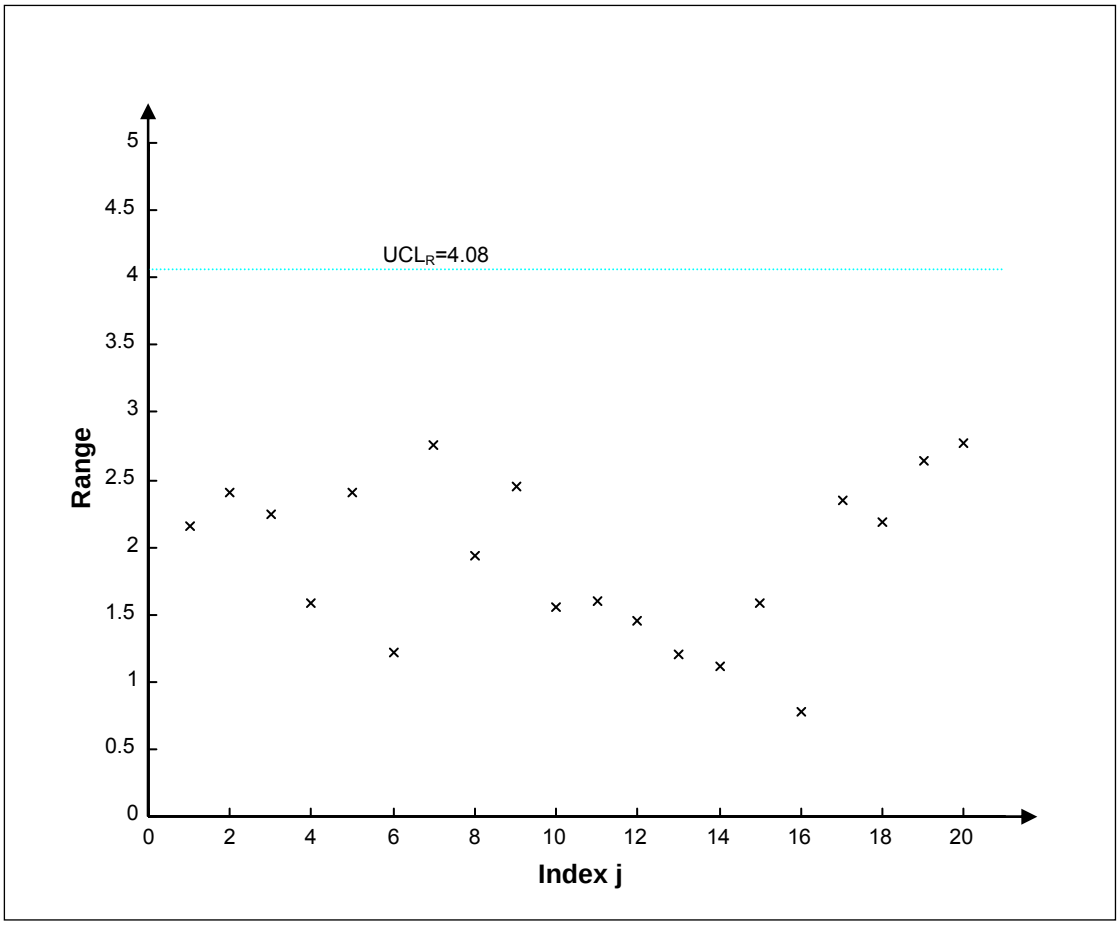


Figure 4 Range chart, twenty groups

If Ranges fall outside the control limits, the process should be investigated further. For further information, please contact your local Atlas Copco representative.

Observe that in Figure 5 some individual measurements fall outside the control interval for group averages. This may not be a problem since the limits are designed for averages, not individual measurements. The boundaries are superimposed in Figure 5 to emphasize this point.

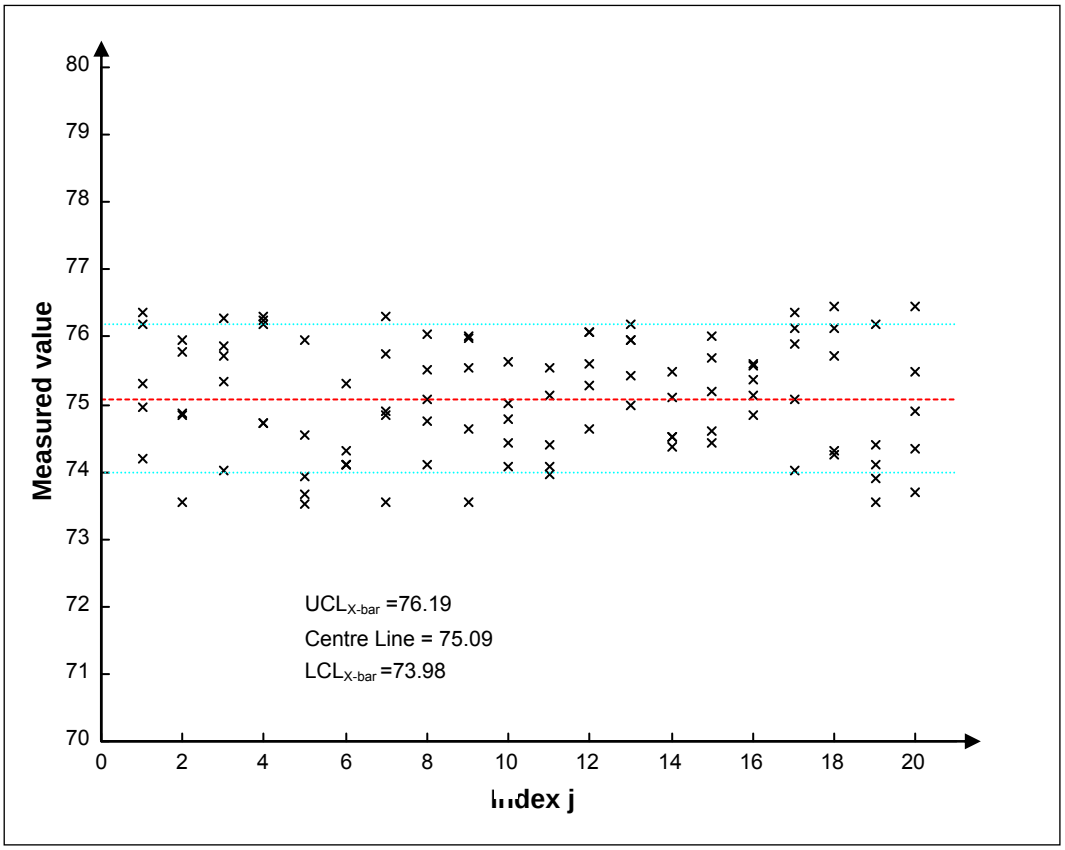


Figure 5 Individual measurements in groups, N=100 and n=5, X-bar control limits

$$\overline{\overline{X}} = \frac{x_1 + x_2 + x_3 + \ldots + x_N}{N}$$

Equation 7 Centre Line

$$UCL_{\overline{X}} = \overline{\overline{X}} + A_2\overline{R}$$

Equation 8 Upper Control Limit for X-bars

$$LCL_{\overline{X}} = \overline{\overline{X}} - A_2\overline{R}$$

Equation 9 Lower Control Limit for the X-bar chart

The coefficient A_2 is found in section 11.2.2.

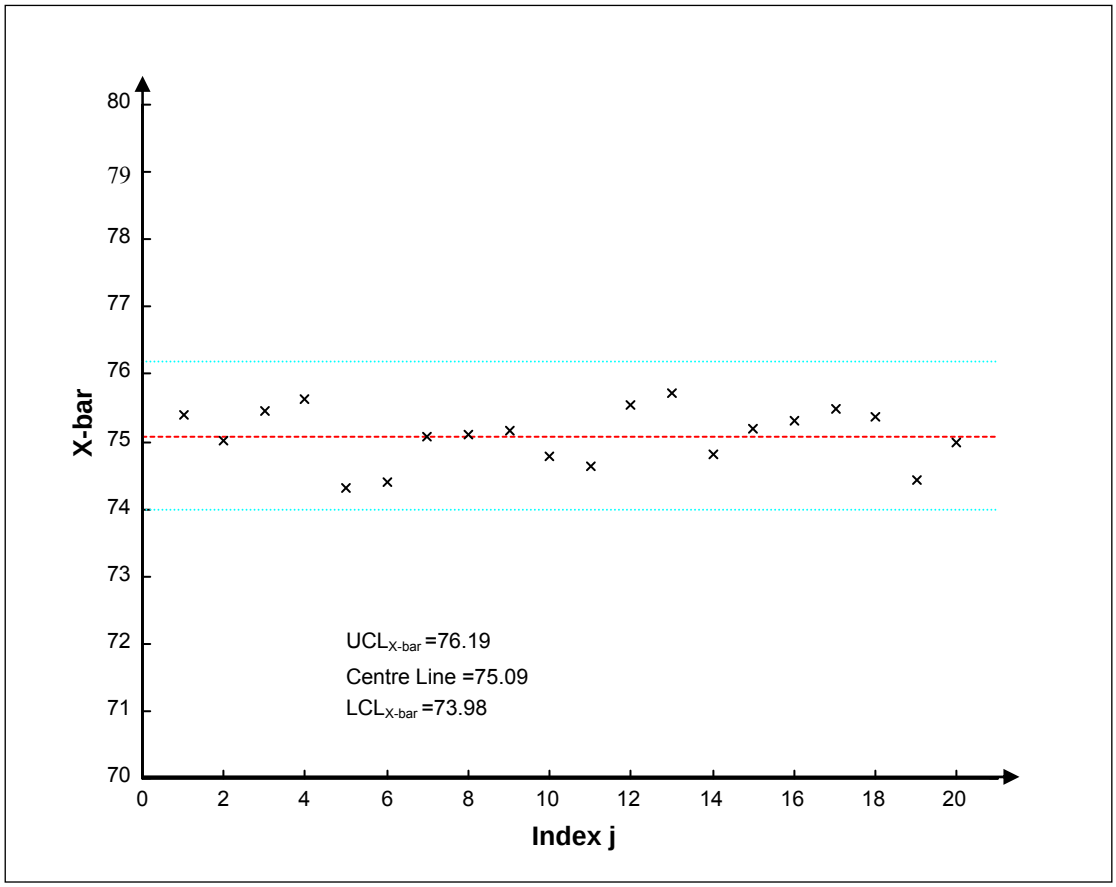


Figure 6 X-bar control chart

If X-bars fall outside the control limits, the process should be investigated further. For further information, please contact your local Atlas Copco representative.

Individual observations outside the control interval may not indicate a problem.

Do not mistake control interval for tolerance.

The tolerance limits are based on the feasibility of the manufactured part, while the control limits are based on the inevitable randomness scattering data. The control limits need to be tighter than the tolerance limits.

11.2.2 X-bar and Range coefficients table

Table 3 shows coefficients for control charts, used in Control charts equations.

Group size n	Coefficient A2	Coefficient D3	Coefficient D4
2	1.880	0	3.267
3	1.023	0	2.574
4	0.729	0	2.282
5	0.577	0	2.114
6	0.483	0	2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777
11	0.285	0.256	1.744
12	0.266	0.283	1.717
13	0.249	0.307	1.693
14	0.235	0.328	1.672
15	0.223	0.347	1.653
16	0.212	0.363	1.637
17	0.203	0.378	1.622
18	0.194	0.391	1.608
19	0.187	0.403	1.597
20	0.180	0.415	1.585
21	0.173	0.425	1.575
22	0.167	0.434	1.566
23	0.162	0.443	1.557
24	0.157	0.451	1.548
25	0.153	0.459	1.541

Table 3 Coefficients table

11.3 Capability studies

The purpose of capability studies is to indicate how well a process or machine performs within the tolerance limits. As for control charts, the method described below is only applicable to normal distributions.

Most commonly used are the ordinary machine capability index, CM, and the modified machine capability index, CMK. CM is defined as the ratio of tolerance interval and the six sigma interval:

$$\mathrm{CM} = \frac{\mathrm{Max\ (tolerance)} - \mathrm{Min\ (tolerance)}}{6\sigma}$$

Equation 10 Machine capability (CM) definition

A common requirement is for the CM-value to exceed 1.33. This indicates that six times the standard deviation covers no more than 75% of the tolerance interval.

However, this index does not ensure that the distribution is centered in the middle of the tolerance interval. The process may still perform outside of the tolerance interval, even if the scatter is small.

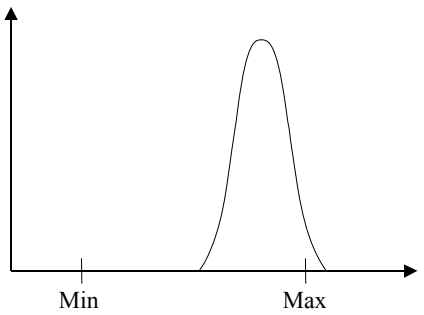


Figure 7 High CM, badly centred process

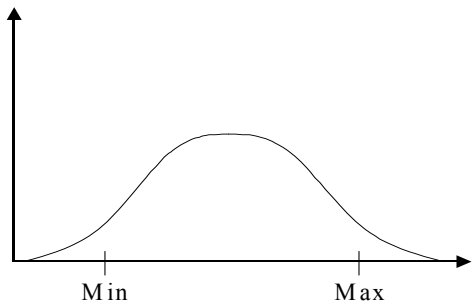


Figure 8 Low CM, well centred process

The modified process capability index takes into account both setting and spread of data. CMK is defined by Equation 11:

$$\text{Minimum of } \frac{\mathrm{Max(tolerance)} - \overline{\mathrm{X}}}{3\sigma} \quad \text{or} \quad \frac{\overline{\mathrm{X}} - \mathrm{Min(tolerance)}}{3\sigma}$$

Equation 11 Modified Machine Capability (CMK) definition

The most common CMK requirement is at least 1.33. Some manufacturers require CMK of 1.5 or more.

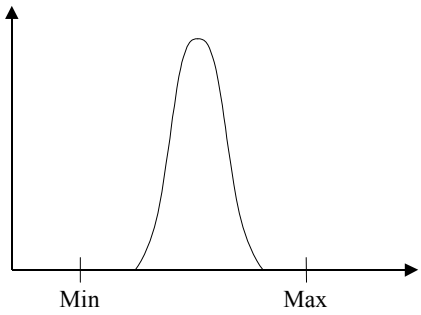


Figure 9 High CM and CMK

11.4 ISO 5393 calculations

The parameters presented during an ISO5393 calibration are calculated as follows.

The combined mean torque $\overline{T}_{comb}$ is calculated as

$$\overline{T}_{comb} = \frac{\text{higher of}(\text{a},\text{b}) + \text{lower of }(\text{c},\text{d})}{2}$$

where

$$a = \overline{T}_H + 3\sigma_H$$
$$b = \overline{T}_L + 3\sigma_L$$
$$c = \overline{T}_H - 3\sigma_H$$
$$d = \overline{T}_L - 3\sigma_L$$

and $\overline{T}_H$ is the mean torque on the high torque rate joint, $\overline{T}_L$ is the mean torque on the low torque rate joint, $\pm 3\sigma_H$ and $\pm 3\sigma_L$ is the 6-sigma multiple limits for the hard and soft torque joints respectively.

The mean shift is calculated as $\overline{T}_H - \overline{T}_L$

The combined torque scatter ΔT_{Comb} is calculated as

$$\Delta T_{comb} = \text{higher of}(a,b) - \text{lower of}(c,d)$$

12 Technical specifications

12.1 Dimensions and weights

Depth	Width	Height	Weight
285 mm	260 mm	77 mm	1.15 kg (including the battery)

12.2 Electrical

Operating voltage: 115 or 230 VAC 50/60 Hz

12.3 Battery

	ACTA 3000	ACTA 4000
Operating time	3,5 hours	7 hours
Charging time	Approximately 3 hours (First time 12 hours)	Approximately 3 hours (First time 12 hours)

The battery is charged by connecting an AC power supply to ACTA 4000.

When using a new ACTA for the first time or after changing the battery, a full charge/discharge cycle is needed for ACTA to store the charge/discharge characteristics of the battery. Charge the battery for 12 hours and then use your ACTA running on battery power until it is out of power.

12.4 Connectors

See sections Back panel connectors, ACTA 4000, and Back panel connectors, ACTA 3000 for a list of all back panel connectors.

12.4.1 Transducer Pin Description

Pin	Description	Pin	Description
A	Excitation, +5VDC	L	-
B	Excitation, -5VDC	M	-
C	+ Signal	N	Gnd
D	- Signal	P	Gnd Angle encoder & transducer memory
E	Shield	R	+5VDC to angle encoder
F	Angle encoder cw trail	S	Yellow LEDs
G	Clock signal for transducer memory	T	+8V To transducer memory
H	Angle encoder cw lead	U	Green LEDs
J	Data signal for transducer memory	V	Red LEDs

12.4.2 Bar Code Reader

A Bar Code Reader (BCD) is used to select tools in the database or set the sequence number. A tool message from the BCD equivalent to a Tool ID in the database, ACTA selects that tool.

Message layout tool ID:

STX	?	?	Tool ID	ETX

A sequence number message from the BCD sets the sequence number to the code starting in position ”Bar-code position” with the length ”Bar-code length”. The ”Bar-code position” and ”Bar-code length” are configuration parameters. Use the ”Configuration” menu to set these parameters.

Message layout sequence number:

STX	Sequence no.	ETX

Barcode reader setup

Baud rate	9600
Parity	None
# of stopbits	1
# of databits	8
Flowcontrol	None
Stop character	STX .... ETX
ACK / NAK	On
Xon/Xoff	Off
RTS/CTS	Off

12.5 Default Setups

12.5.1 ACTA

Item	Set-up
Torque unit	Nm
Pulse unit	Number of
Language	English
Backlight	On
Buzzer	Off
Date/time	Current
Routing	Off
New sequence no.	Off
Printer protocol	PCL3 (only ACTA 3000)
Paper size	A4
Color	Off
Baud rate	115200 (not possible to change)
Flow control	Xon/Xoff
User	----
Torque value	Four digits
Bar-code position	1
Bar-code length	8

12.5.2 Q-prog

This setup is obtained when carrying out quick programming choosing direct driven, pulse, wrench or click wrench.

	Direct driven	Pulse	Wrench	Click Wrench
Target torque	0.75 * TCT * TTS	0.75 * TCT * TTS	0.75 * TCT * TTS	0.75 * TCT * TTS
Calibration torque	0.75 * TCT * TTS	0.75 * TCT * TTS	0.75 * TCT * TTS	0.75 * TCT * TTS
Parameter set	0	0	0	0
Controller	None	None	None	None
Communication	Manual input	Manual input	Manual input	Manual input
Cell ID	0	0	0	0
Channel	1	1	1	1
Model	Tensor S	Tensor S	Tensor S	Tensor S
Filter frequency	500 Hz	1500 Hz	125 Hz	1000 Hz

Rotation direction	CW	CW	CW	CW
Measure startegy	Peak	Peak	Peak or Static installed torque.	Break away
Cycle start	0.05 * TCT	0.05 * TCT	0.05 * TCT	0.05 * TCT
Cycle complete	0.10 * TCT	0.10 * TCT	0.10 * TCT	0.10 * TCT
Start angle	0.12 * TCT	0.12 * TCT	0.12 * TCT	0.12 * TCT
Angle complete	Peak torque	Peak torque	Peak torque	Peak torque
Measure delay time	0 ms	0 ms	0 ms	0 ms
Reset time	0 ms	0 ms	0 ms	0 ms
End time	400 ms	400 ms	400 ms	400 ms
Slip torque1	0.1 Nm	0.1 Nm	0.1 Nm	0.04 * TCT
Batch size	0	0	0	0
Subgroup size	5	5	5	5
Subgroup frequency	1	1	1	1
Batch result	Off	Off	Off	Off
Torque min	0.05 * TCT	0.05 * TCT	0.05 * TCT	0.05 * TCT
Torque max	TCT * TTS	TCT * TTS	TCT * TTS	TCT * TTS
Torque LCLx	-9999.0	-9999.0	-9999.0	-9999.0
Torque UCLx	9999.0	9999.0	9999.0	9999.0
Torque LCLr	0.0	0.0	0.0	0.0
Torque UCLr	9999.0	9999.0	9999.0	9999.0
Torque CM >	0.0	0.0	0.0	0.0
Torque CMK >	0.0	0.0	0.0	0.0
Torque CAM >	0.0	0.0	0.0	0.0
Torque diff % <	9999.0	9999.0	9999.0	9999.0
Angle min	0.0	0.0	0.0	0.0
Angle max	9999.0	9999.0	9999.0	9999.0
Angle LCLx	-9999.0	-9999.0	-9999.0	-9999.0
Angle UCLx	9999.0	9999.0	9999.0	9999.0
Angle LCLr	0.0	0.0	0.0	0.0
Angle UCLr	9999.0	9999.0	9999.0	9999.0
Angle CM >	0.0	0.0	0.0	0.0
Angle CMK >	0.0	0.0	0.0	0.0
Angle CAM >	0.0	0.0	0.0	0.0
Angle diff % <	9999.0	9999.0	9999.0	9999.0
No. of pulses min	0	0	0	0
No. of pulses max	9999	9999	9999	9999

[1] *Not used for direct driven tool.*

Parameter 1	Torque	Torque	Torque	Torque
Statistical parameter 1	Mean, σ	Mean, σ	Mean, σ	Mean, σ
Torque units	Torque units set by Config.	Torque units set by Config.	Torque units set by Config.	Torque units set by Config.
Pulse units	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.
Parameter 2	None (If transducer has an angle encoder: Angle)	No. of pulses	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)
Statistical parameter 2	None (If transducer has an angle encoder: Mean, σ)	Mean, σ	None (If transducer has an angle encoder: Mean, σ)	None (If transducer has an angle encoder: Mean, σ)
Comments row 1				
Comments row 2				

TCT = Transducer Calibration Torque

TTS = Transducer Torque Span

12.5.3 Synchronize

These setups is available in Q-prog synchronize. F2000/PF2000 is only available in ACTA 3000.

Q.prog selection	No controller	Other controller	F2000/PF2000 Manual input	F2000/PF2000 RS232	DS/DL Manual input
Target torque	Depending on selections	0.75 * TCT * TTS	0.75 * TCT * TTS	Read from controller	0.75 * TCT * TTS
Calibration torque	0.75 * TCT * TTS	Depending on selections	0.75 * TCT * TTS	Read from controller	0.75 * TCT * TTS
Parameter set	0	0	0	Read from controller	0
Controller	None	Other controller	F2000/PF2000	F2000/PF2000	DS/DL
Communication	Manual input	Manual input	Manual input	RS232	Manual input
Cell ID	0	0	0	Depending on selections	0
Channel	1	1	1	1	1
Model	None	None	Tensor S	Tensor S	Tensor S
Filter frequency	Depending on selections	Depending on selections	500 Hz	500 Hz	500 Hz
Rotation direction	CW	CW	CW	CW	CW
Measure strategy	Depending on selections	Peak	Peak	Peak	Peak
Cycle start	0.05 * TCT	0.05 * TCT	0.05 * TCT	Read from controller	0.05 * TCT
Cycle complete	0.10 * TCT	0.10 * TCT	0.10 * TCT	Read from controller	0.10 * TCT
Start angle	0.12 * TCT	0.12 * TCT	0.12 * TCT	Read from controller	0.12 * TCT

Q.prog selection	No controller	Other controller	F2000/PF2000 Manual input	F2000/PF2000 RS232	DS/DL Manual input
Angle complete	Peak torque	Peak torque	Peak torque	Read from controller	Peak torque
Measure delay time	0 ms	0 ms	0 ms	Read from controller	0 ms
Reset time	0 ms	0 ms	0 ms	Read from controller	0 ms
End time	400 ms	400 ms	400 ms	Read from controller	400 ms
Slip torque2	0.1 Nm	0.1 Nm	0.1 Nm	0.1 Nm	0.1 Nm
Batch size	0	0	0	Read from controller	0
Subgroup size	5	5	5	Read from controller	5
Subgroup frequency	1	1	1	1	1
Batch result	Off	Off	Off	Read from controller	Off
Torque min	0.05 * TCT	0.05 * TCT	0.05 * TCT	Read from controller	0.05 * TCT
Torque max	TCT * TTS	TCT * TTS	TCT * TTS	Read from controller	TCT * TTS
Torque LCLx	-9999.0	-9999.0	-9999.0	-9999.0	-9999.0
Torque UCLx	9999.0	9999.0	9999.0	9999.0	9999.0
Torque LCLr	0.0	0.0	0.0	0.0	0.0
Torque UCLr	9999.0	9999.0	9999.0	9999.0	9999.0
Torque CM >	0.0	0.0	0.0	0.0	0.0
Torque CMK >	0.0	0.0	0.0	0.0	0.0
Torque CAM >	0.0	0.0	0.0	0.0	0.0
Torque diff % <	9999.0	9999.0	9999.0	9999.0	9999.0
Angle min	0.0	0.0	0.0	Read from controller	0.0
Angle max	9999.0	9999.0	9999.0	Read from controller	9999.0
Angle LCLx	-9999.0	-9999.0	-9999.0	-9999.0	-9999.0
Angle UCLx	9999.0	9999.0	9999.0	9999.0	9999.0
Angle LCLr	0.0	0.0	0.0	0.0	0.0
Angle UCLr	9999.0	9999.0	9999.0	9999.0	9999.0
Angle CM >	0.0	0.0	0.0	0.0	0.0
Angle CMK >	0.0	0.0	0.0	0.0	0.0
Angle CAM >	0.0	0.0	0.0	0.0	0.0
Angle diff % <	9999.0	9999.0	9999.0	9999.0	9999.0
No. of pulses min	0	0	0	0	0
No. of pulses max	9999	9999	9999	9999	9999
Parameter 1	Torque	Torque	Torque	Torque	Torque
Statistical parameter 1	Mean, σ	Contr, Diff	Contr, Diff	Contr, Diff	Mean, σ

[2] *Not used for wrench.*

Q.prog selection	No controller	Other controller	F2000/PF2000 Manual input	F2000/PF2000 RS232	DS/DL Manual input
Torque units	Torque units set by Config.	Torque units set by Config.	Torque units set by Config.	Read from controller	Torque units set by Config.
Pulse units	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.
Parameter 2	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)	None
Statistical parameter 2	None (If transducer has an angle encoder: Mean, σ)	None (If transducer has an angle encoder: Contr, Diff)	None (If transducer has an angle encoder: Contr, Diff)	None (If transducer has an angle encoder: Contr, Diff)	None
Comments row 1					
Comments row 2					

TCT = Transducer Calibration Torque, TTS = Transducer Torque Span

Ethernet selection only available for ACTA 4000.

Q.prog selection	DS/DL RS232	PF3000/PF4000 Manual input	PF3000/PF4000 RS232/Ethernet	Power Macs Manual input	Power Macs RS232/Ethernet
Target torque	Read from controller	0.75 * TCT * TTS	Read from controller	0.75 * TCT * TTS	Read from controller
Calibration torque	0.75 * TCT * TTS	0.75 * TCT * TTS	Read from controller	0.75 * TCT * TTS	Read from controller
Parameter set	Read from controller	0	Read from controller	0	Read from controller
Controller	DS/DL	PF3000/PF4000	PF3000/PF4000	Power Macs	Power Macs
Communication	Infrared or RS232	Manual input	RS232	Manual input	RS232
Cell ID	0	0	0	0	0
Channel	1	1	1	1	1
Model	Tensor S	Tensor S	Read from controller	Tensor S	Tensor S
Filter frequency	500 Hz	500 Hz	500 Hz	500 Hz	500 Hz
Rotation direction	CW	CW	CW	CW	CW
Measure strategy	Peak	Peak	Peak	Peak	Peak
Cycle start	0.05 * TCT	0.05 * TCT	Read from controller	0.05 * TCT	Read from controller
Cycle complete	0.10 * TCT	0.10 * TCT	Read from controller	0.10 * TCT	Read from controller
Start angle	0.12 * TCT	0.12 * TCT	Read from controller	0.12 * TCT	Read from controller

Angle complete	Peak torque	Peak torque	Read from controller	Peak torque	Read from controller
Measure delay time	0 ms	0 ms	0 ms	0 ms	0
Reset time	0 ms	0 ms	0 ms	0 ms	0
End time	400 ms	400 ms	Read from controller	400 ms	Read from controller
Slip torque3	0.1 Nm	0.1 Nm	0.1 Nm	0.1 Nm	0.1 Nm
Batch size	0	0	Read from controller	0	Read from controller
Subgroup size	5	5	Read from controller	5	Read from controller
Subgroup frequency	1	1	1	1	1
Batch result	Off	Off	Off	Off	Off
Torque min	0.05 * TCT	0.05 * TCT	Read from controller	0.05 * TCT	Read from controller
Torque max	TCT * TTS	TCT * TTS	Read from controller	TCT * TTS	Read from controller
Torque LCLx	-9999.0	-9999.0	Read from controller	-9999.0	Read from controller
Torque UCLx	9999.0	9999.0	Read from controller	9999.0	Read from controller
Torque LCLr	0.0	0.0	Read from controller	0.0	Read from controller
Torque UCLr	9999.0	9999.0	9999.0	9999.0	9999.0
Torque CM >	0.0	0.0	0.0	0.0	0.0
Torque CMK >	0.0	0.0	0.0	0.0	0.0
Torque CAM >	0.0	0.0	0.0	0.0	0.0
Torque diff % <	9999.0	9999.0	9999.0	9999.0	9999.0
Angle min	0.0	0.0	Read from controller	0.0	Read from controller
Angle max	9999.0	9999.0	Read from controller	9999.0	Read from controller
Angle LCLx	-9999.0	-9999.0	Read from controller	-9999.0	Read from controller
Angle UCLx	9999.0	9999.0	Read from controller	9999.0	Read from controller
Angle LCLr	0.0	0.0	Read from controller	0.0	Read from controller
Angle UCLr	9999.0	9999.0	Read from controller	9999.0	Read from controller

[3] *Not used for wrench.*

Angle CM >	0.0	0.0	0.0	0.0	0.0
Angle CMK >	0.0	0.0	0.0	0.0	0.0
Angle CAM >	0.0	0.0	0.0	0.0	0.0
Angle diff % <	9999.0	9999.0	9999.0	9999.0	9999.0
No. of pulses min	0	0	0	0	0
No. of pulses max	9999	9999	9999	9999	9999
Parameter 1	Torque	Torque	Torque	Torque	Torque
Statistical parameter 1	Mean, σ	Contr, Diff	Contr, Diff	Contr, Diff	Contr, Diff
Torque units	Read from controller	Torque units set by Config.	Read from controller	Torque units set by Config.	Read from controller
Pulse units	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.	Pulse units set by Config.
Parameter 2	None	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)	None (If transducer has an angle encoder: Angle)
Statistical parameter 2	None	None (If transducer has an angle encoder: Contr, Diff)	None (If transducer has an angle encoder: Contr, Diff)	None (If transducer has an angle encoder: Contr, Diff)	None (If transducer has an angle encoder: Contr, Diff)
Comments row 1					
Comments row 2					

TCT = Transducer Calibration Torque

TTS = Transducer Torque Span

13 Maintenance

13.1 Cleaning

Before cleaning your ACTA always shut it off and disconnect it from the external power supply.

The ACTA should be cleaned with a moist cloth. Use water and a light soap solution. Wipe dry. Do not use any solutions containing oil and silicone or other solutions that are harmful to plastics.

13.2 Service & Calibration

The ACTA does not contain any serviceable items. Never attempt to open the unit. Atlas Copco recommends that you calibrate your ACTA once a year. For calibration, please contact your Atlas Copco service representative.

13.3 Software Upgrade

To upgrade the software in your ACTA, please contact your local Atlas Copco service representative.

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