

UNIVERSAL TORQUE SCREWDRIVER CALIBRATION MACHINE



User Manual

USER MANUAL

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Advanced Witness Systems Ltd

Universal Torque Screwdriver
Calibration Machine

Model 2040



AWS

Advanced Witness Systems Ltd.

Torque Measurement & Calibration

VERSION 2.1

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Introduction

The Universal Torque Screwdriver Calibration Machine (UTSCM) from Advanced Witness Systems Ltd is a fully integrated system to calibrate torque screwdrivers and torque watches from 0.1N·m – 30N·m to BS EN ISO 6789:2017.

The AWS UTSCM, with its internal computer, self-tuning firmware, and feedback control, exerts precise applied torque, meeting the exacting torque and timing requirements of the BS EN ISO 6789:2017 standard.

It is a unique machine in these aspects.

A full colour display informs the user of operation information and sequence of calibration. Soft keys provide the means to set the parameters for calibrating a particular type of torque screwdriver.

Digital, bar graph colour display with limit indicators assist the user in performing either calibration or conformity requirements. 2 rotary switches allow selection of the type of screwdriver, and the selection of 1 of 3 transducers required. A pendant control provides easy automatic or manual control of the calibration machine.

The AWS UTSCM comes with 3 common types of screwdriver handle adapters, for applying torque to the screwdriver handle, however there are numerous versions and styles of torque screwdrivers. Additional optional adapters are available to meet your needs.

A RS232 output facilitates the recording of torque values via software such as our ADMS Kepler 4 software enabling fast, accurate calibrations of torque tools to standards such as BS EN ISO 6789:2017. Kepler 4 includes the ability to produce bespoke certificates, labels, reports, to manage and review the history of calibrations.

The AWS UTSCM uses the AWS Intelligent Inline Torque Transducers (IITT). Other manufacturer's strain-gauge type torque transducers can be accommodated using the AWS Intelligent Instrumented Transducer Cables (IITC).

Dial-type screwdriver's scales, which can be more difficult to read whilst in the AWS UTSCM, can be viewed using our optional flexible probe camera and PC software.

Conforms to UKCA and CE regulations.



Features

- Single push button operation requiring minimal operator effort and training.
- Pre-readings learning cycle, learns and stores the timing to reach full torque for each individual cam.
- Easy selection of screwdriver types by rotary switch.
- Up to 3 AWS intelligent transducers (IITT) or AWS instrumentation cables (IITC) can be powered simultaneously to maintain thermal stability, individually selected by rotary switch.
- Clockwise and Counter-Clockwise operation.
- Multiple sequential loading operations; 1, 3, 5, or 10; dependant on standard requirements. (For more information on the required number of operations, see BS EN ISO 6789:2017 Part 1, 6.5.1, and Part 2, 6.2.2, 6.2.3.2 & 6.2.3.3).
- Overload detection to stop the machine if the user selected limit is reached, set to up to a maximum of 110% of the transducers full scale deflection.
- Additional torque screwdriver handle adaptors available on request.
- Optional flexible probe camera available for easier reading of dial type screwdrivers.

Safety

- It is recommended users should have read all of this User Manual before operation of the machine.
- Do not place liquids on or near the machine and its control unit.
- Do not leave this machine unattended during operation.
- Do not remove top cover of machine while machine is powered on.
- Do not disconnect cables while the machine is powered on.
- Exercise caution when lifting the machine, it has a high centre of gravity and may tip.

Parts List

- 1x Universal Torque Screwdriver Calibration Machine (UTSCM).



- 1x UTSCM Control Unit.



- 3x Torque Screwdriver Handle Adaptors, to suit fluted, straight sided handles.



- 1x CM163 Precision Torque Adapter 3/8" to 1/4".



- 1x UTSCM Handheld pendant controller.



- 1-3x AWS Intelligent Inline Torque Transducers (IITT) (with standard transducer cables) or Intelligent Instrumented Transducer Cables (IITC).



- 2 or 4 transducer support blocks depending on the size(s) of transducers required.



- (Optional) Additional bespoke and adjustable diameter screwdriver handle adaptors, for tapered or knurled handles available on request.



- (Optional) Flexible probe camera



USB Camera



Standalone Camera

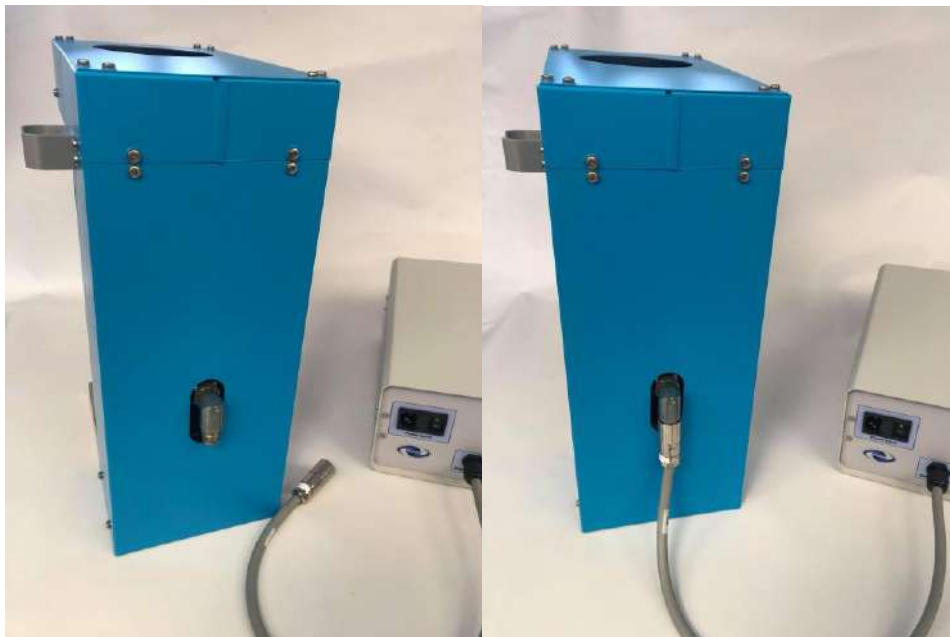
Assembly

Assemble the UTSCM according to the following instructions:

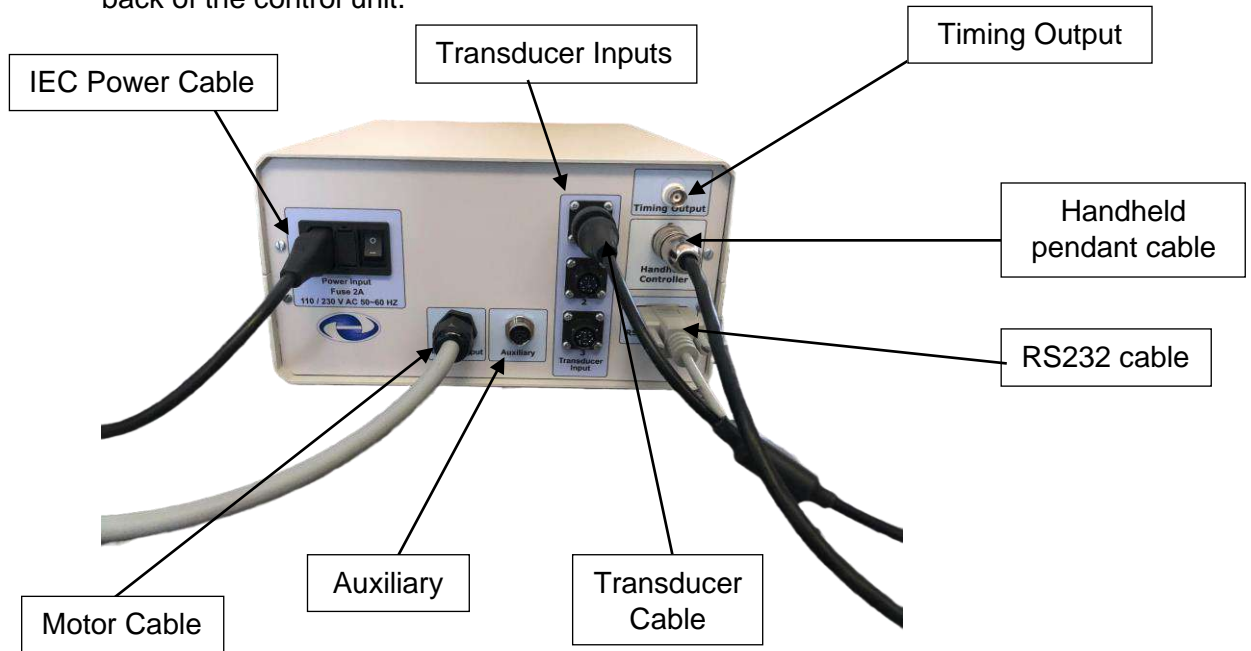
1. Place the UTSCM on a sturdy and level bench next to the controller.



2. Connect the motor cable to the socket on the rear of the machine.



3. Connect the handheld pendant, transducers, RS232 and power IEC cables to the back of the control unit.



4. Connect the RS232 cable to a PC running Kepler 4 (If required). RS232 connection information is on Page 28. For further information on the setup of automatic data entry in Kepler 4 please see the Kepler 4 manual.

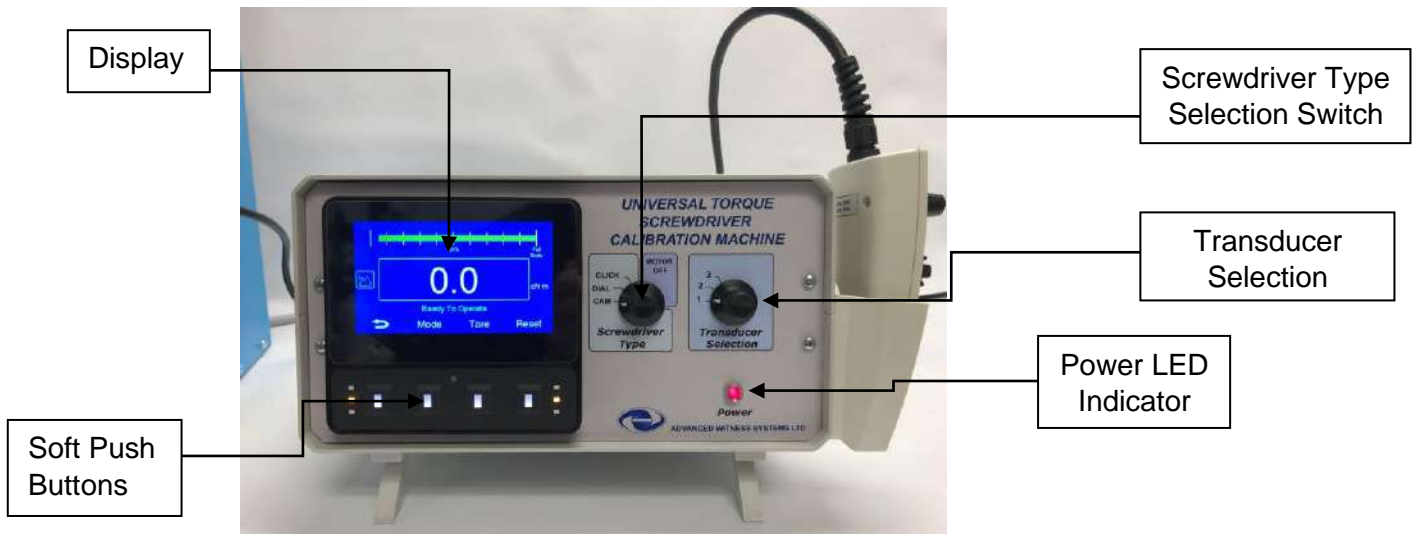
5. Optional probe camera only – Clip the probe camera into the mount on the side of the machine and plug the USB into a PC. For further setup instructions, see Page 28.



USB Camera

Standalone Camera

Front Panel Controls



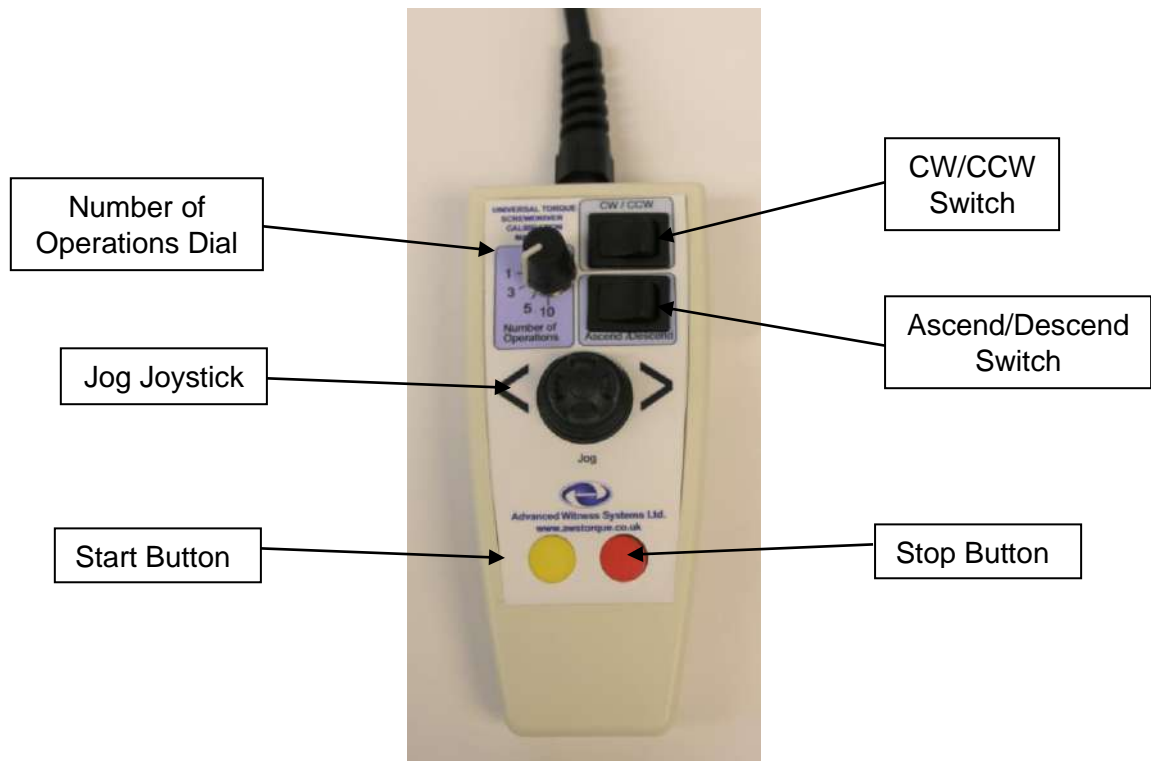
Screwdriver Type Rotary Switch: Select screwdriver type or turn off motor:

- **Cam type screwdrivers:** Screwdrivers with multiple cams that do not require reversing to zero after torque is applied.
- **Dial type screwdrivers:** Screwdrivers with an indicating dial or display.
- **Click type screwdrivers:** Screwdrivers with single cams that do require reversing to zero after torque is applied.
- **Motor Off:** Turns off motor for manual alignment of the screwdriver drive with the transducer.

See Page 28 for a flow diagram to assist with identifying the Type of screwdriver.

Transducer Selection Rotary Switch: Select required transducer from up to 3 Intelligent Inline Torque Transducers (IITT) or Intelligent Instrumented Torque Transducer Cables (IITC) attached to the machine.

Handheld Pendant Controls



Number of Operations Dial: Used to select the number of sequential loading operations; 1, 3, 5, or 10; dependant on standard requirements. (For more information on the required number of operations, see BS EN ISO 6789:2017 Part 1, 6.5.1, and Part 2, 6.2.2, 6.2.3.2 & 6.2.3.3).

Jog Joystick: Used to manually rotate the screwdriver, for aligning the screwdriver drive with the transducer drive, and for precise application of torque to dial-type screwdrivers. Progressive control, greater deflection causes faster rotational velocity.

Start Button: Once the machine is set up, press & hold this button for 0.5s and release to run the machine.

CW/CCW Switch: Changes the direction of torque application.

Ascend/Descend Switch: Used in “Ascend” position for Cam, Click and Dial Type screwdrivers. For Dial Type screwdrivers, “Descend” is used to remove the applied torque, and can be used for Click Types to remove the applied torque.

Stop Button: Stops the machine when running.

Setup









Firstly, turn on the UTSCM using the power switch at the rear of the controller, the red power LED will illuminate, and the display will light up. The display has 4 soft key buttons, the functions of which are dependent on the screen displayed. A summary of the functions are found on Page 14.

After switch on the screen will display the range of the selected transducer attached to the UTSCM. If no transducer is connected, then it will show **“Not Found”** and will not proceed to the next screen. To clear this issue please see troubleshooting on Page 26.



START-UP SCREEN

Soft Key Chart

Soft key Symbol	Effect	Screens where used.
	Accept input/selected item.	Select units, select mode, set limits
	Back to previous screen.	Select units, select mode, 1 st peak auto cancel, set limits, reading
	Increase selected number. Cycles back to zero.	Set limits
	Move right between different mode selections/ units of numbers. Cycles back to first number.	Set limits, select mode, select units
	Move left between different mode selections/ units of numbers.	Select mode, select units
	Cycle through RUN, 1 st PEAK and PEAK.	RUN, 1 st PEAK and PEAK reading
	Tares the reading to zero.	RUN, 1 st PEAK and PEAK reading
	Allows another reading to be taken.	RUN, 1 st PEAK and PEAK reading

Once the transducer range has been displayed, the user is then prompted to select either the previous set-up “**Yes**” or “**No**”.



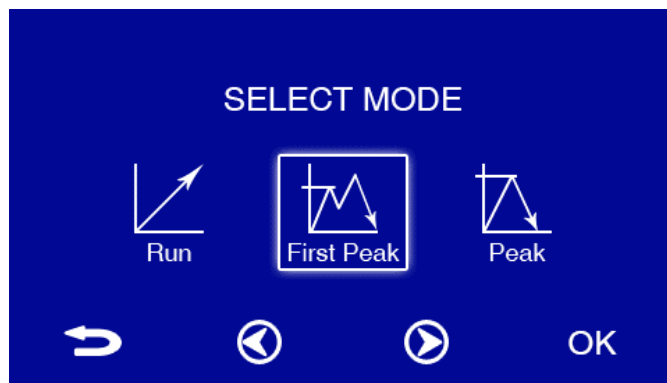
PREVIOUS SET-UP PROMPT

If “**Yes**” is selected the display will use the settings selected at its last power down.

If “**No**” is selected the user will then be prompted to select a Mode.

Modes

The display works in three different modes. The display will show which mode is currently selected by a pictographic graph representing that mode.



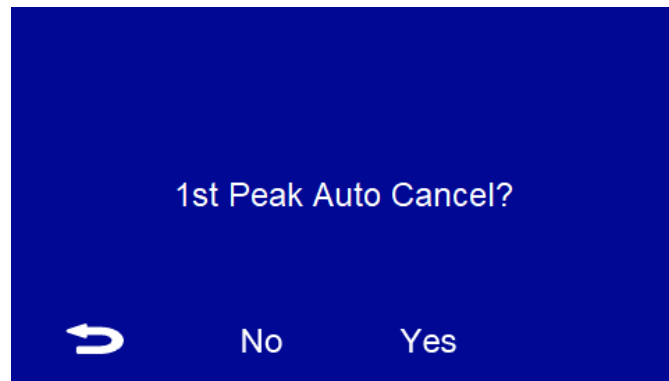
MODE SELECTION

Run: Run mode continually displays the actual torque applied to the transducer. This mode is used for reading torque directly, to calibrate a transducer.

First Peak: This will display the first peak in a torque signal that is detected (above the Lower Limit). This mode is used to check the calibration of click and cam type torque screwdrivers. After a peak in torque signal is detected the displayed torque reading is automatically sent to a PC via RS232. Pressing the “**RESET**” button will reset the memory and the display to zero. If “**1st Peak Auto Cancel**” is selected during setup, the peak reading will be displayed for 3 seconds before being reset. A new first peak cannot be captured until the torque has returned to zero for 2 seconds.

Peak: This will display the maximum torque value that was detected (above the Lower Limit). This mode is used to check the calibration of indicating torque screwdrivers. To send the captured torque reading to a PC via RS232 press “**RESET**” button. This also resets the display to clear the peak. A new peak cannot be captured until the torque has returned to zero for 2 seconds.

If “**First Peak**” is selected the user will then be prompted to select 1st Peak Auto Cancel. Select “**Yes**” for Click or Cam Type Screwdrivers, or “**No**” should you wish to clear the captured peaks manually.

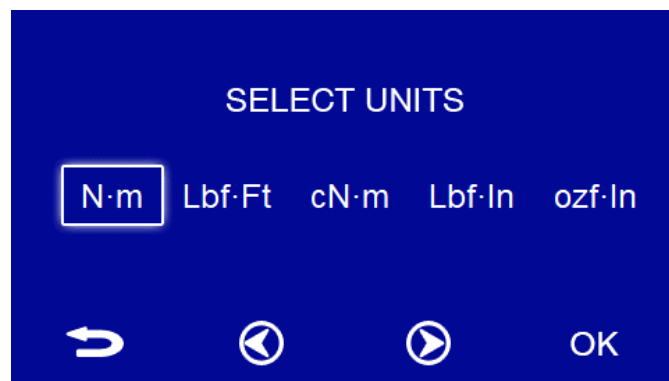


1ST PEAK AUTO CANCEL SELECTION.

The user will then be prompted to set the units of measurement.

Units

The display uses 5 Units of measurement **N.m**, **cN.m**, **Lbf.Ft**, **Lbf.In** and **Ozf.In**. These are selected for the displayed torque value and setting the limits. Selected units can be changed from the main screen by pressing back twice and reselecting a new unit.



UNIT SELECTION.

The user will then be prompted to set the limits.



LIMIT SELECTION.

Limits

Set the “**TARGET TORQUE LIMIT**” to the required setting, see key chart on Page 14 on how to use buttons for limit value setting.



Please note this field is limited to 100% of the transducers full scale torque value or the “Over Range” warning will not allow you to proceed to the next screen.

The transducers also should only be used above 10% of the full scale torque value with the UTSCM.

Set the “**UPPER LIMIT**” to the maximum permissible torque reading. The machine will automatically stop should this limit be reached.

The default value auto populated in this field is 110% of the transducer’s full-scale torque value read from the transducer.

Please note this field is limited to 110% of the transducers full scale torque value and must be above the target torque value or the “Over Range” warning will not allow you to proceed to the next screen.

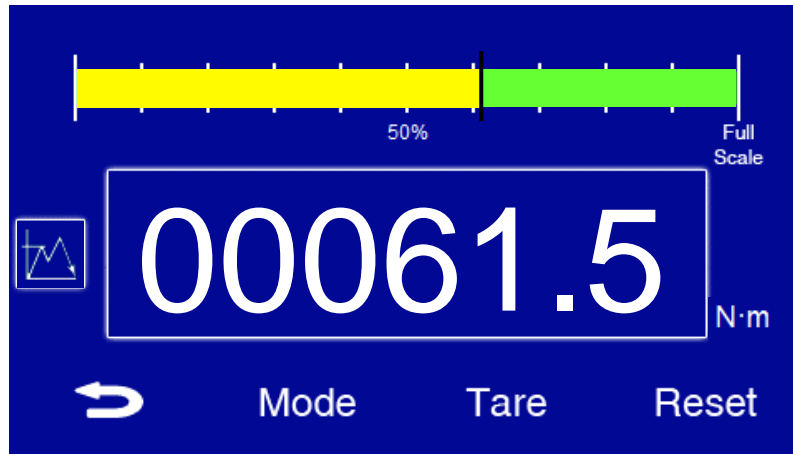
Set the “**LOWER LIMIT**” to the minimum permissible torque reading. The machine will not detect any First Peaks or Peaks below this limit. The default value auto populated in this field is 50% of the set “**TARGET TORQUE LIMIT**”.

When the reading is between the “**LOWER LIMIT**” and “**UPPER LIMIT**” the green LED’s will light up. If the torque reading is at or below the “**LOWER LIMIT**” the amber LED’s will light up. If the torque reading is at or above the “**UPPER LIMIT**” the red LED’s will light up.

Additionally, in Peak and 1st Peak modes the digits on the display will match the colour of the limit indicating LED’s when a peak is detected. Peaks and 1st Peaks are only detected when the value is above the “**LOWER LIMIT**”.

Readings Screen

The yellow ribbon graph at the top of the display shows the percentage of torque applied compared to full scale torque value of the transducer. If the bar is flashing the maximum torque range of the transducer has been exceeded.



READINGS SCREEN

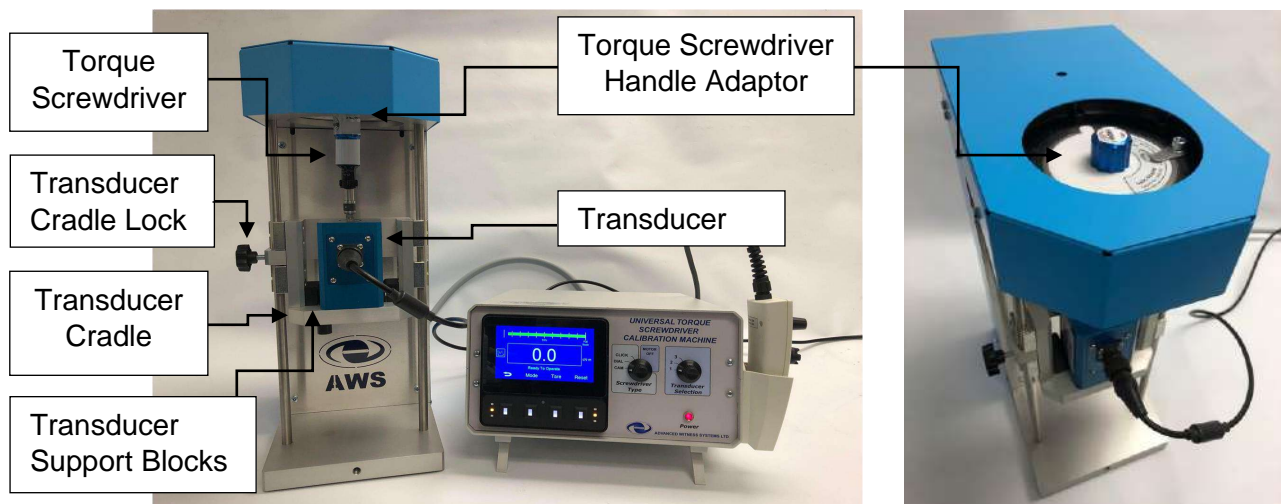
Warning: do not exceed 110% of the MAXIMUM TORQUE RANGE doing so could permanently damage the Transducer and will void its warranty.

Inserting Transducers into UTSCM

1. For transducers with ¼" Male SQ drives, insert the CM163 adapter between the cradle and the transducer. Insert the required transducer with the corresponding size transducer support blocks into the cradle of the UTSCM.
2. Select required transducer using the right-hand rotary switch on the front of the controller.

Inserting Screwdrivers into UTSCM

1. Select screwdriver type using the left-hand rotary switch on the front of the controller. Either "Cam", "Click" or "Dial". Select "Motor Off" if the screwdriver is to be aligned manually.
2. Insert torque screwdriver into the corresponding handle adaptor.
3. Insert the handle adaptor with screwdriver into the torque application pulley. For full engagement this should sit flush with or below the top face of the pulley.
4. If not already free, unlock the transducer cradle by releasing the transducer cradle lock.
5. Raise the cradle with the transducer until the screwdriver fits into the transducer drive. The screwdriver handle can be rotated by either jogging (handheld pendant joystick) or switching the motor off and rotating manually (set Screwdriver Type switch to "Motor Off") to align it with the transducer. Ensure there is no torque on the screwdriver.
6. Lock the height of the transducer cradle using the transducer cradle lock.
7. Once done the machine is ready to use and will look like this.



Please note if the drive has been aligned manually with the motor off, the screwdriver type should be reselected on the front left dial switch.

Operation

The operational procedure to run the UTSCM is dependent on the type of screwdriver being calibrated:

- Cam type screwdrivers: Screwdrivers with multiple cams that do not require reversing to zero after torque is applied. See Page 21.
- Click type screwdrivers: Screwdrivers with single cams that do require reversing to zero after torque is applied. See Page 23.
- Dial type screwdrivers: Screwdrivers with an indicating dial or display. See Page 25.

See Page 28 for a flow diagram to assist with identifying the Type of screwdriver.

Please note if a click type screwdriver is misidentified as a cam type screwdriver it could potentially damage the screwdriver if the machine is run in cam mode. Please identify the type of screwdriver before fitting in the machine.

Machine Operational Messages

There are 4 operational messages shown on the readings screen of the display.

Ready to Learn

Ready to Learn (Orange): The machine is waiting to start a torque learning cycle. This is also displayed if the previous torque learning cycle has failed.

Learning

Learning (Orange): The message displayed while the machine is running during the learning cycle.

Ready to Operate

Ready to Operate (Green): The message displayed on the readings screen after the learning cycle has been completed and is ready to operate.

Running

Running (Red): The message displayed during operation of the machine.

After the selected number of operations have been completed the machine displays “**Ready to Operate**”. To reset to “**Ready to Learn**” either reset the memory by changing the screwdriver type dial to any other position or turn the machine off and on.

During the learning run, and at the end of operations, the UTSCM may reverse to find zero torque when necessary. This is part of the automatic operation of the machine. For more information, please refer to Troubleshooting on Page 26.

Operating Instructions for Cam Type Torque Screwdrivers

1. Select **“Cam”** on the left-hand rotary switch on the front of the controller.
2. When prompted **“Use previous set-up?”**, select **“No”**.
3. When prompted **“SELECT MODE”**, select **“First Peak”**.
4. When prompted **“1st Peak Auto Cancel?”** select **“Yes”**.
5. When prompted **“SELECT UNITS”**, select the correct units for the Torque Screwdriver under test.
6. When prompted **“Set Limits?”**, select **“Yes”**.
7. When prompted **“SET TARGET TORQUE”**, select the correct value. This is the required torque for the setting being tested.
8. When prompted **“SET UPPER LIMIT”**, select a value (this defaults to 110% of the transducer’s full-scale value). When the torque reaches the upper limit, the machine stops to prevent overloading of the transducer.

Please note: Whilst overloading a cam type screwdriver is unlikely, an Upper Limit must be set in case the screwdriver is faulty.

9. When prompted **“SET LOWER LIMIT”**, select a value (this defaults to 50% of the set Target Torque Limit). The machine will not detect any 1st Peaks below this limit.

The machine will now display **“Ready to Learn”**.

10. Tare the display if necessary by pressing **“Tare”**.
11. Select **“Ascend”** on the handheld pendant controller.
12. Select **“CW/CCW”** as appropriate on the handheld pendant controller.
13. The number of operations on the handheld pendant controller do not apply to the learning cycle.
14. When the required settings have been chosen, press and hold the **“Yellow Button”** for 0.5s and release to run the learning cycle.
“Learning” will be shown on the display during this cycle.
15. The learning cycle completes when the machine has learnt the torque curves for each cam position.
The torque will return to zero and **“Ready to Operate”** will be shown in green on the display.
16. Select the required number of operations on the handheld pendant controller: 1, 3, 5 or 10. (For more information on the required number of operations, see BS EN ISO 6789:2017 Part 1, 6.5.1, and Part 2, 6.2.2, 6.2.3.2 & 6.2.3.3).
17. Press and hold the **“Yellow Button”** for 0.5s and release to run the machine for the selected number of operations.

“Running” will be shown on the display during operation.

18. During each operation, when the UTSCM display shows you have reached 80% of the target torque value, the machine will adjust rotational speed to the correct rate to meet the standard (BS EN ISO 6789:2017).
19. When the screwdriver clicks, the machine continues until the screwdriver resets (torque reaches zero). The machine may run again to find zero.
20. The UTSCM will capture the First Peak (indicated in green on the display), and will hold it for 5 seconds, before re-setting (and transmitting it by RS232). The machine will not capture a further peak until the applied torque has returned to zero for 2 seconds. No 1st Peaks will be captured below the Lower Limit.
21. When the number of operations is complete the machine will stop and display “**Ready to Operate**” again.
22. To run again, select the required number of operations on the handheld pendant controller, then press & hold the “**Yellow Button**” for 0.5s and release.

To change the “**Target Torque**”, use the back button to repeat steps 7-10.

Important Note: When disconnecting the screwdriver from the transducer to ascertain reproducibility, or obtaining uncertainty values, **do not operate the Screwdriver** (click over to a different cam), otherwise the learning cycle must be carried out again. Disconnect the Screwdriver from the Transducer, rotate the Screwdriver/Adapters as required, and reconnect the Screwdriver to the Transducer. Ensure that after reconnect, the torque on the display reads zero. If it does not read zero, use the Jog function to remove any residual torque. **Do not tare the display.**

Please refer to Troubleshooting on Page 26 if you have any issues during the learning run or calibration.

Operating Instructions for Click Type Torque Screwdrivers

1. Select “**Click**” on the left-hand rotary switch on the front of the controller.
2. When prompted “**Use previous set-up?**”, select “**No**”.
3. When prompted “**SELECT MODE**”, select “**First Peak**”.
4. When prompted “**1st Peak Auto Cancel?**” select “**Yes**”.
5. When prompted “**SELECT UNITS**”, select the correct units for the Torque Screwdriver under test.
6. When prompted “**Set Limits?**”, select “**Yes**”.
7. When prompted “**SET TARGET TORQUE**”, select the correct value. This is the required torque for the setting being tested.
8. When prompted “**SET UPPER LIMIT**”, select a value (this defaults to 110% of the transducer’s full-scale value). When the torque reaches the upper limit, the machine stops to prevent overloading of the transducer.

Please note applying too much torque could damage a click type torque screwdriver.

9. When prompted “**SET LOWER LIMIT**”, select a value (this defaults to 50% of the set Target Torque Limit). The machine will not detect any 1st Peaks below this limit.

The machine will now display “**Ready to Learn**”.

10. Tare the display if necessary by pressing “**Tare**”.
11. Select “**Ascend**” on the handheld pendant controller.
12. Select “**CW/CCW**” as required on the handheld pendant controller.
13. The number of operations on the handheld pendant controller do not apply to the learning cycle.
14. When the required settings have been chosen, press and hold the “**Yellow Button**” for 0.5s and release to run the learning cycle.
“**Learning**” will be shown on the display during this cycle.
15. When the screwdriver clicks, the machine will stop and reverse automatically until the torque reaches zero, and residual torque has been removed.
16. The learning cycle completes when the machine has learnt the torque curve for the screwdriver.
The torque will return to zero and “**Ready to Operate**” will be shown on the display.
17. Select the required number of operations on the handheld pendant controller: 1, 3, 5, 10. (For more information on the required number of operations, see BS EN ISO 6789:2017 Part 1, 6.5.1, and Part 2, 6.2.2, 6.2.3.2 & 6.2.3.3).

18. Press and hold the **“Yellow Button”** for 0.5s and release to run the machine for the selected number of operations.

“Running” will be shown on the display during operation.

19. During each operation, when the UTSCM display shows you have reached 80% of the target torque value, the machine will adjust rotational speed to the correct rate to meet the standard (BS EN ISO 6789:2017).

20. When the screwdriver clicks, the machine will stop and reverse automatically until the torque reaches zero, and residual torque has been removed. The machine may run again to find zero.

21. The UTSCM will capture the First Peak (indicated in green on the display), and will hold it for 5 seconds, before re-setting (and transmitting it by RS232). The machine will not capture a further peak until the applied torque has returned to zero for 2 seconds. No 1st Peaks will be captured below the Lower Limit.

22. When the number of operations is complete, the machine will stop and show **“Ready to Operate”** again.

23. To run again, select the required number of operations on the handheld pendant controller, then press & hold the **“Yellow Button”** for 0.5s and release.

To change the **“Target Torque”**, use the back button to repeat steps 7-10.

Please refer to Troubleshooting on Page 26 if you have any issues during the learning run or calibration.

Operating Instructions for Dial Type Torque Screwdrivers

1. Set up probe camera if required (See Page 28).
2. Select “**Dial**” on the left-hand rotary switch on the front of the controller.
3. When prompted “**Use previous set-up?**”, select “**No**”.
4. When prompted “**SELECT MODE**”, select “**Peak**”.
5. When prompted “**SELECT UNITS**”, select the correct units for the Torque Screwdriver under test.
6. When prompted “**Set Limits?**”, select “**Yes**”.
7. When prompted “**SET TARGET TORQUE**”, select the correct value. This is the required torque for the setting being tested.
8. When prompted “**SET UPPER LIMIT**”, select a value (this defaults to 110% of the transducer’s full-scale value). When the torque reaches the upper limit, the machine stops to prevent overloading of the transducer.
9. When prompted “**SET LOWER LIMIT**”, select a value (this defaults to 50% of the set Target Torque Limit). The machine will not detect any Peaks below this limit.

The machine will now display “**Ready to Learn**”.

10. Tare the display if necessary by pressing “**Tare**”.
11. Select “**Ascend**” on the handheld pendant controller.
12. Select “**CW/CCW**” as required on the handheld pendant controller.
13. The number of operations on the handheld pendant controller do not apply to Dial-Type screwdrivers.
14. When the required settings have been chosen, press and hold the “**Yellow Button**” for 0.5s and release to run the learning cycle.
“**Learning**” will be shown on the display during this cycle.
15. The learning cycle for dial types learns the angle between 0 and 80% of full torque in order to adjust rotational speed so it takes ~5s to reach 80% for future operations. It then slows down for the last 20%.
16. When the torque screwdriver indicates the target torque value press the “**Red Button**” to stop the machine.

Please note applying too much torque could damage the screwdriver.

17. Select “**Descend**” on the handheld pendant.
18. Press and hold the “**Yellow Button**” for 0.5s and release to return to zero. The machine will return to the same position as when it started.

The machine will show “**Ready to Operate**” again.

19. The UTSCM will capture the Peak (indicated in green on the display) and will hold until manually reset.
20. Press "**Reset**" on the UTSCM to clear the recorded peak value (and transmit it by RS232).
21. Switch the Handheld pendant controller to "**Ascend**".
22. To run again, press and hold the "**Yellow Button**" for 0.5s and release.
"**Running**" will be shown on the display during operation.
23. When the torque screwdriver indicates the target torque value press the "**Red Button**" to stop the machine. If required, the "**Red Button**" can be pressed earlier, and the machine jogged (using the joystick) to the target torque value. If the yellow button is pressed earlier than 80% of the target torque value, the machine will slow down to its final speed, allowing a longer approach to the target torque value. No Peaks will be captured below the Lower Limit.
24. Select "**Descend**" on the handheld pendant.
25. Press and hold the "**Yellow Button**" for 0.5s and release to return to zero. The machine will return to the same position as when it started.
The machine will show "**Ready to Operate**" again.

Repeat steps 21-26 for required number of cycles. (For more information on the required number of operations, see BS EN ISO 6789:2017 Part 1, 6.5.1, and Part 2, 6.2.2, 6.2.3.2 & 6.2.3.3).

To change the "**Target Torque**", use the back button to repeat steps 7-10.

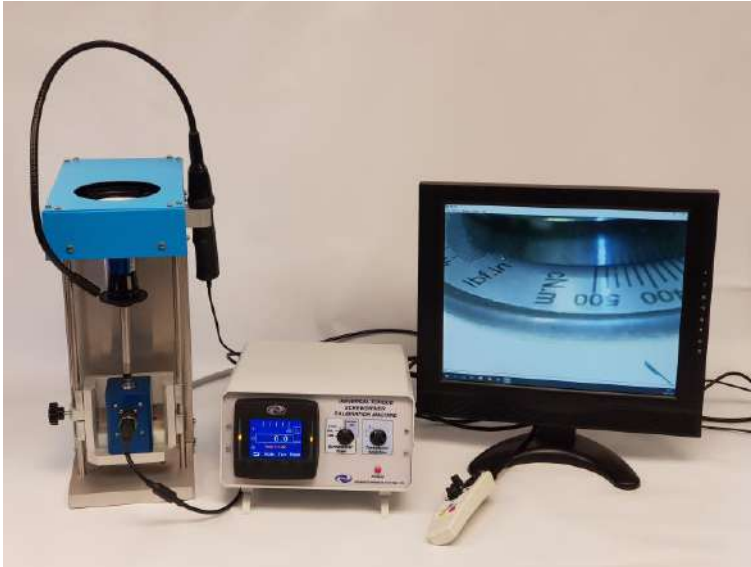
Please refer to Troubleshooting on Page 26 if you have any issues during the learning run or calibration.

Probe Camera Setup

As an optional extra, a probe camera for easier reading of screwdriver digital displays, or scales on dial-type screwdrivers, is available.

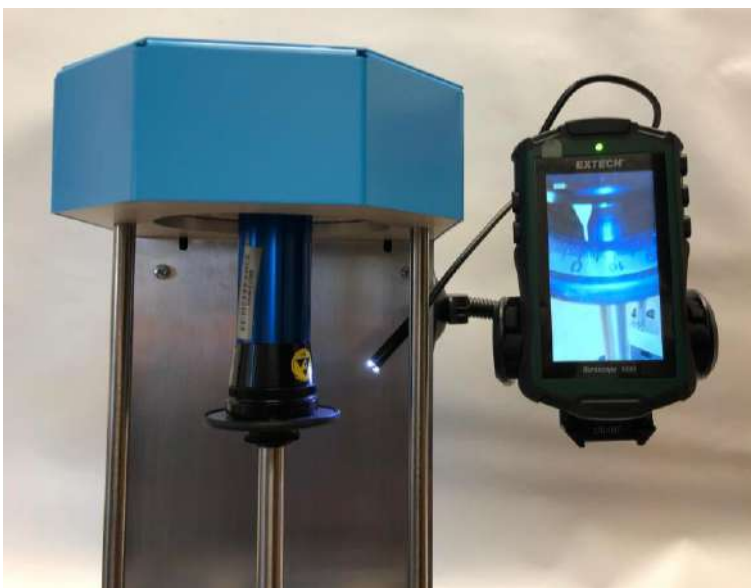
There is a USB version, and a battery powered standalone version with an integrated display.

USB Version:



For the USB version, the camera connects to a PC via a USB port and uses a camera display software. The software for the camera can be installed from the CD supplied. If assistance or an alternative method is required, please contact Advanced Witness Systems Ltd.

Standalone Version:



For the standalone, battery powered version, you will require 4x AA batteries.

Connecting to a PC via RS232

The following information is used when configuring the UTSCM controller to use with **ADMS KEPLER 4** software.

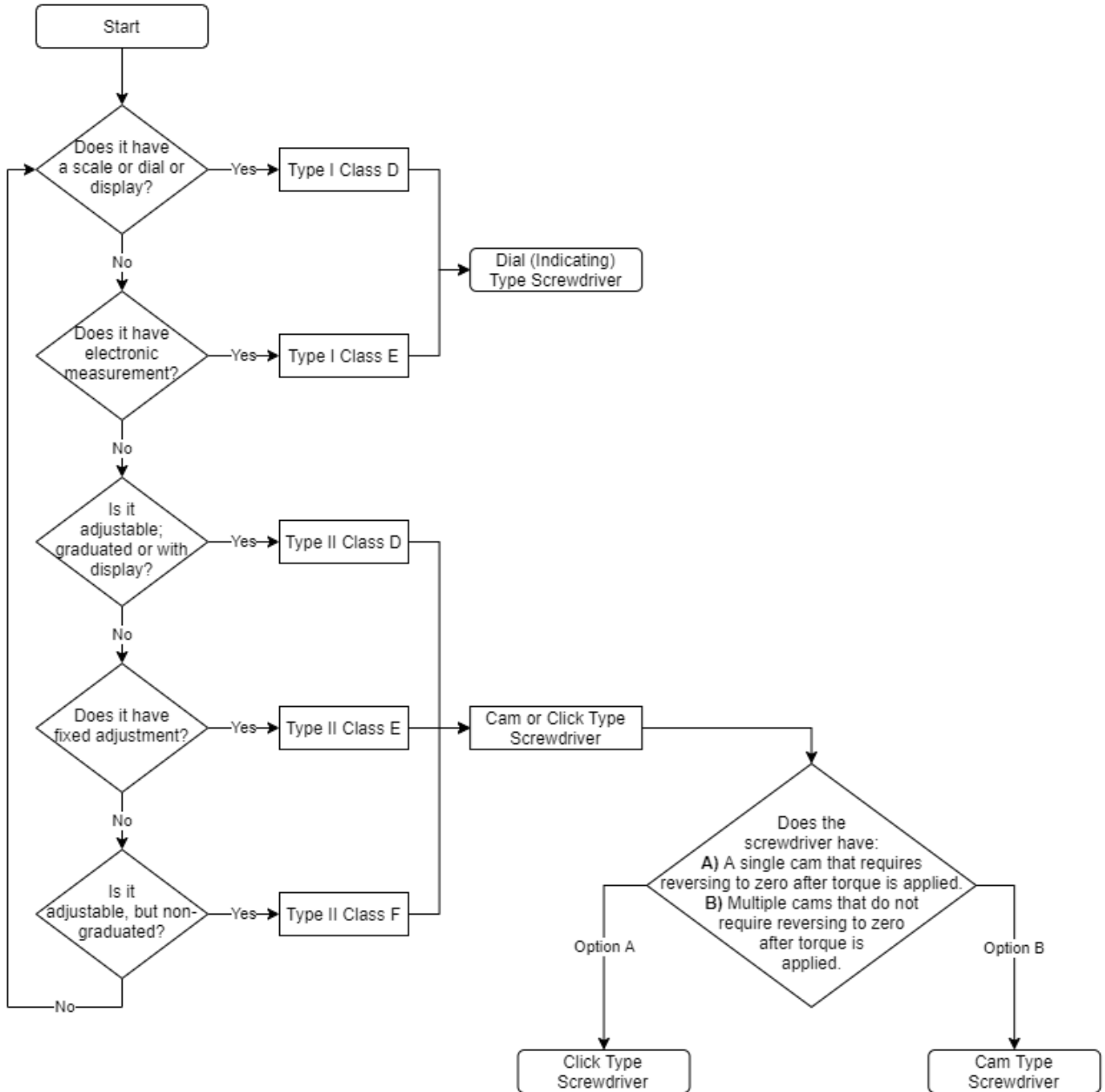
RS232 SETUP: Baud Rate: 19200
 Parity: None
 Stop bits: 1
 Data bits: 8
 Handshake: None
 RTS Enabled: True
 Terminator: CR

Please note RS232 is not transmitted to the PC during a learning cycle.

Screwdriver Classification selection to BS EN ISO 6789:2017

Use the Flow Diagram below to determine the Classification of the Torque Screwdriver under test, as per the BS EN ISO 6789:2017 standard, and the Screwdriver Type, as used when operating the Universal Torque Screwdriver Calibration Machine.

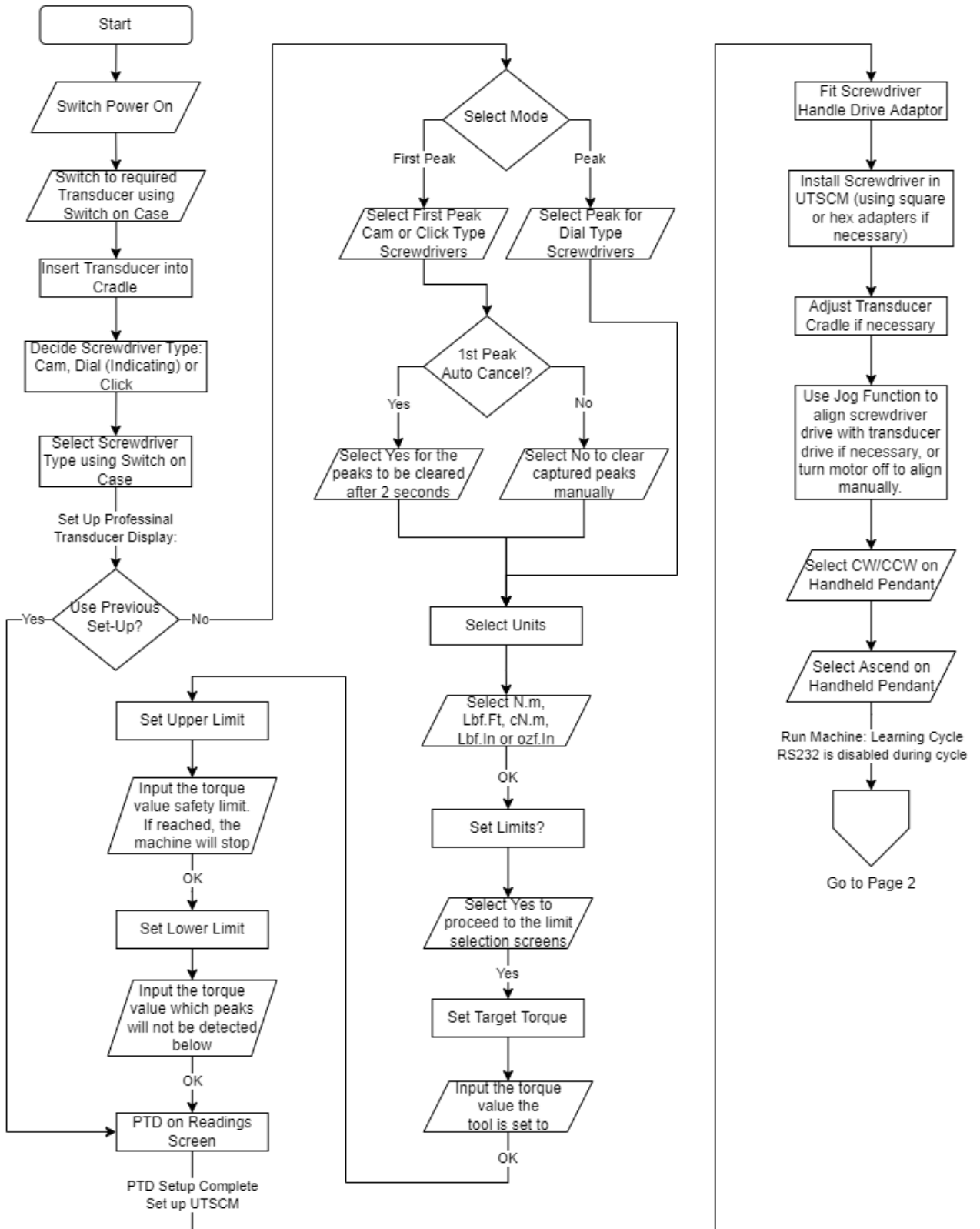
Screwdriver Classification

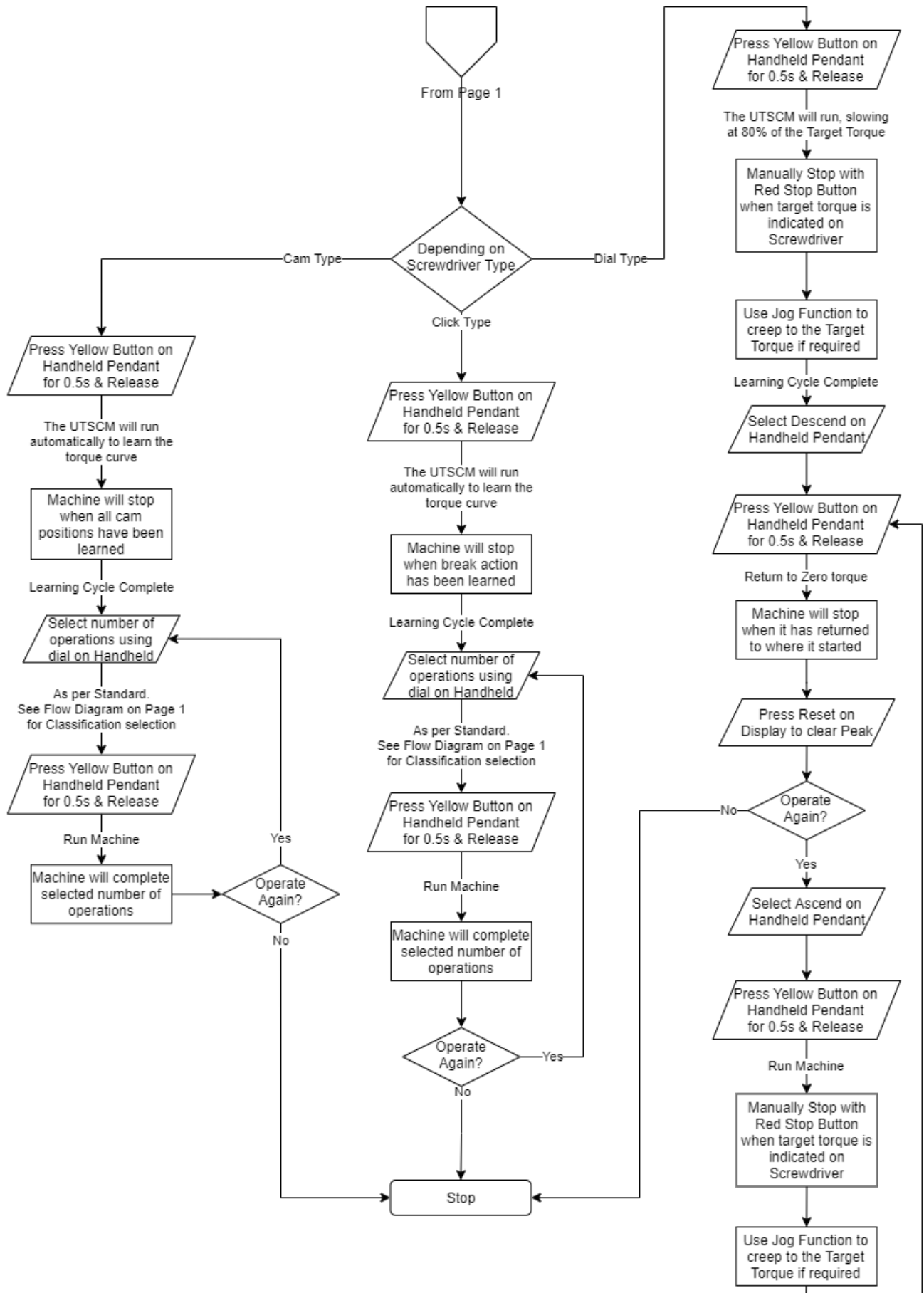


Operator Flow Diagram

Using the Type of Screwdriver determined from the "Screwdriver Classification selection to BS EN ISO 6789:2017" Flow Diagram (Page 28), use the Flow Diagram below to aid operation of the Universal Torque Screwdriver Calibration Machine.

Main Flow Diagram





Troubleshooting

- If the power light is on but machine will not operate:
 - Check that the machine is not in “**Motor Off**” Mode.
 - Check the handheld is connected correctly.
- If the “**Range: Not Found**” is shown on the first screen of the display, please check that the required transducer is attached to the correct port and re-select the transducer using the transducer selection switch. If this does not clear this fault, please switch the UTSCM off and on again.
- Occasionally, the first operation of a Screwdriver will generate irregular results, as the adapters used settle. It may be necessary to operate the Screwdriver using the Jog function in the direction of operation before running the UTSCM.
- The transducers can only be used at >10% of their range with the UTSCM. For example, the 10N·m transducer can only be used >1N·m.
- If the machine fails to learn during a learning cycle it will stop and display “**Ready to Learn**” This can be caused when:
 - The target torque value is set too high, and a peak is triggered below 80% of the target torque value. To resolve check the input target torque value is accurate to the torque setting of the screwdriver under test.
 - The target torque value is set correctly, and a peak is triggered below 80% of the target torque value.

If peaks are captured below or around 80% of the Target Torque, the machine may run, but display irregular behaviour.

These problems can be resolved by:

1. Checking that the screwdriver is not reading below 80% of the target torque value. This can be done by removing the screwdriver from the machine and operating manually. Alternatively, you can use the jog function to operate the screwdriver whilst in the machine.
2. Readjust the screwdriver if required, and then check the value the screwdriver is set to by doing point 1 above. If this does not resolve the problem the screwdriver may be faulty.

Pressing and holding the yellow button for 0.5s will run the learning cycle again.

- If the machine fails to capture any peaks, check that the Lower Limit is set below the value of the peaks.
- If the machine captures a peak below 80%, but fails to capture any further peaks despite running on, please adjust either the Target Torque or the Screwdriver, as described above.
- If the machine is completing more than one peak per operation, ensure that the peaks are not being captured around 80% of the Target Torque. If this is the

case, please adjust either the Target Torque or the Screwdriver, as described above.

- If the screwdriver fails to return to zero after completing an operation, the UTSCM will find zero again. If the screwdriver continues to fail to return to zero, the failure may be due to the screwdriver handle slipping in the handle adapter. If using the adjustable screwdriver handle adapters, please ensure that these are clamped tight, and the flexible top hats are used as necessary on screwdriver handles with minimal grip.
- Should an operation fail with torque still applied, use the Jog function to drive the screwdriver on/back to zero torque. Check that the screwdriver is set up correctly in the machine. It will then be necessary to run the Learning Run again, after which the machine will resume operating correctly.

If any of these problems persist, please contact Advanced Witness Systems Ltd for further assistance.

Maintenance

- The transducer cradle should move up and down freely without the need for lubrication, if it is not sliding freely, please contact Advanced Witness Systems Ltd.
- Regularly check UTSCM for loose bolts and tighten as necessary.
- Prevent the machine from gathering dust when not in use.
- The Adjustable Handle Adapters may require lubricating with PTFE spray periodically to ensure they continue to operate correctly. The PTFE spray should be applied to the curved edge on the back of the nut, which contacts with the backs of the jaws.

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Transducer Calibration Guide

The Universal Torque Screwdriver Calibration Machine (UTSCM) control unit is used as a display to calibrate Intelligent Inline Torque Transducers (IITT) or other transducers using our Intelligent Instrumented Transducer Cables (IITC).

The control unit only provides power to the transducer and displays the reading. All calibration takes place within the transducer. The control unit can be used without the other parts of the UTSCM when used to calibrate a transducer. The handheld pendant controller should be disconnected.

Button Functions (as shown on screen)

INC	Increments the selected number, scrolls through from 0-9. Scrolls through units.
>/TARE	Single Press: Moves cursor to the right. Press and hold: Tares/zeros the reading
CAL	This will set the full scale of the transducer to the selected torque range.
STORE	Will store the selected torque range or torque units.

Order of Calibration

1. Fit transducer in appropriate torque calibration equipment.
2. Connect the transducer to Port 1 on the rear of the UTSCM controller.
3. Select Port 1 on the right-hand "Transducer Selection" rotary switch.
4. The left-hand "Screwdriver Type" rotary switch position does not matter, select "Motor Off".
5. Place the UTSCM display into Calibration Mode by simultaneously holding down the furthest left & furthest right soft key buttons whilst turning the UTSCM on. This will activate the Calibration Mode.
6. Allow the transducer to thermally stabilise for 5 minutes.
7. Use the "**INC**" and "**>/TARE**" buttons to change the N.M. RANGE to the maximum range of the transducer. Press "**STORE**" to store this number.
8. Use the "**INC**" and "**>/TARE**" buttons to change the units to the required units. Press "**STORE**" to store these units.
9. With no torque applied to the transducer, press and hold "**>/TARE**" to tare the display.
10. Apply full scale torque to the transducer. Allow this to settle for 2 minutes.
11. Press "**CAL**" and the reading will show the applied torque. The transducer full scale is now set.



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Torque Measurement & Calibration