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Norbar Torque Tools

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TORQUE WRENCH CALIBRATOR (TWC)

TWC 400 and TWC 1500 - Auto

For the most up to date version of the Operator's Manual, please scan the QR code below.

To find your local Norbar company or distributor, please scan the QR code below.

www.norbar.com

CONTENTS

PART NUMBERS COVERED BY THIS MANUAL

This manual covers the set up and use of the Norbar TWC.

Part Number	Model	Torque Range
60312	TWC 400 AUTO	0 – 400 N·m
60313	TWC 1500 AUTO	0 – 1500 N·m

This product is intended for testing torque wrenches.

TWC Markings

Pictograms	Meaning
	WARNING: **LIVE ELECTRICAL CIRCUITS INSIDE - DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE.**
	Read and understand Operator's Manual.

 WARNING: **READ ALL SAFETY WARNINGS AND ALL INSTRUCTIONS. FAILURE TO FOLLOW THE WARNINGS AND INSTRUCTIONS MAY RESULT IN ELECTRIC SHOCK, FIRE AND / OR SERIOUS INJURY.**

SAFETY

- The TWC is designed for testing torque tools, do not use for other purposes;

- Always read and understand the Operator's Manual fully before use;

- The TWC weighs up to 45 kg. Take care when installing. Only lift by the solid metalwork;

- Ensure the operating area is capable of taking the weight of the TWC;

- This is a powerful torque application system. Care MUST be taken or damage may result to the torque wrench, the torque measurement system, the TWC or injury to operating personnel;

- Do not block cooling air entry and exit points;

- Trapping hazard - keep hands and loose clothing away from the torque wrench during use;

- To avoid damage to the torque wrench under test do not exceed the wrench set torque value;

- To avoid damage to the transducer do not exceed the maximum capacity;

- Never exceed the maximum torque capacity of the TWC;

- Do not operate without a torque measurement system connected and working;

- Ensure wrench guard is in position before using TWC;

- Ensure safety wire at the handle reaction point is in place;

- It is recommended that Portable Appliance Testing (PAT Testing), officially known as 'In-Service Inspection and Testing of Electrical Equipment', is completed at regular intervals. See MAINTENANCE section for more information;

INTRODUCTION

The TWC Auto allows torque wrenches to be calibrated and tested in an accurate and repeatable way whilst reducing operator effort.

This manual covers items 60312 and 60313 only.

The TWC Auto can automatically test all torque wrenches that operate on the 'click-action' or 'cam-action' principle, as well as manually testing dial type wrenches.

Parts Included

Description	Part Number	Quantity
TWC Auto 400 / 1500	60312 / 60313	1
TWC Counterbalance Reaction post assembly	62330	1
Display	62321	1
Power cable for TWC Touchscreen	391060	1
Display stand	62322	1
Power supply including power lead and plug	62323	1
Temperature and humidity sensor	62353	1
USB flash drive with manuals	61143	1
TWC Guard (and fixings)	62346	1
Maintenance grease kit	60325	1
Manual Drive Gear	62336	1

Accessories

Description	Image	Part Number
Static Transducer Support Kit		60318
Short Length Reaction Plate Assembly		60319
FMT Quick Release Kit		60322
Pro-Test and Static Torque Block Adaptor Kit		60323
Hexagon Drive Plate Kit		60324
Greasing Kit		60325
FMT 2 to FMT 25 Adaptor Kit		60327
5 AR Ind CBR Weight		60329
Angle Offset Plate Kit		60330
Square Drive adapter 1" M to ¾" F Flanged		29214
Square Drive adapter 1" M to ½" F Flanged		29215
Square Drive adapter 1" M to ⅜" F Flanged		29216
Square Drive adapter 1" M to ¼" F Flanged		29217
Hand Pendant		60328

FEATURES AND FUNCTIONS

- Allows torque wrenches to be calibrated or tested in accordance with BS EN ISO 6789-1:2017 and BS EN ISO 6789-2:2017;

- Counterbalanced reaction post assembly is designed to support the weight of the wrench so that the weight does not become a parasitic force within the calibration system. The floating nature of the support means that the wrench is able to find its own natural level rather than being constrained as in many other loading devices. Any such constraint will be a parasitic force within the system (Patents apply);

- Lightweight alloy construction ensures the TWC is easily transported, making it well suited for mobile laboratory applications;

- Rotating transducer design ensures that the load is applied 90° to the torque wrench handle. The benefit of this precise alignment is that forces are applied squarely to the load point of the handle;

- Supplied with a powerful yet simple touchscreen User Interface (UI) (keyboard and mouse also supported if desired);

- Flexible tool template system; minimises number of templates required to cover a wide range of tools, aiding efficient use;

- Programmable calibration workflow for each template, can be pre-set to ISO compliant flow for the given tool for a faster set-up or can also support bespoke workflows;

- Calibration job management; book calibrations, track progress of previous bookings and resume them;

- Automated management of calibration and conformance workflows for non-indicating tools;

- Intelligent rate control system ensures fast cycling of tools while maintaining compliance with 2017 standards;

- Environmental monitoring (humidity/temperature) to ensure compliance with calibration standards;

- Automated management of uncertainty data for ISO 6789-2:2017 calibrations, guiding the user through the process using dynamically generated instructions based on the current tool's ISO classification and workflow;

- Inbuilt data analysis and certification generation seamlessly move from calibration/conformance procedure to certificate generation, no third-party software required;

- A substantial amount of inbuilt storage allowing for several years' worth of calibration data through normal use;
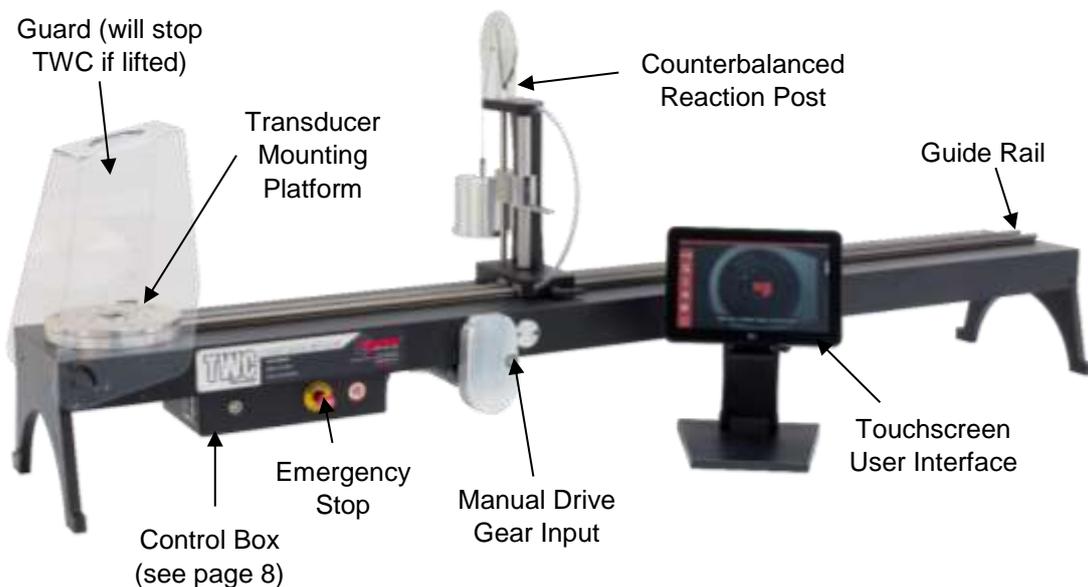

FIGURE 1 – TWC Auto Features

Control Box

Front View

1. Transducer connector
2. Emergency stop
3. Power push-button (Lights up RED when ON)

FIGURE 2 – Control Box Front View

Right View

1. Temperature and humidity sensor
2. Motor connector 1 for controls
3. Motor connector 2 for windings
4. Air outlet
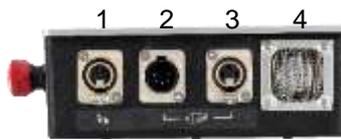
FIGURE 3 – Control Box Right View

Rear View

1. Motor enable switch
2. Power connection
3. Touch screen power connector
4. Touch screen video connector (HDMI)
5. Network connector
6. Six x USB connectors (Touchscreen, keyboard, mouse, camera, USB flash drive**,** etc.)
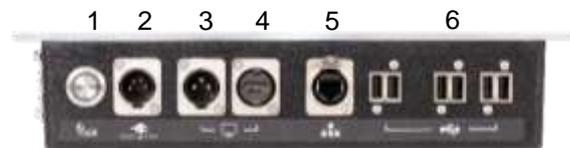
FIGURE 4 – Control Box Rear View

Left View

1. Air inlet

FIGURE 5 – Control Box Left View

SET UP INSTRUCTIONS

⚠️ **WARNING:** ALLOW THE TWC TO EQUALISE TO THE AMBIENT TEMPERATURE / HUMIDITY BEFORE SWITCHING ON. WIPE OFF ANY MOISTURE BEFORE USE.

1. Locate TWC

⚠️ **WARNING:** THE TWC WEIGHS UP TO 45 KG. ALWAYS USE TWO PEOPLE WHEN LIFTING THE TWC.

Ensure location can cope with weight of loader.

Locate the TWC on a level surface at a comfortable working height.

2. Fitting the Guard

Insert two of the four shoulder bolts through the two holes in the guard and slide over the neoprene washer as shown in Figure 6.
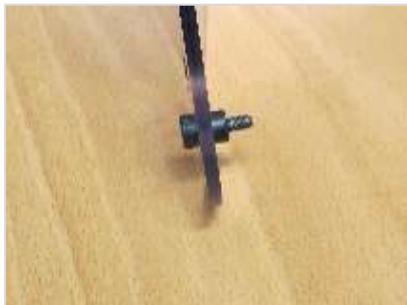
FIGURE 6 – Pairing the Neoprene Washers with Shoulder Bolts

Fasten the above to the two lower threaded holes on the TWC casing as shown in Figure 7. Use the remaining two Shoulder Bolts to secure the guard to the radial slot and check it functions correctly by opening and closing the guard, also shown in Figure 7.

FIGURE 7 – Fitting the Guard

3. Connect Motor

Plug motor wires in.

4. Connect Temperature / Humidity Sensor

Plug in temperature / humidity sensor to its dedicated connector.

5. Connect Display

Connect the display to ports 3, 4 and one of the six USB connectors shown in Figure 4 on page 8

6. Connect USB Keyboard and Mouse (Optional)

Connect keyboard to one of the six USB connectors.

Connect mouse to one of the six USB connectors.

7. Counterbalance Reaction Post Installation

Your TWC has been delivered with the reaction counterbalance wheel assembly unattached to the reaction assembly. This has been done to prevent damage to this assembly during transit.

FIGURE 8 – Disassembled Counterbalance Reaction Post Assembly

Place the counterbalance wheel onto the top plate of the reaction assembly.

FIGURE 9 – Lining up the Counterbalance Reaction Wheel

Attach the counterbalance wheel assembly with the two M4 socket cap screws from the underside of the top plate of the reaction assembly. Tighten to 1 N·m.

FIGURE 10 – Attaching the Counterbalance Reaction Wheel

Assemble the weight carriage over the balance wheel.

FIGURE 11 – Counterbalance Reaction Assembly

Slide the 'Counterbalance Reaction Post Assembly' on to the reaction rail.

NOTE: **Shown for clockwise calibration, mount the opposite way for counter-clockwise calibration.**

FIGURE 12 – Sliding the Counterbalance Reaction Assembly onto the Reaction Rail

Set the locking lever to engage positively when applied. This is done by pulling the lever towards you whilst at the same time winding in the screw with an appropriate screwdriver. When rotated to fully vertical the lever should start to engage to lock the reaction post's position. Turn the lever to the right and you should start to feel some resistance as the lock is engaged. Before continuing check the reaction post assembly is securely fixed in position.

FIGURE 13 – Adjusting and Setting the Locking Lever

8. Mount Transducer (not supplied with TWC)

Select the correct capacity transducer and secure to the platform.

FMT Transducer

Directly mount with three fixings. Torque settings are 25 N·m for TWC 400 and 85 N·m for TWC 1500.

FIGURE 14 – Fitting an FMT Transducer

To save time when using multiple FMT transducers use the optional FMT Quick Release Kit (Part number 60322) first (see page 97).

Static Transducer

Use optional static transducer support kit (Part number 60318) (see page 95).

Place static transducer male square into the TWC.

Use optional adaptors (Part number 29214, 29215, 29216, 29217) as required (see page 95); to reduce uncertainties these adaptors have been manufactured to close fit tolerances.

Place support over transducer and secure to TWC with socket cap screws provided.

9. Connect Power

⚠️ **WARNING:** **CHECK THAT THE POWER SUPPLY CORRESPONDS TO THE VOLTAGE ON THE TWC RATING PLATE.**

⚠️ **WARNING:** **THE TWC MUST BE EARTHED
ENSURE POWER SUPPLY HAS AN EARTH.
DO NOT OPERATE WITHOUT AN EARTH.**

⚠️ **WARNING:** **FOR OPERATOR SAFETY ENSURE THE MAINS SUPPLY HAS A RESIDUAL CURRENT DEVICE (RCD). TEST THE RCD REGULARLY.**

Connect plug to local mains supply.

TIP: **Use of a Different Local Supply Socket:**

Should a different plug be required, the mains cable colours are:

BROWN - LIVE   **BLUE - NEUTRAL**   **GREEN/YELLOW - EARTH**

**The new plug must have a ground (EARTH) connection.
If in doubt consult a qualified electrician.**

If the plug has an internal fuse, a 2 Amp value fuse is recommended.

10. Turn TWC on

Turn on mains supply. Hold down the power push-button (See Figure 2 page 8) on the front until it lights up red. Whilst you do this, the TWC will begin the power-on process.

When the process is complete, you will see the main TWC menu, as shown below:

At this point the TWC is fully powered but the motor electronics are not engaged. To do so, press the motor enable push-button (See Figure 4 page 8). The button should glow blue and remain glowing. If the button turns off after pressing it, check the emergency stop (See Figure 2 page 8) is not depressed, as this will disable the motor electronics.

11. Turn TWC Off

The TWC can be turned off via the power icon on the main menu. Press the power icon and press the 'shut down' button in the confirmation pop-up.

OPERATING INSTRUCTIONS

Locating a Torque Wrench

Ensure the TWC Guard is lowered.

Use lowest capacity transducer to cover the range of the torque wrench to be tested.

NOTE: **For a wrench with a push-through ratchet, ensure the drive square is operating on the correct side of the ratchet.**

Ensure the transducer has been fitted with the correct adaptor and place the torque wrench drive into the transducer. Ensure that the torque wrench drive is fully engaged (see Figure 15).

FIGURE 15 – Attaching a Torque Wrench

Set the reaction post position on the reaction arm so it is in the middle of the torque wrench handle (see Figure 16).

Use counterbalance reaction (supplied) or optional short reaction post (Part number 60319) to suit wrench to be tested.

FIGURE 16 – Locating a Torque Wrench

Counterbalance the wrench by adding weights to the carriage until the wrench is sat horizontally.

FIGURE 17 – Adding Weights to the Counterbalance Reaction Assembly

If you push the reaction balancer up or down at the handle end the wrench should return to a true natural horizontal position.
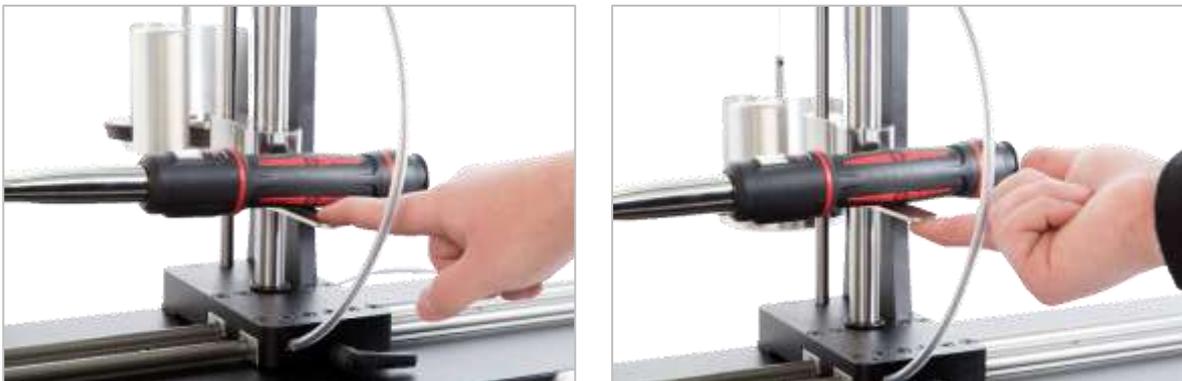
FIGURE 18 – Ensuring the Torque Wrench is in a Horizontal Position

Ensure the TWC is at the extreme minimum of start position (see Figure 19). The two dots to the edge of the bearing housing denote the full travel. To get to the adjustment screen shown in Figure 19 you will first need to ensure both a tool and template have been added (see pages 51 through to 62), from there you can access the adjustment screen by selecting a tool and pressing the adjustment screen icon (see page 62).
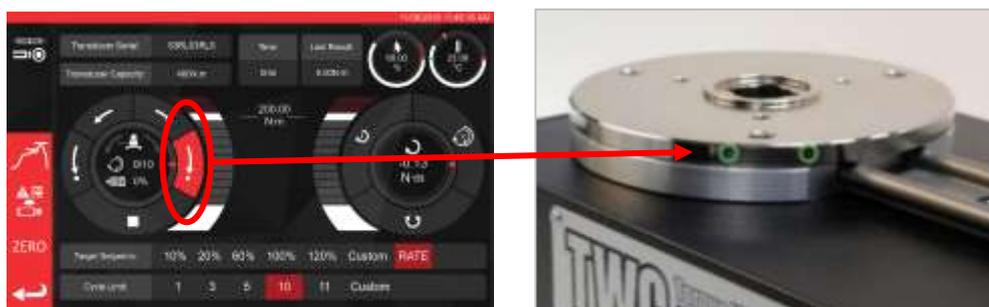
FIGURE 19 – Making Sure the TWC is in the Home Position

Make sure the Guard is in position over the tool before loading.

Exit TWC User Interface

To perform initial setup of a TWC or to change certain system-level settings, it may be necessary to leave the TWC user interface. To exit the TWC UI, use the power button on the main menu and select 'Exit to Desktop'.
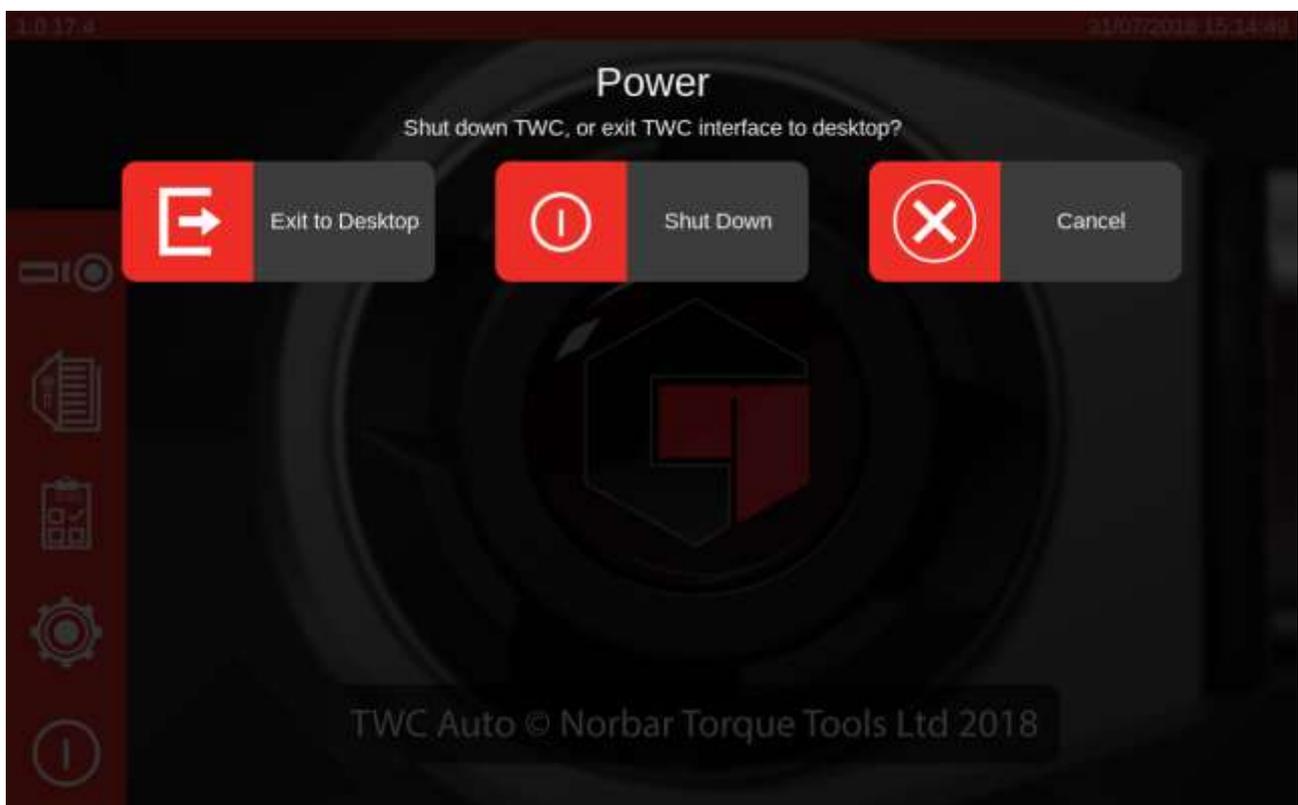
Changing the Default Password

The TWC is supplied with a default user password ('NorbarTWC') which you should change for your security. Once you change this, make sure you do not forget it; you may need to send the TWC back for service if it is forgotten.

IMPORTANT: DO NOT FORGET THE PASSWORD. THERE IS NO MEANS TO RESET IT IF IT IS FORGOTTEN.

NOTE: To change the default password you will need to connect a USB keyboard to the TWC.

To set your own password, exit the TWC UI as described in the previous section, then open the menu bar and select Preferences > Raspberry Pi Configuration
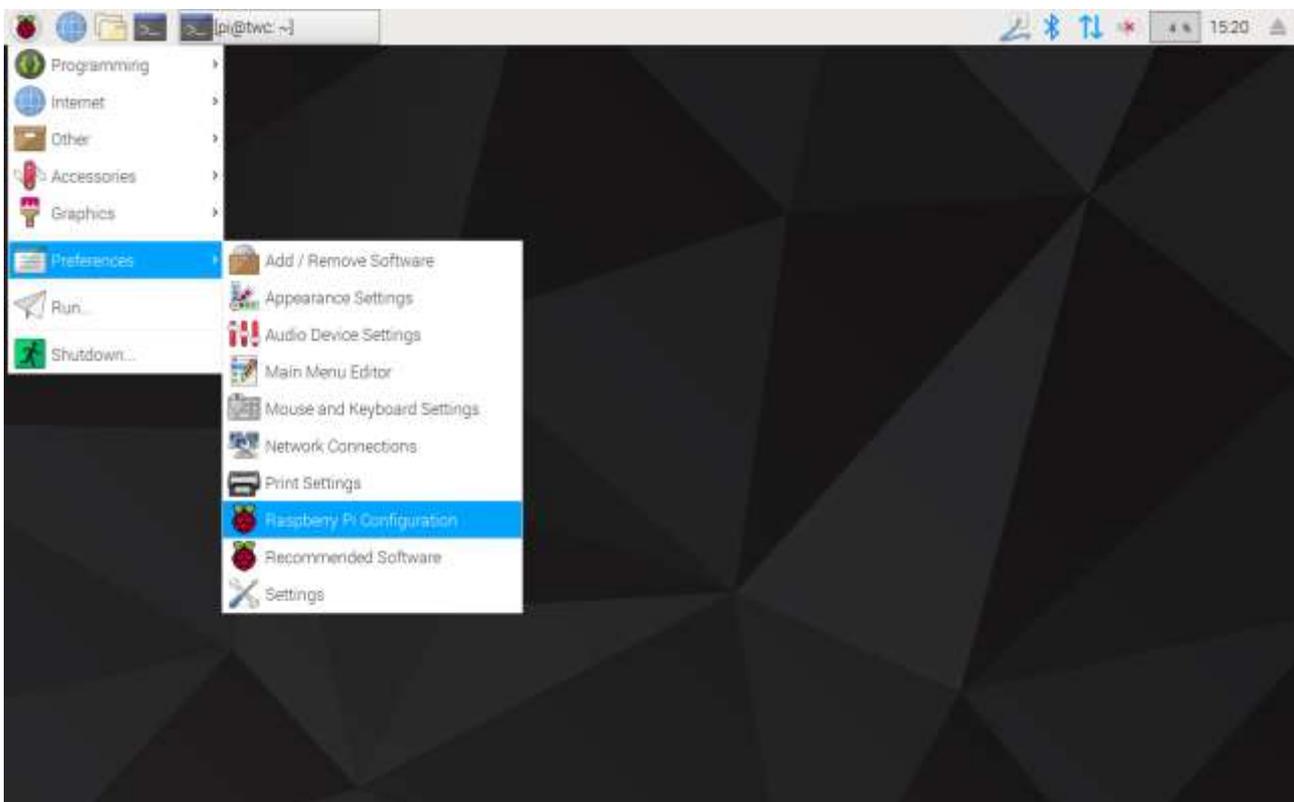
Next, type in the default password ('NorbarTWC') in the password prompt.
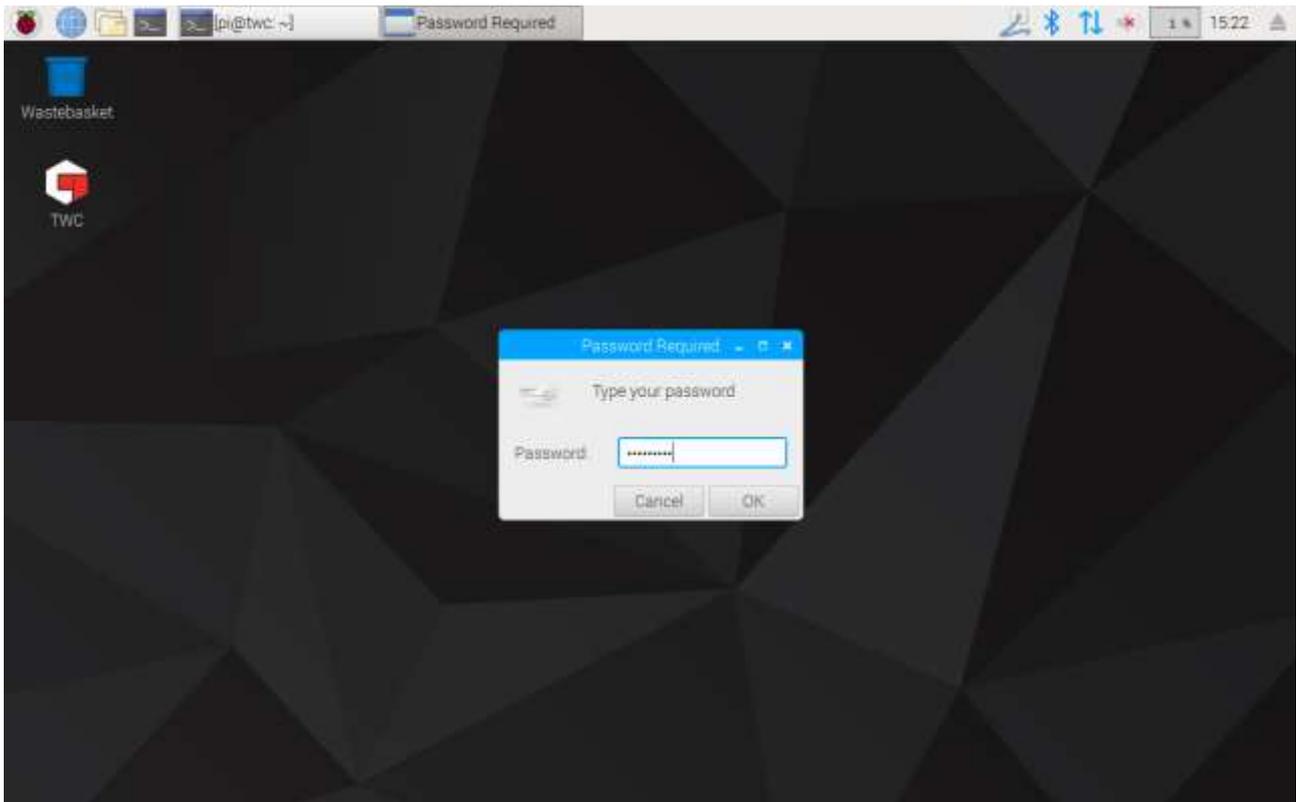
Then in the window that appears, on the System tab select '**Change Password**' and follow the on-screen prompts to set a password of your own.
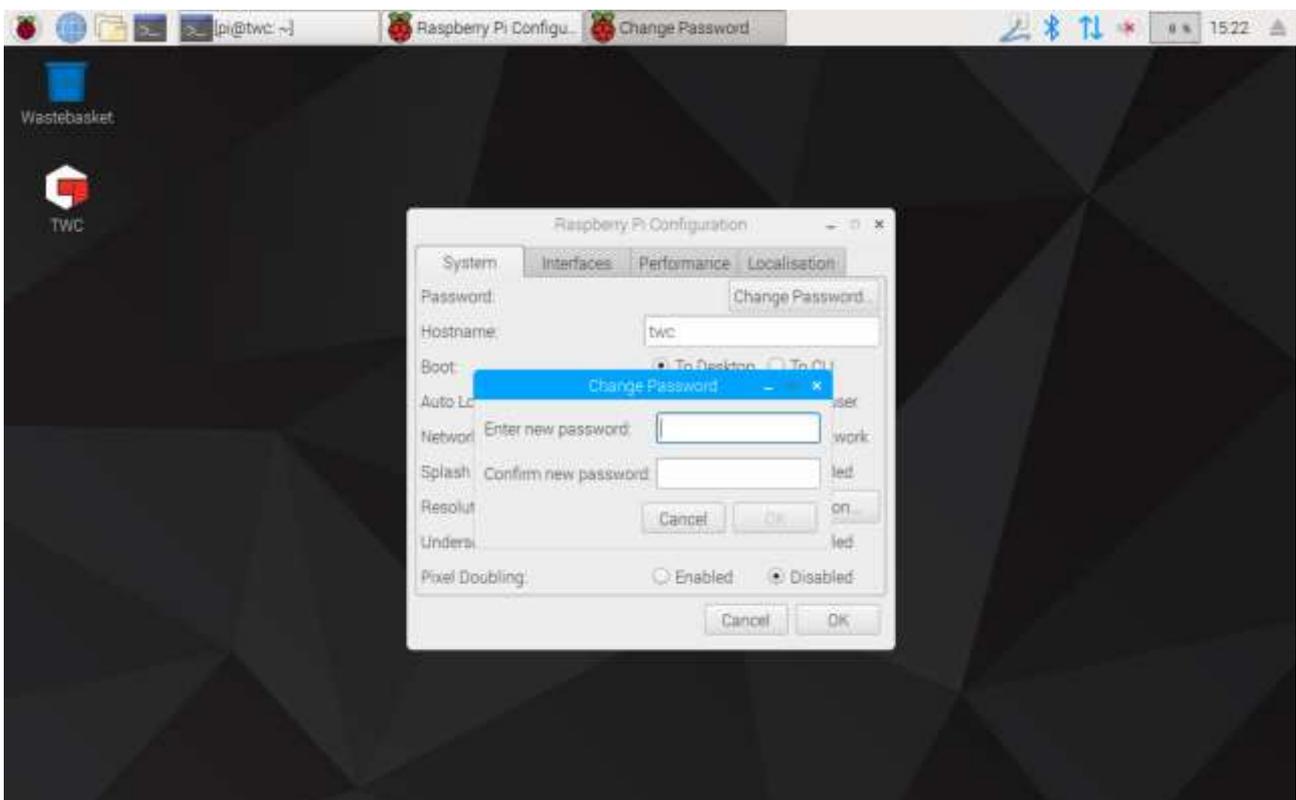
Timezone Setup

The TWC requires accurate timezone settings to keep time properly.

To set/check the timezone, close the TWC UI and open the Raspberry Pi Configuration panel as shown in the 'Exit TWC UI' section and click the Localisation tab to view and change the timezone and locale. You will be asked to select your language and country (Please note: the language setting has no effect on the TWC UI, which at time of writing is available in English only).

Time Setup

Ideally, setting the timezone is enough to ensure correct time as the time is set at the factory. If however, the time is still wrong or if in the future you need to adjust the time, close the TWC UI as shown in the 'Exit TWC UI' section, then open the menu bar and go to **Preferences > Settings.**
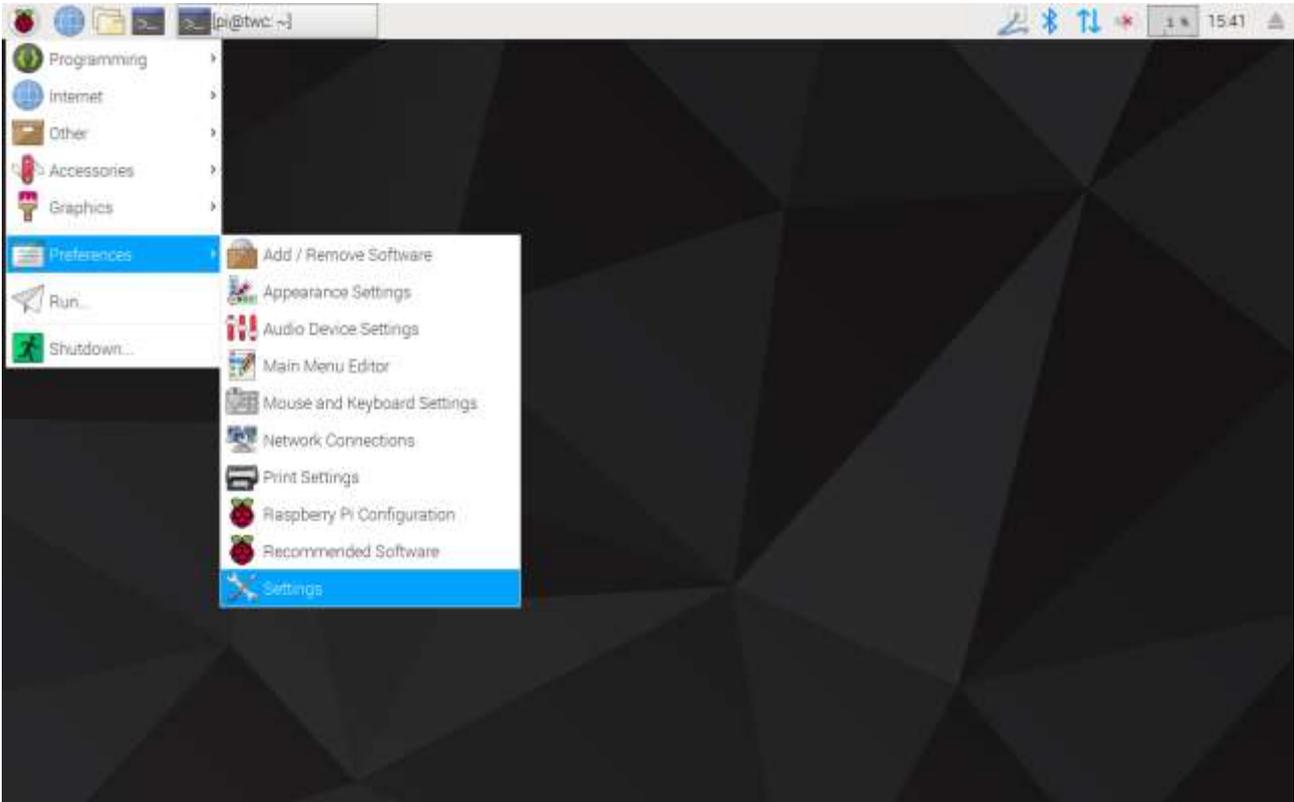
In the window that appears, select 'Date & Time' to change the time.
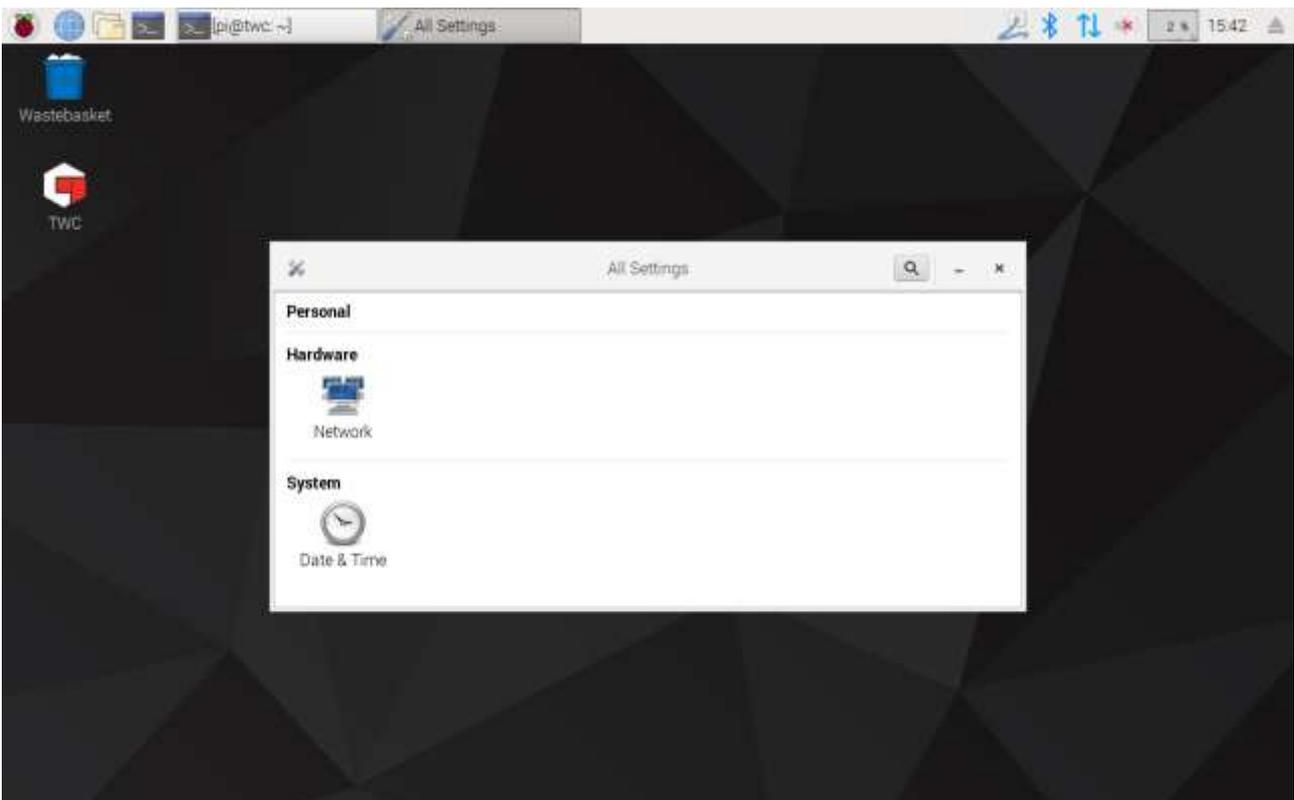
Toggle 'Automatic Date & Time' to 'OFF' and tap the 'Date & Time' field to make changes.
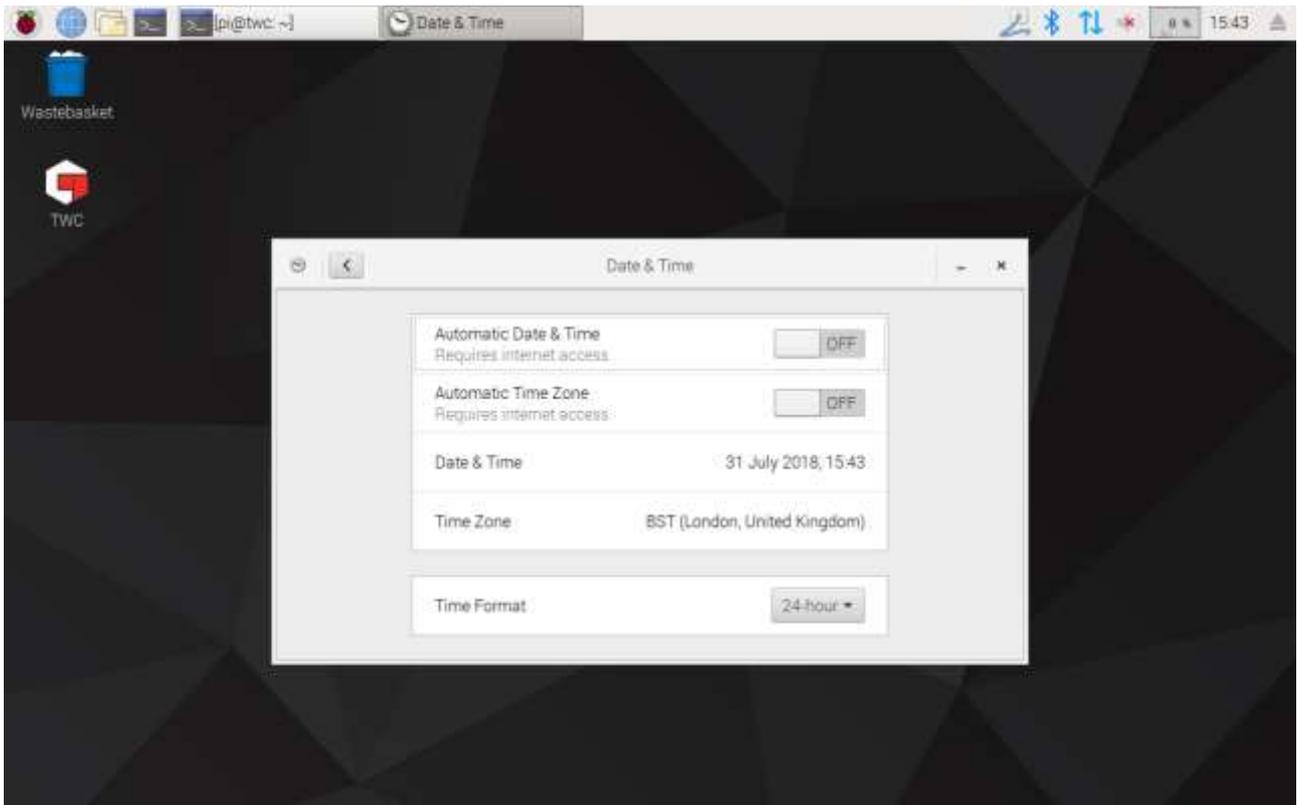
NOTE: **It may take up to a minute for the new time to take effect in the menu bar or on the TWC UI.**

Configuring the Network

The TWC has an Ethernet socket which allows you to connect it to a network for printing to network printers. When setting up printers an internet connection via this network is also necessary.

The TWC is configured to automatically seek the correct network connection settings via DHCP; when you plug the network cable into the TWC, it will immediately request these settings. Once assigned there should be nothing else to do; the TWC is properly connected.

NOTE: **You do not need to connect to a network if you do not intend to use a network printer, but you may still need to connect it temporarily while setting up a USB printer, such that any necessary drivers can be acquired during the printer setup process.**

NOTE: **You will need a USB keyboard if you intend to edit network configuration.**

NOTE: **You can test for internet connectivity by opening the web browser and trying to access a website. If the website loads, the TWC has internet access.**

NOTE: **Some businesses have policies against connecting unknown devices to the network. Ensure your IT department is aware of your intention to connect the TWC to the network. You may also need their assistance to grant the TWC access to the internet or even access to the network itself; whether this is the case depends on your company network's configuration and policies.**

If DHCP services are not provided by your network or are not what you need or want the TWC to use, then you must provide your own. This section demonstrates how to change the network configuration if necessary.

First, close the TWC UI as shown in the 'Exit TWC UI' section then open the menu bar and choose Preferences > Settings.
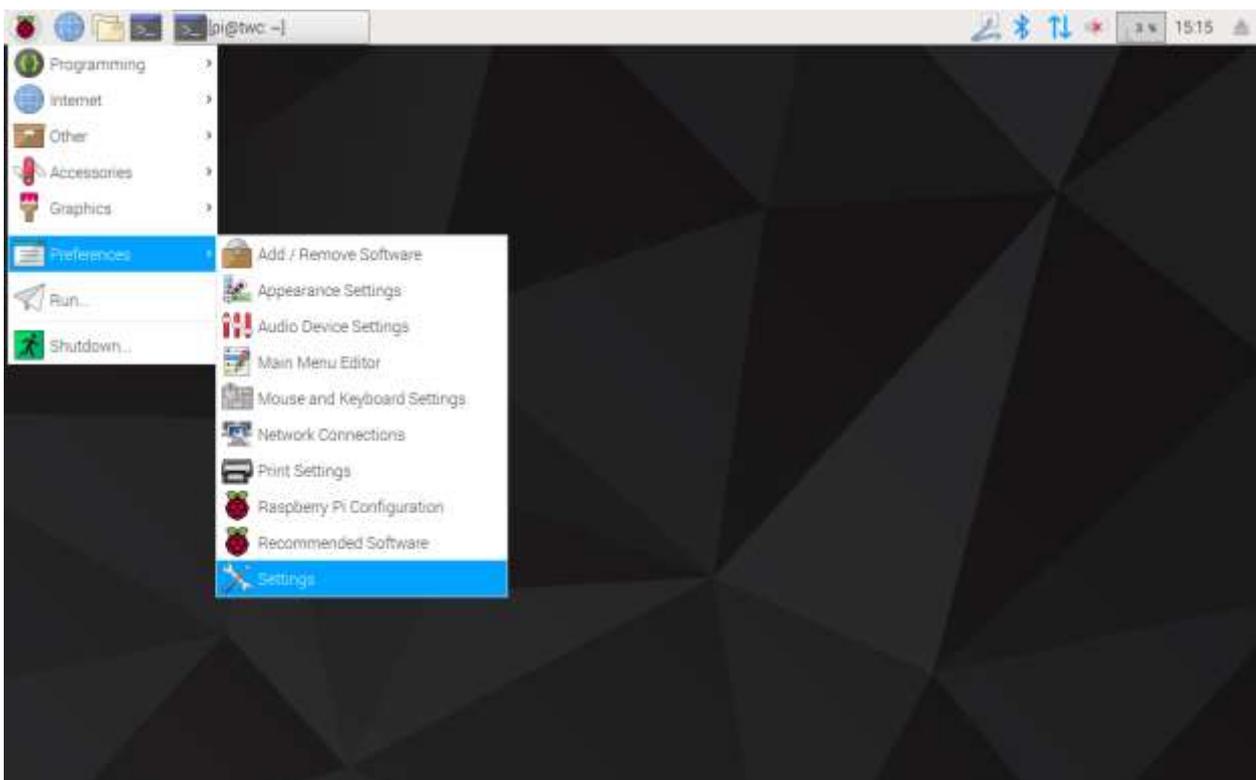
Now Click Network Configuration to open the network configuration panel.
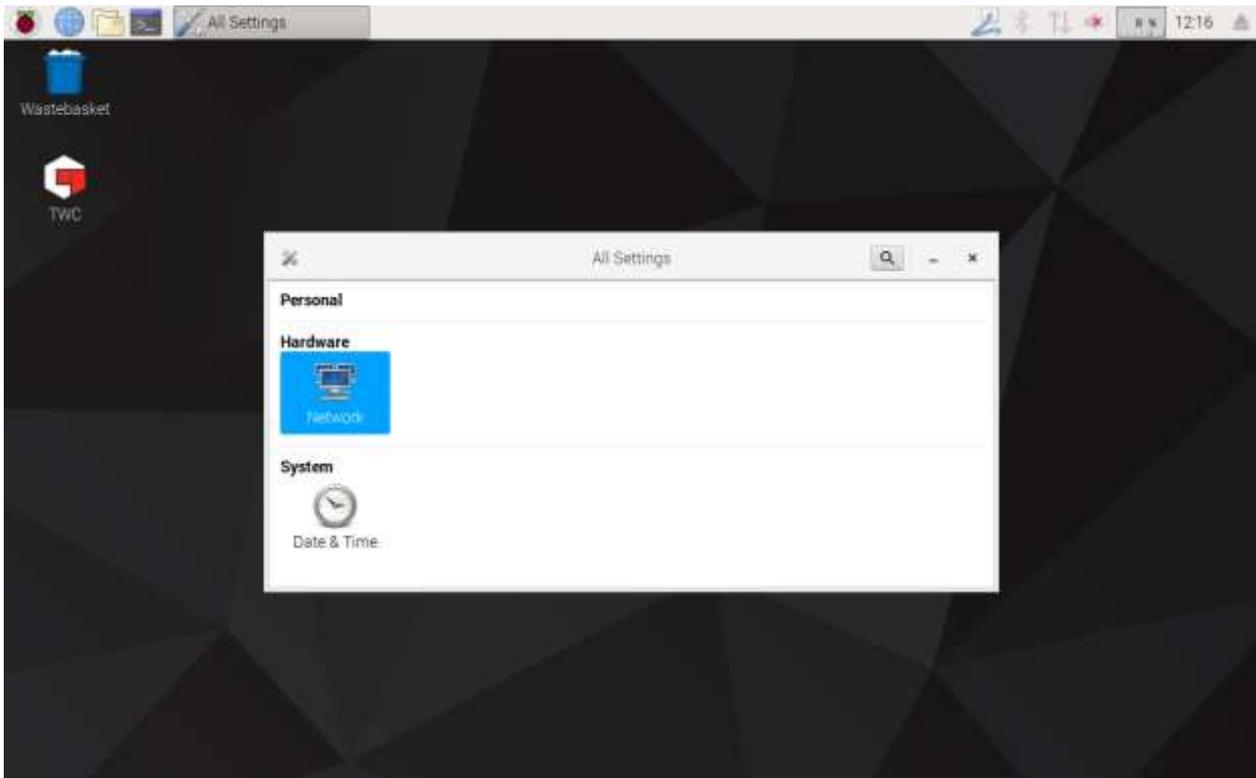
The panel will show the current network state. You should see something like the below if a network cable is connected. Ensure the Wired connection is selected, as shown here and press the settings icon in the bottom right to open the network settings panel.
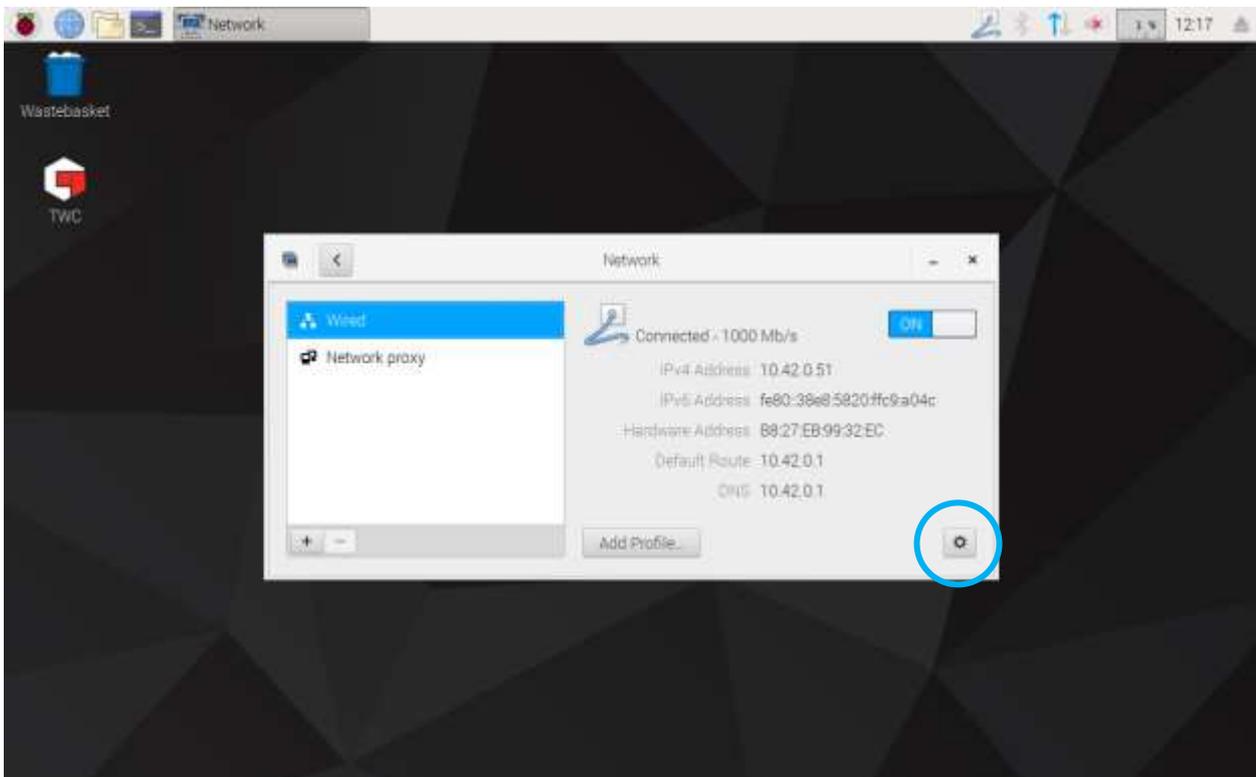
Under the IPv4 tab, change the 'Addresses' drop-down setting from 'Automatic (DHCP)' to 'Manual' as shown here, then type in your desired settings using the USB keyboard:
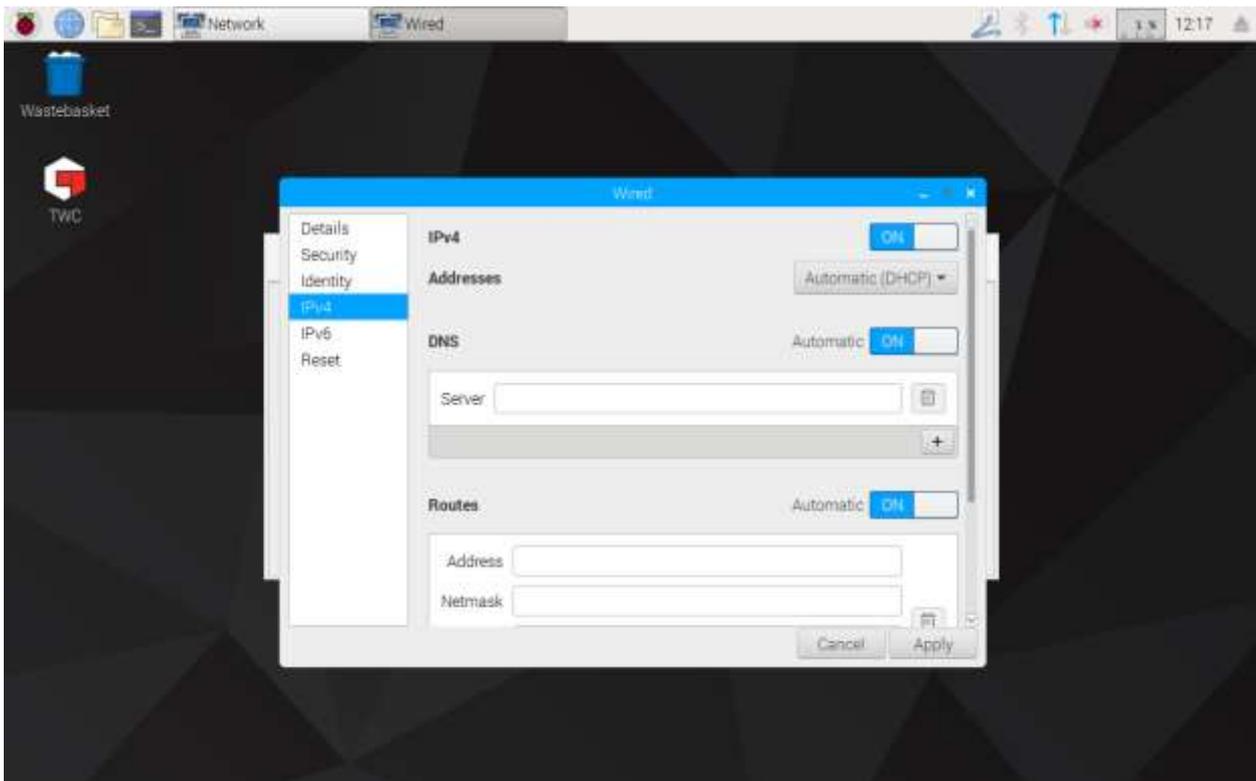
For most networks you are unlikely to need to change any other settings in this window than enter the IPv4 Address, Netmask, Gateway and DNS. You will either already know what you want these to be or your IT department can advise.
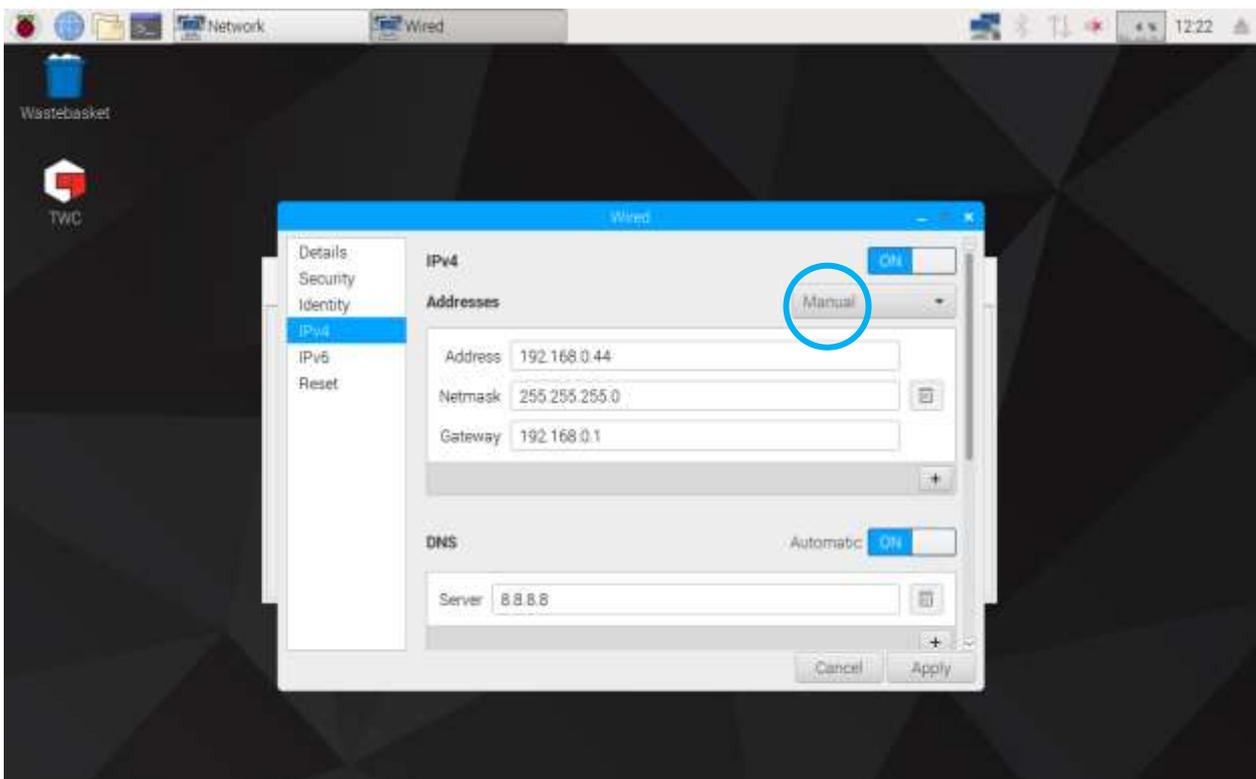
Printer Setup

The TWC supports printing directly to a printer attached via either USB or remotely via Ethernet. Alternatively, if no printer is available, documents can be 'printed' as PDF files.

NOTE: **To add a printer you will need to connect a USB keyboard to the TWC. Network connectivity is required to allow the TWC to search for and attempt to download driver packages for printers when setting up. Network printers will not be visible if the TWC is not on the network.**

To add a printer, close the TWC UI as shown in the 'Exit TWC UI' section, then open the menu bar and go to Preferences > Print Settings
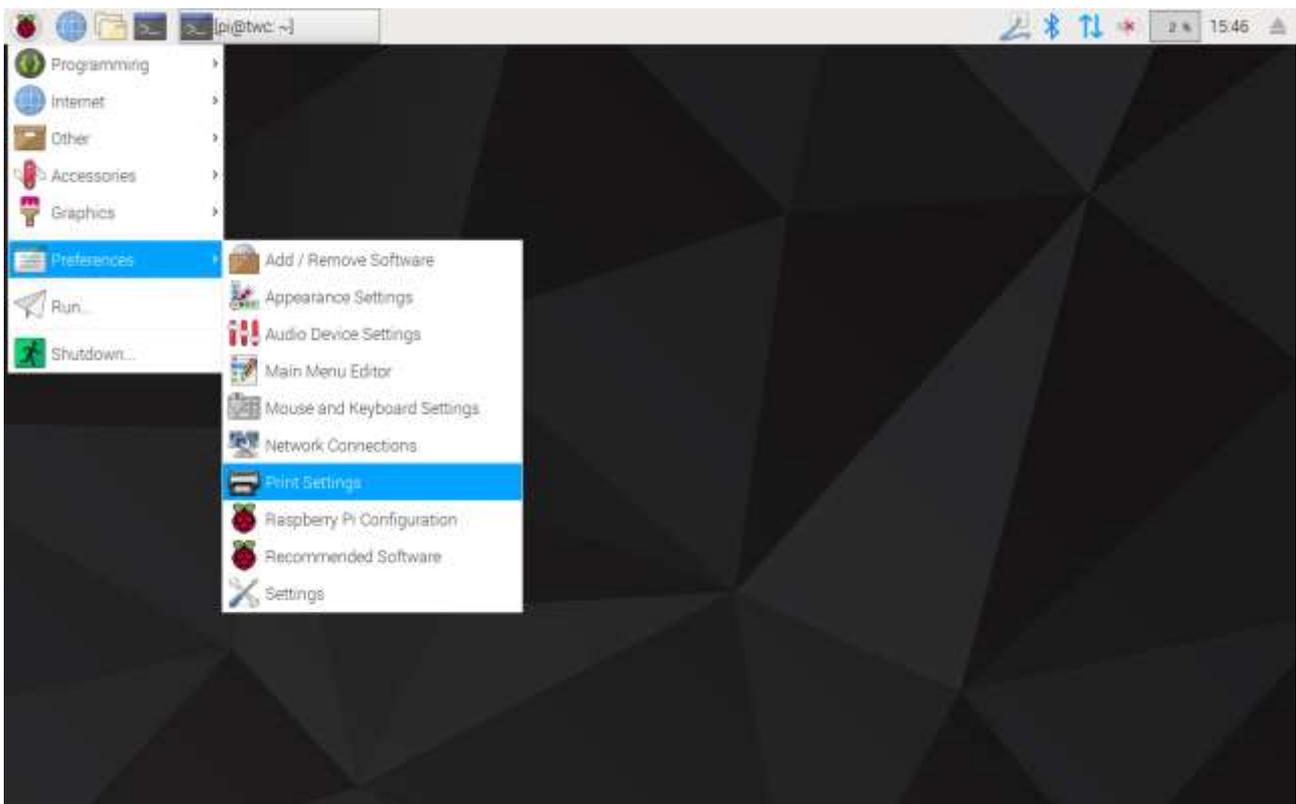
In the window that appears, click 'Add' to add a printer.
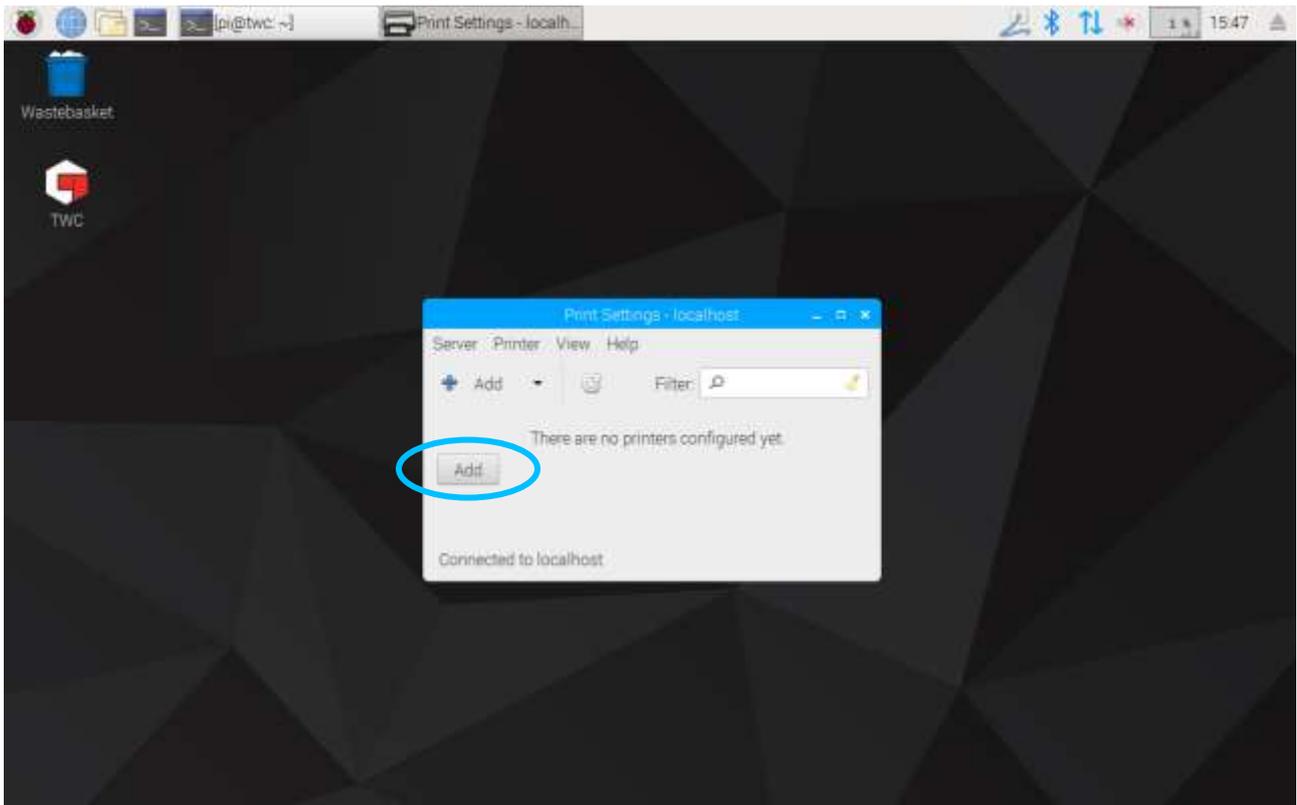
Enter your password (default is 'NorbarTWC') to unlock the printer selection screen.
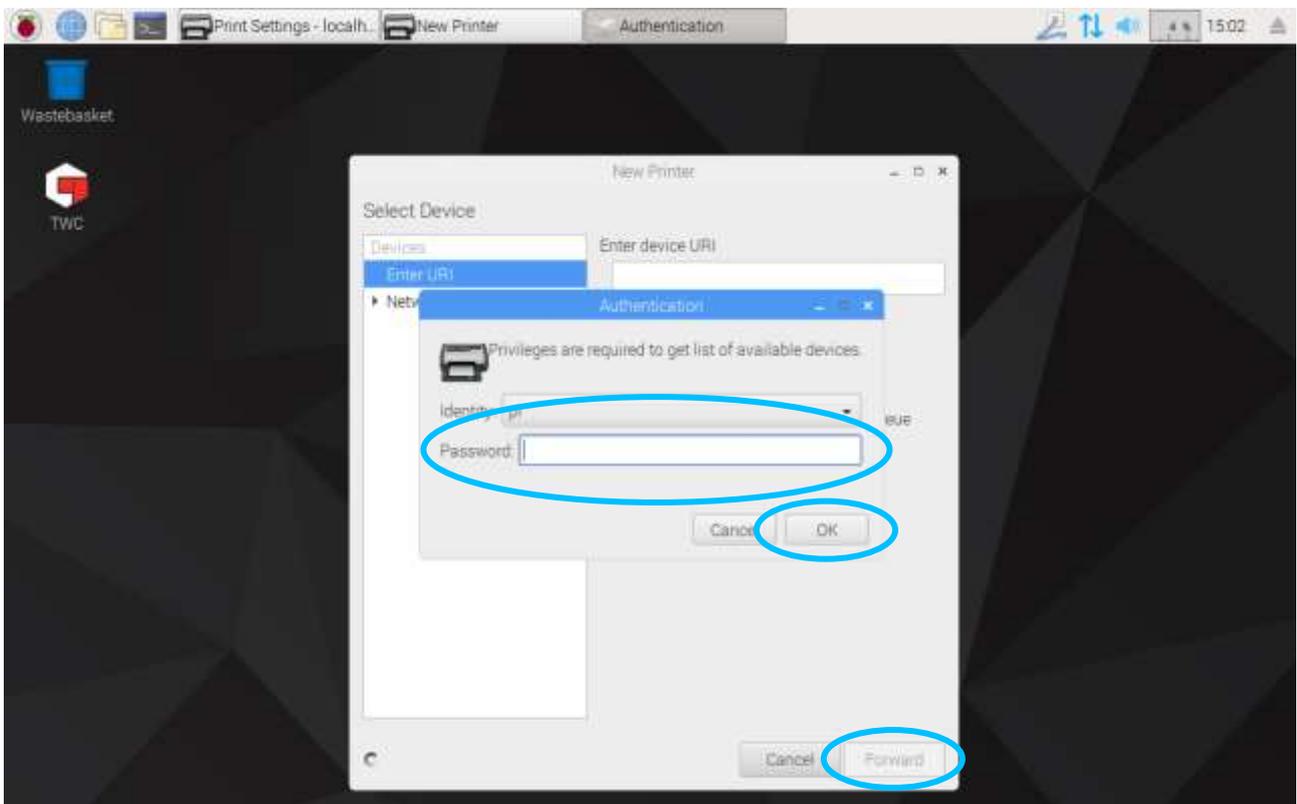
In the left-hand list will appear a USB-attached printer if currently connected. Beneath this, under the Network Printer drop-down menu, network printers will appear as and when the TWC finds them (this may take several seconds).
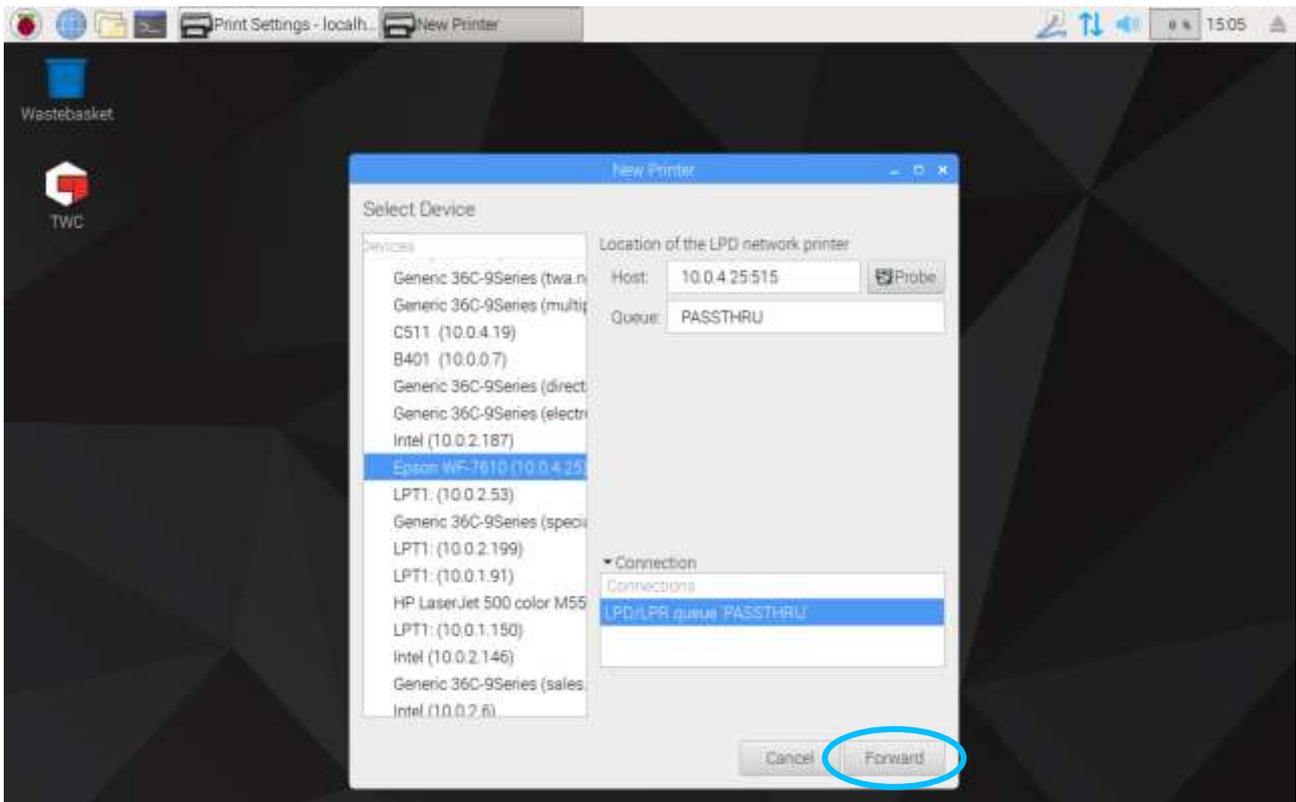
Add a printer by selecting it and clicking 'Forward' to follow the on-screen prompts.
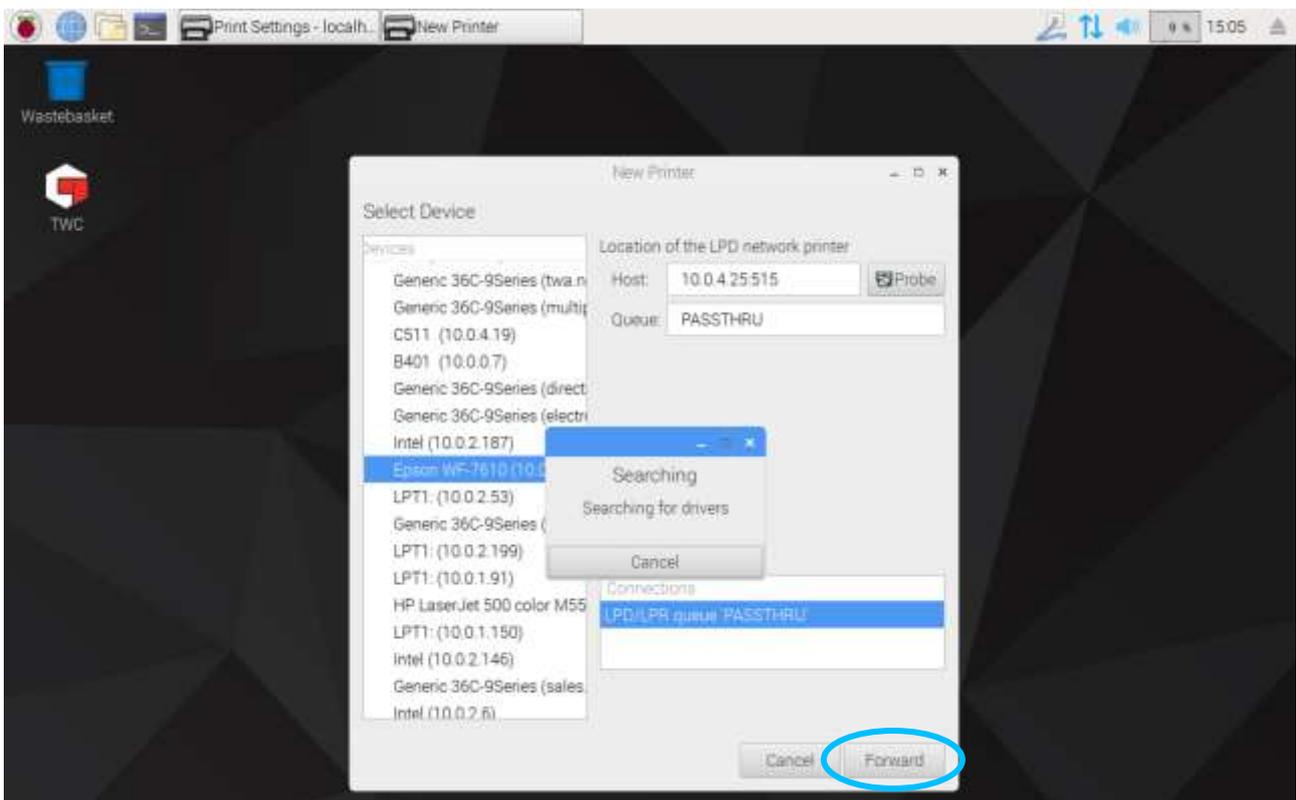
Select a driver for the printer (it is generally best to go with recommended drivers). Press Forward each time when ready to proceed.
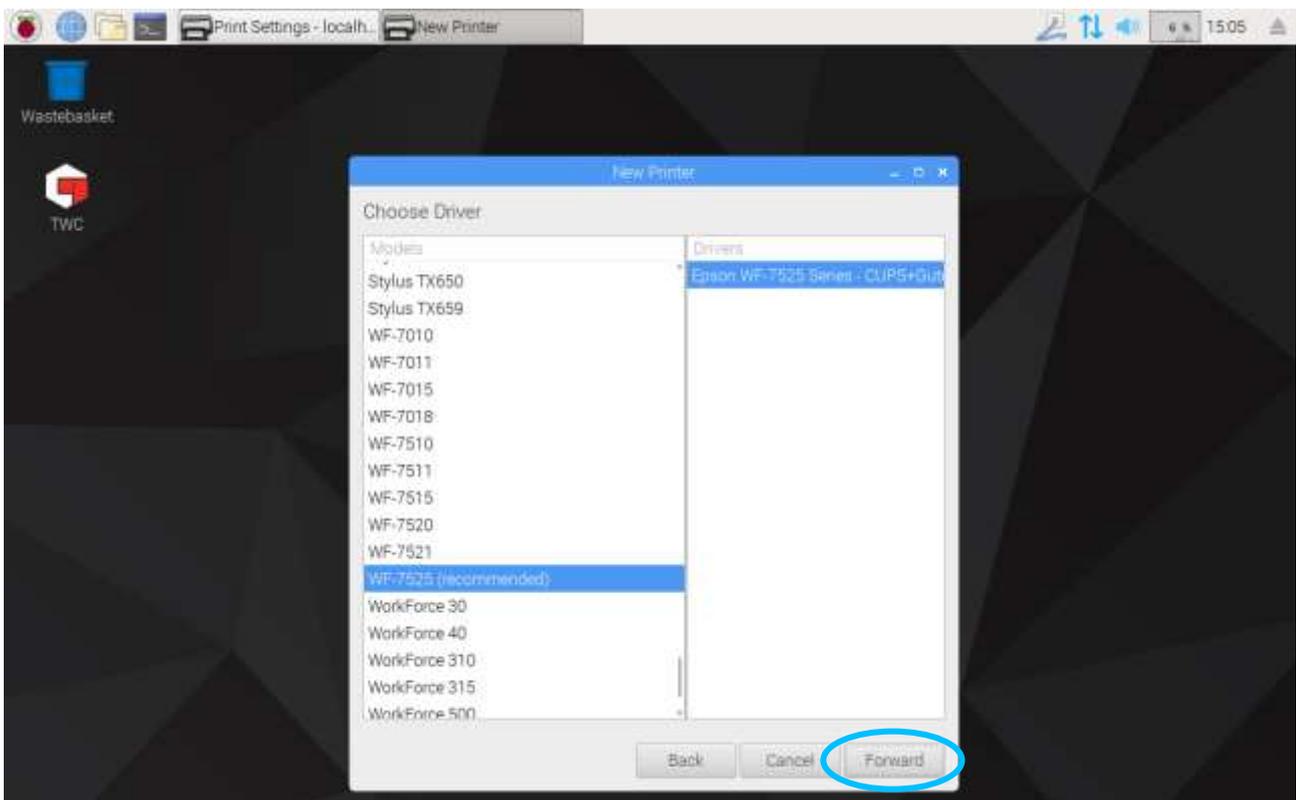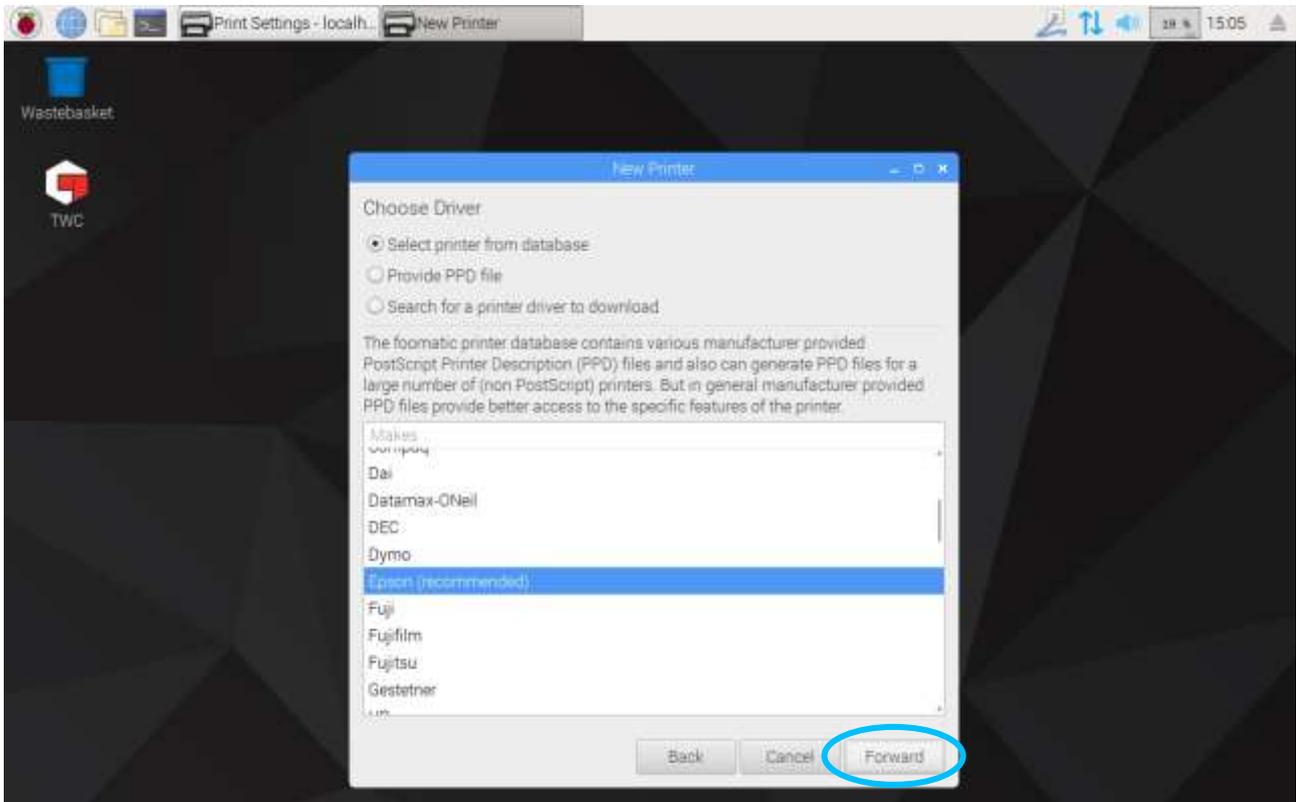
Enter a unique name for the printer if you wish (otherwise it will select a default name for you). When you click 'Apply', you will need to enter the system password again (default is 'NorbarTWC').
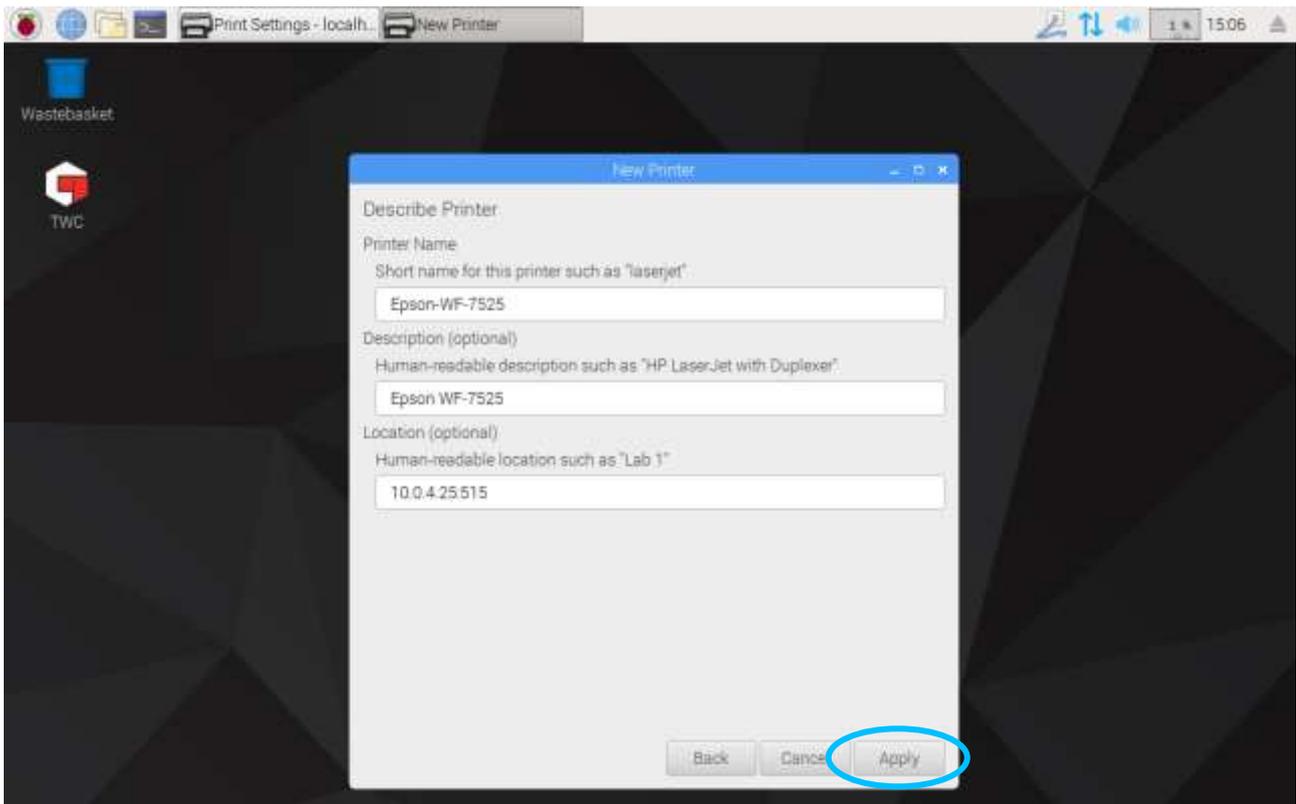
At this point the printer is added and you can print a test page. The printer will appear as an option when printing certificates or declarations of conformance from the TWC UI.
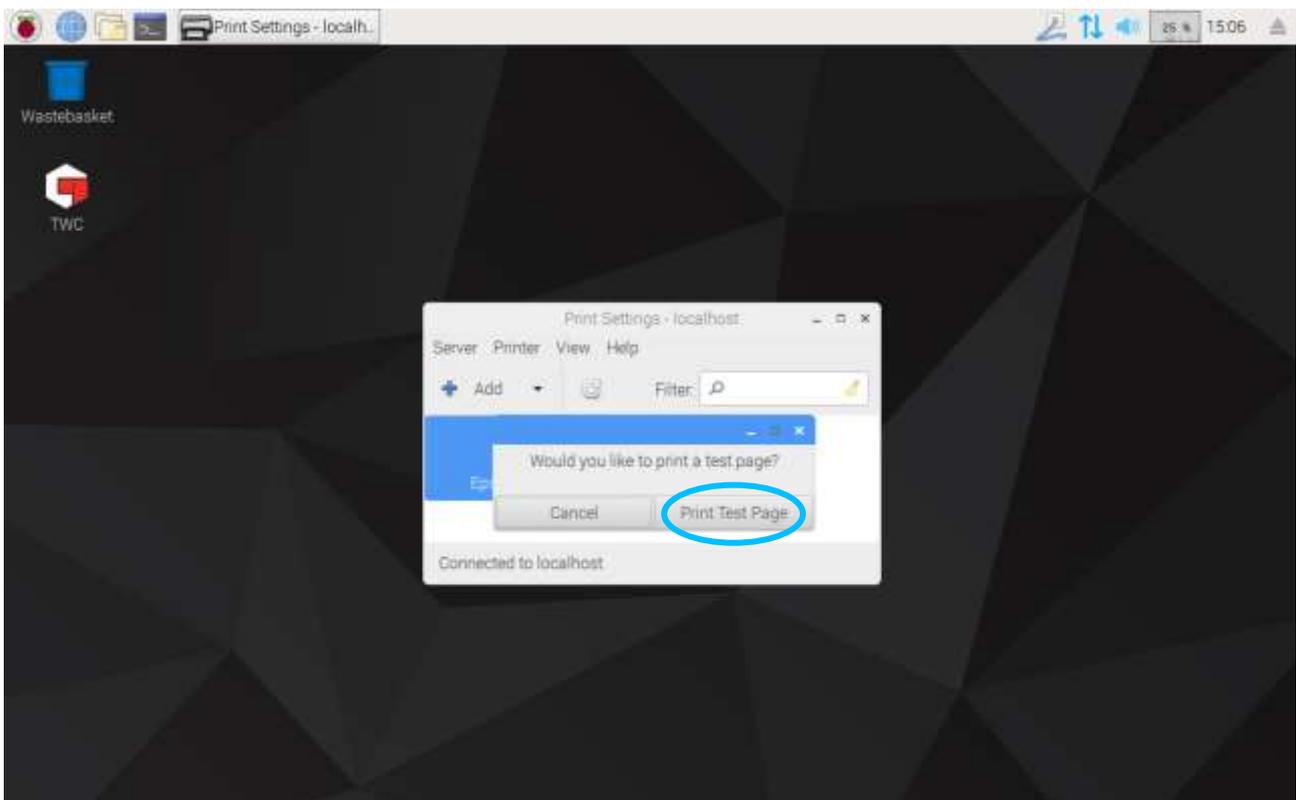
Settings

The Settings menu lets you configure various aspects of the TWC.

NOTE: Before using any transducer to perform jobs on tools with the TWC, you must provide the TWC with information from the calibration certificate. If you do not do this you will be interrupted and asked to provide the data. See 'Loader Calibration' for details.
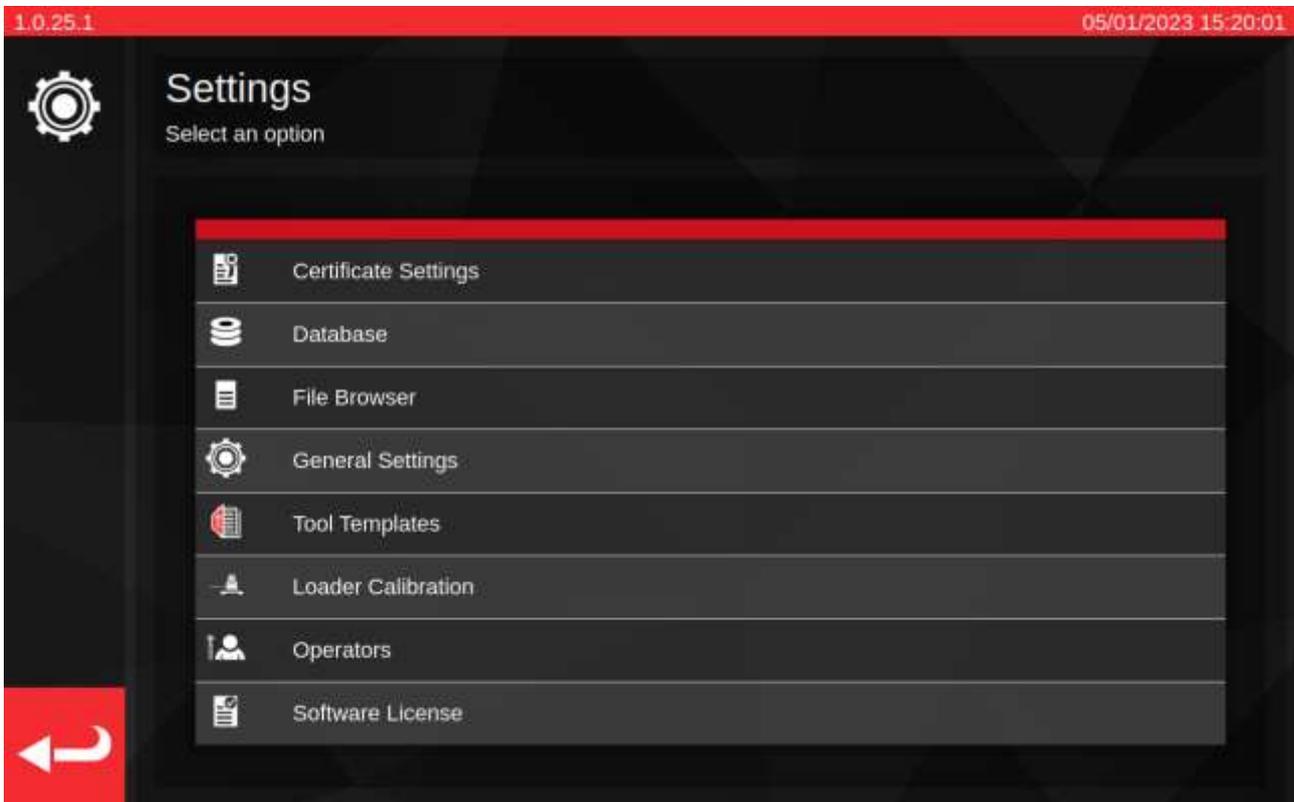
'Certificate Settings': Lets you configure the documents produced after calibration, such as changing company logos, contact details and certificate numbering schemes.

'Database': Lets you manage the database (backup, restore, erase).

'File Browser': Browse and modify the TWC file system or install TWC software updates if found. The 'File Browser' is also used by other tasks where data needs to be saved or loaded from a user-specified location.

'General Settings': Settings to do with operating the TWC, such as first-peak sensitivity.

'Tool Templates': Access Tool Templates (also accessible from main menu).

'Loader Calibration': Manage the TWC's calibration state with the currently connected transducer; enter uncertainty data for the TWC and transducer combination.

'Operators': Manage operators who use the TWC. Operator names as stored will appear in the 'Person Responsible' field on calibration documents if selected.

'Software License': Review TWC software licenses.

Settings > Database Management

This menu allows the TWC data store to be backed up to or restored from, a location on the TWC itself or an external storage device such as a USB flash drive. It is recommended to perform backups regularly and essential to do so before installing any TWC software updates.

In addition, the Database Management menu shows the size of the current database, listing the number of tools, templates and jobs currently stored within.

'Backup Database' – this button will open the File Browser in order to pick a backup destination. This could be a location on the TWC's internal storage or an external storage device like a USB flash drive. The backup will be assigned a filename automatically.

'Restore Database' – this button will open the File Browser for you to pick a TWC backup file to restore from. This file may be located on the TWC's internal storage on an external storage device like a USB flash drive. Restoring from a backup will erase and replace any data already in the database at the time of restoration.

'Erase Database' – this will erase all data in the TWC database. In cannot be reversed, except by restoring a previous backup.

'Rebuild Index' – The TWC uses an indexing system to boost performance for large databases. If any issues arise, such as records seeming to not update or not appearing/disappearing as expected during creation/deletion, then the index can be rebuilt using this button. In normal use this button should not be necessary at all. Rebuilding the index can take a few minutes for especially large databases.
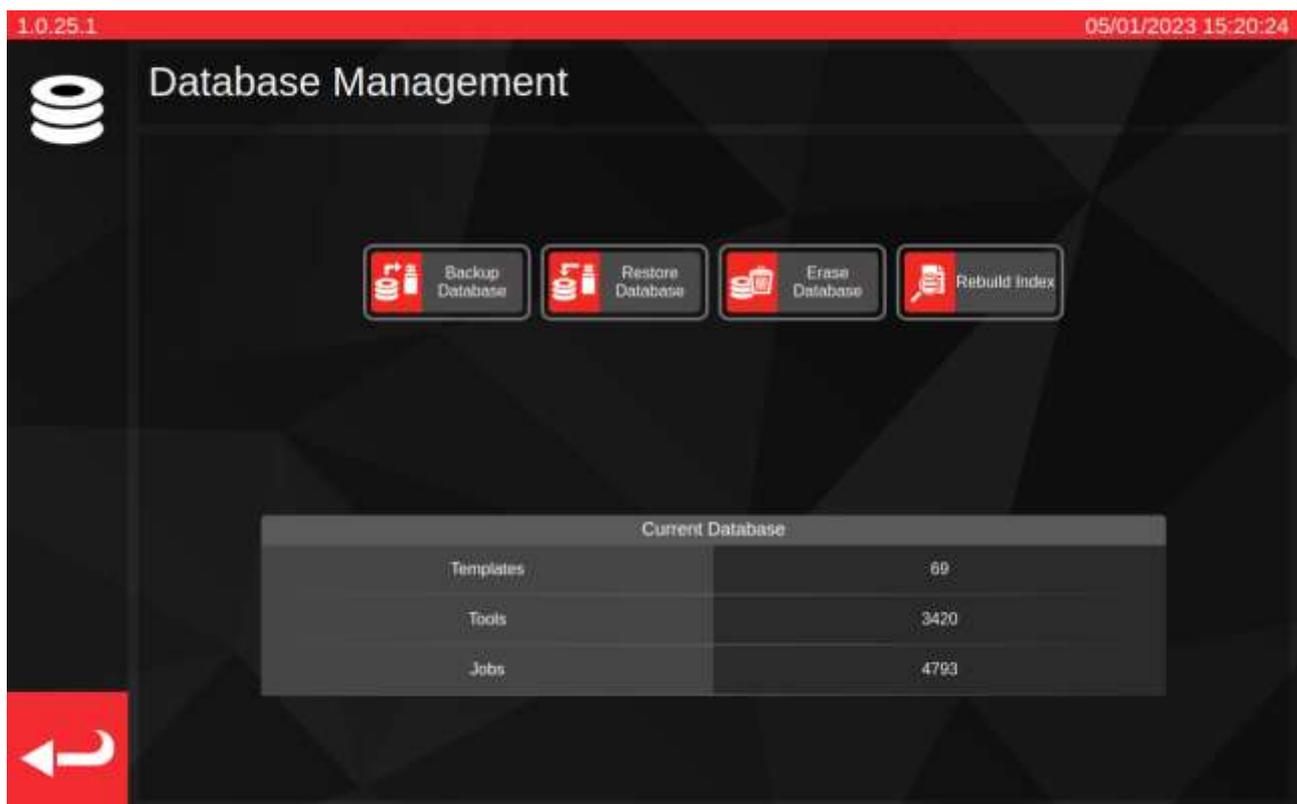
'Data' comprises:
- Tools and tool templates
- Jobs and uncertainty data

Settings are not considered 'data' and therefore are not affected by backup, restore or erasure options.

Performing a Backup or Restore Operation

To perform a backup or restore, select the appropriate 'Backup Database' or 'Restore Database' button in the Database Management menu. You will be taken to the File Browser to either pick a save location or pick a backup file to restore from, as appropriate. Please see **File Browser** for more information on selecting locations and files.

Once the selection is made, you are returned to the Database Management screen and the Backup or Restore operation takes place. After restorations, the restored database is checked for any necessary upgrades and then these upgrade procedures are run to bring the database into compliance for the current software version.

NOTE: **Depending on the size of the database involved, Backup and Restore operations could complete quickly or take a while for larger databases. If backing up or restoring from an external storage device like a USB flash drive then the time may vary depending on the performance of the external memory device.**

Database restorations, in particular, can take a very long time if the restored database is large and in need of database upgrades thereafter. For a database in need of upgrades with circa 5000 tools, templates and jobs, you should expect the restoration to take over a minute and the subsequent upgrade procedure to take about 20-30 minutes. During this time the screen will warn you that an upgrade operation is taking place. After this, the index will need to be rebuilt, which may take a further minute or two.

NOTE: **You may see a pop-up window appear when inserting a USB flash drive. Simply tap cancel or tap on the TWC UI behind it, to drop back to the TWC interface.**

NOTE: **If you encounter problems backing up to external storage, then ensure USB flash drives are formatted in FAT32 and do not have more than one partition. If it still does not work, perform the backup to a location on the TWC itself and use the File Browser to copy the backup over later.**

NOTE: **Restoration is a destructive process; all data already on the TWC will be removed to make way for the backup.**

File Browser

The TWC includes a file browser built into the user interface. Its primary purpose is to facilitate the selection of save locations for database backups, debug logs and job data exports or for selecting files to load in the case of database restoration. It can also be used to find and install updates to the TWC user interface (the instructions for doing this can be found on the Norbar website, along with the latest TWC software).

When selecting a save destination or selecting a file to load, the File Browser is opened with that specific context in mind. This affects the way the user interface works, specifically the functionality of the 'Select' button.

When saving a file: The 'Select' button' (**1**) is for picking the destination directory to save to. It will only work for selecting directories. The workflow for saving a file is the same regardless of whether the file is a database backup, a debug log or a job data export. In all cases, the File Browser will load in a directory-selection context, such that the 'Select' button is for selecting a highlighted directory from the directory listing.

When loading a file: The 'Select' button (**1**) is for picking the file to load. It will only work for selecting files. You must highlight the file you wish to load and then press the 'Select' button.

The exception to the above two cases is if the File Browser is opened directly, from the Settings menu list. Here the File Browser opens with no context and will not try to return files or directories on selection. You can still use the File Browser to navigate the TWC's file structure, make directories, rename directories and files and move files around using the File Browser user interface. As mentioned before, you can also install TWC software updates by double-clicking on them and following the on-screen instructions.

NOTE: **You have to highlight a folder in the directory listing to be able to select it as a save destination. If you are already browsing the directory you wish to select, such that it cannot be highlighted as it is not in the list, use the navigation path or the back button to go up into the parent directory and then select it from there.**

You may use the File Browser to create, delete, copy or rename folders and files during this time.

Navigating the File Browser

At the top of the File Browser are the storage button (**1**), which lets you change between internal and external storage devices (such as USB flash drives) and the navigation path (**2**), which show a trail of where you currently are in the file system, leading back to the base directory (here, showing the current location as being /home/pi/Desktop):
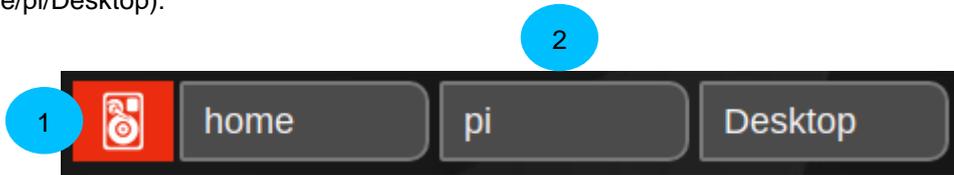
Every time you open a subdirectory, navigating deeper into the file system, it will be added to the navigation path. If you go up a directory, it will be removed. You can tap any of the directories in the navigation path to jump instantly to that directory (for instance, tapping 'home' in the scenario pictured below would take you straight to the home folder). You can also navigate up one directory with the directory 'back' button shown in the left of the directory listing:
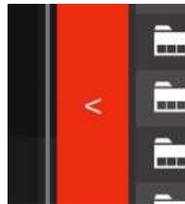
Tapping the storage button will open a pop-up asking whether you wish to browse external ('Removable Media') or internal ('Main Storage') media. Internal media will navigate you to the /home folder, while external media will navigate you to the /media/pi folder where you can then see any mounted external file systems within. You can save to and load from internal or external storage as you wish.
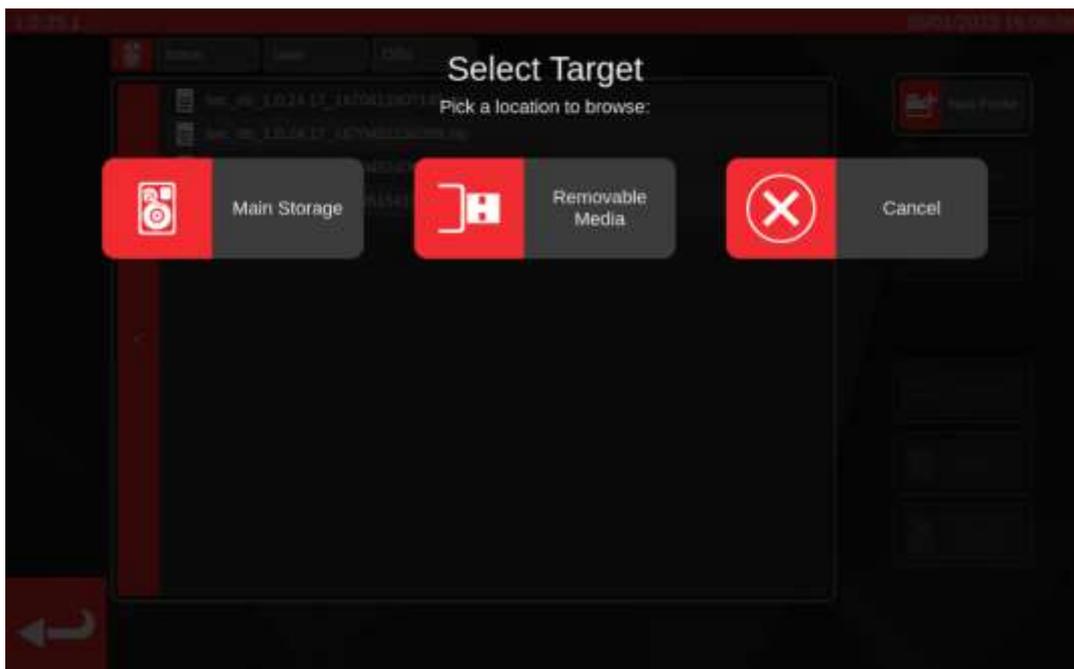
Settings > General Settings

This menu lets you configure settings relating to the loading of setting and indicating tools. It also provides a means to observe and reset the lubrication cycle counter (how many cycles remain until the TWC should be lubricated) and a means to save a debug log in the event of any issues requiring support from Norbar.
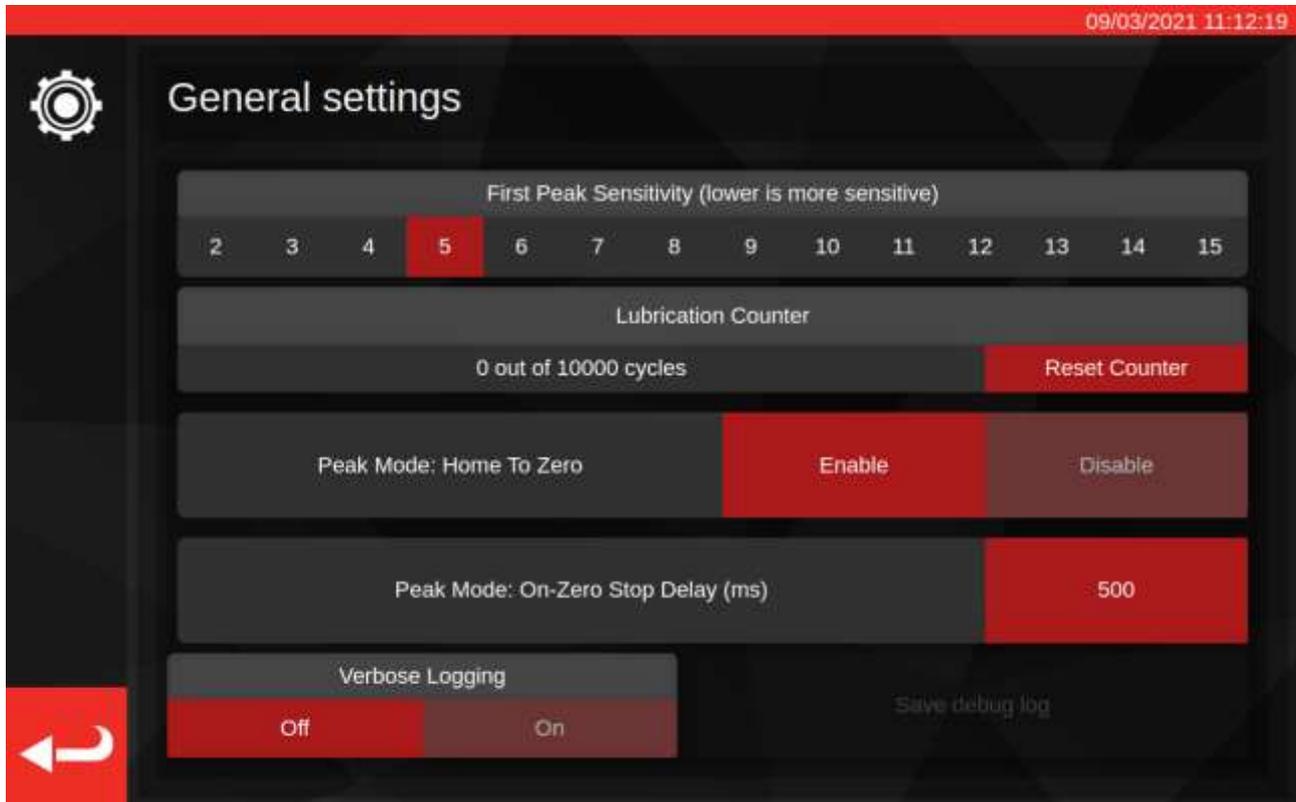
The 'First Peak Sensitivity' setting lets you choose how big of a torque peak must be observed before it is taken as a legitimate first peak reading. If the TWC does not appear to detect the click of your setting tool, try reducing this setting to a smaller value. Conversely, if the TWC is detecting false peaks, try raising this setting so the TWC only pays attention to larger changes in torque. The default value is 5. You can also override this value for specific tool templates in the tool templates themselves (see **Add/Manage Template**)

The 'Lubrication Counter' keeps track of how many cycles the TWC's loading mechanism has undergone since the mechanism was last lubricated. If the counter ever reaches the 10,000 cycle limit, you will see reminders to lubricate the TWC every time you load a job task or the adjustment screen. To reset the lubrication counter, lubricate the mechanism according to the Greasing Procedure outlined in this manual and press 'Reset Counter'.

'Peak Mode: Home To Zero' allows the TWC to home to a zero-torque state when finishing a cycle of an indicating tool, as opposed to returning all the way to the limit of the loading mechanism. Enabling Home To Zero can speed up cycling by avoiding unnecessary movement of the mechanism when working with indicating tools.

'Peak Mode: On-Zero Stop Delay (ms)' controls how long the TWC motor keeps moving after reaching a zero-torque state during a Home To Zero operation. You can adjust this value if there is not enough slack (or too much slack) left in the mechanism when the operation has completed.

'Verbose Logging' turns on extra debug logging that can help if you encounter problems when operating the TWC and need to contact support. In normal operation this should be turned off. If a problem occurs, you can turn it on, repeat the scenario that caused the problem, then save a debug log to send off for investigation. If you contact Norbar for support without a debug log, you may be asked to do this in order to help diagnose any issues.

Pressing 'Save debug log' will invoke the File Browser so you can choose a save destination, such as a USB flash drive.

Settings > Loader Calibration

In order to produce calibration and conformance certificates, the TWC must know about its own calibration state, this is managed here. In this screen you can input calibration data from both the TWC and the currently attached transducer's calibration certificates. You will need to do this for every transducer you plug into the TWC, but you only need to do this once (at least, until recalibration is required).

The screen is split into the following areas:

1. 'Select Direction' buttons: use these to view TWC calibration state for CW and CCW directions;

2. 'Recalibration Window': when the displayed number of days have passed, the TWC's calibration will be considered invalid. You may change this value to suit your obligation to systematically review the calibration state of your TWC, as per ISO 6789. The default value is 730 days, which is two years;

3. 'Current TD' data: The left side of the screen is where you enter data for the transducer; the calibration date from the certificate, the calibrated bottom of scale, the cert. number and laboratory number and the uncertainty data from the transducer;

4. 'TWC data': The right side of the screen is where you enter data for the TWC; here you can enter the certificate number and rig uncertainty data from the TWC calibration certificate. You need only fill in these fields if you and are using an instrument-calibrated TWC and there is no overriding system calibration for the currently attached transducer. The TWC 'Model', 'Serial', 'Sys Cal', 'Inst Cal' and 'Cal State' fields are automatic and not editable;

How to Fill in Loader Calibration Page

The TWC has two main calibration states: 'system' calibration and 'instrument' calibration.

A 'system' calibration is where the TWC and the transducer have been calibrated as a matched pair (a 'system'). In this case, we do not need any data from a TWC calibration certificate as it is all provided by the transducer certificate.

To have a valid system calibration, the TWC must have been system calibrated with the currently attached transducer and you must fill in:

- Transducer certificate number and laboratory number
- Transducer calibration date
- Transducer bottom of scale
- Transducer uncertainty data (see **How to fill in uncertainty data**).

An 'instrument' calibration is where the TWC and the transducer were calibrated separately. In this case, we need data for both devices, such that their calibration information can be combined.

To have a valid instrument calibration, the TWC must have been instrument calibrated, the transducer must have been calibrated and you must fill in:

- Transducer certificate number and laboratory number
- Transducer calibration date
- Transducer bottom of scale
- Transducer uncertainty data
- TWC certificate number
- TWC rig uncertainty data (see **How to fill in uncertainty data**).

NOTE: **Do not change transducers while within the settings menu. The TWC will not re-list it and you risk corrupting the calibration state of the TWC-TD combination if you change any loader calibration fields after having changed the transducer. If you wish to change transducer, first leave the loader calibration menu, then leave the settings menu entirely, then re-open it from the main menu. The TWC will then detect the new transducer.**

NOTE: **Always ensure the serial number of the transducer shown in the Current TD 'Serial' field matches that of the transducer you are trying to enter data for. If it does not, try leaving the loader calibration menu, leaving the settings menu and re-opening it from the main menu again.**

How to Fill in Uncertainty Data

1. Refer to the final page of your TWC/transducer calibration; the page should be titled 'Expression of Uncertainties'

For Transducers:

On the 'Expression of Uncertainties' page, you should see a table like the following (shown here, an example for a 400 N·m transducer):

	Expanded uncertainty k = 2.0	Uncertainty interval k = 2.0
At 20.00 N·m	±0.15%	±0.38%
At 40.00 N·m	±0.12%	±0.18%
At 80.00 N·m	±0.099%	±0.11%
At 160.00 N·m	±0.087%	±0.11%
At 240.00 N·m	±0.087%	±0.13%
At 320.00 N·m	±0.084%	±0.12%
At 400.00 N·m	±0.084%	±0.11%

First, fill in the 'BOS Expanded' and 'BOS Interval' values for the bottom of scale; these come from the expanded uncertainty and the uncertainty interval at the very lowest reading, in this case 20 N·m. That means the BOS Expanded field is 0.15% and the BOS Interval field is 0.38%.

Next fill in the 5% Expanded and 5% Interval fields **using the readings at 5% of transducer capacity**. In this case, this is the same as the BOS Expanded and BOS Interval values, because in our example, the transducer's bottom of scale is 5%.

Repeat the same procedure for the 10% fields **using the readings at 10% of transducer capacity** (in this case, the Expanded field is 0.12% and the Interval field is 0.18%)

For the final two fields, we need to **select the worst-case (largest) expanded uncertainty of the remaining transducer range equal to and above 20% of transducer capacity** and its corresponding uncertainty interval. This is usually the next field on from the 10% readings anyway and indeed this is the case in our example: therefore, the Expanded field should be 0.099% and the Interval field should be 0.11%.

For the TWC (If Instrument Calibrated):

On the TWC certificate's expression of uncertainties, you should see the following (shown here, an example for a TWC):

At 0.50 mV	Is ±0.20%	k = 2.0
At 1.00 mV	Is ±0.13%	k = 2.0
At 2.00 mV to 11.00 mV	Is ±0.11%	k = 2.0

The percentages here correspond with the mV values, so 0.50 mV is the 5% value, 1.00 mV is 10% and so on. Enter all three percentage values from the table in the 5%, 10% and 20% fields respectively. In this example, the 5% Expanded field is 0.20%, the 10% Expanded field is 0.13% and the 20% Expanded field is 0.11%.

IMPORTANT: **BE EXTREMELY CAREFUL THAT YOU ENTER THE CORRECT VALUES IN THESE FIELDS. DOUBLE AND TRIPLE CHECK TO MAKE SURE.**

IF YOU DO NOT ENTER THE CORRECT VALUES, ANY CALIBRATIONS OR CONFORMANCE JOBS PERFORMED BY THE TWC MAY BE RENDERED INVALID.

Settings > Certificate Settings

This menu lets you configure the content of the calibration and conformance documents produced by the TWC. You can change the company address, the logo and customise the certificate numbering scheme. You can also change the language new certificates are created in.

NOTE: **Any changes made in the Certificate Settings menu will not take effect until the next document is created. You cannot change documents which have already been created.**
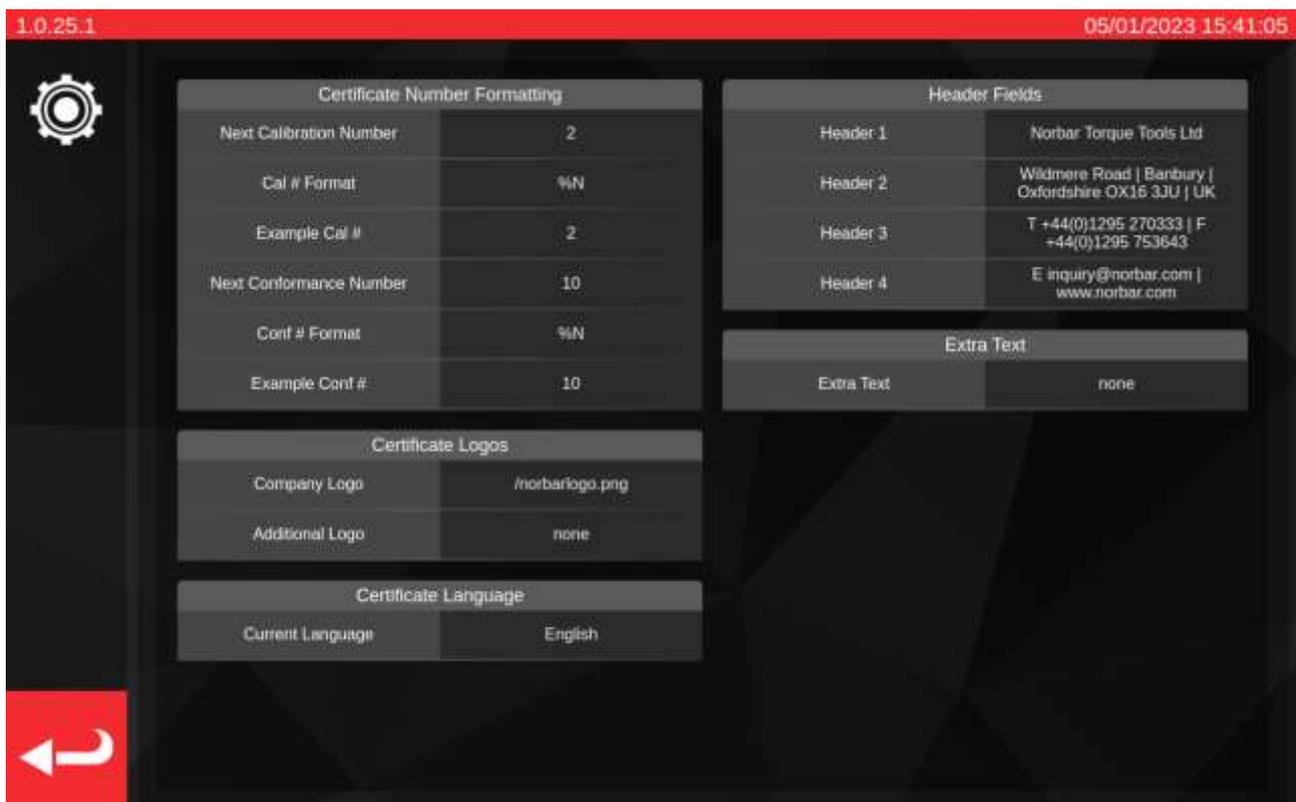
Next Calibration / Next Conformance number: for traceability, each calibration or conformance document is numbered, with the number increasing every time one is produced. You can set or change that number here for both types of document.

Cal/Conf Number Format: This allows you to specify a more elaborate numbering scheme than just a flat number by using format modifiers and text of your choosing:

%N – insert the calibration/conformance number. This is the default setting. Output will be '1', '2', '3' etc.

%Y – Insert the current year (lower case %y enters short year, i.e. 18 for 2018)

%m – Insert the current month

%m – Insert the current day

You can combine these with other text to produce more elaborate numbering. For instance:

%Y-CAL-%N

Will produce:

'2018-CAL-1', '2018-CAL-2', '2018-CAL-3', etc.

When you save the format, you will see a preview of the output to be placed on the next document.

Company logo & Additional logo; this lets you change the logo from the default Norbar logo to one of your choosing and to add an additional secondary logo if you wish. To do this, you must first place an image of your logo in the necessary folder: ~/.twc_logo

To do this:

- Attach a USB keyboard to the TWC (and optionally, a mouse)

- Close the TWC UI using the power icon on the main menu and pressing 'Exit to Desktop'

- Open the file manager; it should start in the user home folder by default

- In the address bar, add '.twc_logo' to the end of the path and press Enter to jump to the .twc_logo folder (as shown below)
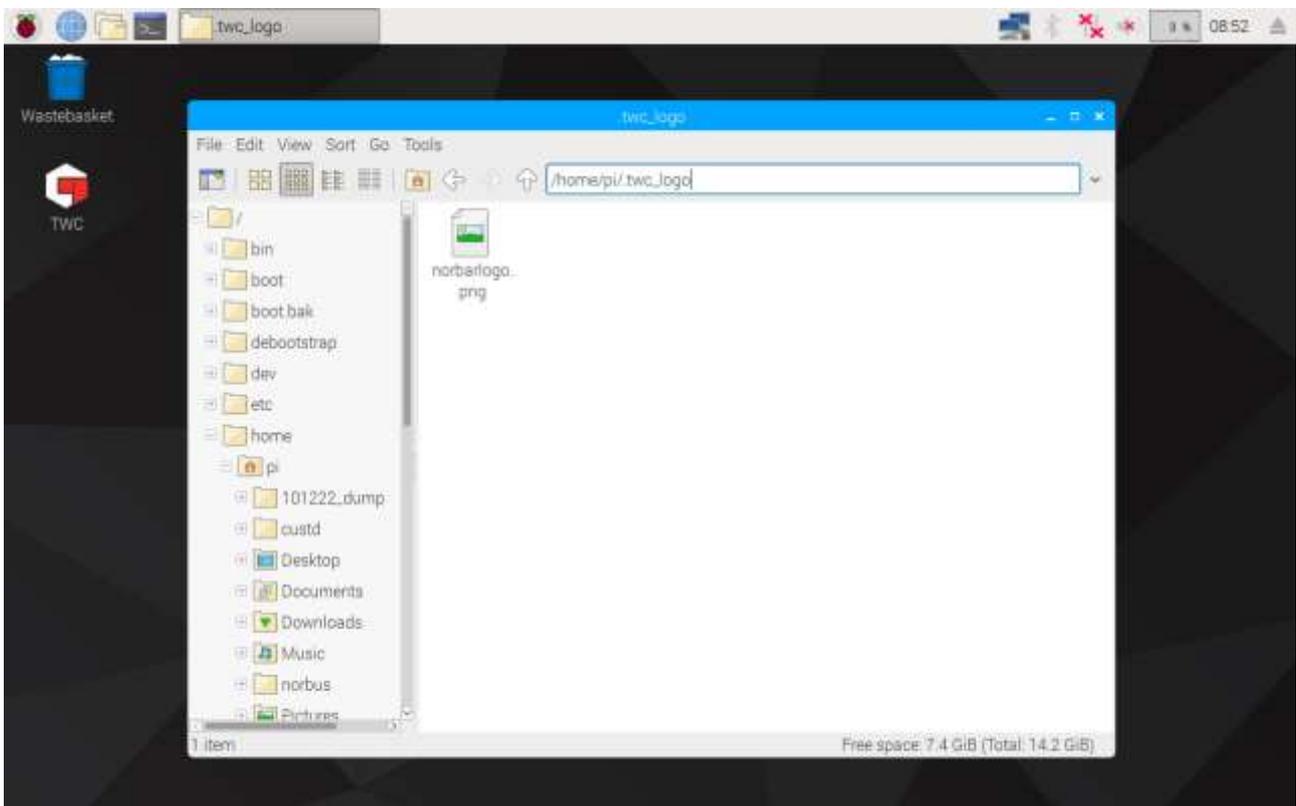
- Copy your logo file in here (for instance, by copying it off a USB flash drive), making note of the file name. You can copy and paste a file by right-clicking it with a mouse and clicking 'copy' or 'paste' or by highlighting it with the touchscreen and using 'Edit > Copy' or 'Edit > Paste' in the file manager menu. It is also possible to do this by highlighting it with the touchscreen and using CTRL+C and CTRL+V on the keyboard

- Restart the TWC UI by double-clicking the TWC icon on the desktop

- Go back to Settings > Certificate Settings and enter the name of the logo file, keeping the leading '/' at the start, as shown below:

NOTE: Your logo file should ideally not be larger than 400x160 px or the document layout may be affected. Use the existing norbarlogo.png file for a good size reference.

NOTE: PNG and JPEG formats are supported. PNG is a 'lossless compression' format which makes it a great choice for storing company logos and is the recommended choice.

Headers and Extra Text Fields; The header fields are shown at the top of the certificate, next to the logo and by default contain the company address. The extra text field appears above the results table if it is used and can contain anything you choose (though it should be brief, so as not to overrun the document with text and cause any layout issues).

Certificate Language

The TWC supports changing the language of generated documents; simply click the Certificate Language setting to see a list of available languages to choose from. After making a selection, the change will take effect on the next document that is produced.

Languages are defined in dictionary files, which can be selected from in the Certificate Settings window. This means that users can define their own languages or even modify the default English language of the certificates to suit their needs, such as to change or add additional phrasing to certain sections of the documents.

By default, the TWC ships with an English dictionary. However, more can be added and will then appear in the menu to choose from.

NOTE: To make modifications or to add new languages, it is strongly recommended to copy and modify the default dictionary, leaving the original alone as a backup.

The dictionary comprises a JSON-formatted data structure of labelled strings. A shortened example is shown below – you can see the labels and their corresponding values inside the 'dictionary' object. Every dictionary also contains an 'englishName' designation of its language in plain English, an 'isoCode' designation of its language in ISO format and a 'localName' designation of its language in the actual language in question.

```
{
        'dictionary': {
                'aLabel': 'Text for the label here',
                'anotherLabel': 'Text corresponding to this other label'
        },
        'englishName': 'English',
        'isoCode': 'eng',
        'localName': 'English'
}
```

For modifying the existing dictionary, simply find the requisite label and change its text to suit your needs. For creating a new language dictionary entirely, the process is the same, but this time using the language desired and every single label will need its text to be changed to a language-appropriate equivalent.

The default dictionary is called eng.json can be found in: /opt/norbar/isoloader/webui/lang

All dictionary files should be placed in the same folder.

46

All dictionary files should be named based on their isoCode value and end with a '.json' file extension. For customised variants of languages, append an appropriate suffix to the isoCode, like 'engCustom'.

NOTE: **The dictionary does not tolerate syntax errors like missing quotation marks or commas. Even a single mistake will break the dictionary. Use an online JSON validator to check your changes are valid, such as jsonformatter.org; this will tell you if you have made any errors.**

NOTE: **Under no circumstances should the dictionary labels be modified or removed, even for other languages. Only the text assigned to a label can be changed.**

NOTE: **When modifying strings, try to keep the length of text similar to the defaults or you risk creating layout issues in the document as the TWC tries to fit too much text in the available space.**

NOTE: **Existing documents cannot have their language changed, but if modifications are made to the dictionary they already use, the changes will be reflected immediately on all documents that use that dictionary.**

Editing Dynamic Dictionary Text

Most of the dictionary's contents are simple text strings which can be changed as required (in line with previously mentioned considerations to overall length of the text). However, the dictionary also includes dynamic text which includes variables (defined in double curly braces {{like this}}) that are set during runtime by the software. This gives the user control as to where these variables will end up in the string, to accommodate the requirements of different languages. An example is provided below:

'cnfEnvironment': 'Calibration temperature {{var1}}°C at a relative humidity <90%',

At runtime, this dictionary string would produce output like this:

Calibration temperature 23°C at a relative humidity <90%

Where '23' has been determined at that moment by the software. If for some reason we changed the string to:

`'cnfEnvironment': 'Calibration {{var1}} temperature °C at a relative humidity <90%',`

Then the rather illogical output would be:

Calibration 23 temperature °C at a relative humidity <90%

With this, you can see how the placement of the variable intuitively effects where the value ends up in the final output. So, when translating this string into another language, we must make sure the dynamic variable is present and placed appropriately for the new language:

```
'cnfEnvironment': 'Temperatura de calibración {{var1}}C a una humedad relativa <90%',
```

Some dynamic text contains multiple variables. These will be numbered {{var1}}, {{var2}} and so on. All of these must be preserved in any alterations to the text, but as shown above their location within the text can change as required. They do not need to be in numerical order (but beware that changing the order may make the output not make sense, depending on the language in question). Some dynamic text also contains the same variable multiple times. Every time it appears, the same value will be inserted at runtime. An example of multiple and repeated variables is shown below:

```
'cnfSpecifiedTorqueRange': 'Specified Torque Range: From {{var1}}{{var2}} to {{var3}}{{var2}}'.
```

This may produce output like so:

Specified Torque Range: From 20 N·m to 100 N·m

You can see, {{var1}} was the first torque value, {{var2}} was the torque units (which was used twice, after each torque value) and {{var3}} was the second torque value.

NOTE: **Ensure every {{variable}} found in a dynamic text entry is preserved in any translated text, otherwise system instability may occur.**

NOTE: **Do not rename the variables. You can move them around, change the order and add more copies of them in, but never change the names. Always ensure that at least one copy of the variable exists in the new string if it was there already in the original.**

NOTE: **JSON formatters and validators will not catch errors in variable names. Do not add spaces or use capitalised letters inside the curly braces.**

48

TWC USAGE WORKFLOW

The TWC user interface's menu structure is data-centric and designed to follow the logical process of calibrating a tool from start to finish. The process for calibrating a tool is as follows:

Define a tool template (i.e. a torque wrench model) > Add a tool based on that template > Book a job for that tool (describe what you are going to do, i.e. calibration) > Perform the job > Produce documentation.

Templates

The TWC represents a tool by using a tool template. The template defines a tool's model, supported units and capacities, physical configuration modifiers like extensions, removable end fittings, square or hex drives, and the calibration and conformance workflow. Before adding a tool to the TWC, you must select or create an appropriate template for it.

You can access the templates menu via the main menu, the settings menu or even the tools menu. When you try to add a new tool you will be invited to visit the templates screen to select or create a template.

Every tool requires a template, but a template can be used for more than one tool. For example, if you are calibrating twenty identical tools of the same make, model and configuration, you should add them all under the same template. This is necessary if you plan to calibrate large quantities of identical tools and wish to gather uncertainty data for statistical analysis to speed up the process.

NOTE: **Always use a specific template that accurately describes a tool. Do not create generic templates when using the TWC to calibrate tools. Only identical tools, with the same physical configuration (i.e. end fitting/extension) can share a template; otherwise, the results produced for ISO 6789-2:2017 calibrations may not be accurate.**

Tools

Tools can be added in the tools menu, which is accessible from the main menu. When you add a tool, you will be asked to jump to the templates menu to create/select a template to use and then enter a serial number. However, you can also copy an existing tool by selecting it before pressing the add button; in this case, you will be asked if you want to create another of those tools and only need to provide the serial number. This lets you quickly add several tools with identical serial numbers.

Jobs

Once you have created a tool, you can book a job for it via the Jobs menu or the Jobs shortcut on the tools menu. A job tells the TWC what you wish to do with the tool; You may select between ISO 6789 Conformance or Calibration tasks, pick directions, specify whether taking readings 'as-found' or 'as-left' or both, select your desired units and make adjustments to the calibration workflow.

Once booked, the TWC will track the progress and automatically mark the job as completed when appropriate. Simply follow the list of tasks and complete each one to complete the job.

You do not need to finish one job before booking and starting another, but each tool can only have one active job at a time. This allows you to book jobs for multiple tools in preparation to perform them later. However, if you start taking torque readings for a job you have booked, you should finish that job before doing anything else.

The Jobs menu lists all jobs in the database. You can open up incomplete jobs to review the settings or continue work or retrieve the job certificate/declaration for completed jobs, for example if you needed to reprint an old certificate.

For ISO 6789-2:2017 calibration, the TWC automatically tracks and manages the uncertainty data necessary for statistically determining uncertainties. If you have sufficient data (at least ten specimens of identical tools using the same tool template), you will be able to skip gathering the uncertainty data and just perform the calibration workflow. This dramatically speeds up the calibration process.

Add / Manage Template

To add / manage a template press the Templates icon on the home screen.

This screen is the templates list, which shows an abbreviated list of all the templates stored in the TWC database. It also allows you to view template summaries, delete templates and duplicate templates to modify them for similar tools (without having to fill in everything again from scratch).

Press the + icon to add a template, which will open the Template Editor.
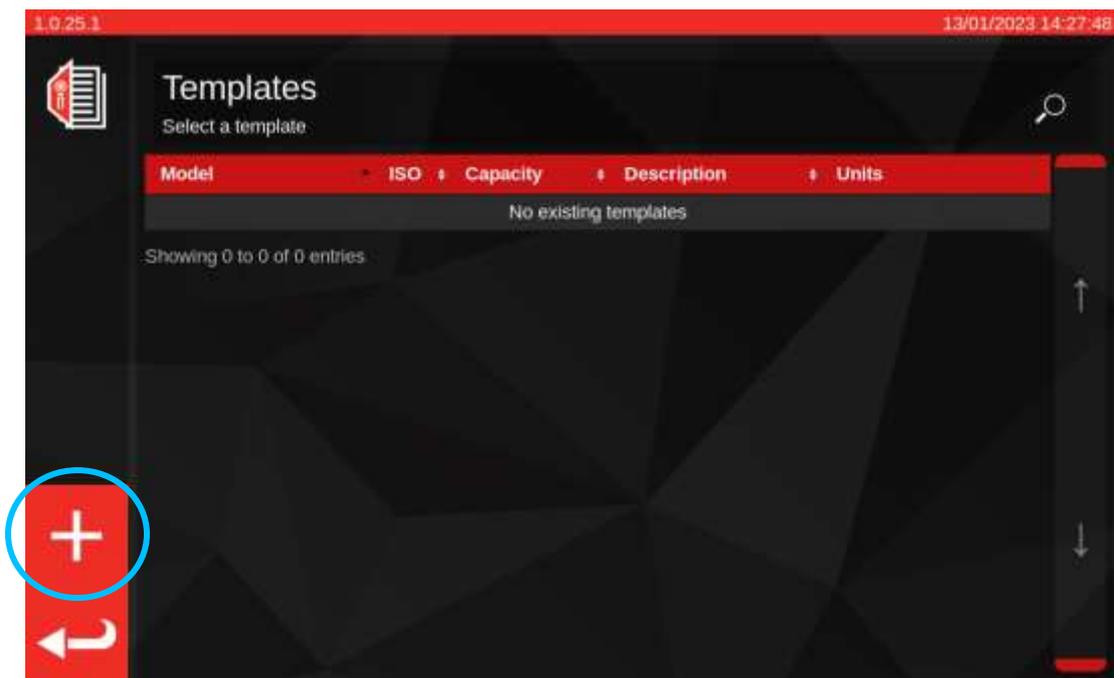
The Template Editor allows you to define all the parameters of a tool model which are necessary for the TWC to calibrate it properly.

It is organised into three main logical segments. The top third of the screen deals with tool identity, configuration and classification. The middle third deals with tool supported units, capacity and accuracy (tolerance, resolution as appropriate). The bottom third deals with the calibration workflow for the tool. For the most part, creating a template involves moving down the screen filling out the missing data.
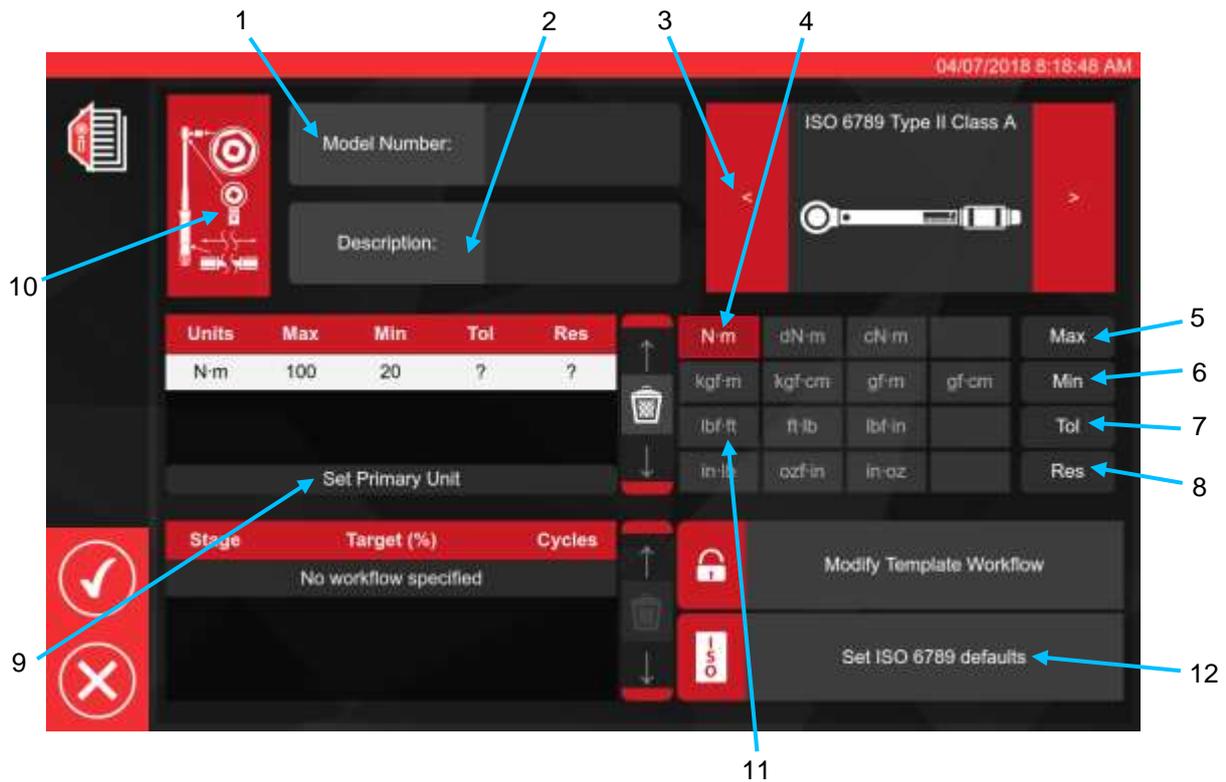
Following the sequence shown above enter all required data as appropriate for steps 1 through to 8.

When adding the first unit of capacity to the tool capacity window, the unit is implicitly set as the primary, or default unit, as there are no others present. As such, step 9 'Set Primary Unit' will be greyed out at this time. You may use it if adding additional unit capacities to set which one should be considered the primary, or default unit for the tool.

A summary of the ISO tool types is given below; for full details please refer to the ISO standard.

Tool Type I: Indicating torque tools (The torque exerted is indicated on scale, dial or display).

Tool Type II: Setting torque tools (A signal is given when the pre-set torque value is met).

Type	Class	Description:	Example:
I	A	Wrench, torsion or flexion bar.	
	B	Wrench, rigid housing, with scale or dial or display.	
	C	Wrench, rigid housing and electronic measurement.	
II	A	Wrench, adjustable, graduated or with display.	
	B	Wrench, fixed adjustment.	
	C	Wrench, adjustable, non-graduated.	
	G	Wrench, flexion bar, adjustable, graduated.	

For step 10, press the tool configuration icon to enable adaptor / end fitting and extension parameters to be added where required, as well as any system overrides to the first peak sensitivity setting, if appropriate.

By clicking the appropriate 'Attach' button, you will be asked to select the adaptor, ratchet type or extension used with the tool. Simply follow on-screen instruction for data entry.

For adapters and end fittings, the principle information required is the minimum degrees of rotation the adapter or end fitting is capable of. This will ensure the correct workflow is generated for the tool for ISO 6789 Part 2 calibrations.

For square drive adapters and end fittings, the 'Angle of Rotation' value is 90 degrees.

For hex drive adapters and end fittings, it is 60 degrees.

For end fittings that cannot rotate at all (i.e. no ratcheting mechanism) it is 0 (zero) degrees, or 'fixed'.
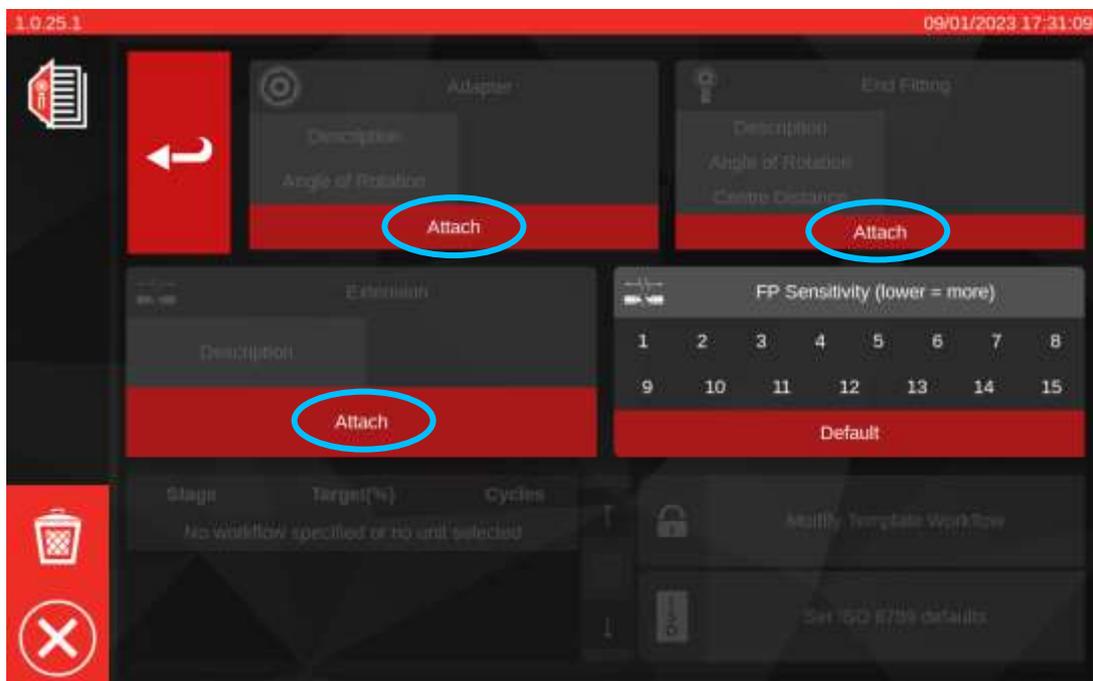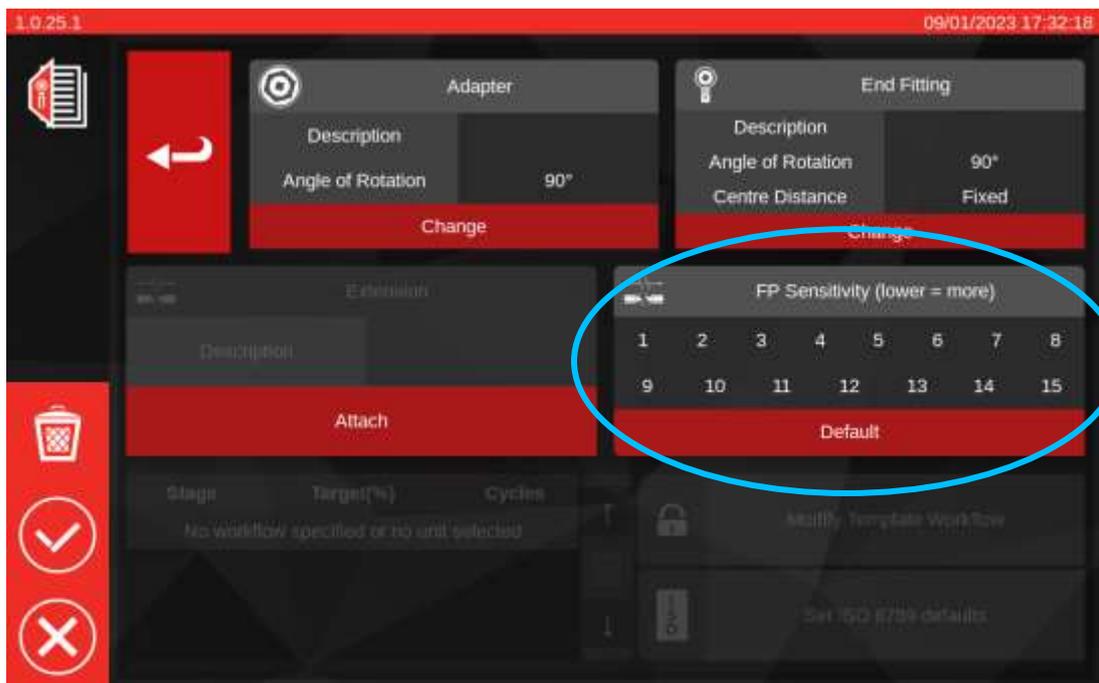
FP Sensitivity Setting

On this page you can also see the FP (First Peak) sensitivity override setting. This setting's purpose is identical to that found in the TWC Settings > General Settings menu (see **Settings > General Settings**), except it overrides that global setting and applies a new one directly to this template.

By default, it is set to 'Default' which will always follow the current value in TWC General Settings.

For most tools, it is acceptable to leave this set to 'Default', but if you find yourself constantly having to change the global sensitivity setting as you switch between tools, consider using the override for their respective templates instead.

NOTE: **Beware of how this setting interacts with jobs. Once you book a job, the template used by that job is fixed and any changes to the template (such as the FP sensitivity setting) will not be reflected in the job. This means you should ensure you have the tool working reliably on the TWC before booking the job; because if you have to change the FP sensitivity later, the change won't be reflected. When this happens, the tool will appear to behave well in the adjustment screen, but will not behave well on the calibration screen, at least until that job is finished and a new job is booked.**

NOTE: **For templates which are left on 'Default' FP sensitivity, the above still applies but because the setting in question is the global default, it is possible to change the FP sensitivity and have that change reflected when completing an existing job.**

If secondary units are required select the desired units (see step 11).
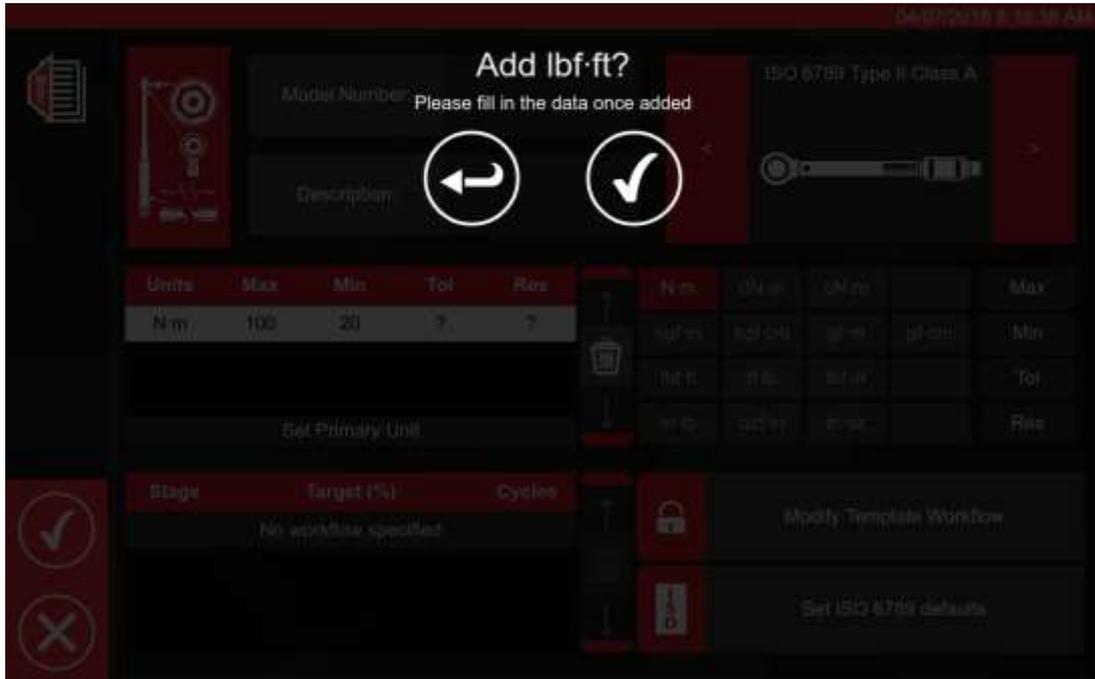
Follow on-screen instruction (most users will only select 1 set of units for calibration within the template).

NOTE: **Your resolution might change when entering additional values.**

From step 12 Set ISO defaults (following on-screen prompts).
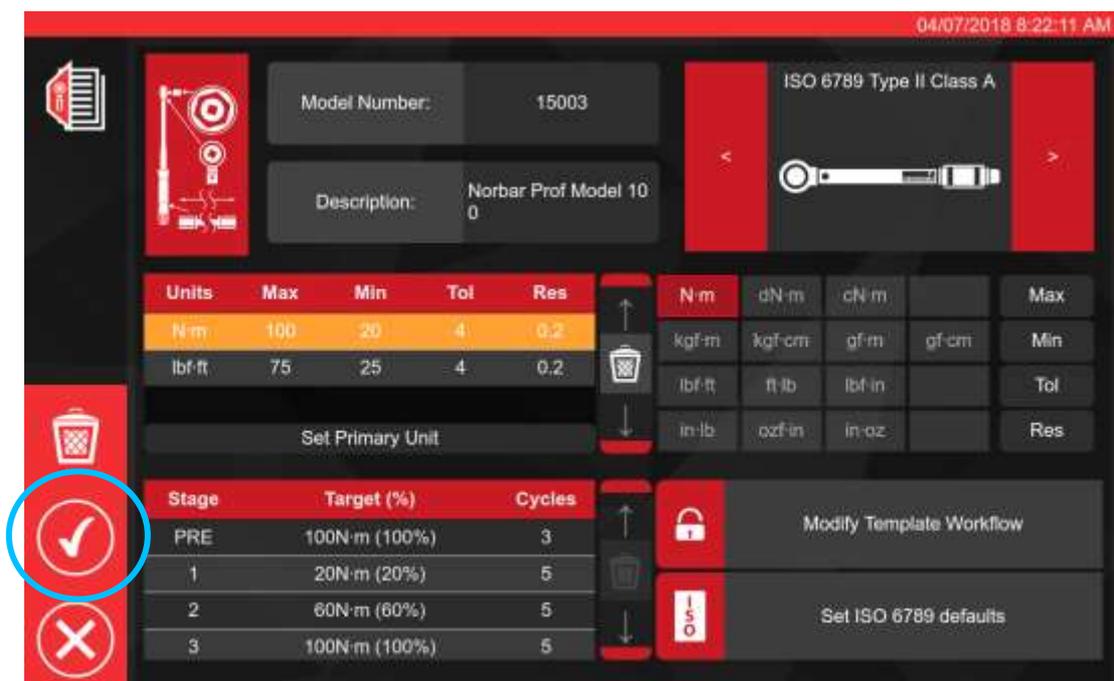
Press ✅ to confirm and save.

The new template will be shown as a new line within TEMPLATES.

At this point the template should be ready to use.

NOTE: **Beware of how templates interact with jobs. When you book a job, a snapshot of the template is taken and stored in the job data. Therefore, no subsequent edits to the template will take effect on a job once it has been booked. Any changes made will only take effect the next time a job is booked for a tool which uses that template.**
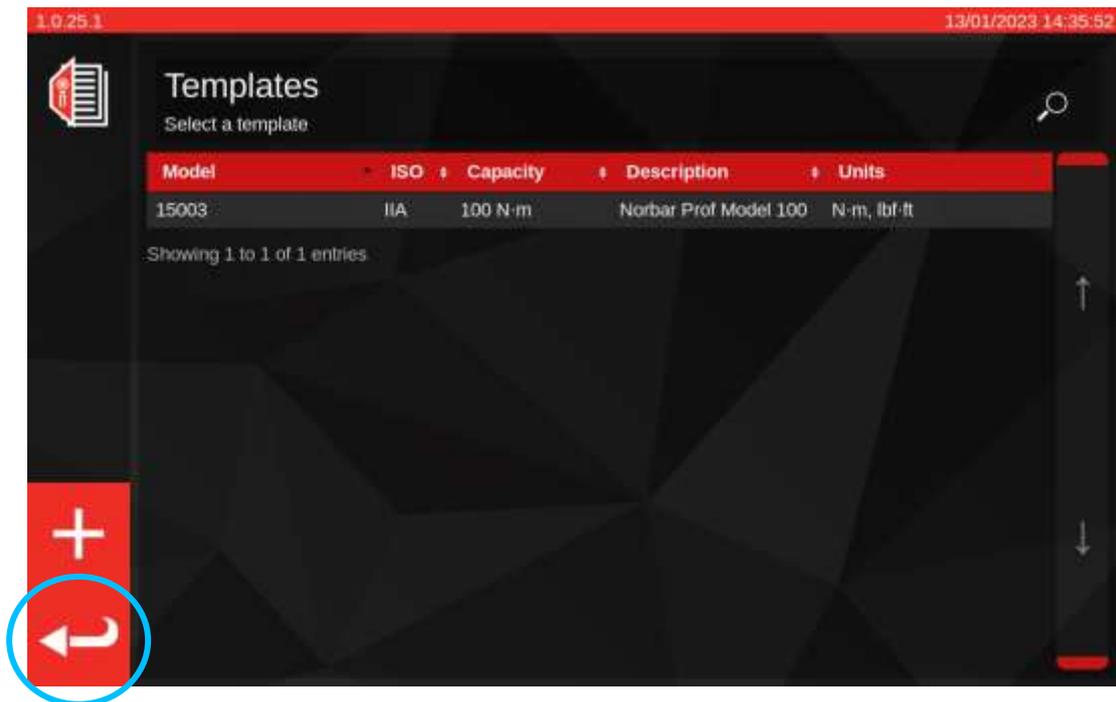
From the main Templates window, press return to go back to the home screen.

# Creating Certificates or Declarations of Conformance

This section shows a start-to-finish walkthrough of how the TWC is normally used. In this section, we will use a tool template to add a tool to the database, book a job for that tool, perform the job and finally produce a certificate based on that job.

To get started, select Tools from the Home screen.

⊐◉	Tools
▤	Templates
▦	Jobs (tools associated with a calibration or conformance)
◉	Settings
①	Power Down

The screen below shows the tools screen when there are no existing tools. Now that we've created a template (see **Add / Manage Template** if not), we can add our first tool based on that template. Press the + icon to add a tool.
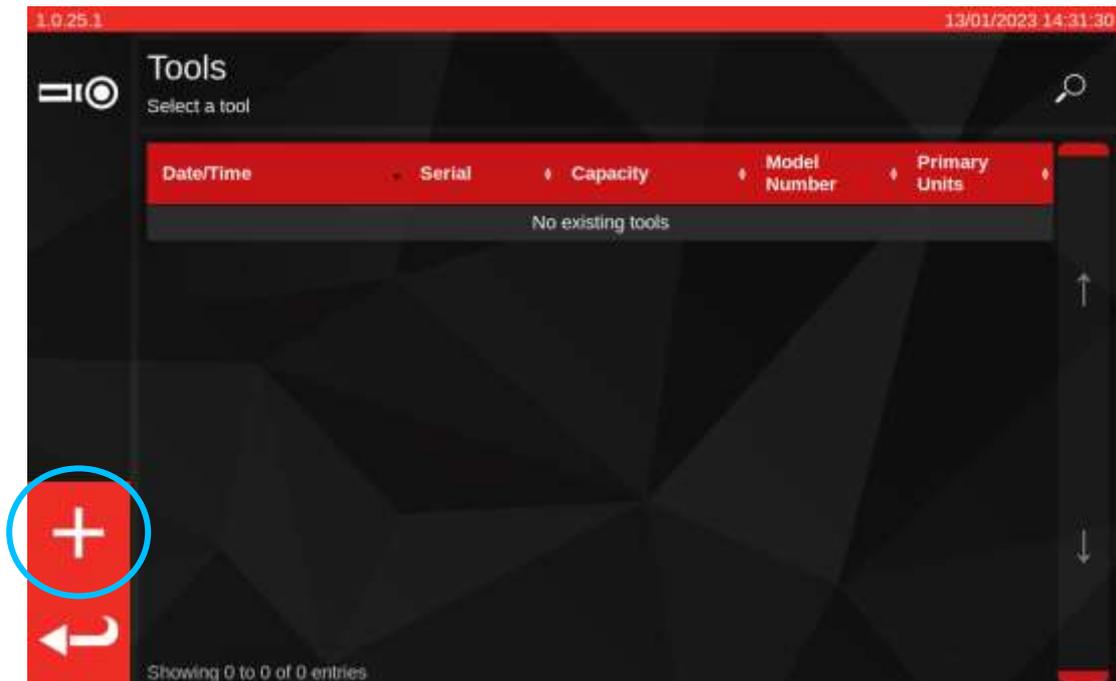

A prompt will appear; confirm you would like to select a template for the tool, which will take you back to the Templates screen.
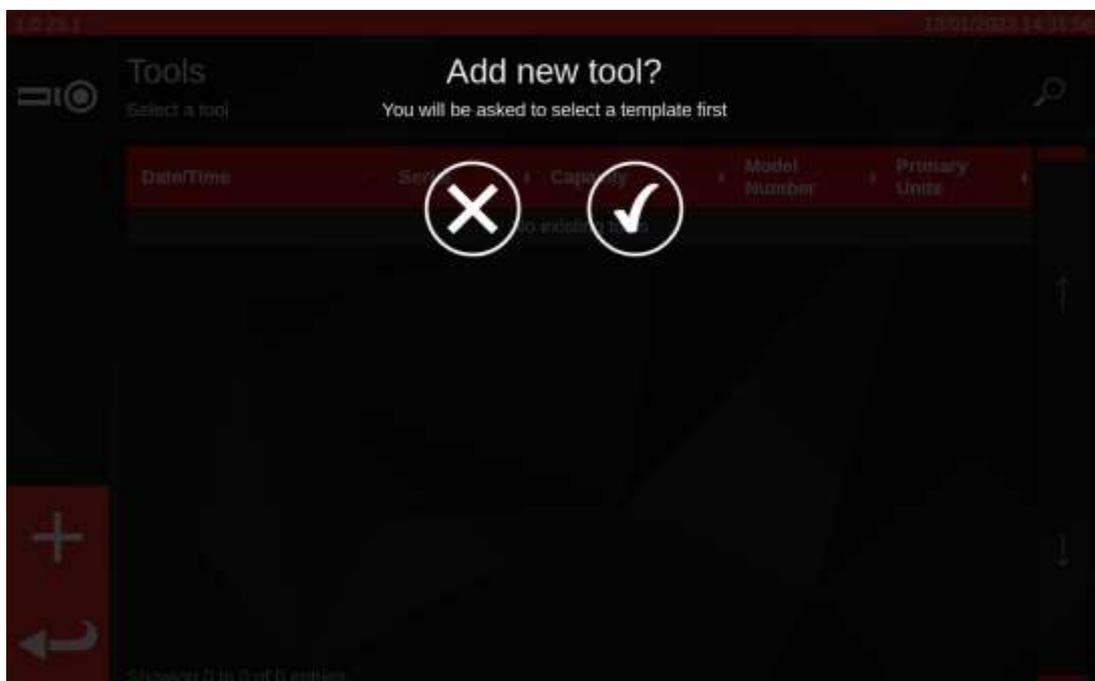
Select the desired template from the templates menu (or create a new one if desired and then select it) and

confirm your choice by pressing

If you want to cancel the tool creation operation, simply deselect any selected templates, then press to return to the Tools screen.
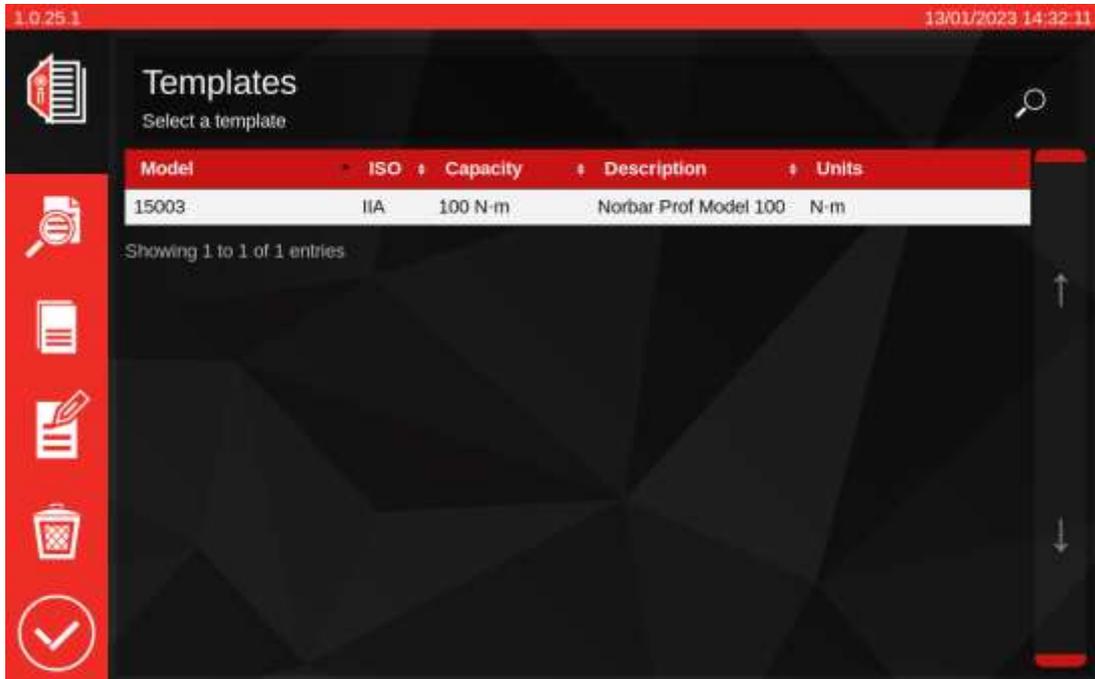
 View template summary

 Duplicate selected template

 Edit selected template

 Delete selected template

 Accept selected template for tool & return to tools screen

Enter the tool's serial number and follow any on-screen instructions.
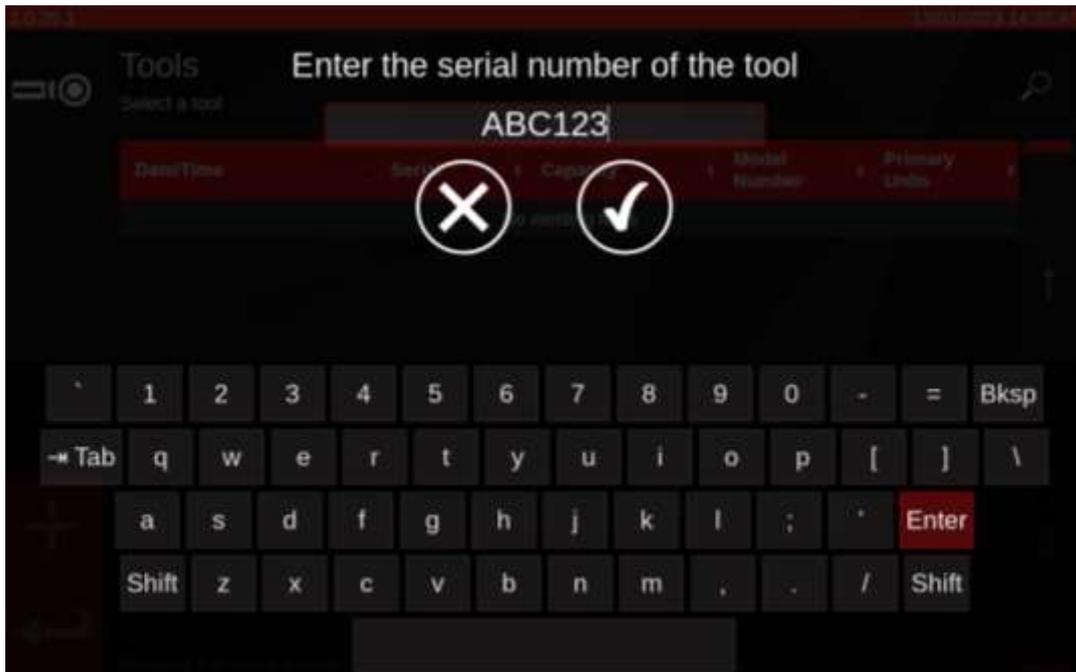

The tool will be added to the tools list.
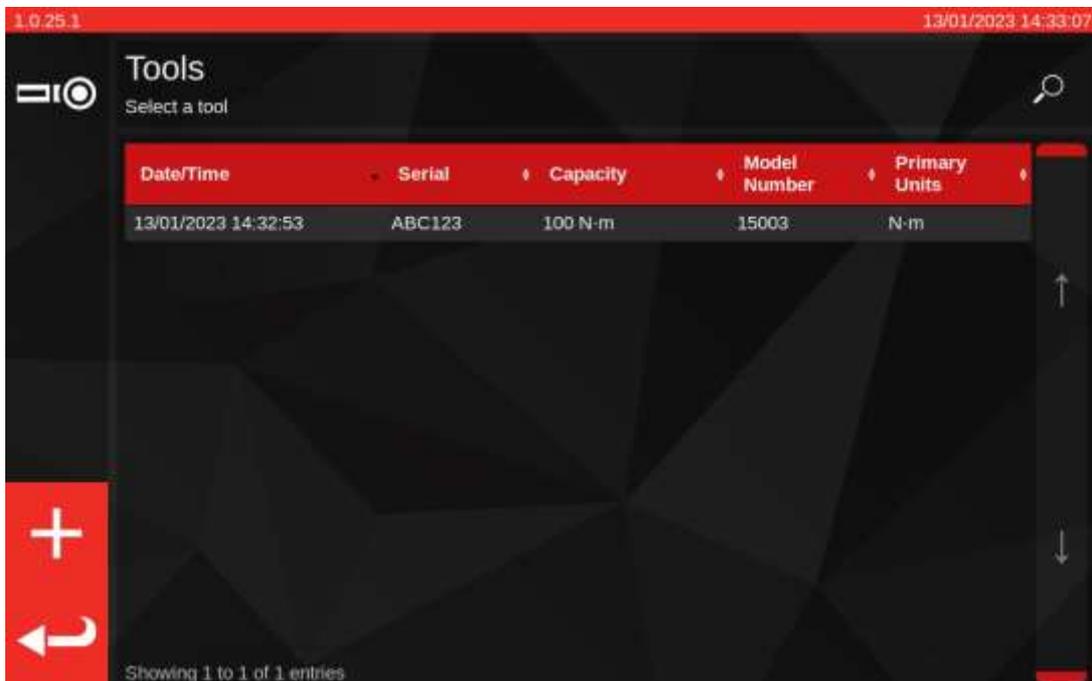
Select the tool
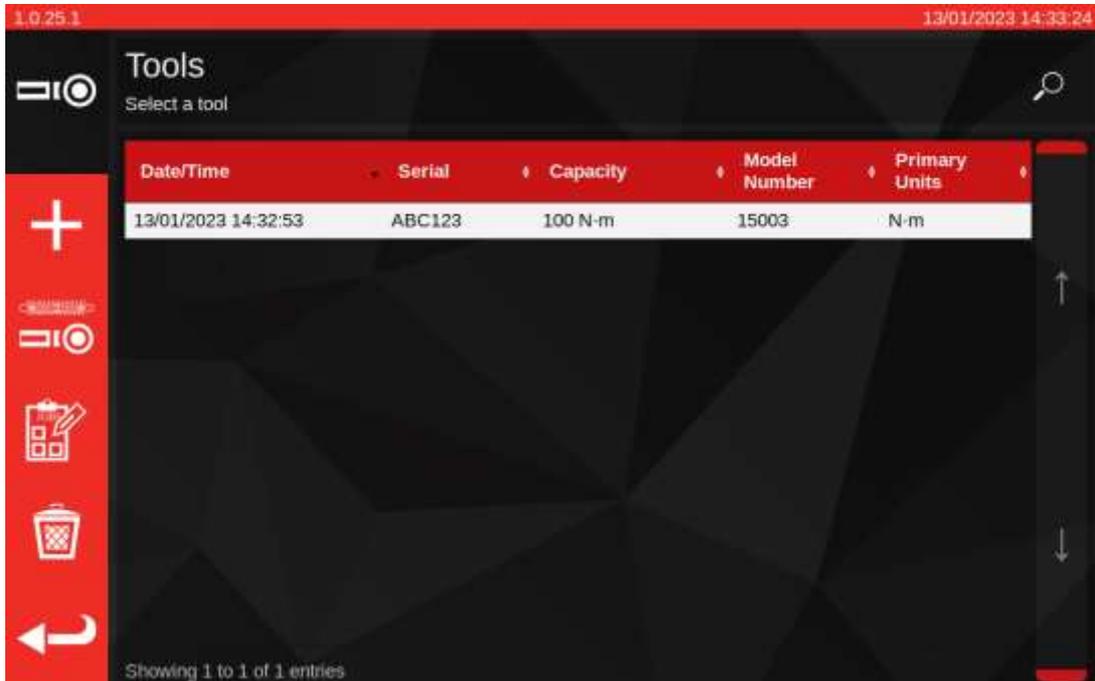
 Add another of selected tool (if no tool selected; just add a new tool)

Adjustment screen (test a tool by performing cycles on it)

Jobs (book or load an existing open job for the currently selected tool)

Delete

Go back

Press jobs ![jobs icon] to book a new job for the selected tool. The job editor will open as seen below.

Choose between a Calibration or Conformance (1) for ISO Part 1 or Part 2.

Select units (2) and make selections from TASKS menu (3) As Found / As Left and direction (3) as applicable.

Press PLAY to continue and follow any on-screen prompts. ![play icon]

The TWC will automatically start with any 'as-found' tasks for a given direction, because these necessarily come first (you cannot check a tool 'as-found' if you've already adjusted it in some way). However, if you've selected both clockwise and counter-clockwise directions, the TWC will prompt you to select which to start with first.

After starting a task, you will land on the task summary screen (also known as the 'Uncertainty Manager' or 'Job Runner'), as shown below. This screen lets you review key information about the job and task as well as the progress made so far.

For Calibration jobs, straight away you will be asked to confirm whether a force loading point is marked on the tool under test and if not, to give a measurement of the loading point's distance from the centre of the tool head. This information is required in advance to determine whether the appropriate uncertainty data is available in the database for the purposes of statistical deduction of the uncertainty budget.

IMPORTANT: AS THE ABOVE IMPLIES, FOR TOOLS WHICH HAVE NO MARKED OR DOCUMENTED LOADING POINT ON THE HANDLE, ALWAYS MEASURE AND USE THE SAME LOADING POINT FOR EVERY TOOL SAMPLE OTHERWISE THE UNCERTAINTY DATA CANNOT BE COMBINED.
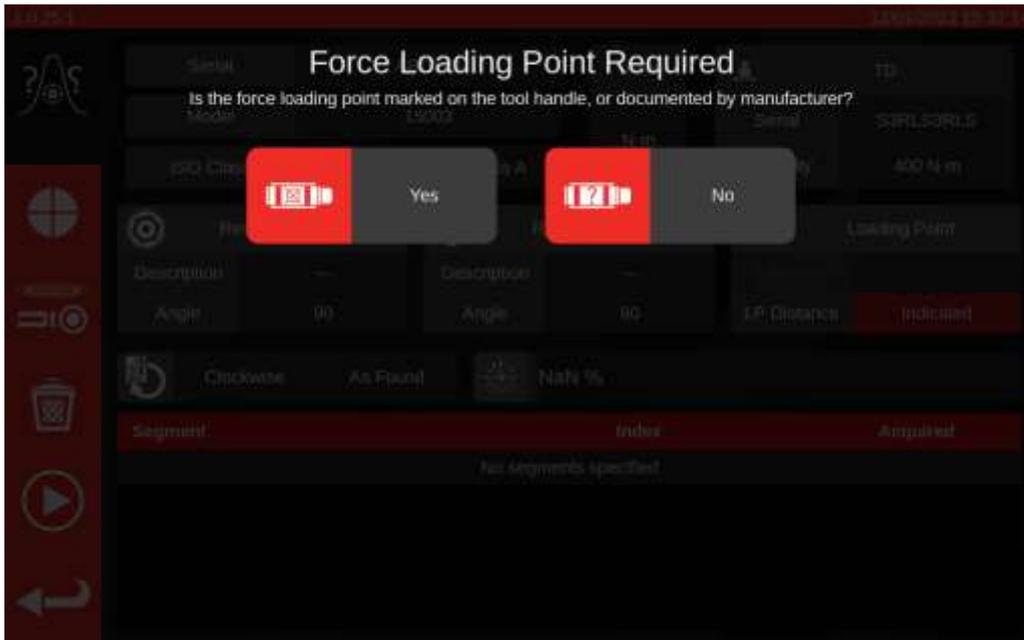
Once the information is given, it will appear in the 'Loading Point' information box. If you made a mistake, you can change the valid by tapping it and re-entering the correct information. The box will show either the measurement in millimetres or 'Indicated' if the loading point is marked on the tool (shown below).
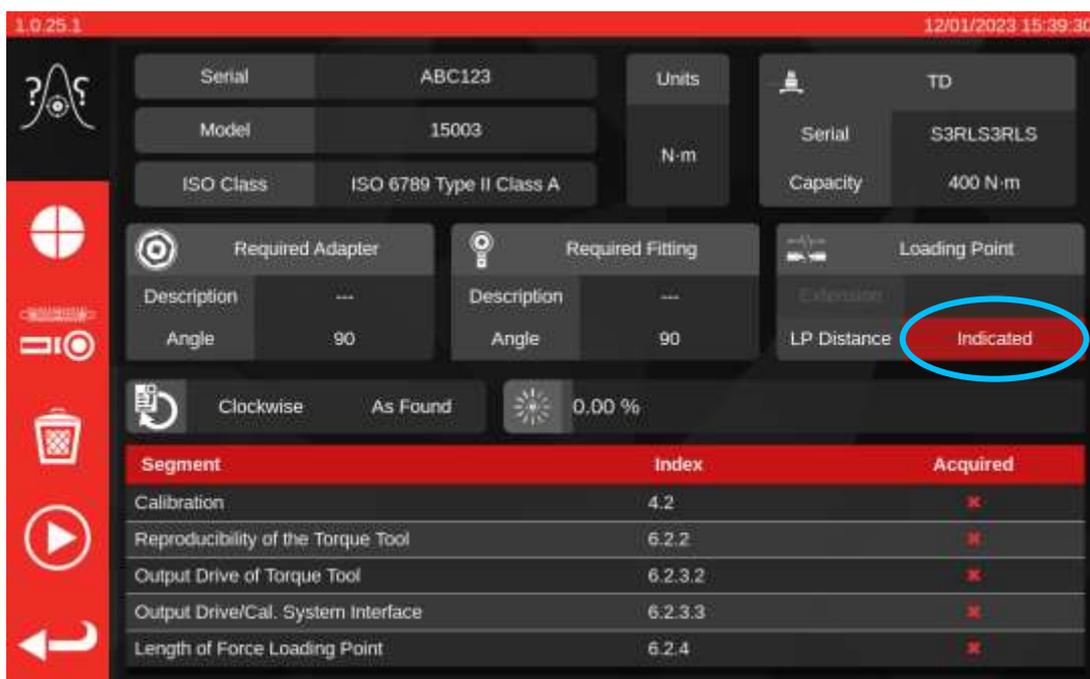
If there is an issue with the uncertainty data available for the TWC itself, you may also see a warning that this data must be entered before proceeding further. See **How To Fill In Loader Calibration Page** for how to do this.

During the calibration process, you may see a warning message about the currently attached transducer being unsuitable. This happens if the TWC checks the transducer against the workflows for the current job and realizes there may be issues. One possible reason for this message is if you have a transducer that is too far oversized for the job at hand, or otherwise has too narrow a calibrated range. This means that the calibrated bottom of scale could be too close to the tool's bottom of scale in the selected torque units for the job. If you collect data with such a transducer, it could risk invalidating the job results if readings come in which fall outside the transducer's calibrated range.

Note: The TWC is a computerised instrument that is designed to avoid issues. However, it is still possible to invalidate a job if a tool is so badly out of adjustment that it clicks far too early and this happens to be outside the current transducer's calibrated range.
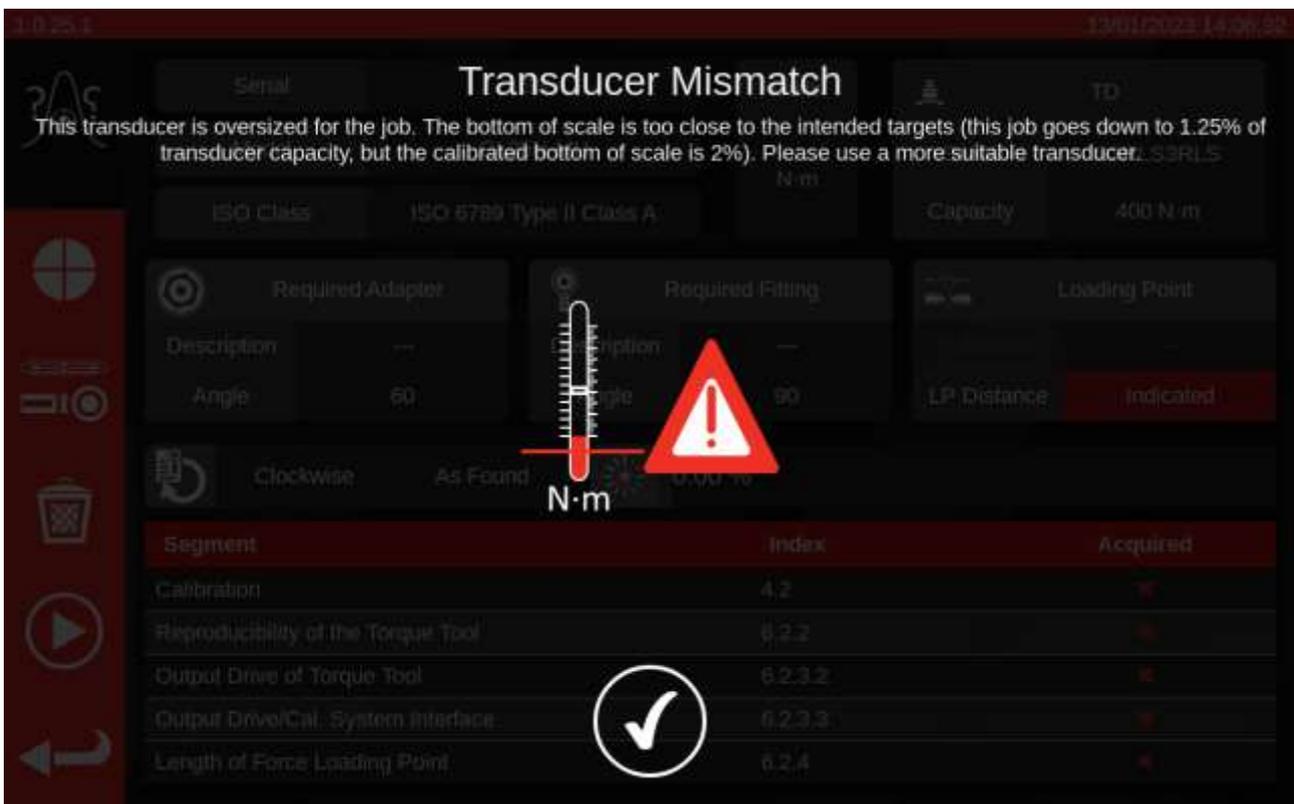
If there are no issues with the transducer or rig uncertainty data, then after entering any necessary information about the force loading point, you will see a list of work required to complete the task in a table at the bottom of the screen. Shown here is the list for a Part 2 calibration of a tool that has an adapter and square drive rotating end fitting. The work required for each task will differ depending on tool ISO classification, job type (conformance or calibration) and tool configuration.

To complete the task, simply select a work item from the table. The PLAY button will appear in the left-hand menu; press it to perform the work.

You can also see the following options:

⊕   Set the speed at which the TWC loads the tool (avoid overshoot on sensitive targets)

▭◉   Visit the Adjustment screen to test and alter tool performance

🗑   Delete all uncertainty data for the current job (if applicable)

▶   Perform the currently selected job segment from the task table

↩   Return to the Job Editor screen

NOTE: **Once an item of work is completed, it will be marked as complete in the 'Acquired' column with a white tick. You are free to repeat work which is already completed if you choose. If you do, the data generated will replace the previous one.**

In the case of Part 2 calibrations, the TWC automatically manages the uncertainty data. Once enough data has been gathered, you no longer need to gather more as the TWC can perform statistical analysis of previously calibrated tool specimens instead. If enough uncertainty data has been gathered, the 'Acquired' column will show orange tick marks for the uncertainty work items; if this happens, you only need to complete the calibration work item (Index 4.2, as shown below) in order to generate a calibration certificate.

NOTE: **The table's 'Index' column refers to the specific section in the ISO 6789:2017 standard which that work relates to.**
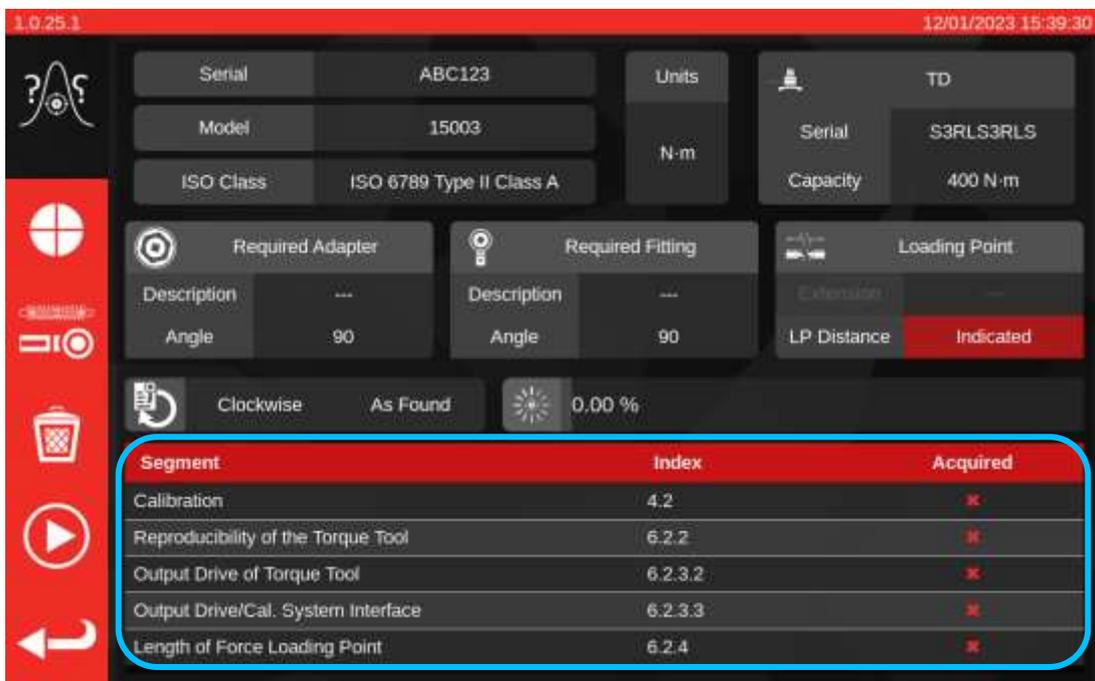
Select an item in the table, press Play ▶ and follow any on-screen instructions.

Once you've selected work to perform, you will arrive at the cycling screen (shown below). This screen will guide you through the data collection process; simply follow its instructions until the work is complete. The instructions will vary depending on tool ISO classification, job type, tool configuration and the currently selected work item.

Work items are split into 'stages'. Instructions normally occur in between these stages and tell you what to do to get ready for the next stage. For instance, an instruction might tell you to set the tool to a specific target, or to remove the tool, rotate the drive square by 90 degrees and refit it. The instructions will appear in the form of pop-up messages. When they appear, you can confirm you have performed what was requested, or cancel the work and return to the task summary screen. If the instruction appears in between stages, you will also be given an opportunity to retry the previous stage, if you wish.

For Setting Tools:

Follow the instructions as they appear; the TWC will gather readings for you.

For Indicating Tools:

Follow the instructions as they appear, then use the on-screen controls to gather the readings. You will need to use this screen to load the tool manually because the TWC cannot automatically read a wrench which produces no variation of output on the transducer (by comparison, a setting tool may produce a 'click', which can be detected by the TWC). Despite this, the TWC can, at your request, automatically apply some of the target torque to an indicating tool, at which point you may take over to reach the target value and take a reading. The amount automatically applied is controlled by the Stop Point button (**1**). By default, this is 80% of the target value. For more details see Adjustment Screen with Indicating Tools.

Transducer Load Controls   % Complete   Temperature   Humidity

Press the back arrow at the bottom left if you wish to cancel the work and return to the task summary screen.

Once finished with all stages of reading capture, the following screen will be displayed. The button behaviours are described below.
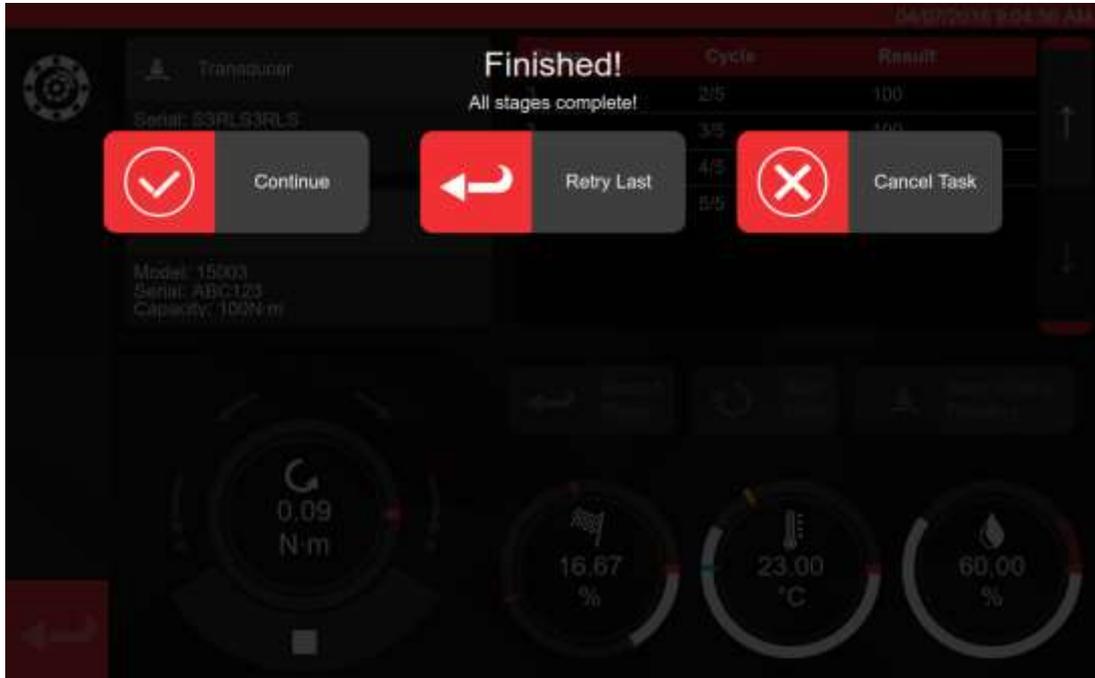
FOR PART 2 CALIBRATIONS		FOR PART 1 DECLARATIONS	
Continue:	To summary screen	Continue:	Finish or next Cal
Retry last:	Repeat last sequence	Retry Last:	Repeat last sequence
Cancel:	Will delete the results collected during the test	Cancel:	Will delete the results collected during the test

Press Continue.

If performing a Part 2 calibration the screen below will list outstanding steps.
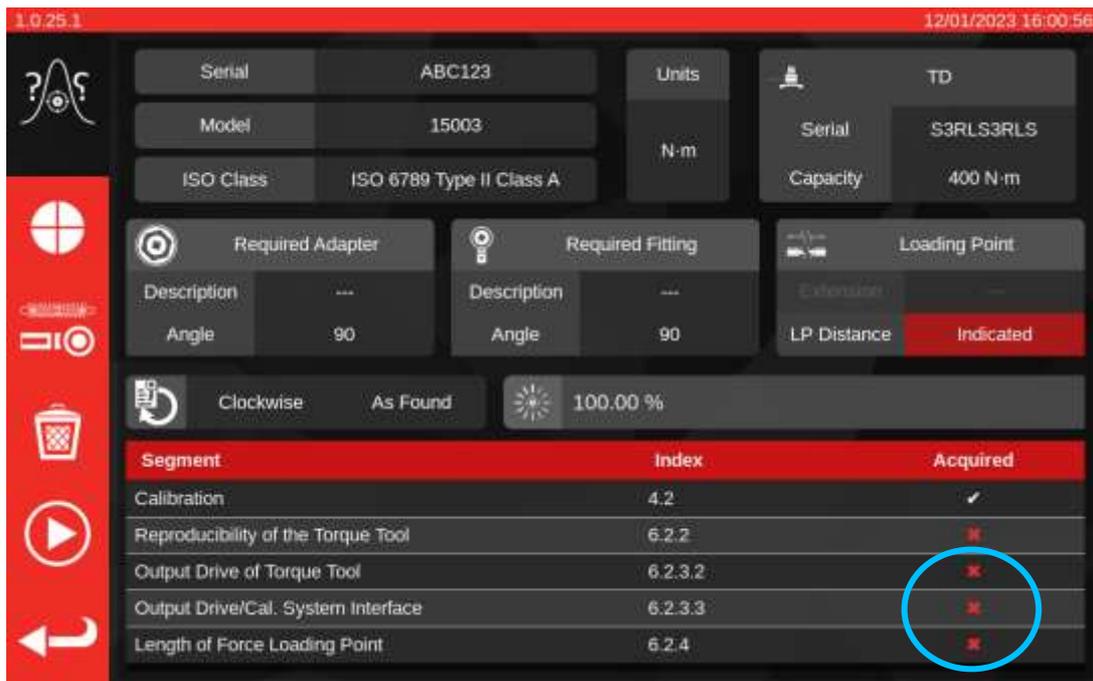
Continue through the steps until they are all complete following any on-screen prompts.

NOTE: **These steps do not need to be completed in the listed order, but calibration should be performed first.**

If performing a Part 1 declaration or where all steps from a Part 2 calibration have been completed the screen below will appear. Select from the available options:
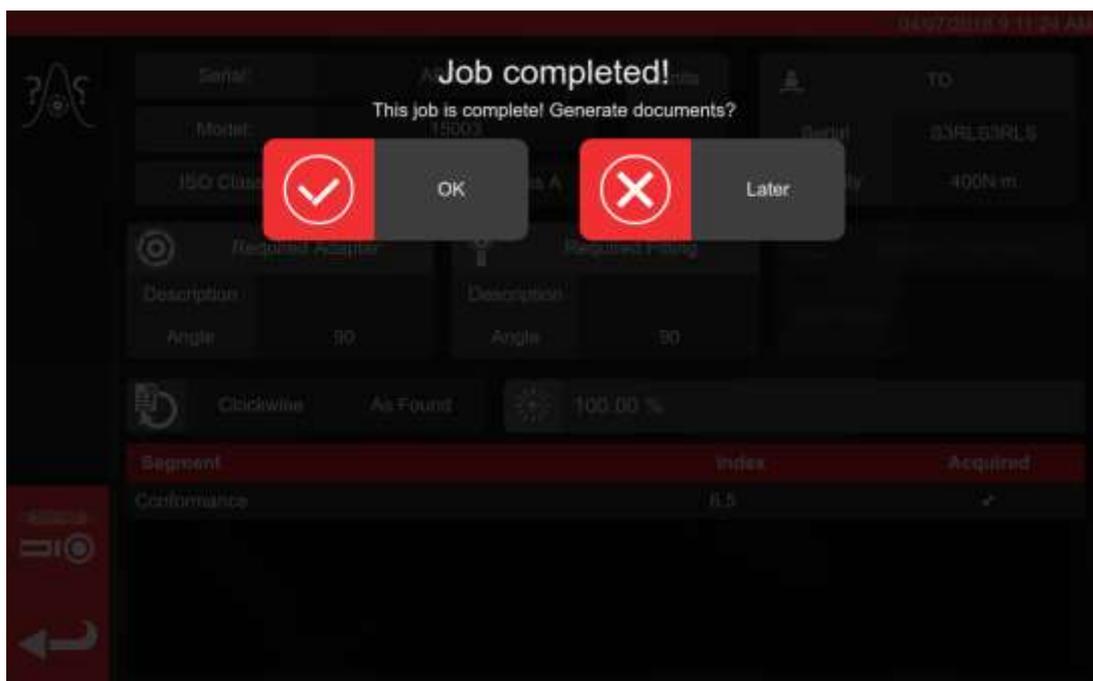
Select from the options;

- 'OK' will produce documentation now

- 'Later' allows you produce / print your documents at a later date.

If you selected OK you will be shown the Certificate Viewer and be presented with the final document for the job, which will be either a Declaration of Conformance or a Certificate of Calibration, as appropriate for ISO 6789 Part 1 or ISO 6789 Part 2 jobs, respectively.

You can now review the document displayed, print if required or press the back arrow to return to home screen for printing at a later date. If the job involved both counter-clockwise and clockwise directions, then you can use the direction button (**2**) to view the document for each respective direction.

If there are problems with the calibration or conformance, they are brought to your attention by red highlighting, as demonstrated above.

If you wish to see the job data, press the Export Data button (**3**) to view the Job Data Report and export to either JSON or PDF file formats.

At this stage you can also assign an Operator to the job (**1**). This will open the Operators screen and allow you to choose an operator; once selected, their name will appear in the 'Person Responsible' field in the job document.

70

Job Data Report

When clicking the 'Export Data' button on the Certificate Viewer, you will be presented with the Job Data Report, as shown below.

This screen displays all the data used by the job for the purposes of generating the documentation and can be useful for trying to understand the final numbers. It can also be used to export the data in PDF or JSON formats for use elsewhere, by pressing the Print button (**1**) or the Export button (**2**), respectively. If exporting to JSON file, the File Browser will be opened to select a save location. Please see the File Browser section for information on using the File Browser.

The primary table contains the main calibration/conformance workflow and any stage-specific values derived from those readings as part of the ISO 6789 process. For calibrations, there may also be one or more secondary tables containing uncertainty data that was statistically derived or gathered for the job.

NOTE: **For jobs where uncertainty data was statistically derived, only the final values are shown for that data. For jobs where all uncertainty segments were performed directly, all readings and intermediate values for those segments are shown as well as the final values.**

How to Test a Type 1 Indication Tool

From Tools select your wrench (refer to templates production for tool template set up).
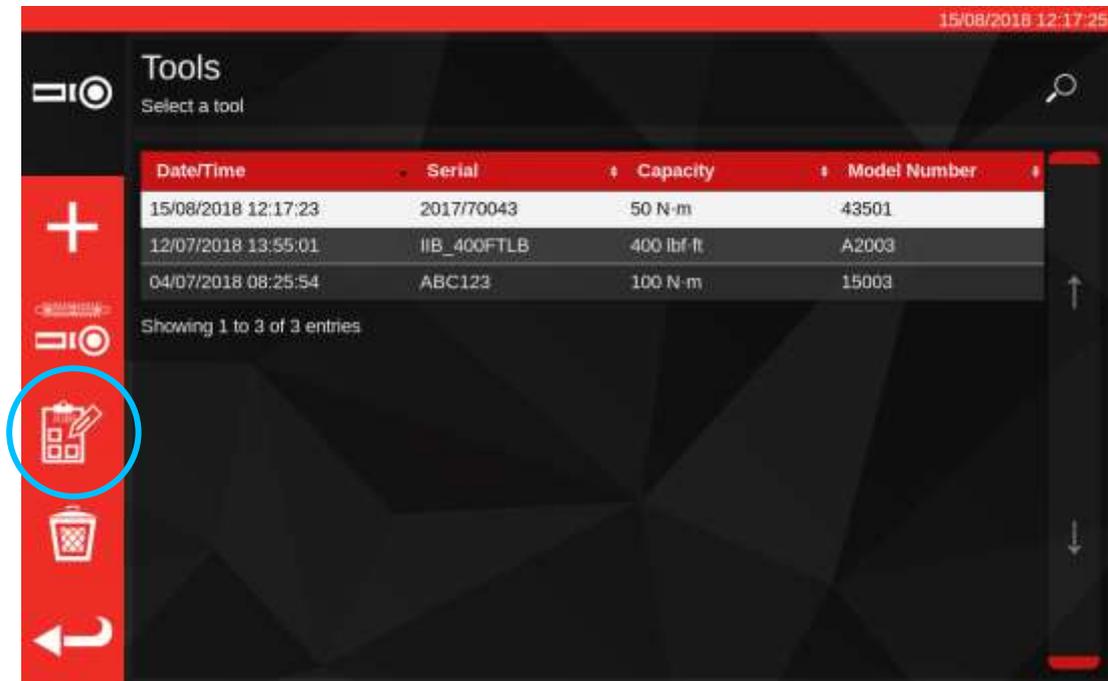
Press the jobs button to create a new job for the selected tool.

Select (1) for Conformance or Calibration. Select units (2), make selections from direction / As Found / As Left (3) as applicable.

Press PLAY to start task and follow on-screen prompts.
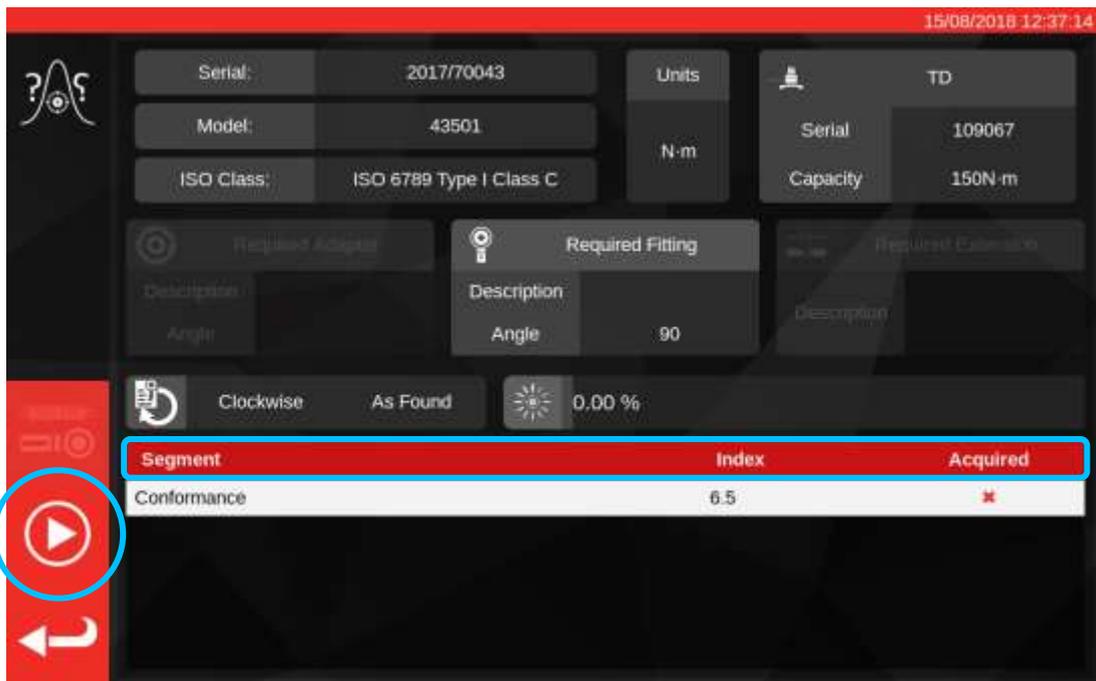
Highlight segment.

Press PLAY.
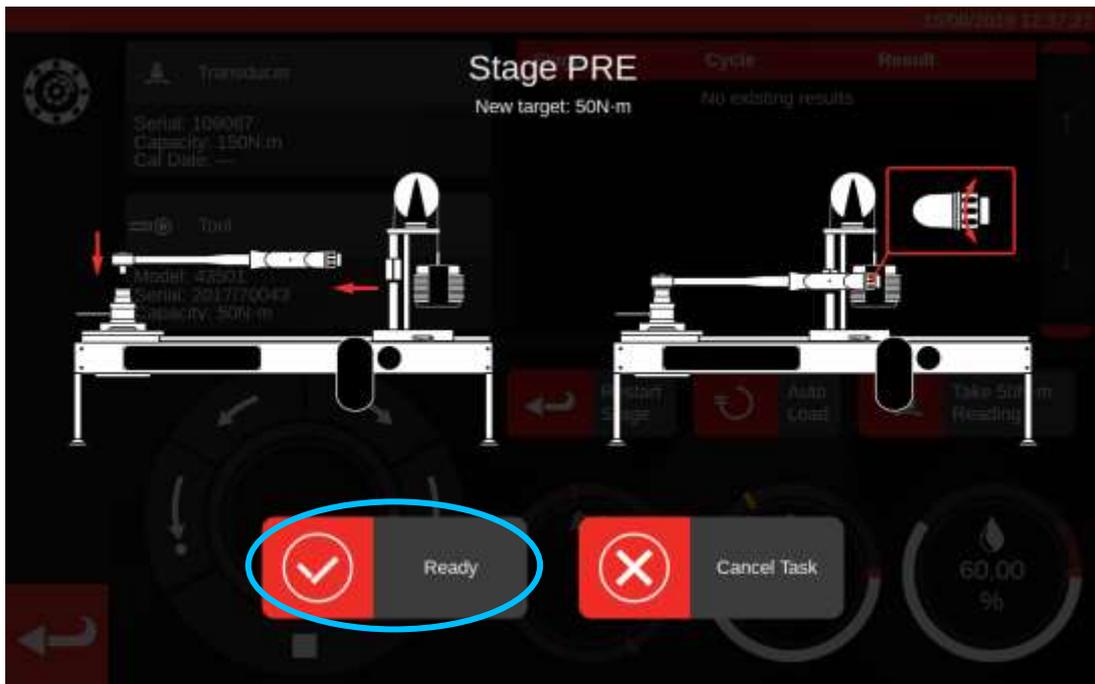
Press 'Ready'.

Home CCW   Nudge CCW   Stop   Nudge CW   Home CW   Load to nominal 80%   Take reading
                                                                                              of target torque   (capture value)

Press 'Auto Load' for a nominal 80% of target to be achieved.

Use the motor control dial buttons and / or the manual I/P drive gear adaptor (pictured below) to increase the torque until the tool indicates that the target torque is attained.

Use the Manual I/P Drive Gear Adaptor to achieve the correct value on the torque tool.

Shown above: target value is indicated on the tool, the next stage is to capture readings.

Press 'Take Reading' to capture current torque value.

Press the CW home to return the load to Zero and then press stop.

Once returned to zero torque, the next reading can be taken by following the same procedure.

Continue until all readings for the stage are complete.

Once Preloading is complete, the 'Take Reading' button will change to 'Next Stage'. Press 'Next Stage' to advance to the next stage of the workflow.
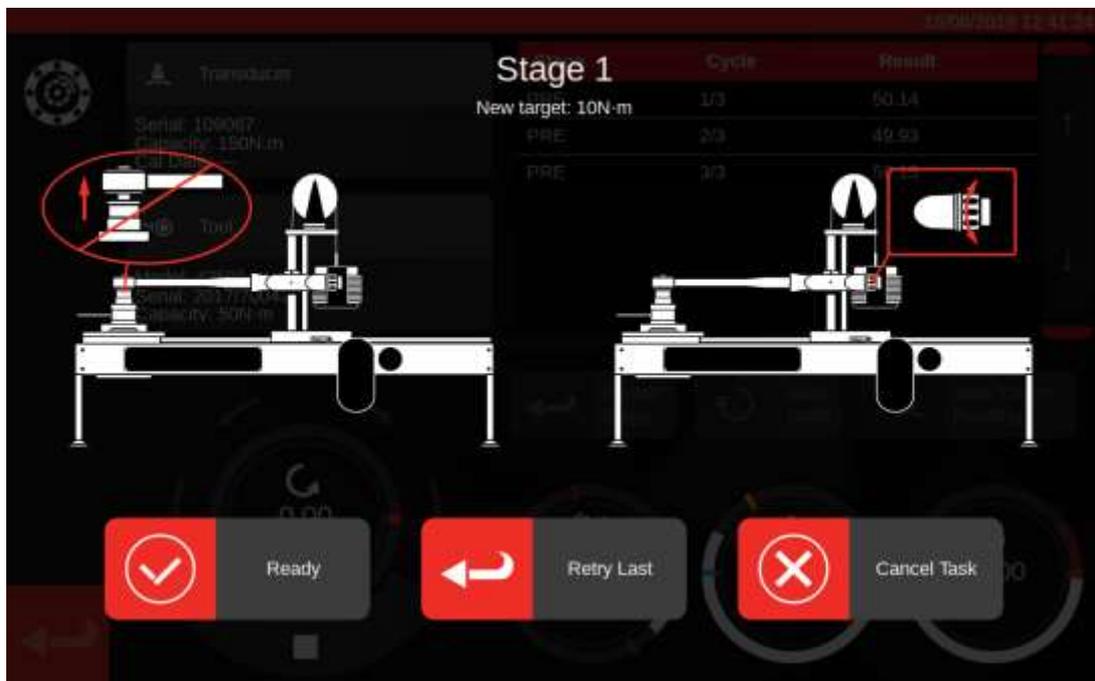
Follow on-screen instructions and complete stage 1 as you did the preload stage. Repeat these actions to collect results for stage 2 and 3.

When the final stage is completed, press 'Next Stage' one final time to advance to the finish screen.
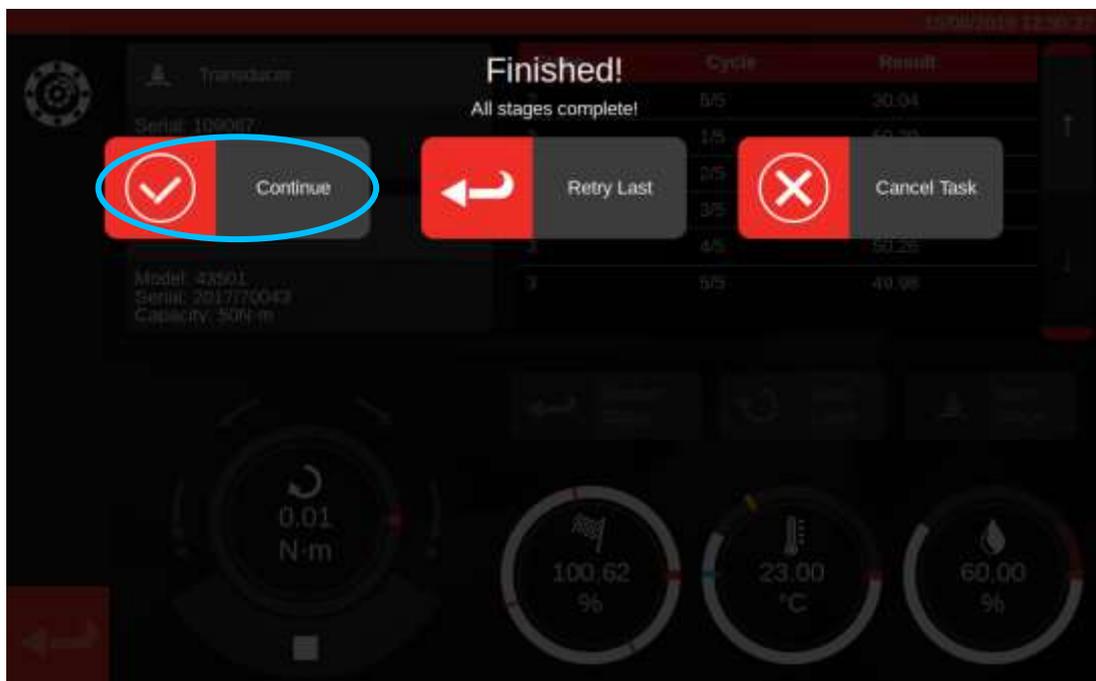
To complete the task press 'Continue'; this will save the results.

Now that the results are saved, press the back button to return to the task summary screen.
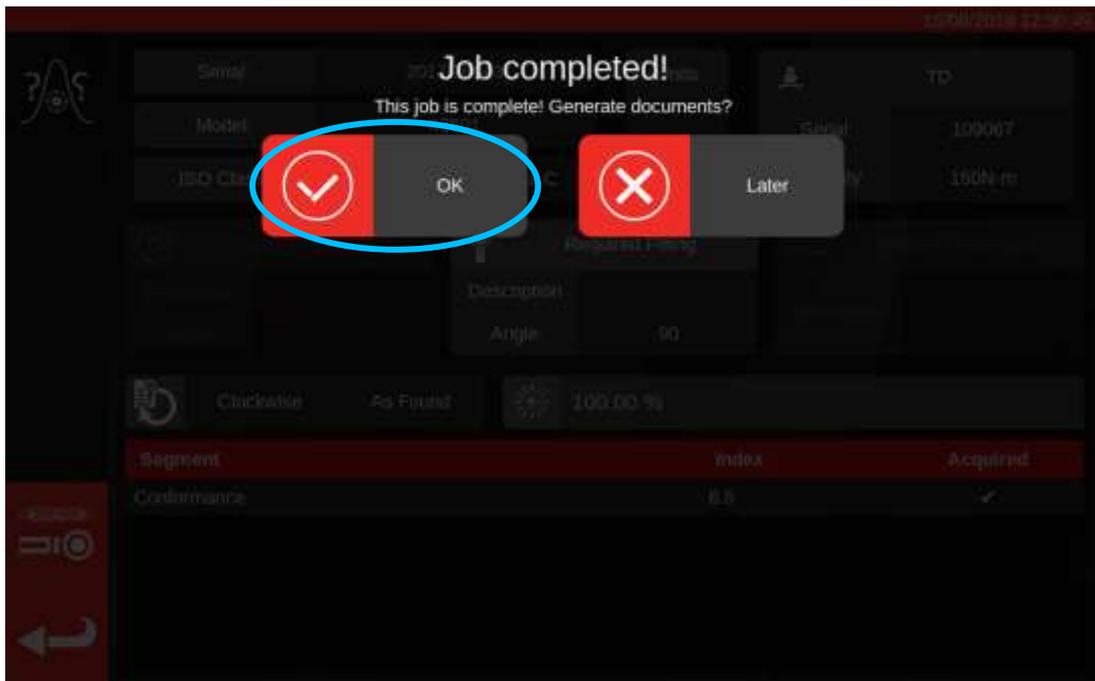
If all components of the task are completed, you will see a message offering to generate a document for the completed job. Press 'OK' to generate.

Document displayed ready for printing.

If you wish to see the job data, press the 'Export Data' button (**1**) to export the collected conformance data to a JSON file (a pop-up will show you the name of the file and where it was saved).

Press return to go back to the home screen.

Viewing / Reprinting Job Documents

The Job Management page lists all jobs in the database (including new, as yet unfinished jobs if any) along with their current status. You can book new jobs from here (it will take you to the Tools menu to select a tool) or you can view existing incomplete jobs to continue them or examine their settings or retrieve documents the TWC generated for previously completed jobs.

To retrieve documentation for a completed job, select it from the job table and press the '**View Document'
button (1).** This will open up the declaration of conformance or calibration certificate viewer, just the same as appears when finishing a job, with the old document on display.

Just like when finishing a job, the user can then print the documents (or print to / save to PDF if they prefer) as well as export the job data to JSON files using the Export Data button, as shown on the previous page.

Adjustment Screen

The adjustment screen is for experimenting with and adjusting tools. Use the controls to load the tool and take readings as you choose.

You may access the adjustment screen by:

- Selecting a tool on the tools page and pressing the button to load the adjustment page
- On the task summary page, when no work is selected to perform

In the latter case, you might use the adjustment screen after having completed an 'as-found' task on a tool and deciding that the tool is badly adjusted. You can then perform adjustment using the adjustment screen, before finishing the job with an 'as-left' task.

NOTE: **To know in advance whether you ought to book a job with both 'as-found' and 'as-left' tasks, or just 'as-found', you may also use the adjustment screen to quickly test a tool beforehand. If it seems like the tool is well adjusted, you may not need to book an 'as-left' task for the job. If it seems like the tool is performing poorly, it will likely perform poorly in the 'as-found' calibration or conformance and so you can book an 'as-left' in anticipation of it needing adjustment.**
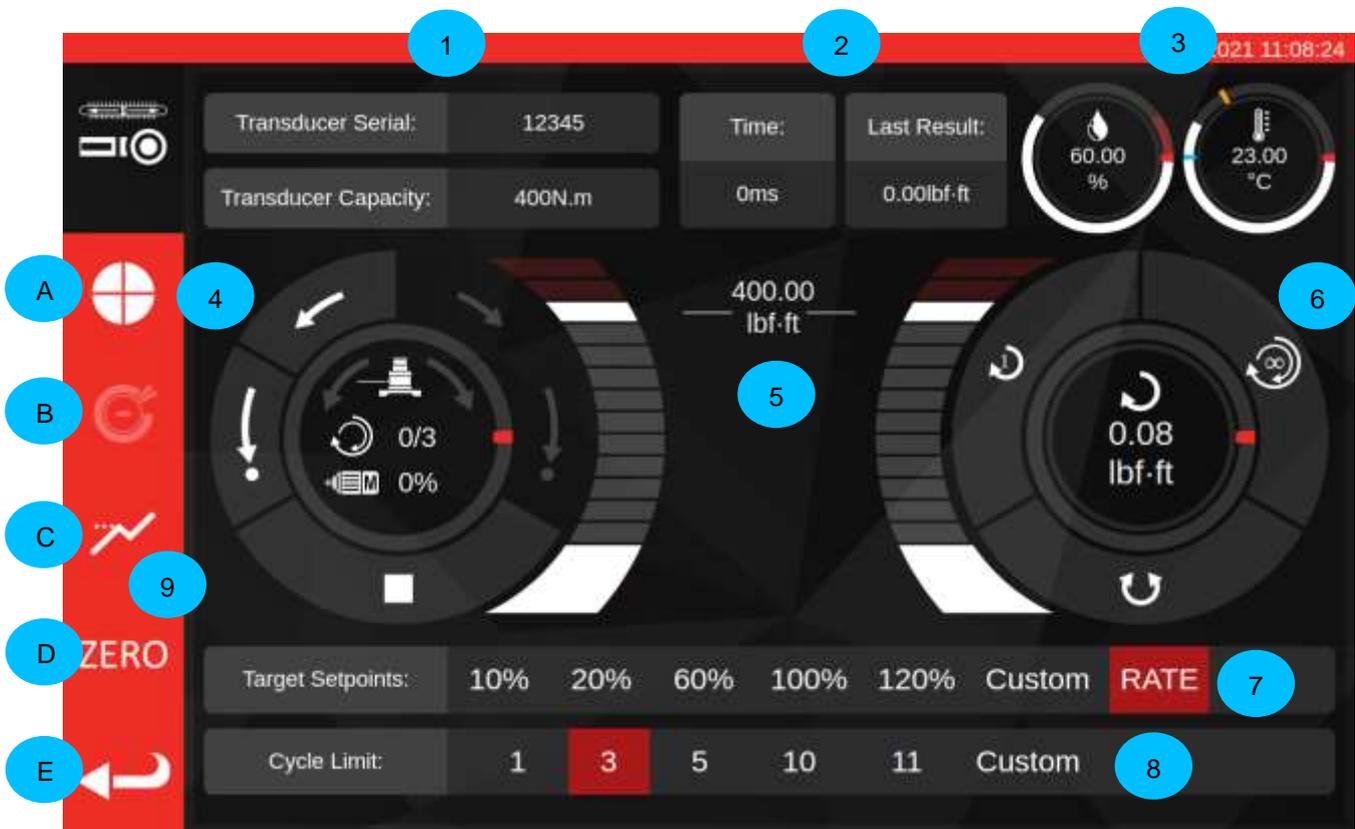
The main areas of the screen are as follows:

1. **Transducer summary**: the currently attached transducer serial and capacity.

2. **Last cycle result**: the time duration of the final 20% of the cycle and the torque reading.

3. **Environment data**: temperature and humidity.

4. **Motor control and status dial**: Jog (short arrows) and home (long arrows) the TWC mechanism in either direction, or stop the motor moving. The centre of the dial shows the current direction of motion if the mechanism is moving, the current X out of Y cycles completed if performing continuous cycles and the current motor speed. The dial's inner circumference is a graphical representation of the single or multiple cycle work to be completed and will gradually fill up until the rig is finished.

   NOTE: **The direction buttons rotate the transducer mechanism; for instance, the clockwise arrows will spin the transducer clockwise. Because of this, to build clockwise torque, the mechanism needs to rotate counter-clockwise.**

5. **Target torque slider**: Drag up and down with your finger or a mouse to quickly set a target up to 120% of the current tool's capacity in the current units.

   NOTE: **If you need more precision than the slider allows, tap the target torque slider to open an input window and enter your desired target. The slider will jump to the correct setting.**

6. **Cycle and transducer dial**: The centre of this dial shows the current torque value and direction in the selected units. To cycle between available units, tap or click the unit inside the dial. The dial's inner circumference is a graphical representation of live transducer torque represented as a percentage of the currently set target. It will fill up clockwise (or counter-clockwise) depending on the current torque seen on the transducer. If a torque peak is detected, the flash ring within it will flash.

   NOTE: **You can only cycle between units which are defined in the current tool's template.**

   In order to toggle units on the adjustment screen, at least two units must be defined in the template.

   Click to initiate a single cycle of a setting tool. Click to initiate a multi-cycle run. Click to change the direction between clockwise and counter-clockwise cycles.

   NOTE: **When changing direction, the TWC will want to move the mechanism to an appropriate position. Ensure there is no tool installed on the TWC before allowing this to happen.**

7. **Target setpoints and rate control**: these are a set of shortcuts to quickly jump to commonly used targets and a button to disable or enable rate control. If rate control is disabled, readings may not be accurate to the ISO 6789 standard but will be quicker to perform. Press the 'Custom' button to open the same target input window used by the torque target slider (5) and enter a more precise target.

8. **Cycle limit settings**: change the number of cycles the TWC will automatically perform in a row when using the 'Multiple-cycle' button on the cycle and transducer dial (6). Press the 'Custom' button to enter your own value if it is not shown on the setting bar.
.
9. **Cycle Speed, Stop Point, Peak mode, Zero and Back buttons:** The 'Cycle Speed' button (**A**) lets you adjust how quickly the TWC loads a tool. Reduce it if you encounter overshoot or are working with very small targets or increase to speed up cycles.

   The 'Stop Point' button (**B**) lets you adjust where the TWC will stop when working with indicating tools (see Adjustment Screen with Indicating Tools for more details).

   The 'Peak Mode' button (**C**) toggles the UI between modes appropriate for indicating or setting tools (you will see the icon change according to the mode you are in). You generally should not need to use this button; the correct mode is already chosen for you based on the currently selected tool, which in turn is derived from its ISO classification in the tool template.

   The 'ZERO' button (**D**) reads the currently attached transducer's settings (capacity, serial, etc.) and zeroes it.

   The 'Back' button (**E**) will return to the previous screen.

   NOTE: **Anytime you change transducers whilst on the adjustment screen, you should first press the 'ZERO' button before continuing to pick up the changes.**

Adjustment screen with Indicating Tools

If you are using an indicating tool, or if you use the peak mode button to change modes manually, the adjustment screen will look like the below. Note that some areas of the UI are now disabled compared to the previous screenshot and the Stop Point button (**B**) is now enabled in the side bar. Furthermore, the Peak Mode icon has changed to reflect that we are in Peak Mode, for indicating tools.
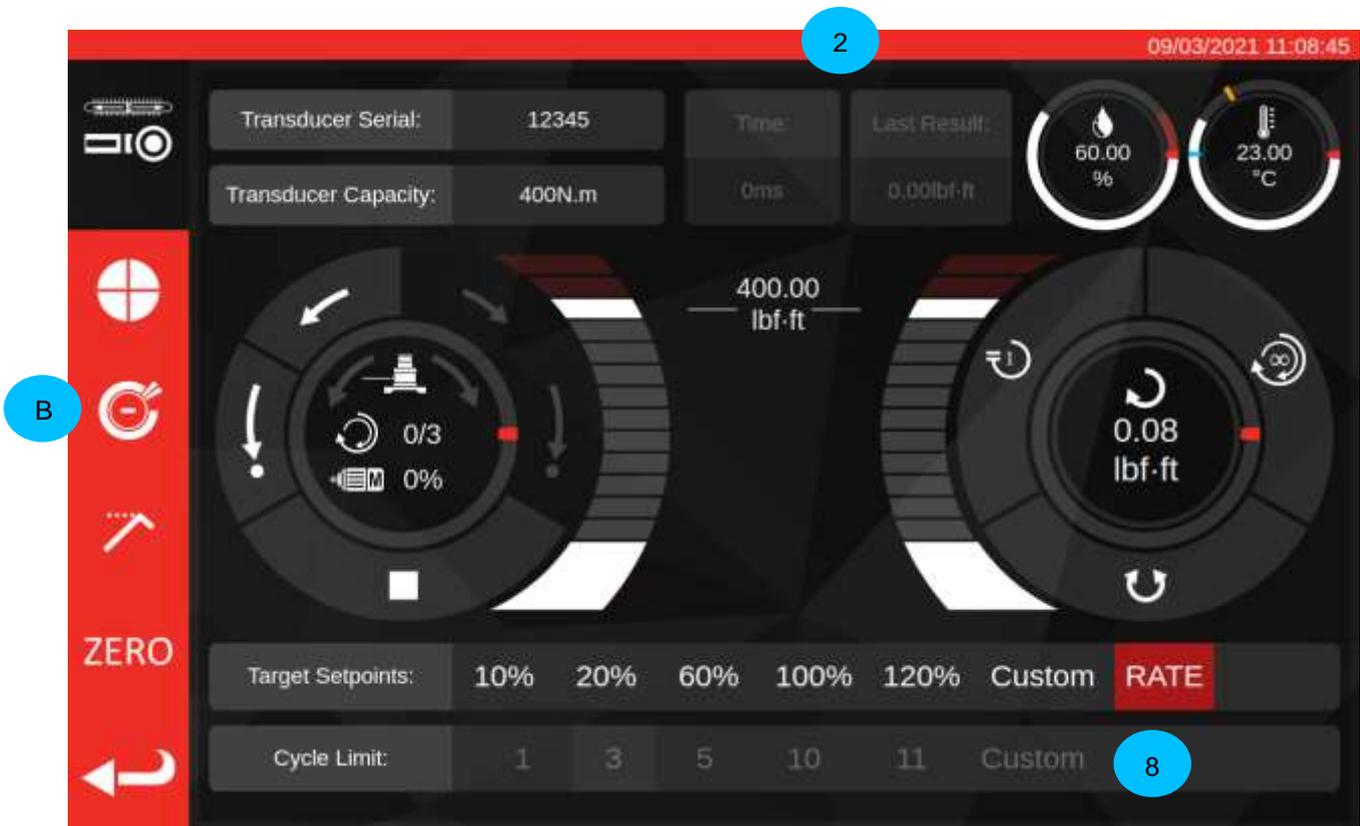
In this case, the last cycle results (**2**) are disabled (as indicating tools do not mark attainment of target torque in a way that the TWC can detect, such as by clicking) and the Cycle Limit settings (**8**) are disabled (the TWC cannot automatically cycle indicating tools because it cannot detect when the target is reached on the tool). Similarly, this means multiple cycles are not supported for indicating tools, therefore the continuous-cycle button behaves the same as the single-cycle button in Peak Mode.

The adjustment screen works exactly the same as it does for setting tools, except for the cycle and transducer dial; here, both the single and multiple cycle buttons initiate an auto-load sequence to the Stop Point setting, which is a percentage of the currently set target torque (typically 80%). You can adjust this point by pressing the Stop Point button (**B**) and entering a new percentage.

Once loading up to the stop point has occurred, the user may continue to load the tool using the manual motor controls until the tool indicates the target torque is attained, then use the home button to complete the cycle.

SOFTWARE UPDATE PROCEDURE

The TWC software is simple to update and comes in the form of a .deb package. Contact Norbar to get the latest TWC software update.

After copying the update to a USB flash drive, insert the drive into the TWC.

Updates can be installed via the File Browser. Simply browse to the .deb package where it sits on the USB flash drive and double-click it to begin the installation. If it is determined to be a valid installer, you will be asked to enter the system password (default is NorbarTWC), after which the installation will begin, which should only take a few minutes.

> **NOTE:** **Please be aware that after installing an update, there may be database upgrades that need to take place and depending on the size of the TWC database, these could take some time.**

After updates have been applied, it is recommended to restart the TWC. Since the UI will insist on closing after the update is completed, you can restart via the operating system's user interface by opening the menu and clicking 'Shutdown':
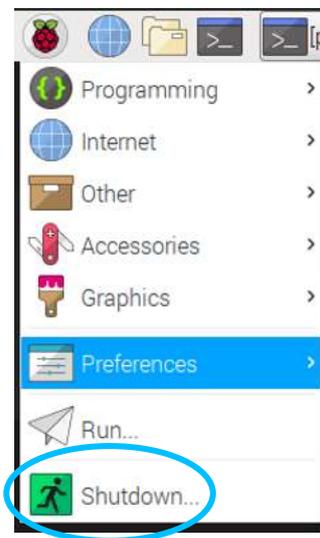
After restart has completed, the new TWC software should start up. Check in the top left corner of the screen to see that the software version number has changed from before.

MAINTENANCE

WARNING: **ENSURE THE TOOL IS DISCONNECTED FROM MAINS SUPPLY BEFORE ANY MAINTENANCE.**

For optimum performance and safety, regular tool maintenance is required.

User maintenance is described in and should be carried out in accordance with this section.

Any other maintenance or repairs should be carried out by Norbar or a Norbar approved distributor.

Maintenance intervals will depend on the TWC usage and the environment in which it is being used.

The maximum recommended maintenance and recalibration interval is 12 months.

Daily Checks

It is recommended that the overall condition of the TWC is checked before use:

- Check power cord for damage – replace if faulty

- Ensure PAT test is within date

- Test the external Residual Current Device (RCD) in the mains supply (if fitted)

- Ensure TWC is clean - DO NOT use abrasives or solvent-based cleaners

- Ensure fan and ventilation slots are clean and dust free. If cleaned with compressed air please wear eye protection

- Free run TWC to both home positions to ensure operation is smooth and quiet

- Ensure transducer is within recalibration.

Torque Calibration

Your TWC has been supplied with a certificate of calibration. To maintain the specified accuracy, it is recommended that the TWC is recalibrated at least once per year.

Recalibration should be carried out at Norbar or by a Norbar approved distributor, where all the facilities are available to ensure that the instrument is functioning at maximum accuracy.

Temperature and Humidity Accuracy

The TWC is supplied with a sensor for measuring temperature and humidity. It is recommended to check the accuracy of the sensor at least once per year. Accuracy testing should be completed by a testing facility with the relevant equipment. A faulty sensor should be exchanged for a new unit.

Greasing Procedure

The TWC is engineered to be a low maintenance device. Under normal operation maintenance is not required, however at six-monthly intervals or after 10,000 applications (whichever comes sooner) it is recommended that the unit is greased as described in this section.

Use TWC Greasing Kit, Part number: 60325

1. Ensure that the TWC drive wheel is in the 'Home' position.
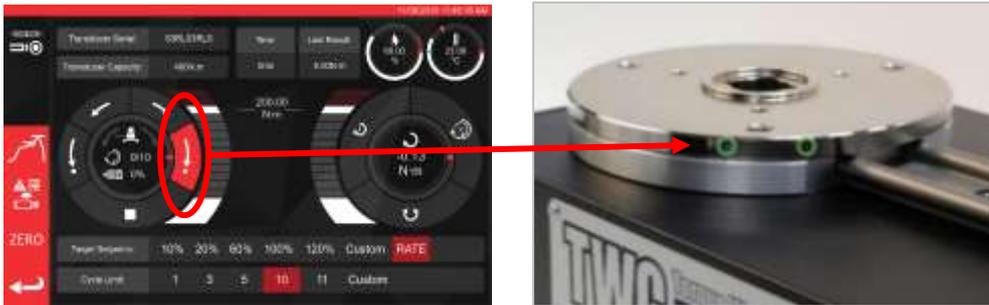
FIGURE 20 - Making Sure the TWC is in the Home Position

2. Remove the button head cap screw which is in-line with the motor.

FIGURE 21 – Removing Button Head Cap Screw

3. Inject 50% of the grease through the screw hole using the syringe provided.

FIGURE 22 – Applying Grease

4. Wind the drive wheel to the extreme opposite of its current position.

FIGURE 23 – Extreme Maximum Position

5. Inject the remaining grease.

FIGURE 24 – Applying Grease

6. Return the TWC to the home position.

FIGURE 25 – Returning to the Home Position

Disconnecting the Control Box for Calibration

1. There are four holes on the box where the screws fix the box to the rig. First these need to be unscrewed carefully so as not to let the box fall.
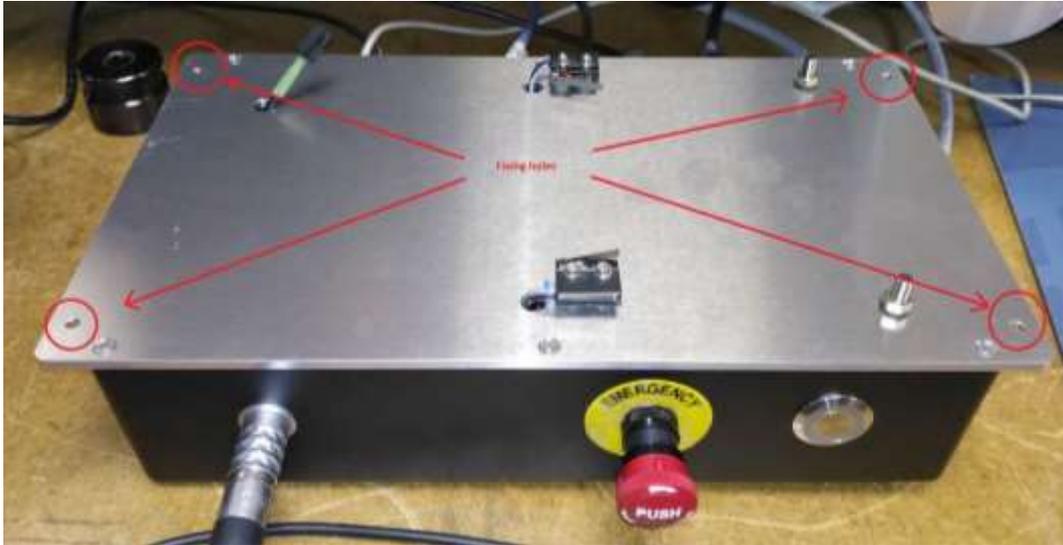
2. Next carefully lower the box. The connector of the guard sensor is inside the frame, to expose, gently ease out the cable.

3. Now push the lever on the connector to disconnect.
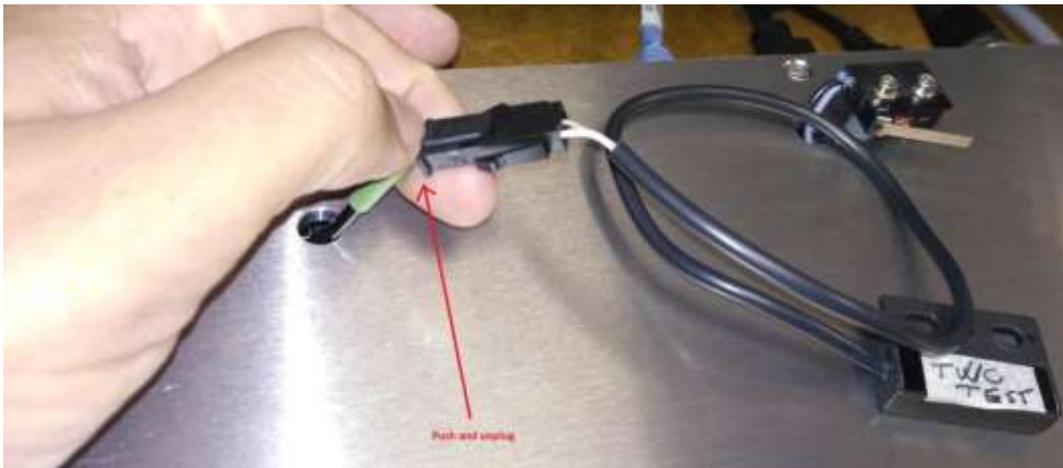
Product Disposal

This symbol on the product indicates that it must not be disposed of in the general waste.

Please dispose of according to your local recycling laws and regulations.

Contact your local distributor or see the Norbar website (www.norbar.com) for further recycling information.

SPECIFICATIONS
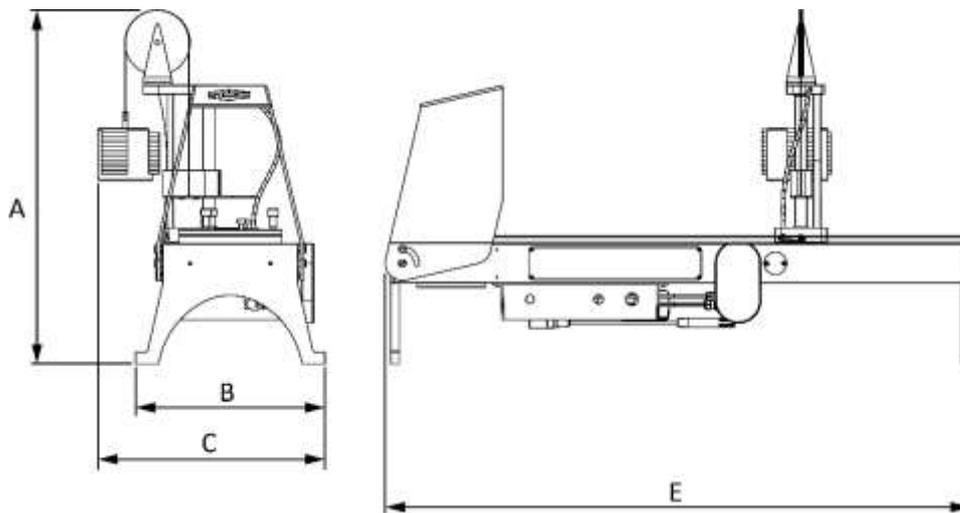
| Specification		TWC 400	TWC 1500
Maximum Output Torque:		400 N·m / 295 lbf·ft	1500 N·m / 1100 lbf·ft
Wrench Length (Torque Radius):	Minimum	135 mm	135 mm
	Maximum	750 mm	1500 mm
Wrench Orientation:		Horizontal	Horizontal
Calibration Direction:		Clockwise and Counter-Clockwise	Clockwise and Counter-Clockwise
Operating Temperature:		0 °C-40 °C	0 °C-40 °C
Dimensions (Maximum):	A	620 mm	620 mm
	B	330 mm	330 mm
	C	395 mm	395 mm
	E	1019 mm	1769 mm
Weight		40 kg	45 kg
Display		256 mm (10.1 "), TFT LCD Touchscreen, 1280 x 800, 16:10	
Power supply		48 VDC, 5.84 A, 280.32 W	
Voltage Requirements		110 - 240 Volts AC ± 10% at 47 - 63 Hz.	
Mains Power Fuse:		2 A	
Internal Fuse		Not user-replaceable	
Power Consumption:		280 W (maximum)	
Operating Temperature Range		0 °C to +40 °C	
Storage Temperature Range		20 °C to +60 °C	
Maximum Operating Humidity		80% Relative Humidity @30 °C	
Environment:		Indoor use within a light industrial environment. IP 40	
Overload protection		Between 20% - 50% of the set target torque depending on torque value	
Speed		1.22 (degrees per second)	
Vibration:		The vibration total value does not exceed 2.5 m/s².	
Sound Pressure Level		LpA = 72.2 dB(A) with no load & 78.7 dB(A) with high torque,	

Specification	TWC 400	TWC 1500
	with uncertainty k = 3 dB.	
Humidity sensor accuracy	±2% RH @25 °C	
Temperature sensor accuracy	±1 °C (maximum)	

Due to continuous improvement all specifications are subject to change without prior notice.

NOTE: **If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.**

EU Declaration of Conformity (No 0021.1)

The object of the declaration:
Torque Wrench Calibrator (TWC) 400 N·m Auto (Model: 60312).
Torque Wrench Calibrator (TWC) 1500 N·m Auto (Model: 60313).

The object of the declaration described above is in conformity with the relevant union harmonisation legislation:
Directive 2006/42/EC on Machinery Directive.
Directive 2014/30/EU on Electromagnetic Compatibility.
Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

The object of the declaration described above has been designed to comply with the following standards:
BS EN ISO 12100:2010 & BS EN 61326-1:2013

The basis on which conformity is being declared:
This Declaration of Conformity is issued under the sole responsibility of the manufacturer.
The technical documentation required to demonstrate that the product meets the requirements of the above directives has been compiled by the signatory below and is available for inspection by the relevant enforcement authorities.

The CE mark was first applied in: 2018.
The product is also compliant with a Norbar transducer connected.

The authorised representative within the European Union (EU) is:
Francesco Frezza Snap On Equipment Via Prov. Carpi, 33 42015 Correggio RE Italy

Signed for and on behalf of Norbar Torque Tools Ltd.

Signed: *T. M. Lester*
Date: 8 September 2020
Place: Norbar Torque Tools Ltd., Wildmere Road, Banbury, Oxfordshire. OX16 3JU

Full Name: Trevor Mark Lester B.Eng.
Authority: Compliance Engineer

UK Declaration of Conformity (No 0021.0)

The object of the declaration:
Torque Wrench Calibrator (TWC) 400 N·m Auto (Model: 60312).
Torque Wrench Calibrator (TWC) 1500 N·m Auto (Model: 60313).

The object of the declaration described above is in conformity with the relevant UK statutory requirements:
Supply of Machinery (Safety) Regulations 2008
Electromagnetic Compatibility Regulations 2016
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The object of the declaration described above has been designed to comply with the following standards:
BS EN ISO 12100:2010 & BS EN 61326-1:2013

The basis on which conformity is being declared:
This Declaration of Conformity is issued under the sole responsibility of the manufacturer. The technical documentation required to demonstrate that the products meet the requirements of the above legislation has been compiled by the signatory below and is available for inspection by the relevant enforcement authorities.

The UKCA mark was first applied in: 2021.
The product is also compliant with a Norbar transducer connected.

Signed for and on behalf of Norbar Torque Tools Ltd.

Signed: *T. M. Lester*
Date: 13 May 2021
Place: Norbar Torque Tools Ltd., Wildmere Road, Banbury, Oxfordshire. OX16 3JU

Full Name: Trevor Mark Lester B.Eng.
Authority: Compliance Engineer

ACCESSORY INSTRUCTIONS

Square Drive Adaptors – 29214, 29215, 29216, 29217

- The square drive adaptors are all 1" male to a range of female sizes.
- The manufacturing tolerances have been significantly reduced on these components to ensure a close fit and reduced uncertainties.

FIGURE 26 – Inserting Square Adaptor

Static Transducer Support Kit - 60318

- Secure the support to the TWC mounting platform using the socket cap screws provided.
- Static transducers male square drive engages into the 1" female square drive in the TWC mounting plate.
- In some instances, a square drive adaptor may be required. Further details below.
- When smaller bodied static transducers are needed, the reducer is used.

FIGURE 27 – Fitting Static Transducer Support Kit

Short Length Reaction Plate - 60319

- To calibrate small torque wrenches the use of the 'Short Length Reaction Plate' may be required.

- The reaction plate assembly simply bolts to the end face of the TWC using the M6 thumb screws provided

- There are two mounting positions which depend on which style of transducer is being used.
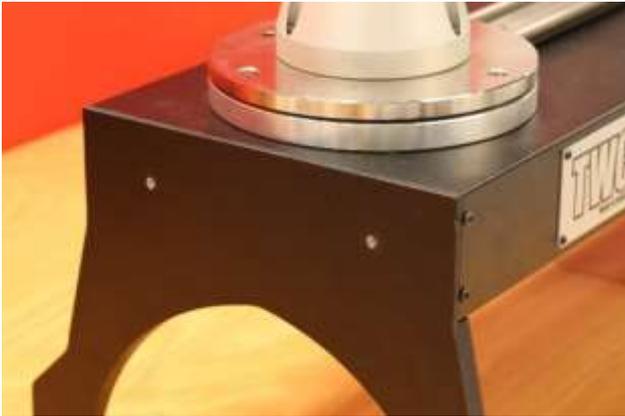
FIGURE 28 – Attaching Short Length Reaction Plate

- Adjust the reaction point as necessary using the thumb screws shown in Figure 29 to secure in place.

FIGURE 29 – Adjusting the Short Length Reaction Plates Reaction Point

NOTE: When using the Short Length Reaction Plate the wrench will no longer be counterbalanced.

FMT 2 to FMT 25 Adaptor Kit - 60327

- Place the adaptor plate on the TWC and secure in place with the three bolts supplied as shown in Figure 30.

- Secure the FMT onto the adaptor plate using the three bolts supplied with the FMT.

- Ensure a suitable reaction device is used. The Counterbalanced Reaction may be too large, in which case the Short Length Reaction Plate (60319) may be required, see page 96.

FIGURE 30 – Attaching FMT 2 to FMT 25 Adaptor Kit

FMT Quick Release Kit – 60322

The quick release kit allows for quick exchange of FMT transducers.

- Remove all transducers from the TWC.

- Insert the three threaded screws upright in to the TWC mounting platform. Use cross holes to tighten to a pinch.

- Bolt any FMT selection to the two quick release plates.

- Drop the desired transducer and quick release plate over the top of the uprights and secure with the quick release thumb nuts.


FIGURE 31 – Attaching FMT Quick Release Kit

TWC Angle Offset Plate Kit – 60330

- Place the Angle Offset plate on the TWC and secure in place with the three bolts and washers supplied as shown in Figure 32
- Secure the FMT onto the adaptor plate.

FIGURE 32 – Attaching TWC Angle Offset Plate

TROUBLE SHOOTING

The following is only a guide, for more complex fault diagnoses please contact Norbar or a Norbar distributor.

Problem	Likely Reason	Likely Solutions
No Display	No mains power	Check electrical mains power is working
	External fuse or circuit breaker has operated	Check fuse or circuit breaker
	External RCD has operated	Check for faults then reset the RCD
Tool output does not rotate when trigger is pressed	Tool is on tight fastener	Remove from fastener Check correct setting of tool direction
	Tool is off	Ensure tool is ON (display lit)
	Tool is in set up mode	Exit set up to return to operate mode
	Output drive square sheared	See MAINTENANCE section to replace drive square
	Gear train or motor is damaged	Contact Norbar
No display	No mains power	Check mains supply
	Fuse in mains plug blown	Replace fuse A value of 2 A is recommended
	Touch screen not powered	The USB power plug of the screen plugged into one of the different USB connectors (these do not have power output), must be in designated screen connector
Motor not running	Motor not connected	Connect both cables
	System initially turned on	Press 'Motor Enable' push-button
	Emergency stop pressed	Remove hazard Release emergency stop button Press 'Motor Enable' push-button
	Motor failed	Release torque with Manual Drive Gear
Overtorque detected / Overload protection activated / End of rig travel tripped	Torque wrench click not detected	Check wrench is not faulty Remove overtorque (if needed use Manual Drive Gear) Press 'Motor Enable' push-button
Overtemperature	Ensure fan grills are clear of obstructions. Ensure fan working	Once cooled down and there is no warning message carry on using it
Other	Return to Norbar for repair	

GLOSSARY OF TERMS

Word or Term	Meaning
A	Amps
AC	Alternating Current
FMT	Flange Mounted Transducer
Pro-Test	Professional Torque Tester
RCD	Residual Current Device, for disconnecting the electrical supply in the case of a fault; so protecting the operator. A device with a trip value of 30 mA or less is recommended.
Target	The Torque that the wrench set to achieve.
STB	Static Torque Block
TWC	Torque Wrench Calibrator
V	Volts