

Assessing

Test P...sse

## USER GUIDE

Version 2.2 – January 2023



# PROBEWELL CONNECT 2.0

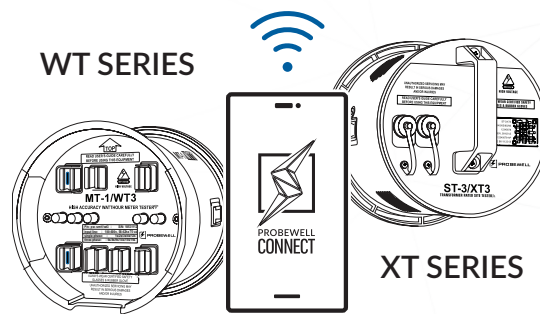






PROBEWELL  
**CONNECT 2.0**

## User Guide



## for WT & XT Series

Version 2.2 – January 2023

## End-User License Agreement (“Agreement”)

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Please read this End-User License Agreement (“Agreement”) carefully before downloading or using the Probewell Connect 2.0 (“Application”).

By downloading or using the application, you are agreeing to be bound by the terms and conditions of this agreement.

If you do not agree to the terms of this agreement, do not download or use the application.

### License

Probewell Lab Inc. grants you a revocable, non-exclusive, non-transferable, limited license to download, install and use the application solely for your own purposes strictly in accordance with the terms of this agreement.

### Restrictions

You agree not to, and you will not permit others to:

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### Modifications to Application

Probewell Lab Inc. reserves the right to modify, suspend or discontinue, temporarily or permanently, the application or any service to which it connects, with or without notice and without liability to you.

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### Contact Information

If you have any questions about this agreement, please contact us.

Last updated: 2019-11-06

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## Limited Warranty

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Each of your XT Series CT-Rated site tester and WT Series meter tester comes with a two-year hardware warranty. Probewell Lab Inc. (Probewell) warrants its XT and WT Series tester against defects in material and workmanship for a period of two (2) years from the date of purchase from Probewell. This warranty applies only to the original purchaser of the XT or WT Series tester and is not transferable.

For additional information regarding your tester warranty, please refer to the related XT or WT Series tester user guide.

## Disclaimer

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Probewell Lab Inc. (Probewell) reserves the right to make changes to this document and to the products it describes without notice. Probewell shall not be liable for technical or editorial errors or omissions made herein, nor for incidental or consequential damages resulting from the furnishing, performance, or use of this material.

Features and specifications are subject to change without notice.



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## Abbreviation List

Abbreviation	Complete Term	Abbreviation	Complete Term
<b>A</b> .....	Ampere	<b>PT</b> .....	Potential transformer
<b>AC</b> .....	Alternating current	<b>Q</b> .....	Reactive power (VAR)
<b>Amp</b> .....	Ampere	<b>Rev</b> .....	Revolution, number of revolutions
<b>AP</b> .....	Access point	<b>RMS</b> .....	Root mean square
<b>ATK</b> .....	Accuracy Testing Kit	<b>S</b> .....	Total power (VA)
<b>CFM</b> .....	Cubic feet per minute	<b>TA</b> .....	Test ampere
<b>CL</b> .....	Class	<b>THD</b> .....	Total harmonic distortion
<b>CSV</b> .....	Comma-separated values file	<b>THDI</b> .....	Current line total harmonic distortion
<b>CT</b> .....	Current transformer	<b>THDu</b> .....	Voltage line total harmonic distortion
<b>DSP</b> .....	Digital signal processor	<b>U</b> .....	RMS voltage
<b>Freq</b> .....	Line frequency	$\angle U$ .....	Phase angle between line voltage A and this line voltage
<b>HL</b> .....	High load (full load)	<b>V</b> .....	Volt
<b>I</b> .....	RMS current	<b>VA</b> .....	Volt-ampere
$\angle I$ .....	Voltage-current angle for this line	<b>VAC</b> .....	Volt alternating current
<b>Kh</b> .....	Watt-hour constant. The number of watt-hours represented by one revolution of the disk. Also, called disk constant.	<b>VARh</b> .....	VARhour (volt ampere reactive hour)
<b>Kt</b> .....	Test constant. For electronic (no disk) meters, the amount of energy represented by each calibrated pulse of the LED.	<b>Vdc</b> .....	Voltage direct current
<b>kW</b> .....	Kilowatt	<b>VT</b> .....	Voltage transformer
<b>Lb</b> .....	Pound	<b>W</b> .....	Watt(s)
<b>LL</b> .....	Light load	<b>Wh</b> .....	Watt-hour
<b>NIST</b> .....	National Institute of Standards and Technology	<b>Wi-Fi</b> .....	Wireless Fidelity
<b>P</b> .....	Resistive power (watt-hour)	<b>WLAN</b> .....	Wireless local area network
<b>PF</b> .....	Power factor	<b>WWW</b> .....	World Wide Web
<b>PPI</b> .....	Pore per inch	$\mu$ <b>VARh</b> .....	Micro-VARhour
<b>PQ</b> .....	Power quality	$\mu$ <b>Wh</b> .....	Microwatt-hour

## Introduction

Probewell Connect 2.0 is the official companion application for MT-1/WT3 and MT-1/WT1 wireless wathour meters testers and the ST-3/XT3 site tester. It allows the user to perform various types of tests, review test report data and change the WT and XT Series testers' operation parameters. The application is available free of charge for iOS and Android.

The following document outlines the scope of the application, its capabilities and how it enables complete control over the WT and XT Series testers.

## Download the App

The Probewell Connect application is available on all major platforms as stated above and is continually updated to ensure the best user experience. To download the application, follow the instructions for your mobile device operating system:



### IOS

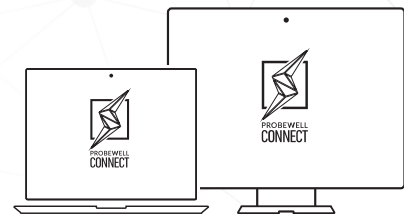
On your iOS device, launch the App Store and search for the Probewell Connect application.

The application supports all devices running iOS 11 and above.



### ANDROID

On your Android device, launch the Google Play Store and search for the Probewell Connect application. The application supports all devices running Android 7.0 and above.



### WINDOWS 10

The application supports all PCs running Windows 10. Older versions of Windows are not actively tested by Probewell Lab.

Please note that the installer requires administrator privileges.

#### INSTALL FROM THE PROVIDED USB KEY

The Probewell Connect application installer is included on the USB stick provided with every XT Series tester purchase. Browse to the USB drive using Windows Explorer. Launch the installer and follow the on-screen instructions.

#### INSTALL FROM THE WEBSITE

The latest version of Probewell Connect for Windows 10 is downloadable from the Probewell website at the following link: <https://probewell.com/pw-connect/>

To download the application installer (.exe file), click on “**Download for Windows 10**”. Once the download is complete, launch the installer and follow the on-screen instructions.

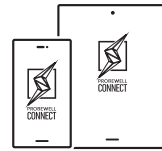
## Features

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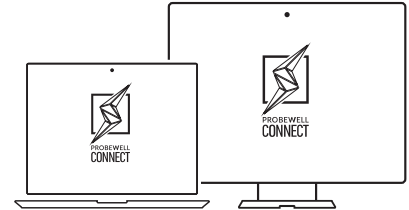
### Operating systems

The Probewell Connect application has a different feature set depending on the device used. Throughout this document, the following icons help identify which features are available for a specific operating system:

A quick rundown of the available features per operating system is given in the table



iOS or Android



Windows PC

GPS coordinates	✓	✗
Email reports	✓	✗
Barcode scanner	✓	✗
Export CSV / PDF	✓	✓
Offline Mode	✓	✓
Settings Profiles	✓	✓
Accuracy Validation	✓	✓

---

### Online/Offline mode

Some features are also only accessible when the Probewell Connect 2.0 application is in online mode (connected to a WT or XT series tester). The icons indicating these are:



Online mode



Offline Mode



## Main View

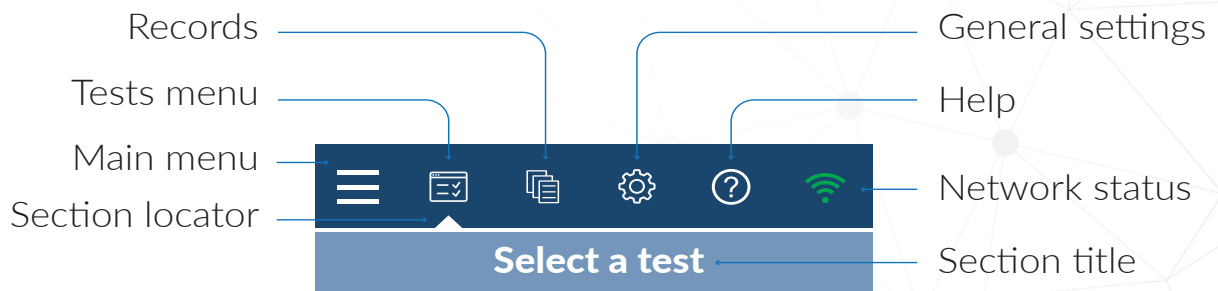
The Main View of the application is always available to the user. It provides a shortcut to basic controls within the application.

### Header

The header is located at the top of the window and allows basic navigation within the application for both the WT or XT Series.



#### Mobile navigation header



A color code is used throughout the app to identify the version of the application for the detected device: a blue header for the WT Series or a black one for the XT Series.

### ≡ Main menu

The Main Menu icon expands and collapses the menu containing direct links to Network Status, Setup, Tests, Records, Settings, WT Series Settings and XT Series Settings as well as the Info and Help sections. (See details on page 10.)

### ☑ Tests menu

The Tests view lists all available test modes. Some test modes are only available for certain meter categories and system operation modes. A summary of available test modes and their minimal conditions is available in the Tests section of this document.

### 📄 Records

The Records view lists all test reports.

### ⚙️ General settings

The Settings view shows all available setting options and device-specific settings.

### ❓ Help

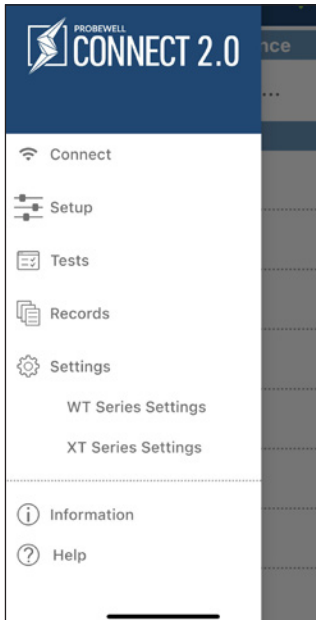
Open the Help page for contact information when you need support.

### 📶 Network status

Manage your connection to the tester, a user can tap on the green icon to disconnect the device, the icon turns red when the device is disconnected.

## ≡ Main Menu

The Main menu is located at the very left of the navigation header at the top of the screen.



Tapping on the main menu button **≡** expands the menu tab and displays the menu options as described below:



### Connect:

Takes you back to the home screen to connect to a device by scanning the QR code or selecting it from the list.



### Setup:

Takes users to the device Setup Screen when the device is connected. (See page 12 for details)



### Tests:

Open the Tests menu Screen when the device is connected.



### Records:

The saved reports are accessible both online or offline.



### Settings:

- Application parameters
- Utility profile
- User profile
- WT Series settings
- System
- Meter
- Calibration
- Custom Questions
- Personalized test sequence
- CSV: Manage column headers
- XT Series settings
- Power Quality
- Primary Secondary
- Secondary Burden
- Custom Questions



### Information

Tapping on this button displays all system information. (See details below)



### Help:

Provides contact information for support



### Information button

Tapping on this button displays all system information, including:

#### 1. Socket information (when connected):

- Tester model
- DSP number\*
- Optical (Metercam or Pulse Pickup)\*

#### 2. System information\* (when connected):

- User calibration date
- Factory calibration date

#### 3. Site (when connected):

- TA\*
- FORM
- Kh\*

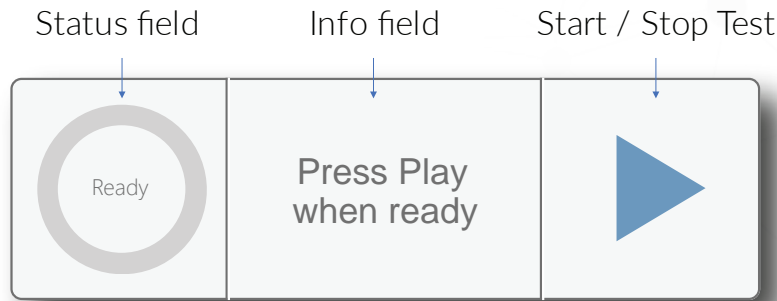
#### 4. App:

- Firmware version (when connected)
- Software version

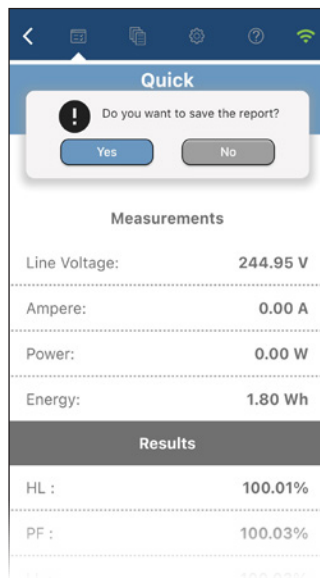
\* Option for WT Series only.



## ▶ Control Panel



**i** A color code is used throughout the app to identify the version of the application for the detected device: a blue header for the WT Series or a black one for the XT Series.



### The Control Panel

Located just below the main navigation menu, the control panel is only available in test mode.

**Status field:** The Status field displays three different types of information (Idle, Ready or a Timer), all within a wheel that spins when the application is processing data.

**Idle:** The application is waiting for user input or setup.

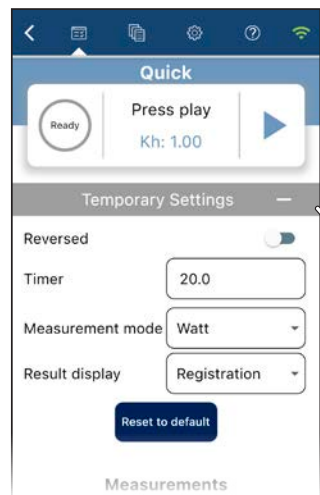
**Ready:** The setup phase is finished, the user can start the test.

**Timer:** The application displays a countdown when a test is underway.

**Info field:** The Info field displays the Kh when in test mode, tips on what to do next or what operation the application is currently performing (i.e., Setup, Tap Play when ready, Waiting for pulse or In progress).

**Start / Stop:** Allow the user to start or stop the test.

**Save report:** When a test is complete, a message is displayed on the control panel, prompting the user to save the test.



### Temporary Settings (WT Series only)

This tab is located below the Control Panel and is only available when a test mode is selected.

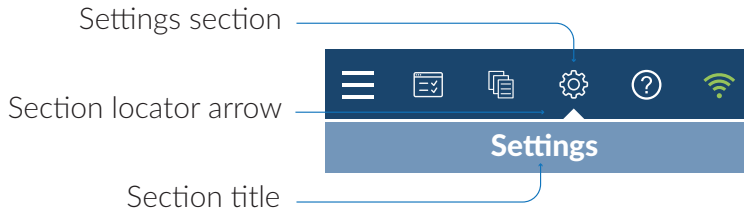
Tapping on the Temporary Settings tab expands the temporary test settings window. These settings can be changed to match the required test parameters. Such modifications are reset to the default settings by tapping the **Reset to default** button.

The number and type of available parameters in this test view vary with the selected test. Collapse the Temporary Settings by tapping the minus sign in the title bar.



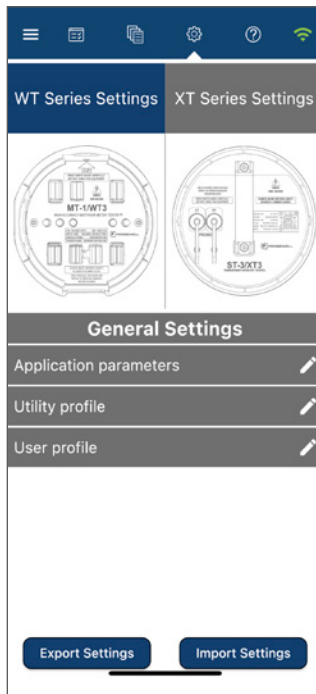
## Settings

### Settings Mobile Header



Settings can be accessed directly by tapping the cog icon shortcut or from the main collapsible menu.


## General Settings



The WT Series tester comes with factory default settings that are suitable for most operations. The device settings can be easily changed to suit the operator's needs by using the Settings tab in the app. These settings can then be saved to a profile and reused as needed.

The Settings comprise 3 main sections, General Settings which are described here, WT Series Settings (see pages 41-47) and XT Series Settings (see pages 63-66).

<b>– General Settings</b>	App. parameters	Adjust parameters specific to the app, such as language and dark mode.
		Language selection. - English (default)
	Utility profile	Brand reports by adding the company logo, address and contact info.
	User profile	Add field tech user ID and email here.

 Users can now access some functions of the app while offline, such as “Settings” and “Records” for both the WT and XT Series device. This allows users to setup their device beforehand and access records at any time.

As a rule of thumb, the color code is generally ● blue for the WT Series header and ● black for the XT Series header.

## Sample Report Header

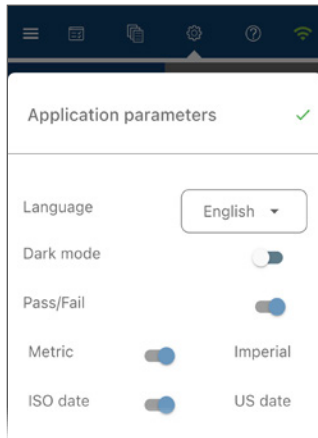






## Application parameters

The configuration of formats and display options in the application parameters will be carried out throughout the application.

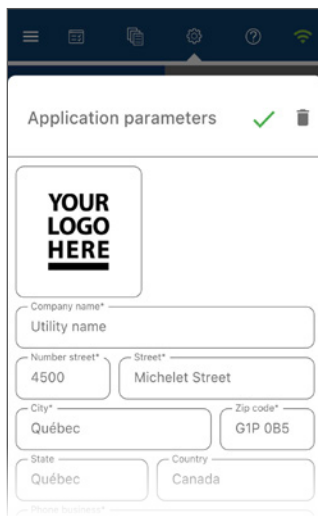


The device settings can be easily changed to suit the operator's needs. These settings can then be saved to a profile and reused as needed.

- App. parameters
  - Language selection The app is available in English (default), Spanish or French.
  - Dark mode Enable the dark mode to improve the screen's legibility in sunlight.
  - Pass/Fail status This toggle allows to choose whether or not to display the pass/fail status of a test.
  - Measurement unit Use this toggle to switch measurement units from imperial (default) to metric.
  - Date format ISO: YYYY-MM-DD UTC (24h) to US: MM-DD-YYYY AM/PM (12h)

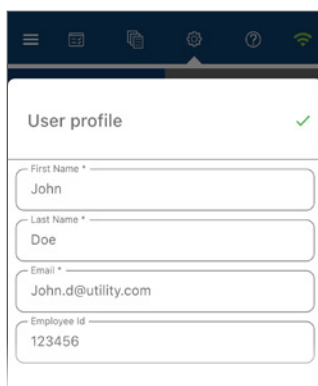
## Utility profile

Customize reports by adding your company's contact information and to reflect your brand by uploading the utility logo.



- Utility profile
  - Upload a logo This logo will appear in the header of all your test reports.
  - Contact info Utility contact information will also be displayed in the header of the report, to the left of the utility's logo.
    - Utility name
    - Address
    - Phone
    - Email
    - Website

## User profile



Complete this section to allow the manager to easily link the report to the field technician who performed the inspection.

- User profile
  - Contact info Utility contact information will also be displayed in the header of the report
    - Field technician's first and last name
    - Email
    - Employee ID


## Operation

### Connecting to the WT Series tester



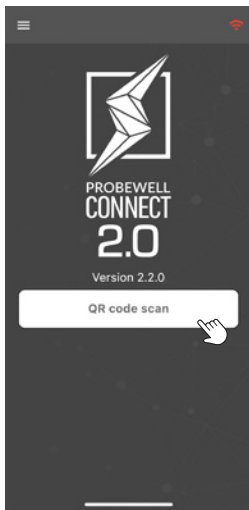
In order to use the WT Series tester, the user must first connect their mobile device to the socket.

By default, the Probewell Connect application first displays the connection screen when the application is open.

The user can tap the WiFi icon  in the upper right corner of the header to disconnect the app from the device. The app will return to the connection screen by default and will be ready to establish a new connection.

Alternatively, the user can also access the connection screen through the Main menu  by selecting  Connect from the list.

#### iOS and Android



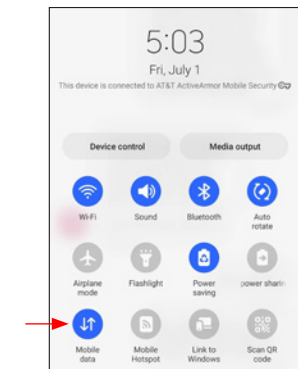
(Figure 1)




(Figure 2)



(Figure 3)





 For some devices such as Samsung, the user may have to turn off mobile data before connecting.

The connection process is done from within the Probewell Connect application itself.

Follow these steps to connect the WT Series tester:

1. Secure the socket to the meter base and attach the meter to the front of the socket.
2. Power up the tester by setting the Power switch to the "ON" position.
3. Launch the Probewell Connect application on your mobile device.
4. Tap the **QR CODE SCAN** button. (Figure 1) If prompted, allow the app to use the device's camera.
5. Point the camera at the QR code located on the side of the WT tester unit. (Figure 2)
6. When prompted, tap **Join** to allow connection to the WT tester. (Figure 3)
7. Once connected, the unit emits a sound notification.

 If the tester has already been connected to this mobile device, it can also be selected from the known devices list, identified by their SSID, below the **QR Code Scan** button.

 The device only allows one user to connect at a time.



## Meter Setup

The Meter Setup view lets the user set basic parameters for the meter to be tested. These parameters are used by the WT Series tester to properly energize the meter and calculate test results.

The Meter Setup parameters are:

**Meter ID:** Required

**Barcode Scanner:** Optional

**Site ID:** Optional

**Work Order:** Optional

**Meter Form:** The meter form (already populated with detected meter form)

**Meter TA:** The meter test amps

**Kh Auto-detection delay:** Time delay to start registering pulses after the meter is first energized

**Kh Auto-detection:** Allows or disables auto-detection of the meter Kh value with the optical pickup or metercam

**Accessory:** Type of accessory detected

**Kh Drop-down:** To manually select the Kh value

- 1. Meter ID:** Required fields  
Can be entered manually or by scanning the device barcode
- 2. Barcode Scanner**  
Users have the option of scanning the device barcode
- 2. Work Order Number**  
The assigned work order is included in the inspection reports to ease data tracking.
- 3. Site ID field:** Optional  
Tip: When performing meter and site testing at the same location, it is recommended to use the same Site ID and Meter ID for both fields. Doing so make it easier to find a report when needed.
- 4. Kh auto-detect ON/OFF**  
Users can turn off the Kh auto-detect and enter a value manually.



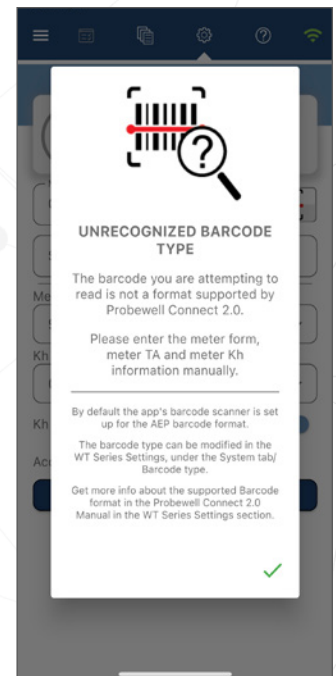
## Barcode Scanner

On a mobile device (iOS or Android), the meter settings can be automatically imported by scanning a barcode located on the meter itself. **The barcode must be in the AEP** or one of the predefined formats (See the system settings barcode note on page 43) and contain information on the meter form, TA, Kh and serial number. The serial number is then entered in the Meter ID field and is kept in memory to be automatically filled in when saving test results.

Once all meter parameters are correctly entered, tap *Confirm Setup* to complete the meter setup.



If the meter is equipped with a communication module (AMI/AMR) that emits from the same port as the test pulse, a delay can be added before registering the first pulse by modifying the **Kh Auto-detection delay** setting. For example, use a 10-second delay for a KV2C Form 9S, TA 2.5A.





## Tests for the WT Series

The Tests View shows a list of all available Test sequence(s) and test modes for the meter. A short and full description of all test modes follows.

### Summary of test modes and availability

	Meter type	Pickup
<b>Personalized test sequence</b>		
Custom Utility Profi...	Any or None	Any or None
<b>Select a test</b>		
Quick test	Any	Optical/Metercam
Full test	Polyphase	Optical/Metercam
Custom test	Any	Optical/Metercam
WH4Quad test	Solid-state	Optical
VarH4Quad test	Solid-state	Optical
Demand test	Any	Any or None
Line monitor	Any or none	Any or None
KYZ	Any	Any
Creep	Any	Any or None

**i** The *personalized test sequence* menu item at the top of the screen displays the test sequence(s) created by the user in the *WT Series Settings* section under the *personalized test sequence* tab.

**i** The test modes available in the Tests View is dependent on the types of meter (single phase or polyphase) and the accessories.

### Test Description

**Personalized Test Sequence:** Custom test sequences are user-defined test sequence that can be created in the Settings section of the WT series. They can include any number of tests and quickly perform a sequence of tests autonomously.

**Quick:** The Quick Test is the most common type of test. It can be used to quickly assess the accuracy of a meter. The Quick Test runs a predetermined sequence of subtests, all in one operation, during which all phases are energized simultaneously.

**Full:** This is the most thorough type of test, as it runs a complete sequence of subtests. It uses the same testing sequences as a Quick Test and adds additional testing of individual elements. This results in a longer but more thorough test.

**Custom:** Custom Test consists of choosing one of the three loads to apply to the meter: HL, PF or LL. The disk revolutions or pulses are counted automatically by the pickup. No critical timing is required to start a test. The test ends automatically.

**4 Quad:** 4 Quad is an automatic test sequence that can be used to assess the meter's ability to register energy in all four quadrants of the power vector diagram.

**Demand:** Demand Test is used to test meters that have a demand register. The meter must first be configured to be in kW demand test mode (check meter manual for device-specific procedures).

**Line Monitor:** Line Monitor is used to observe the input voltage and obtain the THD measurement.

**KYZ:** KYZ Test is used to assess the ability of some solid-state meters to transmit energy use information to another piece of equipment via a physical wire interface.

**Creep:** Creep Test is used to check the effect of a 0 A current and nominal voltage on the energy registration of a meter.

**Manual/Tracking:** Manual/Tracking is used to assess the quality of a mechanical meter without using external accessories. To do this, the meter is energized with a low or high load while the test operator counts the number of disk revolutions.



## Quick Test

### Prerequisites

An optical pickup or a Metercam must be installed on the WT Series tester.

### Description

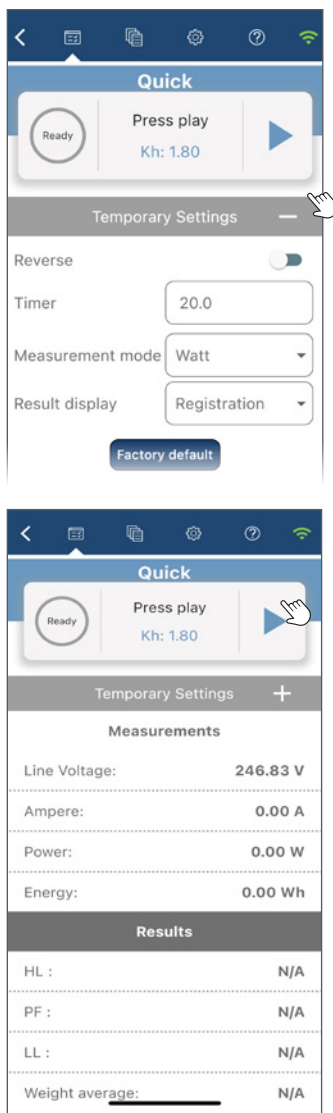
The Quick Test is the most common type of test. It can be used to quickly assess the accuracy of a meter. The Quick Test performs a predetermined sequence of subtests, all in one operation, during which all phases are energized simultaneously.

The subtests are:

- a) All phases, High Load (HL)
- b) All phases, Power Factor (PF)
- c) All phases, Low Load (LL)

When the test has been completed, the user can save the test data.

### Operation



#### Step 1: Temporary test settings

If necessary, modify the test settings by tapping on the Temporary Settings bar, below the control panel.

Test settings for the quick test are:

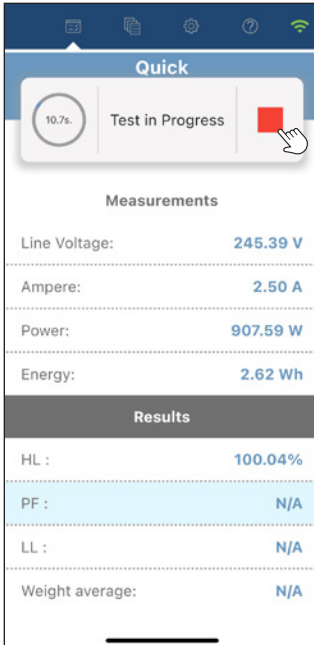
- **Reversed:** Enables or disables reverse flow testing
- **Timer:** Minimum test time in seconds
- **Measurement mode:** Watt or VAR
- **Result display:** Result display type

Modifications are reset to the default settings by tapping the **Reset to default** button.

To collapse Temporary Setting, tap the minus sign in the title bar.

#### Step 2: Start test

Tap the **Play** ► (start test) button to initiate the test sequence. The load current will increase to its HL value, the meter will send pulses and the WT Series' internal electronic standard will register the energy that flows through the meter.



### Step 3: Test execution

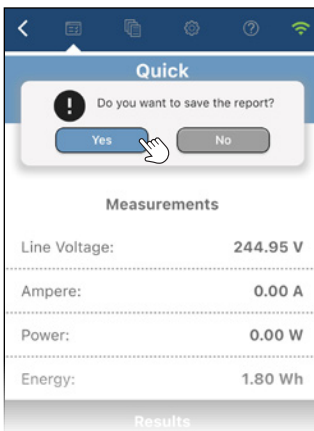
In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the top, within the status field of the control panel, a timer displays the remaining time for the subtest.

The subtest currently running is highlighted.

A sound notification is heard when a subtest is completed.

The test can be stopped at any time by tapping the **Stop** button.

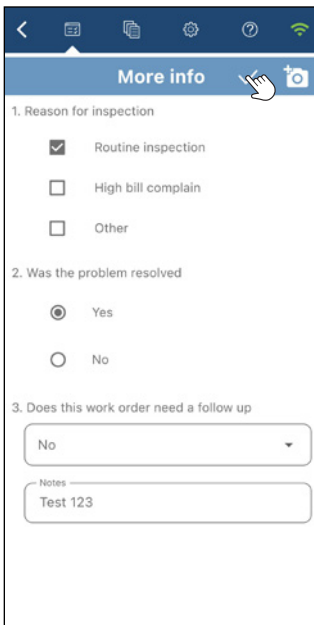


### Step 4: Test end

When all the subtests have been completed, the test ends automatically. The load is then removed, and the test results are displayed.

The last test result, Weight, is the weighted average of the three other test results. The Weight result formula depends on the meter type and the Weight factor configuration in the settings. Please refer to the System Settings section for a complete description of the Weight result calculation.

To save the test results, tap on the **Yes** button within the control panel at the top of the screen.

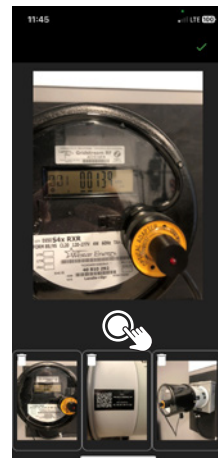


### Step 6: More Info (Optional)

Up to 8 user-defined questions\* can be added in the WT Series Settings under *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **white checkmark**.

\*See WT Series Settings/Custom Questions section to learn how to setup predefined questions





## ✓ Full Test

### Prerequisites

An optical pickup or a Metercam must be installed on the WT Series tester.

### Description

The Full Test is the most thorough type of test. It is used to fully assess the quality of a meter as it runs a complete sequence of subtests. The Full Test runs an equivalent of the Quick Test followed by additional single-element tests.

The subtests are:

#### High Load (HL)

- a) All phases
- b) Phase A
- c) Phase B\*
- d) Phase C

\*If applicable

#### Power Factor (PF)

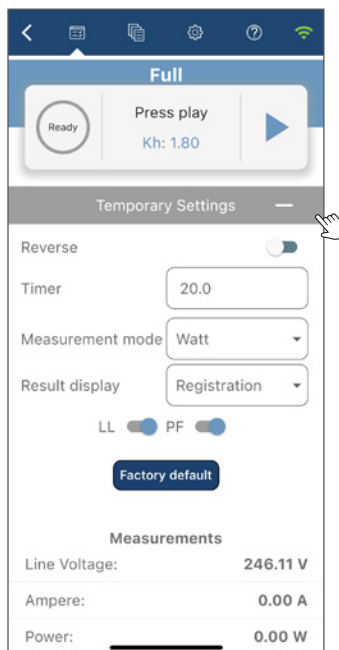
- All phases
- Phase A
- Phase B\*
- Phase C

#### Low Load (LL)

- All phases
- Phase A
- Phase B\*
- Phase C

When the test has been completed, the user can save the test data.

### Operation



#### Step 1: Temporary test settings

If necessary, modify the test settings by tapping on the Temporary Settings bar below the Control panel.

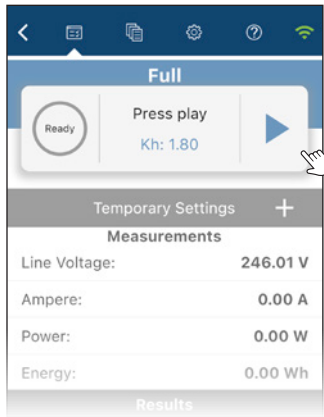
Test settings for the Full Test are:

- **Reversed:** Enables or disables reverse flow testing
- **Timer:** Minimum test time in seconds
- **Measurement mode:** Watt or VAR
- **Result display:** Result display type
- **Low load (LL) testing:** Enables or disables low load testing on single element
- **Power factor (PF) testing:** Enables or disables power factor testing on single element

Modifications are reset to the default settings by tapping the **Reset to default** button.

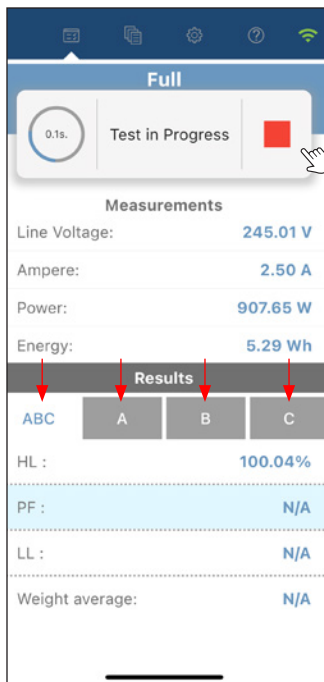
To collapse Temporary Settings, tap the minus sign in the title bar.





### Step 2: Start test

Tap the **Play** ► (start test) button to initiate the test sequence. The load current will increase to its HL value, the meter will send pulses and the WT Series' internal electronic standard will register the energy that flows through the meter.



### Step 3: Test execution

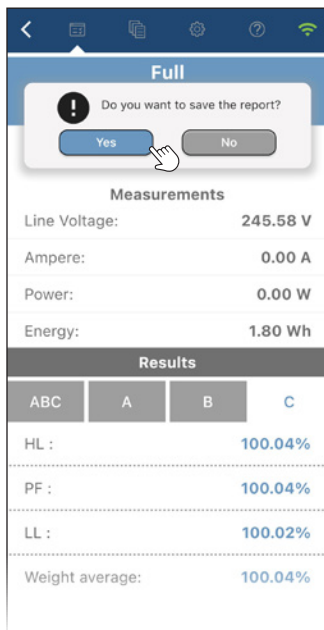
In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the top, within the status field of the control panel, a test timer displays the remaining time for this subtest.

The subtest currently running is highlighted.

At any time during the test, the user can review the results for multiphase and single-element by using the ABC, A, B or C tabs to navigate and preview results fields.

The test can be aborted at any time by tapping the **Stop** button.



### Step 4: Test end

When all the subtests have been completed, the test ends automatically. The load is then removed, and the test results are displayed.

The last test result, Weight, is the weighted average of the three other test results according to the following formula:

$$\frac{(4HL+2LL+PF)}{7}$$

To save the test results, tap on the **Yes** button within the control panel at the top of the screen.





**More info**

1. Reason for inspection

- Routine inspection
- High bill complain
- Other

2. Was the problem resolved

- Yes
- No


3. Does this work order need a follow up


No

Notes

Test 123

### Step 5: More Info (Optional)

Up to 8 user-defined questions\* can be added in the WT Series Settings under *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon**  in the upper right corner of the screen.

Answer each question and save the test report by tapping the **white checkmark** .

\*See WT Series Settings/Custom Questions section to learn how to setup predefined questions



## Custom Test



### Prerequisites

An optical pickup or a Metercam must be installed on the WT Series tester.

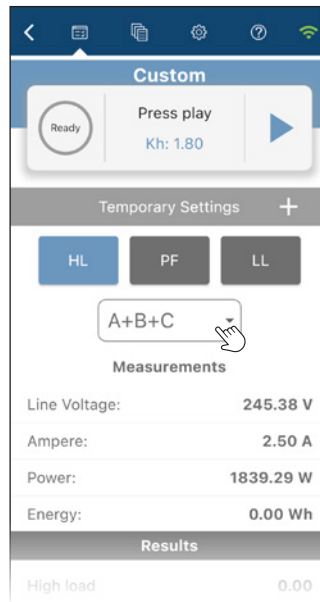
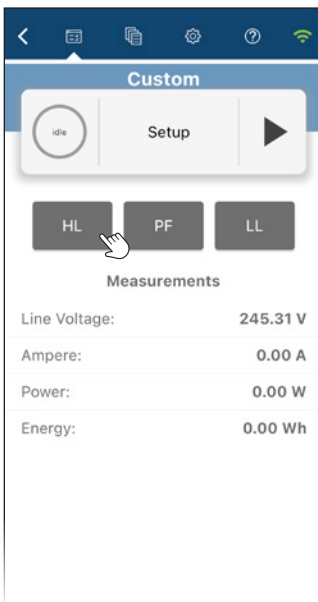
### Description

The Custom Test is used to test a specific combination of loads and active phase.

When the test has been completed, the user can save the test data.

**i** The Custom Test runs a specific subset of the Full Test. If a meter has already been tested in Full Test mode, running a Custom Test is redundant.

### Operation



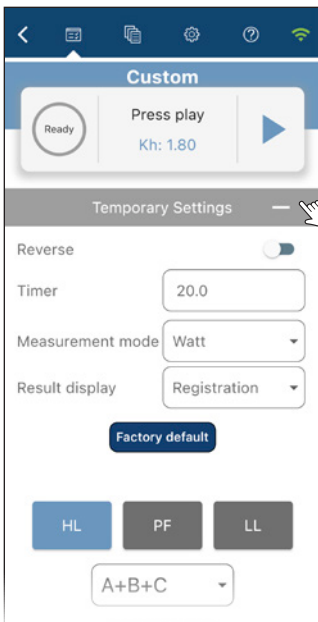
#### Step 1: Test setup

Select the load and the active phase.

#### Active phase:

A+B+C or A+C: multiphase test on polyphase meter  
A, B or C: Single-element test on phase A, B or C

The **Play** ▶ (start test) button and Temporary Settings are only available when a load is selected.



#### Step 2: Temporary test settings

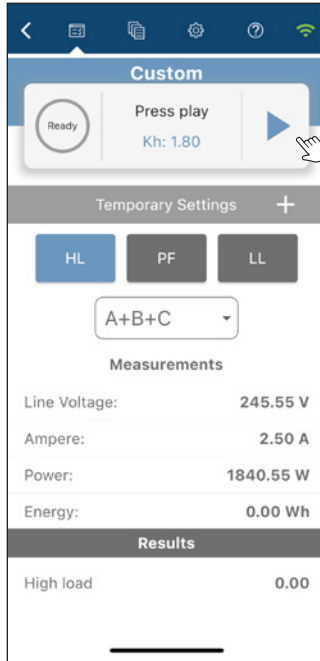
If necessary, modify the test settings by expanding the *Temporary Settings* tab below the control panel.

The test settings for the Custom Test are:

- **Reversed:** Enables or disables reverse flow testing
- **Timer:** Minimum test time in seconds
- **Measurement mode:** Watt or VAR
- **Result display:** Result display type

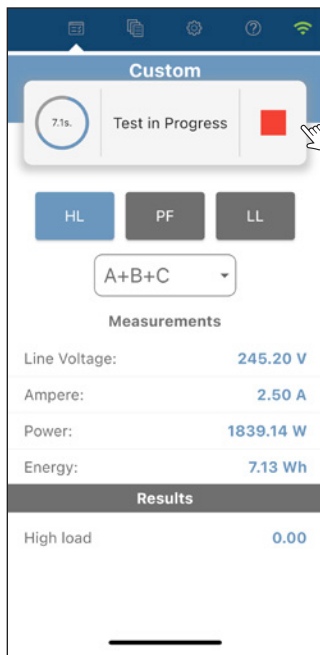
Modifications are reset to the default settings by tapping the **Reset to default** button.

To collapse the Temporary Settings, tap the minus sign in the title bar.



### Step 3: Start test

Tap the **Play** ► (start test) button to initiate the test sequence. The load current will increase to its selected load value, the meter will send pulses and the WT Series' internal electronic standard will register the energy that flows through the meter.

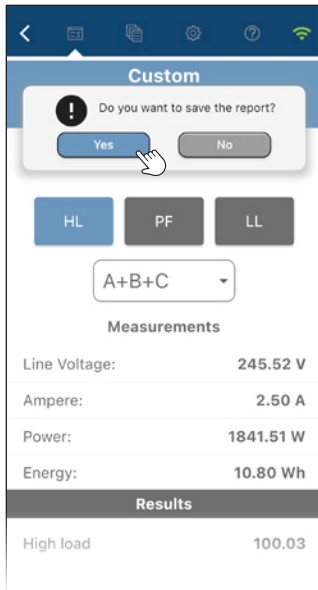


### Step 4: Test execution

In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the top, within the status field of the control panel, a timer displays the remaining time for the test.

The test can be aborted at any time by tapping the **Stop** button.

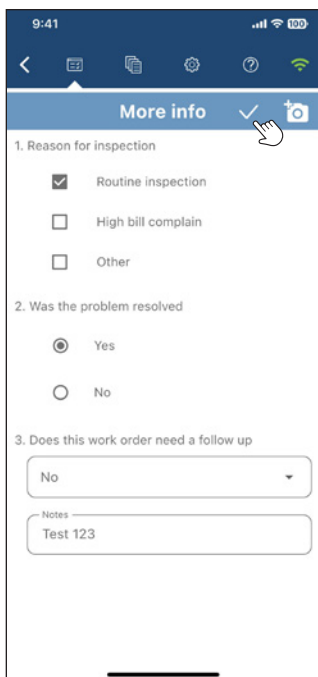


### Step 5: Test end


When enough test pulses have been registered, the test ends automatically.


The load is then removed, and the test result is displayed.

To save the test result, tap on the **Yes** button at the top of the screen.



### Step 6: More Info (Optional)

Up to 8 user-defined questions\* can be added in the WT Series Settings under *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon**  in the upper right corner of the screen.

Answer each question and save the test report by tapping the **white checkmark** .

\*See WT Series Settings/Custom Questions section to learn how to setup predefined questions





## THD Line Monitor

### Prerequisites

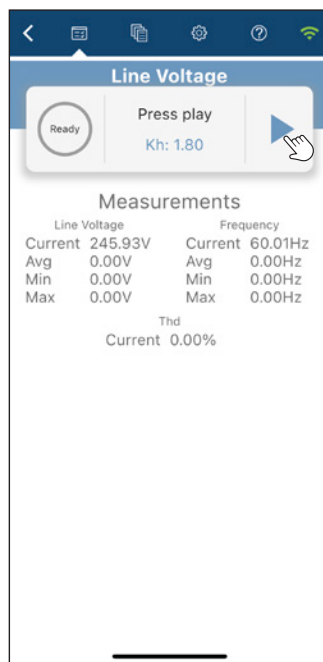
There are no prerequisites for running the Line Monitor test.

### Description

The Line Monitor Test is used to observe the input voltage and obtain the THD measurement.

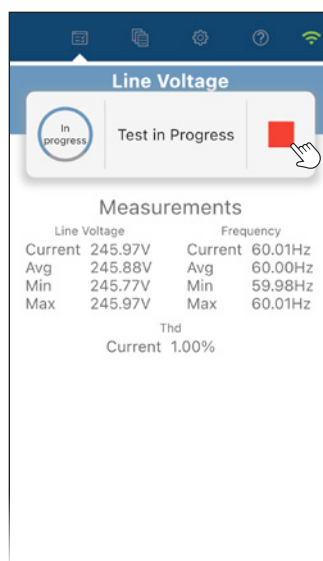
The test report can be saved for later analysis.

### Operation



#### Step 1: Start test

Tap the **Play** ► (start test) button to initiate the test sequence. This test only monitors the line voltage and does not involve the meter.



#### Step 2: Test execution

The voltage, frequency and THD values are continuously updated. Minimum and maximum values are also displayed for each parameter.

The harmonic content (THD) considers harmonics up to the 32<sup>nd</sup> order.

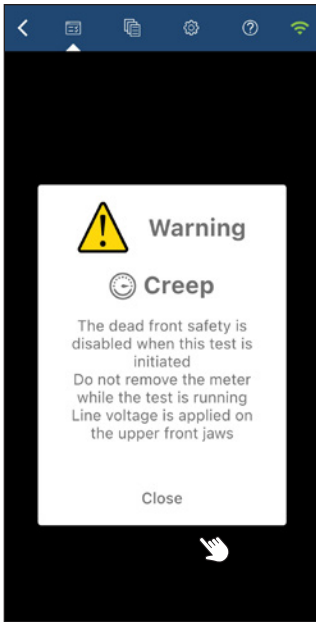
To stop the test, tap on the **Stop** button.

## Description

The Creep Test is used to check the effect of a 0 A current and nominal voltage on the energy registration of a meter. Under a 0 A load, a mechanical meter should do no more than one disk revolution in a 10-minute time window. Under the same conditions, a solid-state meter should emit no more than 1 pulse in a 10-minute time window. If these conditions are not met, the meter is considered to creep.

This test does not save data.

## Operation



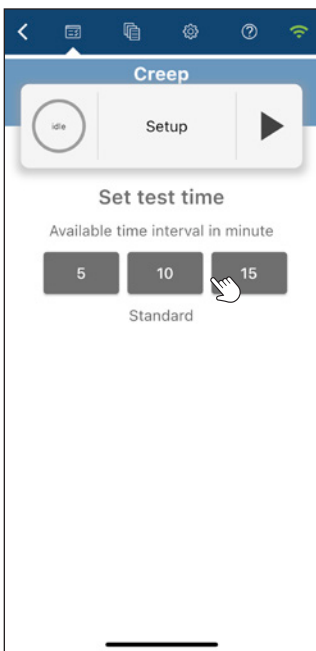
### Test execution



**WARNING:** The dead front safety is disabled when this test is initiated. Do not remove the meter while the test is running. Line voltage is applied to the upper front jaws. A warning message is displayed.



The WT Series tester uses a closed-link arrangement on the meter's load terminals and cannot be opened. However, in the Creep Test, the internal current synthesizers are set to 0.00 A (no current), thus simulating an open circuit.



### Step 1: Test setup

The length of time can be set by selecting the test duration.

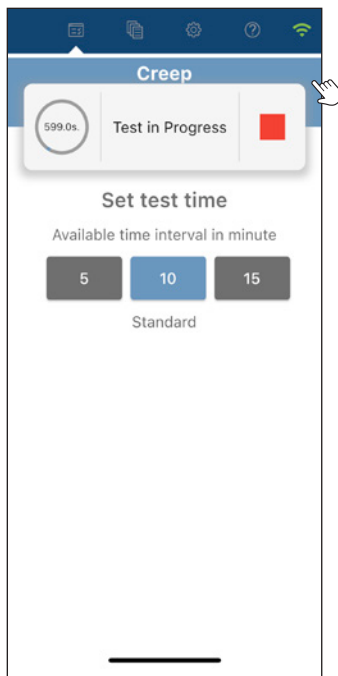
The available time intervals are:

- 5 minutes
- 10 minutes (standard)
- 15 minutes



### Step 2: Start test

Tap the **Play** ► (start test) button to initiate the test sequence.



### Step 3: Test end

At the top, within the status field of the control panel, a timer displays the remaining time for the test. When the test timer runs out, the test ends automatically.

The dead front safety is re-enabled. It is now safe to remove the meter if needed.

If the disk has not completed a full revolution or no more than one pulse was received during this time, the meter does not creep.

The test can be stopped at any time by tapping the **Stop** button. This will re-enable the dead front safety. It is now safe to remove the meter if needed.



## Demand

### Prerequisites

No accessories must be connected to the WT Series tester.

### Description

The Demand Test is used to test meters that have a demand register. The meter must first be configured to be in kW demand test mode (check meter manual for device-specific procedures). The Demand Test applies a load to the meter for a given subinterval time. When the subinterval time is reached, the energy reading of the internal standard of the WT Series tester is compared to the energy reading given by the meter.

The test report can be saved for later analysis.

### Operation



#### Step 1: Test setup

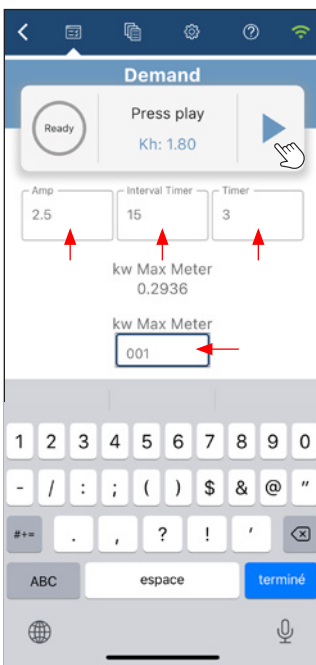
The available parameters for this test are:

**Amp:** Load to apply to the meter

**Interval Time (min.):** The demand interval time of the meter in minutes (between 1 and 99)

**Timer:** Duration of the demand test in minutes (must be less than or equal to the demand interval of the meter under test)

Fill in the appropriate values for the meter in the input fields.



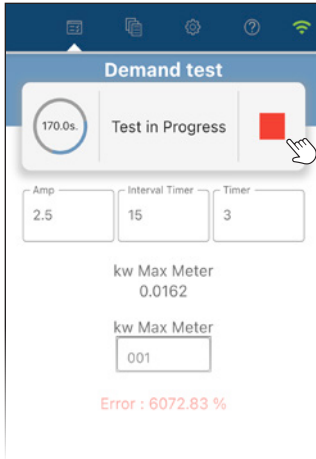
#### Step 2: Start test

To initiate the test sequence, reset the meter's demand register and tap the **Play** ▶ (start test) button on the mobile device simultaneously.



To know how to reset the demand register of the meter under test, please refer to the meter manufacturer's specific instructions.



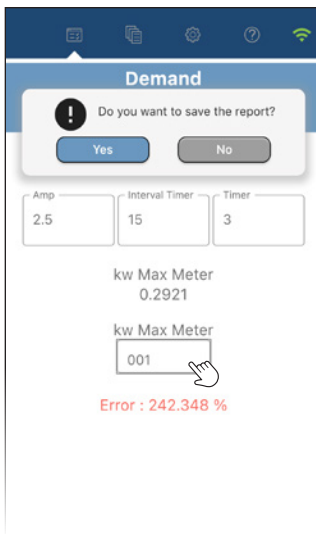


### Step 3: Test execution

During the test, the WT Series tester's internal standard registers the accumulated energy and displays it onscreen.

The test can be aborted at any time by tapping the **Stop** button.

At the top, within the status field of the control panel, a test timer displays the remaining time for the test.



### Step 4: Save test

When the test timer runs out, the test ends automatically, and the load is removed.

Type the value of the demand the meter has registered (read on the meter display) in the kW Max Meter field. Probewell Connect 2.0 will automatically calculate and display the final test results as a percentage error.

A result higher than 100% indicates that the meter records a higher kW demand compared to the reference. Conversely, a result lower than 100% means that the meter records less kW demand compared to the reference.

To save the test result, tap on the **Yes** button at the top of the screen.



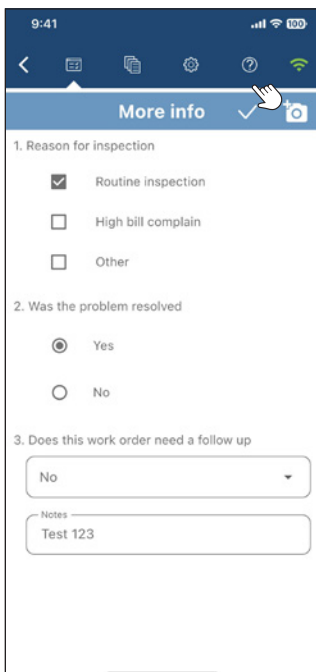
There may be a slight delay between tapping the **Play** (start test) button onscreen and resetting the meter demand register. This may affect the precision of the test. Please ensure that both actions are performed simultaneously.

### Step 5: More Info (Optional)

Up to 8 user-defined questions\* can be added in the WT Series Settings under *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **white checkmark**.

\*See WT Series Settings/Custom Questions section to learn how to setup predefined questions



## Prerequisites

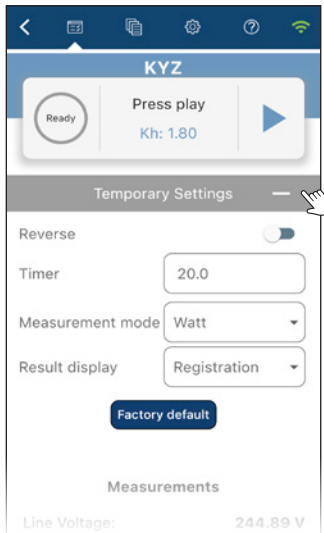
An optical pickup must be connected to the WT Series tester.

## Description

The KYZ Test is used to assess the ability of some solid-state meters to transmit energy use information to another piece of equipment via a physical wire interface. This test mode requires the KYZ Device accessory (model PW-0767) and an optical pickup with suction cup (model PW-9073). The KYZ device accessory changes the electrical pulses generated by the meter into optical pulses to be picked up by the optical device. The optical pickup is connected to the IO port of the WT Series tester and transmits pulses to the device. By using the total energy registered by the internal standard of the WT Series tester and the number of registered KYZ pulses, a Watthour / Pulse value can be obtained.

The test report can be saved for later analysis.

## Operation



### Step 1: Temporary test settings

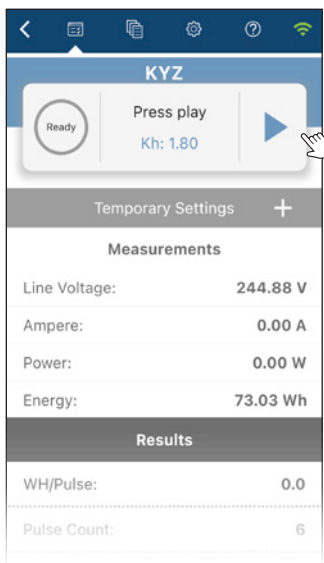
If necessary, modify the test settings by expanding the Temporary Settings tab located below the control panel.

The test settings for the KYZ test are:

- **Reversed:** Enables or disables reverse flow testing
- **Timer:** Minimum test time in seconds
- **Measurement mode:** Watt or VAR
- **Result display:** Result display type

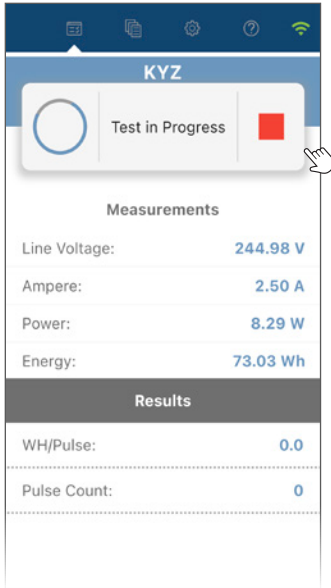
Modifications are reset to the default settings by tapping the **Reset to default** button.

To collapse the Temporary Settings, tap the minus sign in the title bar.



### Step 2: Start test

To initiate the test sequence, tap the **Play** ► (start test) button.



### Step 3: Test execution

During the test, the WT Series tester's internal standard registers the accumulated energy and the number of pulses obtained from the KYZ interface. The average Watthour/Pulse value and the number of pulses is displayed.

Once enough KYZ pulses have been registered, the user can stop the test by tapping the **Stop** button. **The test will not stop by itself.**

The average WH/Pulse value is displayed. Depending on how the solid-state meter is programmed, this value may be different from the Kh value.

The test can be aborted at any time by tapping the **Stop** button.

The KYZ test saves itself automatically and will skip ahead to the "More info" screen if questions have been provided in the WT Series Settings section.



### Step 4: More Info (Optional)

Up to 8 user-defined questions\* can be added in the WT Series Settings under *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** 📷 in the upper right corner of the screen.

Answer each question and save the test report by tapping the **white checkmark** ✓.

\*See WT Series Settings/Custom Questions section to learn how to setup predefined questions





## Manual / Tracking

### Prerequisites

No accessories must be connected to the WT Series tester and the Kh has to be entered manually.

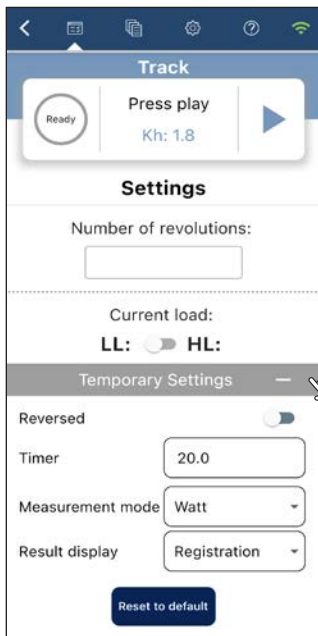
### Description

The Manual/Tracking test is used to assess the quality of a mechanical meter without using external accessories. To do this, the meter is energized with a low or high load while the test operator counts the number of disk revolutions.

Once a predefined number of revolutions have been completed (default is 10), the operator ends the test and an error percentage result is given.

This test does not save any data.

### Operation



#### Step 1: Temporary test settings

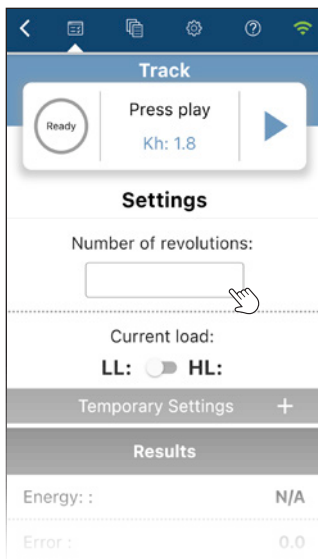
If necessary, modify the test settings by expanding the Temporary Settings tab located below the *Current load* section.

Test settings for the Manual/Tracking test are:

- **Test decimal:** Displays results with 2 or 3 digits
- **Reverse:** Enables or disables reverse flow testing
- **Test error display:** Test error display type
- **Measurement mode:** Watt or VAR

Modifications are reset to the default settings by tapping the **Reset to default** button.

To collapse the Temporary Settings, click the minus sign in the title bar.



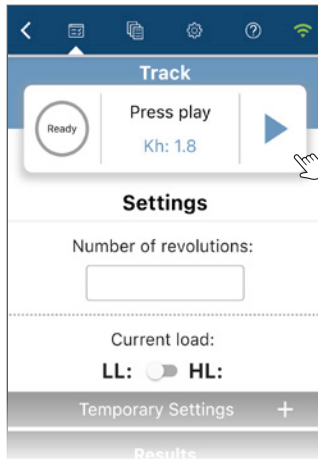
#### Step 2: Test setup

Select the test mode:

- **Manual:** The meter is energized and the disk rotates. The test operator must track the position of the disk and count its revolutions.
- **Tracking:** Same as Manual, with the addition that the WT Series tester emits a single beep at each disk rotation (approximated with the reading of the internal standard) and a double beep before the last disk rotation.

Input the required number of revolutions in the "Number of revolutions" field (default value is 10).

The load current will be set to LL value (calculated from the selected TA at meter setup) and the disk will start to rotate slowly. The load can be switched between LL (light load) and HL (high load) by toggling the Current load control.



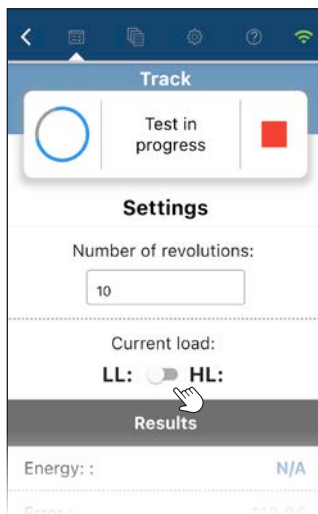
### Step 3: Start test

The Manual/Tracking test can be started by either tapping the **Play** ► (start test) button on the mobile device (app) or by shortly tapping a magnet to the left side of the WT Series.

Operating the test with the magnet switch is deemed to be more accurate as it removes the latency of the mobile app.

When the black mark on the mechanical meter disk lines up with the black line on the meter nameplate, start the test using your method of choice.

At this precise moment, the electronic standard of the WT Series tester begins to register the energy flowing through the meter.



### Step 4: Test execution

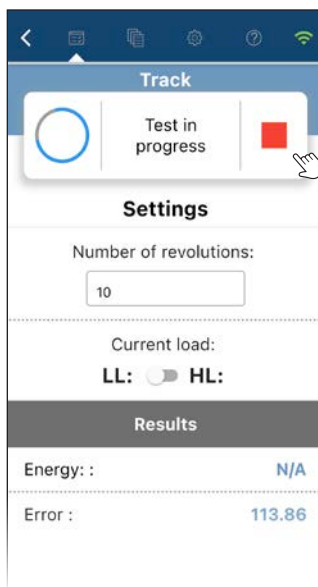
At this step, the load can be changed to HL in order to speed up the test. To do this, toggle the current load button to HL.



It is easier to start and end a test when the disk rotates slowly. To do this, toggle the current load button to switch from HL to LL and from LL to HL.

In Manual mode, the test operator must fully track the number of disk revolutions.

In track mode, the WT Series tester beeps at the end of each disk revolution. At the second-to-last revolution, the socket emits a double beep and will automatically switch the load to LL in order to slow down the disk for the end of the test.



### Step 5: Test end

On the last rotation, stop the test at the exact moment the disk mark lines up with the black line on the meter plate. This can be done by either tapping the **Stop** button in the app or by using the magnetic switch on the side of the WT tester.

The error percentage is displayed.



## Four Quadrants

### Prerequisites

An optical pickup must be installed on the WT Series tester.

### Description

The Four Quadrant test whether in Wh or in VARh is an automatic test sequence that can be used to assess the meter's ability to register energy in all four quadrants of the power vector diagram.

It runs four subtests. The first two are an equivalent of a Quick Test in active power and reactive power, followed by Custom Tests for PF in the remaining angles.

#### 4 Quad Watthour

The four subtests are:

- a. **Subtest 1: Watthour (Quadrant 1)**  
HL angle: 0°  
Power factor angle: 60°  
LL angle: 0°
- b. **Subtest 2: Watthour (Quadrant 3)**  
HL angle: 180°  
Power factor angle: 240°  
LL angle: 180°
- c. **Subtest 3: Watthour (Quadrant 2)**  
Power factor angle: 120°
- d. **Subtest 4: Watthour (Quadrant 4)**  
Power factor angle: 300°

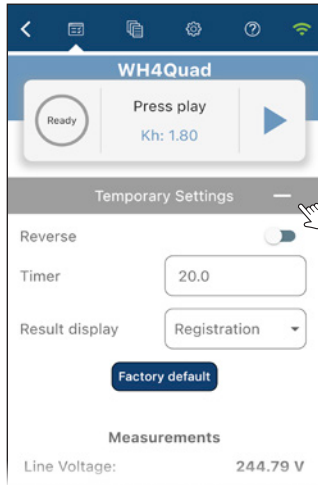
#### 4 Quad VARhour

The four subtests are:

- a. **Subtest 1: VARhour (Quadrant 1)**  
Power factor angle: 30°
- b. **Subtest 2: VARhour (Quadrant 3)**  
Power factor angle: 210°
- c. **Subtest 3: VARhour (Quadrant 2)**  
Power factor angle: 150°
- d. **Subtest 4: VARhour (Quadrant 4)**  
Power factor angle: 330°



## Operation



### Step 1: Temporary test settings

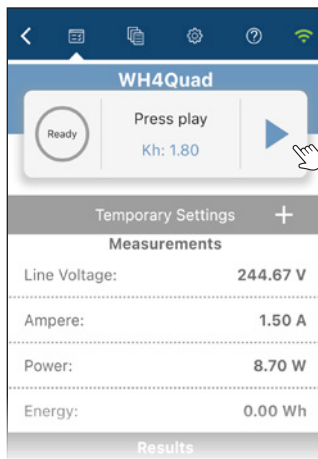
If necessary, modify the test settings by tapping on the Temporary Settings bar below the control panel.

The test settings for the 4 Quad Test are:

- **Reversed:** Enables or disables reverse flow testing
- **Timer:** Minimum test time in seconds
- **Result display:** Result display type

Modifications are reset to the default settings by tapping the **Reset to default** button.

To collapse Temporary Settings, tap the minus sign in the title bar.

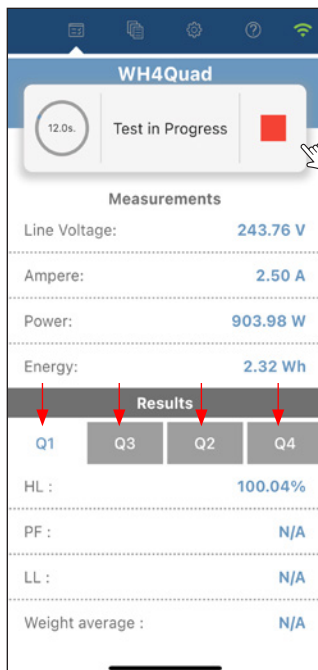


### Step 2: Start test



If the meter has separate optical outputs for Wh and VARh, install the optical pickup on the output depending on the test you are performing.

Tap the **Play** ▶ (start test) button to initiate the test sequence. The load current will increase to its HL value, the meter will send pulses and the WT Series' internal electronic standard will register the energy that flows through the meter.



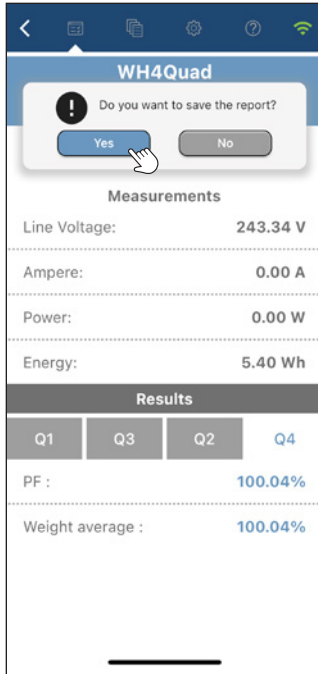
### Step 3: Test execution

In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the top, within the status field of the control panel, a test timer displays the remaining time for the subtest.

At any time during the test, the user can navigate the test results for each subtest by using the tabs at the top of the Results table.

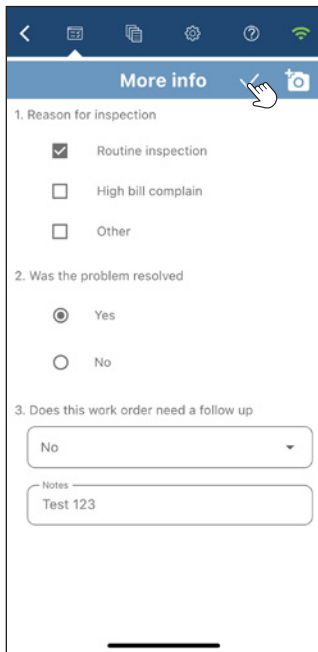
The test can be aborted at any time by tapping the **Stop** button.



#### Step 4: Test end

When all subtests have been completed, the test ends automatically. The load is then removed and the test results are displayed.

To save the test results, tap on the **Yes** button at the top of the screen.

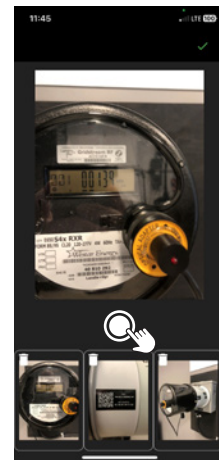


#### Step 5: More Info (Optional)

Up to 8 user-defined questions\* can be added in the WT Series Settings under *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **white checkmark**.

\*See WT Series Settings/Custom Questions section to learn how to setup predefined questions







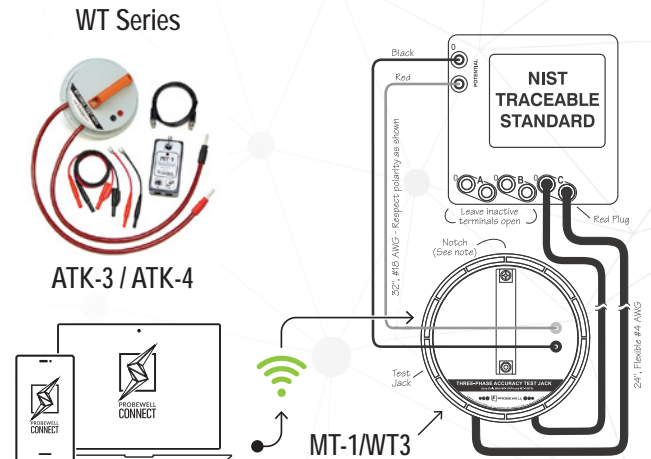
## Accuracy

### Description

The accuracy of MT-1/WT1 and MT-1/WT3 can be checked against a NIST-traceable standard using the following test procedure. The accuracy is tested on 6 different current test points: 1.5, 3.0, 5.0, 15.0, 30.0 and 50.0 A at both 1 (0°) and 0.5 lag (60°) power factors in Wh. Additionally, the MT-1/WT3 does VARh at 30° and 90°. The accuracy test can be done using a stabilized and isolated AC power source at either 120, 240 or 480 volts.

### Equipment required

- A primary or secondary electronic watt-hour standard traceable to NIST, with an output BNC port of  $3\mu\text{Wh}$ ,  $10\mu\text{Wh}$  or  $20\mu\text{Wh}$  per pulse. The standard must have at least one isolated current input port of a minimum capacity of 50 A with autoranging capability. We recommend a standard with an accuracy of 0.02% or better.
- The Probewell Accuracy Test Kit (single-phase or three-phase) includes the following items:
  - An Accuracy Test Interface (PW-8967), a BNC coaxial cable and a Probewell extension cable with an RJ12 type connection.
  - An Accuracy Test Jack
    - Three-phase (ATK-3) for MT-1/WT3
    - Single-phase (ATK-4) for MT-1/WT1
- A laboratory-stabilized and isolated AC power source with fundamental waveform selectable at 120 V or 240 V  $\pm 5\%$ , 58–62 Hz, rated at least 150 VA
- A Windows PC, an Android device or iOS device with the latest Probewell Connect application installed.



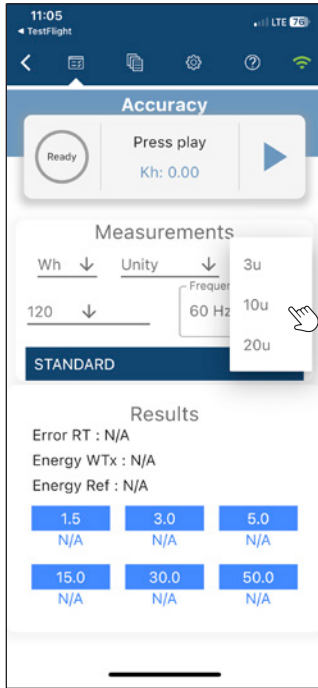
Caution: This operation involves high voltage. Use extreme caution when performing any high-voltage connection procedure. Always wear appropriate protective equipment.



A laboratory-stabilized, and isolated AC power source is preferred to a small isolated line transformer or autotransformer. Such small transformers could generate severe harmonics and voltage fluctuations which could cause small additional measuring errors. **Always fuse** the power leads going to rear tabs 1 & 3 of the unit with a quick action 1A fuse. The power leads and fuses are not provided with the Accuracy Test Kit (ATK).

For further information and the complete calibration and hardware connection procedure for the WT Series tester, please refer to the *Accuracy Test Kit User Guide* which can be downloaded from the Probewell website at the following link: <https://probewell.com/atk3-atk4/>

## Operation



### Step 1: Initial configuration

The fields in the Measurements section of the Accuracy Test screen are configurable test parameters. Using the drop-down menu allows the user to customize the test parameter such as measurement type, lag factor, pulse constant and voltage.

The configurable Accuracy Test parameters are:

#### Measurement type

Watt-hour or VAR-hour. Must match the pulse output parameter of the reference standard.

#### Lag factor

Unity (100% PF) or Half-Power (50% PF). Translates to a 0° or -60° phase angle in Wh and to a 90° or 30° phase angle in VARh.

#### Pulse constant

3 μWh/pulse, 10 μWh/pulse or 20 μWh/pulse. Must match the pulse output parameter of the reference standard.

#### Voltage

Between 120, 240 and 480 Volts. Must match the AC voltage source and be within 5% of the specified value.

#### Frequency

Not configurable. Set at 60 Hz.

#### Results

The bottom half portion of the screen shows the Accuracy Test results.

#### Standard identification parameters

##### Manufacturer name:

Name of the manufacturer of the test board

##### Model:

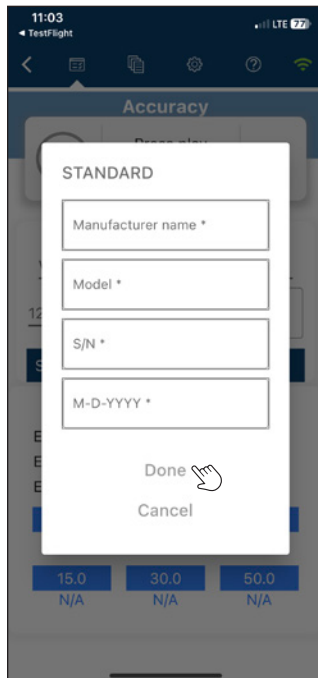
Model name of the test board

##### Serial number:

Unique serial number of the test board

##### Calibration date:

Date at which the latest calibration was done on the test board

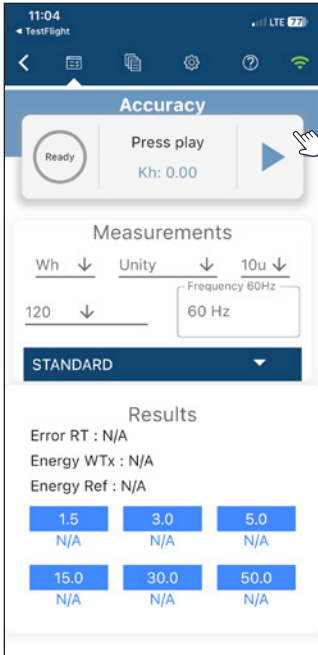


### Step 2: Customize parameter

The blue standard drop-down menu on the middle of the accuracy screen opens a Wh standard identification parameters popup. The manufacturer name, model, serial number and calibration date can be customized by selecting "Add a standard" in the popup screen. These values are only used for test traceability.

The bottom section of the popup screen can be used to modify the Wh standard identification parameters.

Click the "Done" button to save the parameters and close the popup window.



### Step 3: Start test

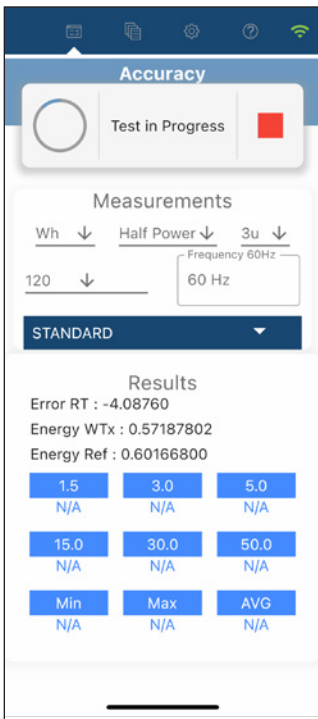
Tap the **Play** ▶ (start test) button to begin the test. The unit being tested runs an initialization sequence which includes checking the wiring setup and auto-scaling.

**i** If the cables are not properly connected, the application displays an error message. For maximum safety, turn off both the AC power source and unit in test. Check all the connections (polarity) and review the parameters.

**i** Don't forget to configure the standard in Wh (watthour) mode. Make sure that the coaxial cable between the Standard's output pulse and the Accuracy Test Interface is properly connected.

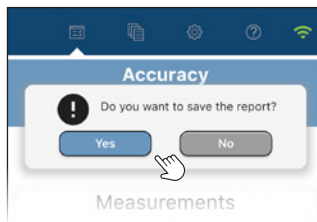
After proper initialization, the test begins automatically. The current test point being tested is identified by a spinning wheel.

At the end of each test point, the unit in test emits a single beep. The % error of the current test point is registered, and the test result table is duly updated.



### Step 4: Save test

When all test points are completed, the unit in test emits a triple beep. This indicates the end of the test. At this step, the test result table is complete. The average, maximum and minimum % errors are displayed.



Click on **Yes** to save the test data.

If the average error of the unit is within specification, it does not need to be calibrated in shop. Otherwise, please follow the User Calibration procedure to apply a user-defined calibration factor.

**i** The unit's internal Watthour Standard does not contain potentiometers or any other type of mechanically adjusted device that could shift or become unstable with time. This means that the accuracy should not change much over the lifetime of the product. However, if a unit does need to be recalibrated, follow the User Calibration procedure in the ATK User Guide.

**⚠ WARNING:** If the same test is performed more than once on the same Lag Factor (i.e.: (120 V unity, 120 V 60 lag) the results of a previous test having the same preset will be automatically overwritten. It is recommended to export the Accuracy Report to preserve the results prior to performing a second test.

## Exporting an Accuracy Report

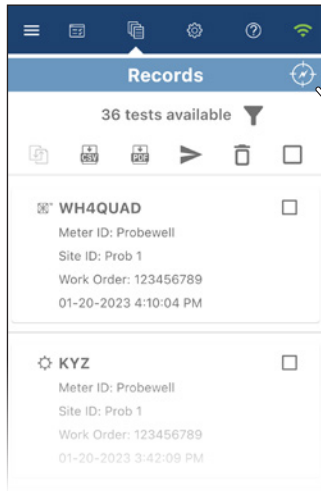


Figure 1

The accuracy of MT-1/WT1 and MT-1/WT3 can be accessed via Records section by tapping its icon in the top menu and then by tapping the accuracy icon on the right side of the title bar. (Figure 1)

- Doing so will open a popup window prompting the user to choose between Wh or VARh.
- Click Export to close the window and continue the export process. (Figure 2)
- An Accuracy PDF Report will be generated and attached to an email.
- Edit the subject and the content of the email and tap send to continue. (Figure 3)
- Select the mail application (iOS).
- Enter the recipient's email then the subject and click send.
- A preview of the PDF Report is available for review by tapping the PDF icon . (Figure 4)

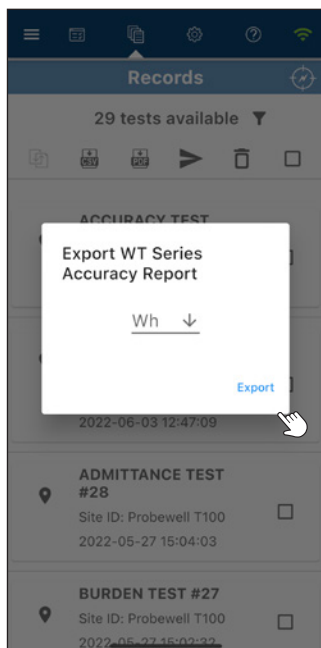
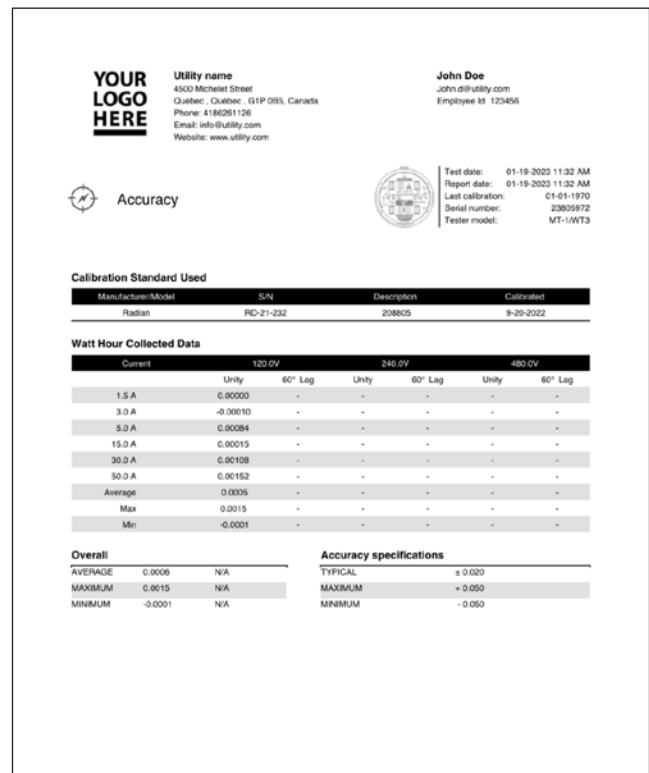


Figure 2



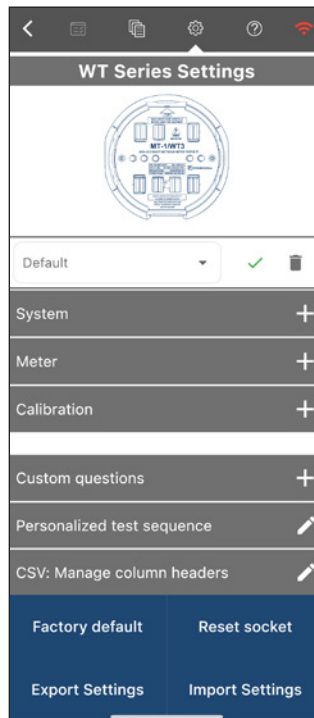
Figure 3






## WT Series Settings

System Settings allow the user to configure how the WT Series tester performs tests. It contains various basic usability settings.

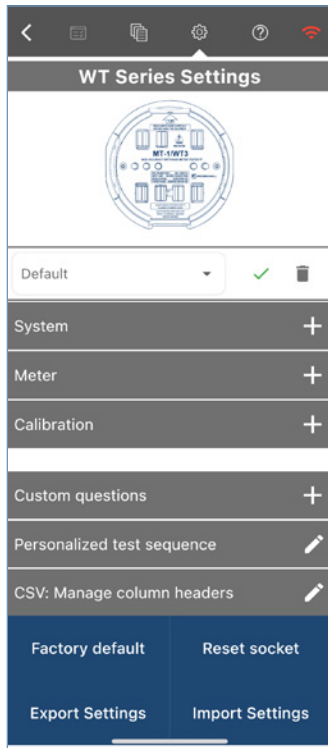


Factory default	The WT Series tester comes with factory default settings that are suitable for most operations. Tap the <b>Factory Default</b> to restore the initial factory settings
Reset socket	Tap the <b>Reset socket</b> button to de-energizes the meter, reset the current meter configuration and return to the Setup screen 
Export Settings	The WT Series tester settings that can be customized, saved as a backup or shared with other users as needed.
Import Settings	A WT Series user can import backup settings to restore custom user parameters or used shared company-wide settings to streamline the deployment process.
Profile	The WT Series tester comes with factory default settings that are suitable for most operations.  The device settings can be easily changed to suit the operator's needs by using the Settings tab in the app.  These settings can then be saved to a profile and reused as needed.
System	Personalize the system's technical specifications as required, these settings will remain active until they are modified by the user.
Meter	Change the pass/fail parameters or other meter parameters
Calibration	Change the tester calibration parameters
Custom questions	Add up to 8 predefined questions relating to the WT test (these will be included in the report)
Personalized test sequence	Save time through automation by creating a predefined sequence of tests to standardize and accelerate the inspection process.
CSV: Manage column headers	Map the column headers of the CSV report to match database requirement (These column headers will be used as the header of the CSV report.)



Add a setting profile for both the WT or the XT Series Settings. Use the drop-down menu to add a profile or activate one by selecting its name in the list.

## WT Series Profiles



### Profile

The WT and XT Series testers come with factory default settings that are suitable for most operations.

The settings for both devices can easily be changed individually to suit the operator's needs by opening the device-specific Settings tab in the app.

These settings can then be saved and exported as a preset profile and share and reused as needed.

- Default:** The default factory settings for both devices are suitable for most operations.
- Create a new profile:** Tap the drop-down menu and select "Add a setting profile", input a relevant name and tap done, the profile will be created with all the current fields values (Figure 1).
- Select a profile:** Tap the drop-down menu and select the name of the needed profile (Figure 2).
- Modify a profile:** To modify a profile, start by selecting the profile, make the required changes in the settings and tap the green checkmark ✓ to save the changes (Figure 3).
- Delete a profile:** To delete a profile, select the name of the profile from the drop-down menu and tap the garbage can 🗑️ to delete it (Figure 4).

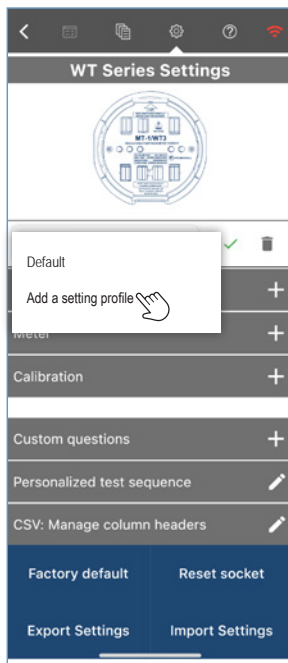


Figure 1

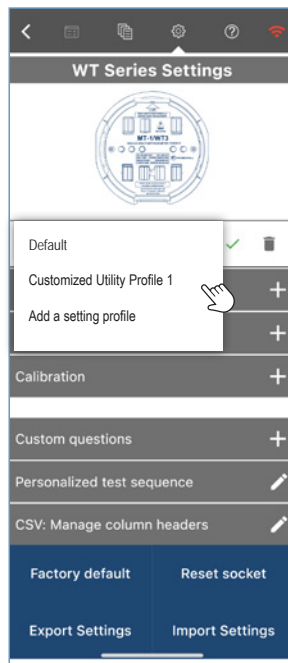


Figure 2

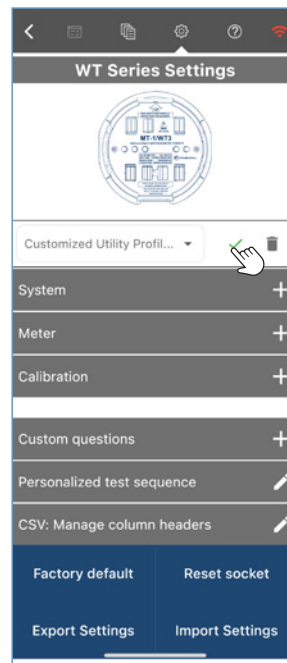


Figure 3

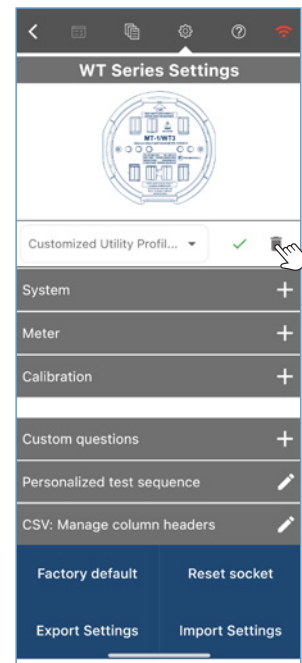


Figure 4



## System Settings

System

Barcode type: AEP

Result display: Registration

Measurement mode: Watt

Minimum testing time(s): 20.0

Weight: 4.00

Test decimal: 2  3

Power factor: Off  On

Low load: Off  On

Reverse: Off  On

### Barcode Type

By default the app's barcode scanner is set up for the AEP barcode format.

You can find a breakdown of the predefined barcode setup below:

- AEP: Positions 1 & 2 = Meter Setup / Position 3 = Meter Manufacturer (skipped) / Positions 4 to 12 = Meter ID
- Custom 1: Positions 1 & 2 = Meter Setup / Positions 3 to 8 = Meter ID
- Custom 2: Positions 1 to 6 = Meter ID

\*Only the above-mentioned barcode position digits are taken into consideration for Meter Setup and Meter ID

### Result display

Display type of error percentage result.

- **Error percentage:** Error on the meter readout compared to the reference. Positive values indicate a leading meter and negative values indicate a lagging meter.
- **Registration (default):** Readout of the meter as a percentage of the reference standard measurement. Values over 100% indicate a leading meter and values under 100 % indicate a lagging meter.

### Measurement mode

- **Wh (Default):** Tests the meter in watthour
- **VARh:** Tests the meter in VARh

### Minimum test time

Minimum test duration time per load type for solid-state meters. Minimum time is 10 seconds and maximum time is 120 seconds. Default is 20 seconds.

### Weight ratio

High load-specific weight in the weighted average calculation. Default value is 4.

With WR as the weight ratio parameter, the weighted average formulas are:

**Single-phase and 125 meters**  $\frac{(WR \cdot HL + LL)}{(WR + 1)}$

With a default WR value of 4, the formula is:

$$\frac{(4 \cdot HL + LL)}{5}$$

With a WR value of 2, the formula is:

$$\frac{(2 \cdot HL + LL)}{3}$$

The WR parameter is only used for single-phase.

This parameter for polyphase is hardcoded to 4

See equation examples:

**Three-phase meters**

The value for HL is hardcoded to 4, the formula is:

$$\frac{(4 \cdot HL + 2 \cdot LL + PF)}{7}$$

With a WR value of 4 and with the LL in Full Test option disabled, the formula is:

$$\frac{(4 \cdot HL + PF)}{5}$$

### Test decimal

Number of test decimals used to display the error percentage result. Default value is 2.

### Power factor test enable

Enabled by default.

For polyphase meters:

- Enables or disables PF Load in Full Test sequence.

### Low load testing in full test

Enables or disables the Low Load single element subtest in Full Test mode. Disabled by default.

### Reversed

Enables or disables reverse flow testing when doing Net Metering. Disabled by default.



## Meter Settings

**Meter**

**Kh auto detection** Off  On

**Kh auto-detection delay**

**Electronic precision (%)**

**Electromechanical precision**

**Sensus 3S meter** Off  On

**KH default table**

1S	<input type="text" value="3.6"/>	2S	<input type="text" value="7.2"/>
3S	<input type="text" value="0.3"/>	4S	<input type="text" value="0.6"/>
9S	<input type="text" value="1.8"/>	12S	<input type="text" value="14.4"/>
14S	<input type="text" value="21.6"/>	15S	<input type="text" value="21.6"/>
16S	<input type="text" value="21.6"/>	6S	<input type="text" value="1.8"/>
8S	<input type="text" value="1.8"/>	5S	<input type="text" value="1.2"/>
45S	<input type="text" value="1.2"/>		

**TA default table**

1S	<input type="text" value="15.0"/>	2S	<input type="text" value="30.0"/>
3S	<input type="text" value="2.5"/>	4S	<input type="text" value="2.5"/>
9S	<input type="text" value="2.5"/>	12S	<input type="text" value="30.0"/>
14S	<input type="text" value="30.0"/>	15S	<input type="text" value="30.0"/>
16S	<input type="text" value="30.0"/>	6S	<input type="text" value="2.5"/>
8S	<input type="text" value="2.5"/>	5S	<input type="text" value="2.5"/>
45S	<input type="text" value="2.5"/>		

**Load**

LL  PF

HL

**Revolution per load**

LL  PF

HL

### Kh Autodetection

Enables or disables the automatic detection of the meter's Kh value when an Optical Pickup or Metercam is connected. Enabled by default.

### Kh autodetection delay

Adds a delay (in seconds) before registering the first pulse to automatically detect the Kh. This option is useful for meters that have an AMI/AMR module that emits from the same port as the test pulse.

Available values are (in seconds):

- 0 (default)
- 1
- 2
- 5
- 10

### Electronic precision (%)

Solid-state meter accuracy class (e.g., 0.2%). This value is used to evaluate the Pass/Fail status of a test when an Optical Pickup is used. When the error percentage is greater than the meter's accuracy class, the numerical result is surrounded by square brackets [ ].\*

### Electromechanical precision (%)

Electromechanical meter accuracy class (e.g., 2%). This value is used to evaluate the Pass/Fail status of a test when a Metercam is used. When the error percentage is greater than the meter's accuracy class, the numerical result is surrounded by square brackets [ ].\*

\*The RESULTS window should read something like this, LL exceeding the accuracy: HL 99.95% PF 99.97% LL [99.97]%

### KH default table\*

Default Kh value per specific meter form. This value is populated in the Meter Setup view depending on the automatically suggested meter form.

### TA default table\*

Default TA value per specific meter form. This value is populated in the Meter Setup view depending on the automatically suggested meter form.

### Load\*

Percentage of the test amperage (TA) that defines which current value to use for each subtest. By default, LL is set as 10% of TA while PF and HL are set as 100% of TA.

As an example, with a TA of 25 amperes:

- LL:  $0.1 * 25 = 2.5$  A
- PF and HL:  $1 * 25 = 25$  A

### Revolution per load\*

Number of revolutions registered when using the Manual/Tracking mode or any automatic test using the Metercam. Default values are:

- LL: 1 revolution
- PF: 5 revolutions
- HL: 10 revolutions

\*Default values can be modified





## Calibration Settings

The screenshot shows the 'Calibration' settings screen with the following fields:

- User calibration factor: 0.000
- Calibration test time: 20.0
- Calibration decimal: 4 (toggle set to 5)
- Show calibration date: OFF (toggle set to ON)

### User calibration factor

Custom user calibration factor (affects all error percentage results)

### Calibration test time

User calibration factor, last update

### Calibration decimal

Number of test decimals used to display the error percentage result in the accuracy test. Default value is 4.

### Show calibration date

Toggle on to display the device calibration date within the reports

## Custom Questions

The screenshot shows the 'Custom questions' screen with a 'Question(s) list & summary:' section and an 'Add Custom Question' button.

Add up to 8 predefined questions relating to the WT test. These will be included in the report

- Tap on the *Add Custom Question* button to add a question.

The screenshot shows the 'Add Custom Question' dialog with the following fields:

- Question type: Checkbox (Multiple)
- Input a new question
- Input an option

Select one of the 4 types of preset questions (Text field, drop-down menu, Checkbox (Multiple), Radio (Single)), let's use Checkbox for this example

- In the text below, input your question
- In the next field, input answer option number 1
- Tap on the **Plus sign icon** to add answer option number 2.
- Once you are done, tap the **green checkmark** at the top to save the question

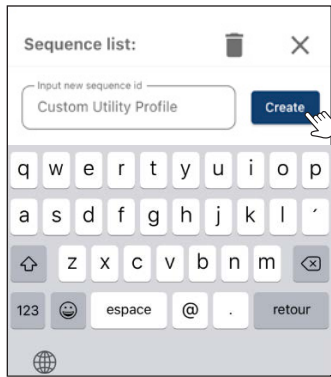
The question is added under *Question(s) list & summary*:

- Tap on the *Add Custom Question* button to add another question.
- Tap the **pencil icon** to edit an existing question.
- To delete a question select it first and tap the **trash can icon** at the top of the section.

The screenshot shows the 'WT Series Settings' screen with a list of settings:

- Default
- System
- Meter
- Calibration
- Custom questions
- Does this work order need a follow up
- Personalized test sequence
- CSV: Manage column headers

## Personalized Test Sequence

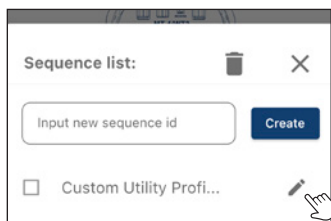


### Step 1: Create a personalized test sequence

Save time through automation by creating a predefined sequence of tests to standardize the inspection process for all users and optimize productivity.

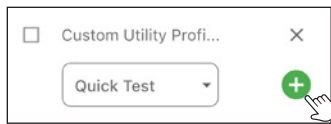
Although a user can access the settings while offline, the Probewell Connect 2.0 app must be paired with a WT series device to create a personalized test sequence.

1. Start by naming the new test sequence using the text field and then tap create.



### Step 2: In the Sequence setup popup screen:

2. To add tests, edit the test new sequences by tapping the pencil icon.



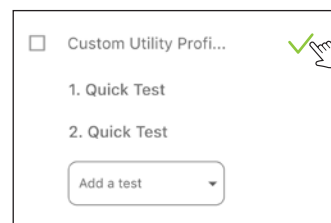
### Step 3: In the Sequence setup popup screen:

1. Use the drop-down menu to select the first test of the sequence and tap the plus icon to add it to the sequence.

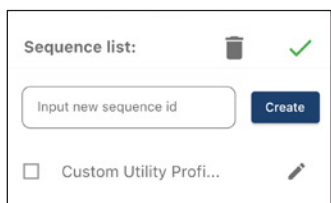


### Step 4: Customized the parameter of a new test in the sequence.

1. When adding a test, options to change its parameters will be displayed.
2. Tap the create button to close the window and add the test to the sequence.
3. Once you are done, tap the **green checkmark** to save and close the window.



Repeat steps 3 and 4 to add other tests to the sequence

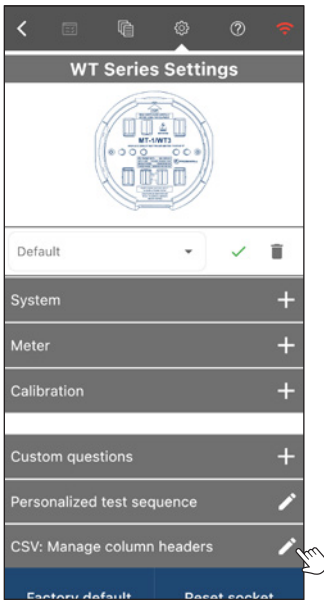


### The test sequence is now added to the sequence list summary

- The new test sequence can be modified by tapping the pencil icon.
- A user can delete one or several test sequences by selecting them and tapping the **trash can icon** at the upper right corner of the test sequence section.
- The test sequence will now be available and displayed at the top of the test menu screen.

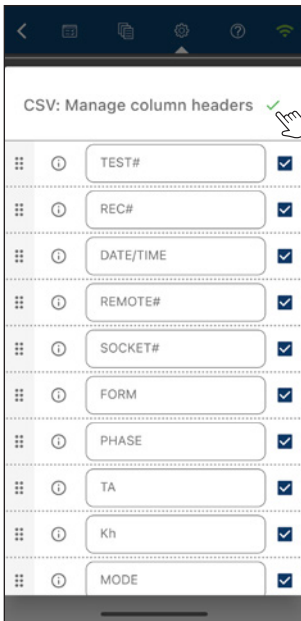


## CSV: Manage Column Header



Map the column header of the CSV report to match database criteria

- Mapping the column header of the CSV report will facilitate the integration of the test report data within utility database.
1. To begin edit an existing CSV column header, tap the **pencil icon** on the right side of the *CSV: Manage column header* tab.



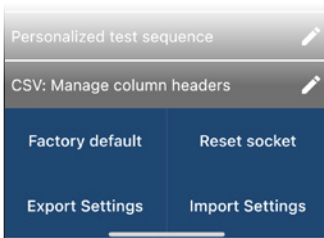
### In the Sequence setup popup screen:

You can reorganize the columns, change their names or hide a column entirely in the CSV report.

- Use the **handle** on the left of the rows to drag them to the required position.
- The **information button** displays the original name of the column for reference purposes.
- Customized column headers according to your requirements by editing the name in the text field.
- All columns are visible by default, uncheck the **checkbox**  on the right side to hide a column.

Save all the changes and close the popup window by tapping the **green checkmark** .

## Factory Default & Reset Socket



**Factory default:** Resets the settings of the WT Series tester to the factory default values. Previously saved configurations are erased. The WT Series tester's factory default settings are suitable for most operations.

**Reset socket:** Tap the **reset socket** button to de-energizes the meter, reset the current meter configuration and return to the Setup screen .

**Export Settings:** Users can export settings for backup purposes or simply share them with their peers and establish consistent settings to organize the inspection process.

**Import Setting:** Users can use the import settings to restore their personal settings from a backup. It is also possible to provide a single settings file to all field technicians to standardize the inspection process.


## Operation

### Connecting to the XT Series Site Tester



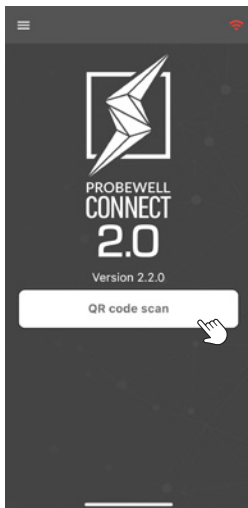
To use the XT Series tester, the user must first connect their mobile device to the socket.

By default, the Probewell Connect application first displays the connection screen when the application is open.

The user can click the WiFi icon  in the upper right corner of the header to disconnect the app from the device. The app will return by default to the connection screen and will be ready to establish a new connection.

Alternatively, the user can also access the connection screen through the Main Menu  by selecting “ Connect” from the list.

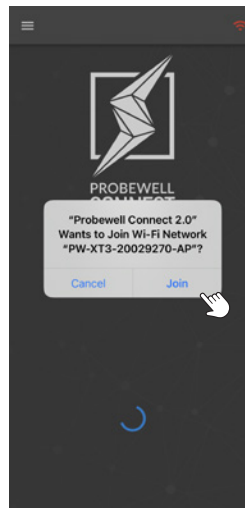
#### iOS and Android



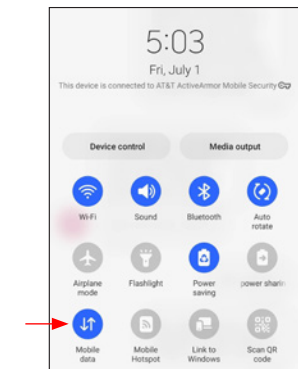
(Figure 1)




(Figure 2)




(Figure 3)




 For some devices such as Samsung, the user may have to turn off mobile data before connecting.

The connection process is performed from within the Probewell Connect application itself. Follow these steps to connect the XT Series tester:

1. Connect the tester to a meter base.
2. Power up the tester by setting the Power switch to the ON position.
3. Launch the Probewell Connect application on your mobile device.
4. Tap on the **SCAN QR CODE** button. (Figure 1) If prompted, allow the app to use the device camera.
5. Point the camera at the QR code located on the front of the ST-3/XT3 site tester unit. (Figure 2)
6. When prompted, tap **Join** to allow connection to the XT Series tester. (Figure 3)
7. Once connected, the unit emits a sound notification.

 If the tester has already been connected to this mobile device, it can also be selected from the known devices list, identified by their SSID, below the **Scan QR code** button.

 The device only allows one user to connect at a time.

## Site Setup



The Site Setup view lets the user set basic parameters for the site to be tested. These parameters are used by the XT Series tester to properly calculate the test results.

### The Site Setup parameters are:

#### Site ID: Required

This ID will be automatically included in the saved report to identify the site.

**Work Order:** Easily track report data to its work order by filling in this field.

**Select Setting Profile:** The default setting is suitable for most operations, but users can save and reload their most useful profile instead of manually filling the fields every time.

**Form:** Users must use the drop-down menu to select the meter base form of the installation.

For single-phase installations, the compatible meter base forms are: 3S and 4S.

For polyphase installations, the compatible meter base forms are: 6S, 8S, 9S and also 5S, 35S and 45S when using the adapter included.

**Wiring:** Users must use the drop-down menu to select the wiring scheme of the installation.

For single-phase installations, the available wiring scheme is: Single Phase.

For polyphase installations, the available wiring scheme is: Wye and Delta.

#### 1. Site ID field: Required

This is a unique identifier for the service to be tested. It can be entered manually or by scanning the device barcode. This information will be automatically included in the report for reference and authentication.

#### 2. Barcode scanner button

Users can scan the installation barcode if a utility has generated and assigned one to the site. (AEP meter barcodes are not suitable for this as they do not include a specific site ID.)

#### 3. Work Order Number

The assigned work order is included in the inspection reports for traceability purposes.

#### 4. Select Settings Profile:

The XT Series tester comes with factory default settings that are suitable for most operations.

The device settings can be easily changed to match specific site requirements by accessing the XT Settings tab under **general Settings** in the app's top menu.

These settings can then be saved to a profile and selected from the drop-down menu as needed.

#### 5. Confirm Setup

This button is grayed out until the user provides the Site ID. Once the Site ID is specified in the Site ID field, it turns blue and the user can confirm their configuration and access the test menu screen.

**Accessory:** Type of accessory detected

**Confirm Setup:** Once a Site ID has been provided, the **Confirm Setup** button becomes available. Click **Confirm Setup** to complete the setup.



## Barcode Scanner

On a mobile device (iOS and Android), the site ID can be automatically imported by scanning a **custom user-generated barcode** located on or near the meter base. The serial number is then added to the site ID field and is stored in memory to be automatically filled in when test results are recorded.

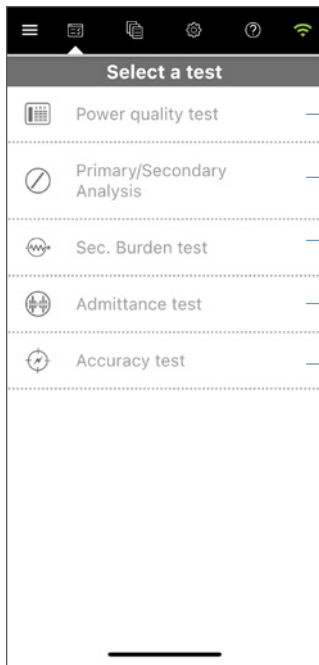
Once all site parameters are correctly filled in, tap **Confirm Setup** to complete the setup.



## Tests for the XT Series

The Tests View shows a list of all available test modes for the site. A short and full description of all test modes follows.

### Summary of test modes and availability



#### Test mode

Power Quality  
 Primary / Secondary Analysis  
 Secondary Burden  
 Admittance  
 Accuracy Validation\*

#### Accessories

Any or None  
 At least one accessory connected  
 Any or None  
 Any or None



The test modes available in Tests View are dependent on both the type of accessories currently connected to the XT Series tester and the System Operating Mode (which can be changed in the Settings tab).

\*The Accuracy test mode aims to validate the accuracy of a device which is only available for the 9S form and when the ST-3/XT3 is connected to a high-accuracy, NIST-traceable polyphase test board or standard.

## Test Description



#### Power Quality:

The Power Quality test is the most useful type of test to fully assess the quality of the service installation on the secondary side, at the meter base.



#### Primary / Secondary Analysis

The Primary/Secondary Analysis test performs a transformer ratio analysis on the instrument transformers using the customer load. The secondary voltage or current reading is done directly at the meter base while the primary reading is done using the accessories. With both measurements, the real transformer ratio can be calculated and compared to the nameplate ratio.



#### Secondary Burden:

The Secondary Burden test is used to analyze the effect of a resistive burden on the CT's behavior. Within the ST-3/XT3 is an array of high-accuracy resistors that can be, with the use of electromechanical relays, added to the secondary path of the CT to cause burden.



#### Admittance:

The Admittance test is used to characterize the ability of the CT (and attached conductors) to allow a current flow. This measurement is called the admittance of the system and it is measured in siemens units (S). The test is done sequentially for each phase.

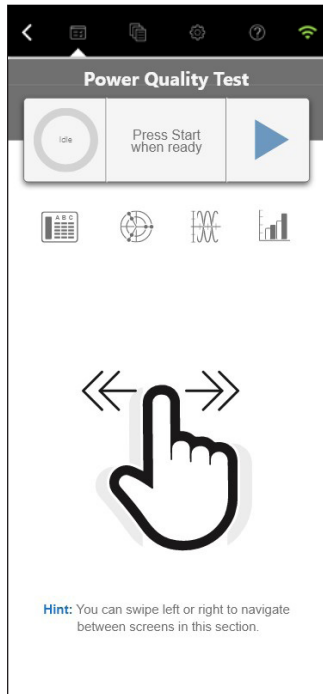


#### Accuracy:

The ST-3/XT3 provides a built-in test mode that aims at validating the accuracy of the device by comparing it to a high-accuracy, NIST-traceable polyphase test board or standard. This test is meant to be done in a lab environment and at a rate of once or twice per year, depending on the customer's guidelines for equipment validation. At the end of the sequence, a complete accuracy validation report can be saved in PDF and CSV file format on the host computer. The test voltage and current test points are all fully configurable.



# Power Quality Test



Meas	A	B	C	Unity
U	120.15	119.45	119.92	V
I	2.48	2.56	2.56	A
P	297.86	305.48	306.87	W
Q	-12.11	-6.03	3.22	VAR
S	298.04	305.67	306.97	VA
$\angle U$	0.00	119.96	239.37	$^{\circ}$
$\angle I$	357.67	118.85	239.93	$^{\circ}$

## Prerequisites

There are no prerequisites for running the Power Quality test.

## Description

The Power Quality test is the most useful type of test to fully assess the quality of the service installation on the secondary side, at the meter base.

In this test mode, the XT Series tester acquires real time measurements for secondary voltage and current on all connected phases. The test runs continuously until the user opts to press the **Stop** button and save the test data.

**i Use the swipe left and right function to navigate between the Table, Vectors, Time and Harmonics screens.**

## Operation

### Step 1: Start test

Tap the **Play** ▶ (start test) button to begin real-time data acquisition.

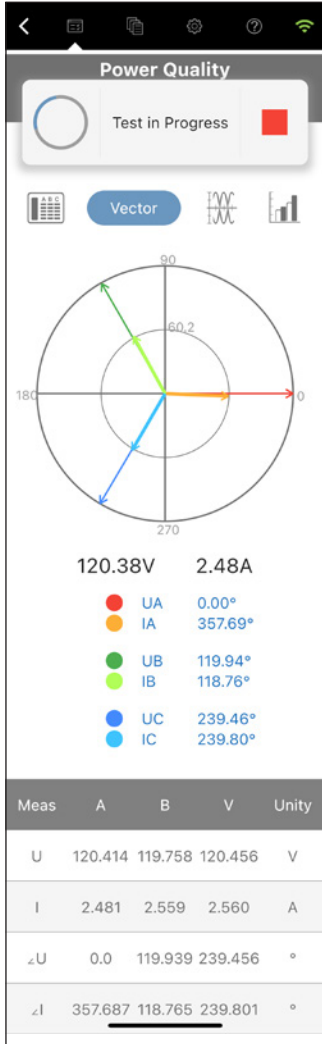
### Step 2: Observe

While the test is being performed, the user interface and measurement displays are updated to match the latest readings from the device. The Power Quality user interface is divided in four tabs. (Table, Vector, Times and Harmonics).

**Table:** The Table tab shows a raw display of the device readings for each line:

- U: ..... RMS voltage
- I: ..... RMS current
- P: ..... Resistive power (Watt)
- Q: ..... Reactive power (VAR)
- S: ..... Apparent power (VA)
- $\angle U$ : ..... Phase angle between line voltage A and this line voltage
- $\angle I$ : ..... Voltage-Current angle for this line
- Ref.: ..... Phase AN-BN-CN
- $\angle$ : ..... Phase shift of the current in relation to its voltage (angle Ux-Ix)
- Ref.: ..... Phase AC-BC-AB, Unit
- Voltage: ..... Voltage line to line (UL-L)
- PF: ..... Power Factor
- THDu: ..... Voltage line total harmonic distortion
- THDI: ..... Current line total harmonic distortion
- Freq: ..... Line frequency





### Vector

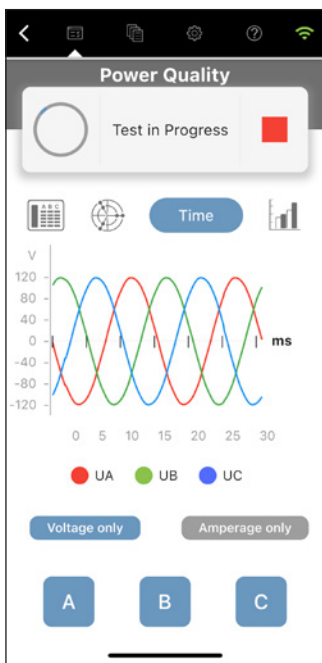
The Vector tab shows a complete phasor diagram of the installation. The plot automatically scales itself with the real time measurements. A color-coded legend for the diagram is also displayed.

#### Voltage

- The voltage vectors are shown as a full line. The diagram scale for voltage is displayed at the bottom left.

#### Current

- The current vectors are shown as a dotted line. The diagram scale for current is displayed at the bottom right.



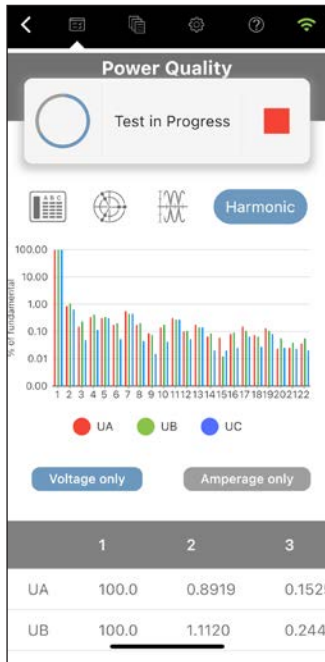
### Time

The Time tab shows a data plot of line cycle measurements for voltage and current. The plot automatically scales itself with the real time measurements. A color-coded legend for the line cycle plot is also displayed.

#### The following display options are available:

- Voltage only: Displays the voltage line cycles for all lines on the same plot
- Current only: Displays the current line cycles for all lines on the same plot
- A: Displays voltage and current line cycles for line A on the same plot
- B: Displays voltage and current line cycles for line B on the same plot
- C: Displays voltage and current line cycles for line C on the same plot



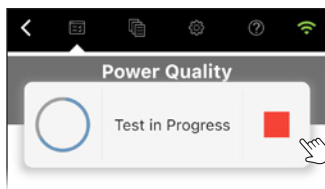


### Harmonics

The harmonic tab shows the harmonic composition of all acquired line cycle measurements. The harmonic content is displayed as a percentage of the fundamental harmonic (in this case, the 60 Hz component of the signal). The system processes harmonics up to the 22<sup>nd</sup> order.

The following display options are available:

- Voltage only: displays the voltage harmonics for all lines on the same plot
- Current only: displays the current harmonics for all lines on the same plot
- Use the horizontal scroll to navigate and display all the 22 harmonic values in the results table.



### Step 3: Stop test

To stop the Power Quality test, tap on the **Stop** button at the top of the screen. The test data is kept in the device until the test is either saved or discarded.



### Step 4: Save test

To save the test results, click on the **Yes** button in the control panel.

**More info**

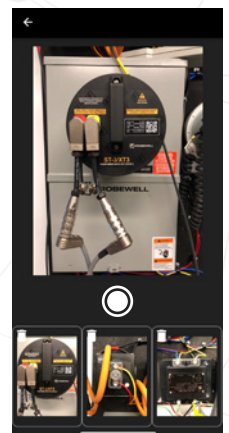
- Reason for inspection
  - Routine inspection
  - High bill complain
  - Other
- Was the problem resolved
  - Yes
  - No
- Does this inspection need a follow up
  - No
- Check-list
  - Visual inspection
  - Power Quality

### Step 5: More Info (Optional)

Up to 8 user-defined questions\* can be added in the *XT Series Settings* section under the *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save by tapping the **green checkmark** to save the test report.

\*See XT Series Settings/Custom Questions section to learn how to setup predefined questions





## ⚡ Primary/Secondary Analysis

### Prerequisites

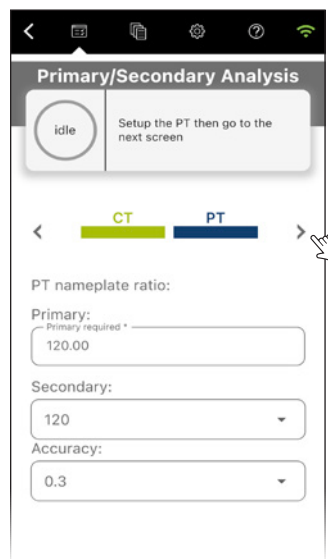
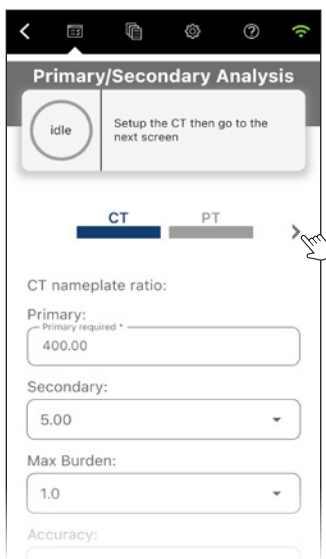
At least one accessory (CT or PT measurement probe) must be connected to the front panel of the XT Series tester.

### Description

The Primary/Secondary Analysis test performs a transformer ratio analysis on the instrument transformers using the customer load. The secondary voltage or current reading is done directly at the meter base while the primary reading is done using the accessories. With both measurements, the real transformer ratio can be calculated and compared to the nameplate ratio.

The test runs continuously until the user opts to press the stop button and save the test data.

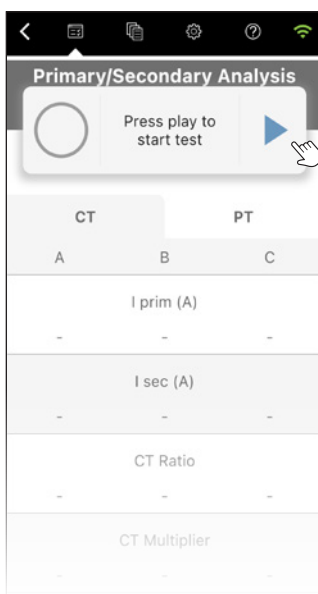
### Operation



#### Step 1: Start test

Enter CT/PT specifications into the CT and PT Setup screen, use the **Arrows** ➤ to go to the next screen.

Tap the **Play** ▶ (start test) button to begin real time data acquisition.



#### Step 2: Observe

While the test is being performed, the user interface and measurement displays are updated to match the latest readings from the device. The Primary/Secondary Analysis user interface is divided in two Measurements tables:

##### PT table

The Measurements table shows the raw data from the device readings for each line:

- Uprim: RMS primary voltage
- Usec: RMS secondary voltage
- PT Ratio: Transformer ratio of the PT calculated from primary and secondary measurements
- PT Ratio error: Error percentage on the measurement ratio compared to the nameplate ratio

##### CT table

The Measurements table shows raw data from the device readings for each line:

- Iprim: RMS primary current
- Isec: RMS secondary current
- CT Ratio: Transformer ratio of the CT calculated from primary and secondary measurements
- CT Ratio error: Error percentage on the measurement ratio compared to the nameplate ratio.



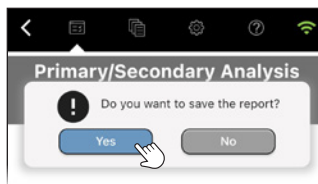
Primary/Secondary Analysis

Test in Progress

CT		PT
A	B	C
I prim (A)		
51.05	52.92	52.30
I sec (A)		
2.48	2.56	2.56
CT Ratio		
102.92:5	103.36:5	102.15:5
CT Multiplier		
20.58	20.67	20.43
CT Ratio Error (%)		
-74.27	-74.16	-74.46

### Step 3: Stop test end

To stop the Primary/Secondary Analysis test, tap on the **Stop** button at the top of the screen. The test data is kept in the device until the test is either saved or discarded.



### Step 4: Save Test

To save the test results, tap the **Yes** button in the control panel.

More info

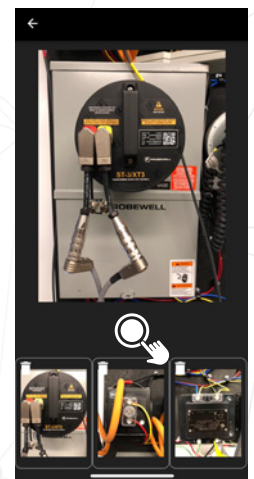
- Reason for inspection
  - Routine inspection
  - High bill complain
  - Other
- Was the problem resolved
  - Yes
  - No
- Does this inspection need a follow up
  - No
- Check-list
  - Visual inspection
  - Power Quality
  - Primary/Secondary Analysis
  - Burden

### Step 5: More Info (Optional)

Up to 8 user-defined questions\* can be added in the *XT Series Settings* section under the *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **green checkmark** ✓.

\*See XT Series Settings/Custom Questions section to learn how to setup predefined questions



## ⦿ Primary/Secondary Analysis: using the ST-3/ALW or ST-3/VLW adapter



### Prerequisites

At least one accessory (ST-3/ALW or ST-3/VLW adapter) must be connected to the CT port on the front panel of the XT Series tester.

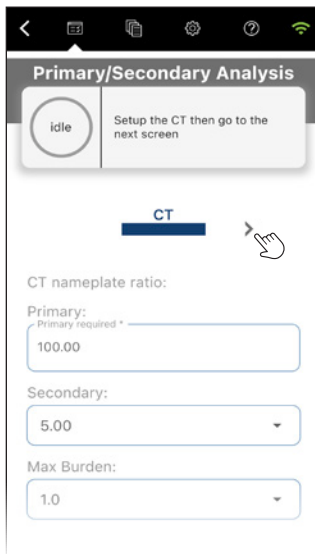
### Description

The ST-3/ALW adapter enables the connection of the SensorLink® Amp Litewire accessory to the Probewell ST-3/XT3 site tester when testing overhead installations. This accessory allows testing for only one phase at the time.

The Primary/Secondary Analysis test performs a transformer ratio analysis on the instrument transformers using the customer load. The secondary voltage or current reading is done directly at the meter base while the primary reading is done using the accessories. With both measurements, the real transformer ratio can be calculated and compared to the nameplate ratio.

The test runs continuously until the user opts to press the stop button and save the test data.

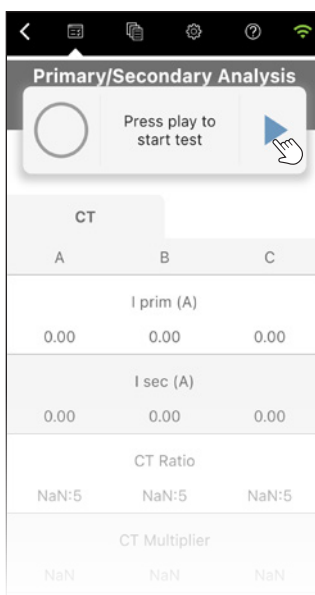
### Operation



#### Step 1: Connecting the accessory

- 1) Follow the instructions provided by SensorLink® to connect the ammeter components using their optic cable.
- 2) Connect the SensorLink® Amp Litewire BNC cable to the BNC female jack of the ST-3/ALW adapter.
- 3) Connect the other end 12 pins male connector of the ST-3/ALW to the CT port on the front of the ST-3/XT3 site tester.
- 4) Follow the SensorLink® instructions to power up the SensorLink® Litewire accessory.
- 5) When the Probewell ST-3/XT3 site tester is powered on, the unit will automatically detect the ST-3/ALW adapter. The Primary/Secondary test is automatically adjusted by the Probewell Connect application to reflect the functionality. The user can now start the Primary/Secondary test Configuration with the Probewell Connect application.

Enter CT specifications into the CT Setup screen, use the **Arrows** ➤ to go to the next screen.



#### Step 2: start the test and observe

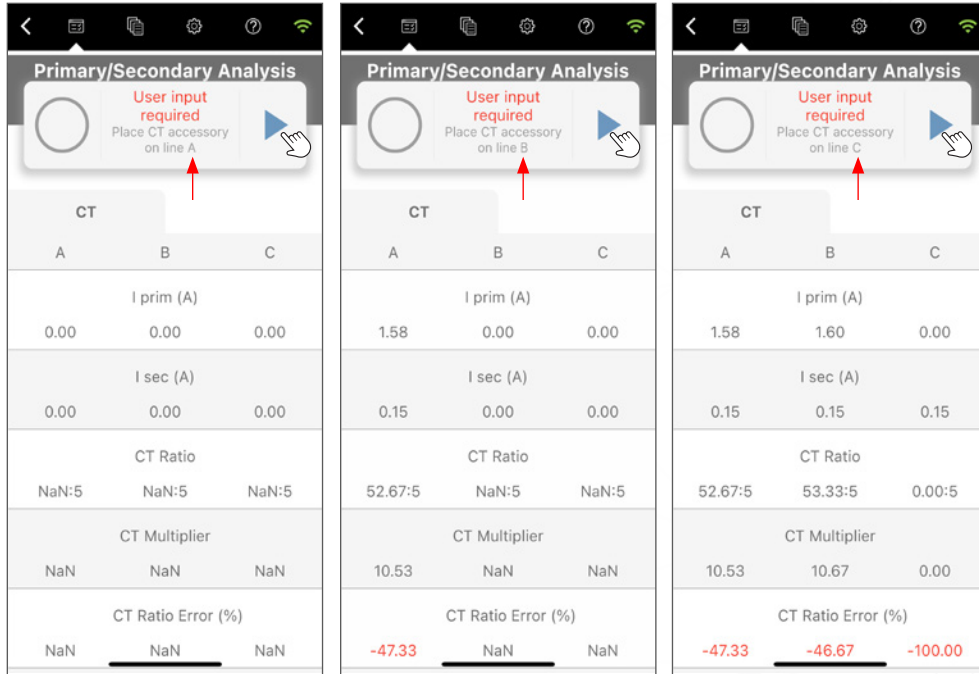
Tap the **Play** ▶ (start test) button to begin real time data acquisition.

While the test is being performed, the user interface and measurement displays are updated to match the latest readings from the device.

#### CT table

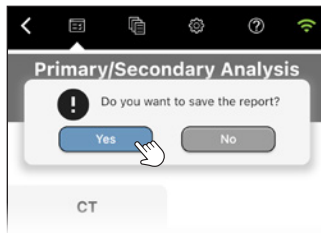
The Measurements table shows raw data from the device readings for each line:

- Iprim: RMS primary current
- Isec: RMS secondary current
- CT Ratio: Transformer ratio of the CT calculated from primary and secondary measurements
- CT Ratio error: Error percentage on the measurement ratio compared to the nameplate ratio.



### Step 3: Test execution

Since this accessory can only test one phase at a time, the Probewell Connect app will prompt the user to manually move the Amp probe from phase A to the next phase. Tap the **Play** button again to continue on to phase B, then again for phase C until all three phases have been tested.

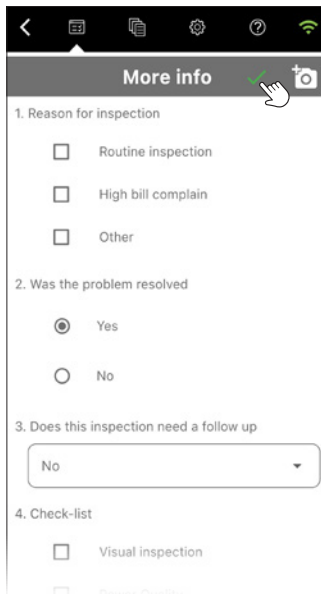


### Step 4: Save Test

To stop the Primary/Secondary Analysis test, tap on the **Stop** button at the top of the screen.

The test data can be saved or discarded.

To save the test results, tap the **Yes** button in the control panel.

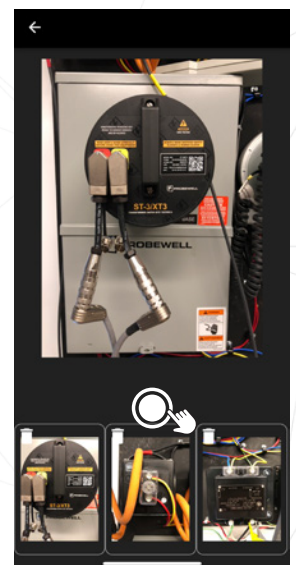


### Step 5: More Info (Optional)

Up to 8 user-defined questions\* can be added in the *XT Series Settings* section under the *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **green checkmark**.

\*See XT Series Settings/Custom Questions section to learn how to setup predefined questions





## Secondary Burden

### Prerequisites

There are no prerequisites for running the Secondary Burden test.

### Description

The Secondary Burden test is used to analyze the effect of a resistive burden on the CT's behavior. Within the ST-3/XT3 is an array of high-accuracy resistors that can be, with the use of electromechanical relays, added to the secondary path of the CT to cause burden.

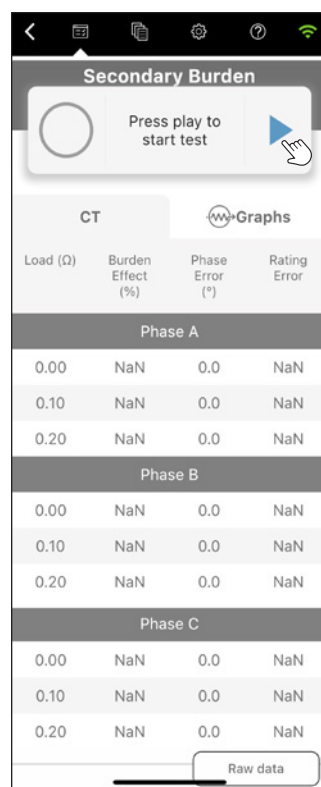
The available burden values are:

- 0.1  $\Omega$
- 0.2  $\Omega$
- 0.5  $\Omega$
- 1.0  $\Omega$
- 2.0  $\Omega$
- 4.0  $\Omega$

The Secondary Burden test steps through the available burden values and measures the primary (if an accessory is connected) and secondary current values. This process is repeated for each of the service lines (A, B and C).

The test automatically stops when it reaches the maximum burden value that can be applied to the CT, as configured in the CT setup interface prior to starting the test. The user may then save the test data.

### Operation



#### Step 1: CT setup screen

Enter the CT specifications in the CT Setup screen.

Tap the **right arrow button** at the top of the screen to go to the next page

#### Step 2: Start test

Tap the **Play** (start test) button to begin the test sequence.



In addition to relative and Raw data, users can access graphical displays of data such as parallelogram, phase error, load effect and classification error under the Graph tab.





Secondary Burden

Test in Progress

CT **Graphs**

Load (Ω)	Burden Effect (%)	Phase Error (")	Rating Error
Phase A			
0.00	0.00	0.091	2.615
0.10	-0.29	-1.385	2.916
0.20	-0.40	0.64	3.025
Phase B			
0.00	0.00	-0.078	2.536
0.10	-0.17	-0.015	2.714
0.20	-0.36	-0.289	2.904
Phase C			
0.00	0.00	-0.246	2.076
0.10	-0.40	-0.773	2.486
0.20	-0.96	-0.583	3.061

Raw data

Secondary Burden

Test in Progress

CT **Graphs**

Load (Ω)	I Sec. (A)	I Prim. (A)	Phase (")
Phase A			
0.00	2.53	51.96	0.09
0.10	2.19	45.07	-1.39
0.20	1.97	40.61	0.64
Phase B			
0.00	2.58	52.86	-0.08
0.10	2.58	53.00	-0.02
0.20	2.35	48.39	-0.29
Phase C			
0.00	2.58	52.64	-0.25
0.10	2.57	52.71	-0.77
0.20	2.29	47.12	-0.58

Relative data

### Step 3: Test execution

While the test is being performed, the user interface and measurement displays are updated to match the latest readings from the device. The Secondary Burden user interface separates the results for phase A, B and C (service line) and displays its Raw data by default. Relative data can also be accessed by tapping the button at the bottom of the screen (See red arrows) to switch between data type.

#### Burden table relative data screen

Load (Ω)

Burden Effect: Percentage difference between secondary current at 0 Ω and secondary current at specific burden value

Available with CT accessory only

- Rating Error: Percentage difference between calculated CT ratio at 0 Ω and CT ratio at specific burden value
- Phase Error: Phase difference between the primary and secondary currents at specific burden value, expressed in minutes and seconds of arc

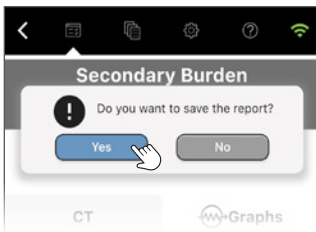
#### Burden table raw data screen

Load (Ω)

Isec: RMS secondary current

Iprim: RMS primary current

Phase angle



### Step 3: Save test

When the sequence has run for all applicable service lines, the test ends automatically and the results are displayed.

To save the test result, click on the **Yes** button in the control panel.

More info

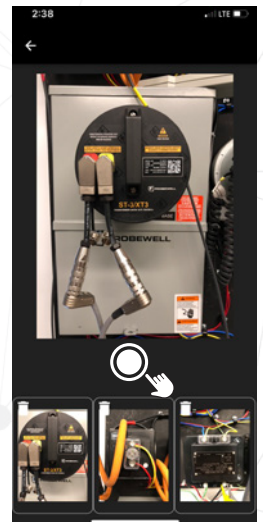
- Reason for inspection
  - Routine inspection
  - High bill complain
  - Other
- Was the problem resolved
  - Yes
  - No
- Does this inspection need a follow up
  - No
- Check-list
  - Visual inspection
  - Power Quality
  - Primary/Secondary Analysis
  - Burden

### Step 4: Info (Optional)

Up to 8 user-defined questions\* can be added in the *XT Series Settings* section under the *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **green checkmark**.

\*See XT Series Settings/Custom Questions section to learn how to setup predefined questions





## Admittance

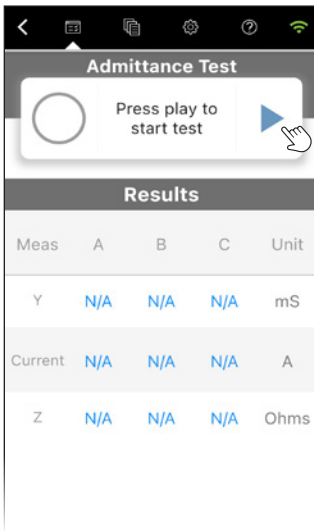
### Prerequisites

The secondary current on all lines must be below 0.5 A in order to run the admittance test. If the current is over 0.5 A, please consider running the Secondary Burden test instead.

### Description

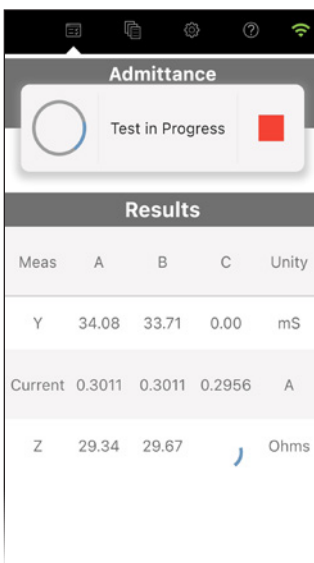
The Admittance test is used to characterize the ability of the CT (and attached conductors) to allow a current flow. This measurement is called the admittance of the system and it is measured in siemens units (S). The test is done sequentially for each phase and the results can then be saved. For additional information on the working theory behind the Admittance test, please refer to the ST-3/XT3 user guide.

### Operation



#### Step 1: Start test

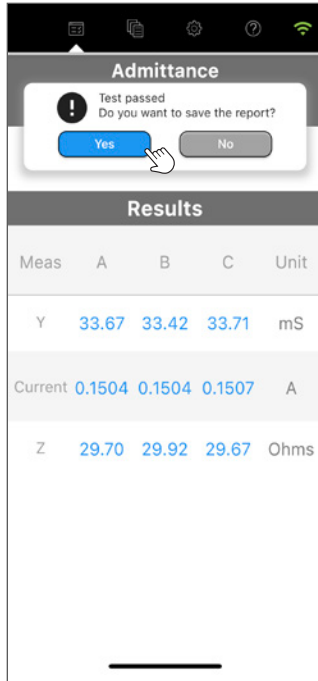
Tap the **Play** ► (start test) button to begin test sequence.



#### Step 2: Test execution

While the test is being performed, the user interface and measurement displays are updated to match the latest readings from the device. The same measurement procedure is run sequentially on each of the available lines.

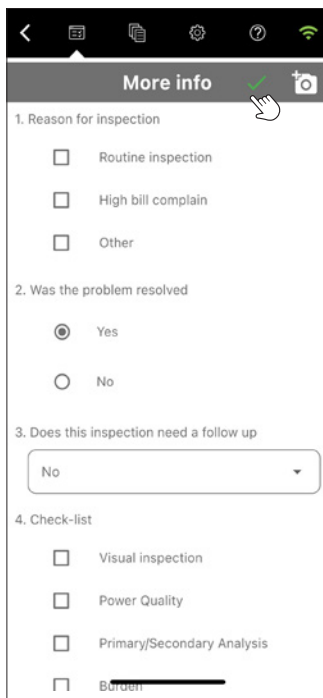




### Step 3: Test end

When the sequence has run for all applicable service lines, the test ends automatically and the results are displayed.

To save the test results, click on the **Yes** button.

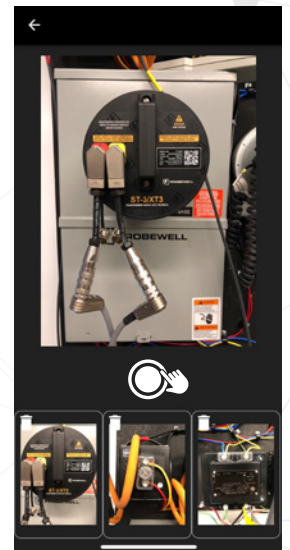


### Step 4: Info (Optional)

Up to 8 user-defined questions\* can be added in the *XT Series Settings* section under the *Custom Questions* tab. 3 Pictures of the installation can be added to the report by tapping the **camera icon** in the upper right corner of the screen.

Answer each question and save the test report by tapping the **green checkmark**.

\*See XT Series Settings/Custom Questions section to learn how to setup predefined questions



**Interpreting the test results:** The measured values for the system admittance may range from close to 0.1 millisiemens up to a few hundred millisiemens. Very high values may indicate a short circuit (SC) and very low values may indicate an open circuit (OC). The admittance value for an installation may vary in time with normal wear on the system.



## Accuracy

### Equipment required:

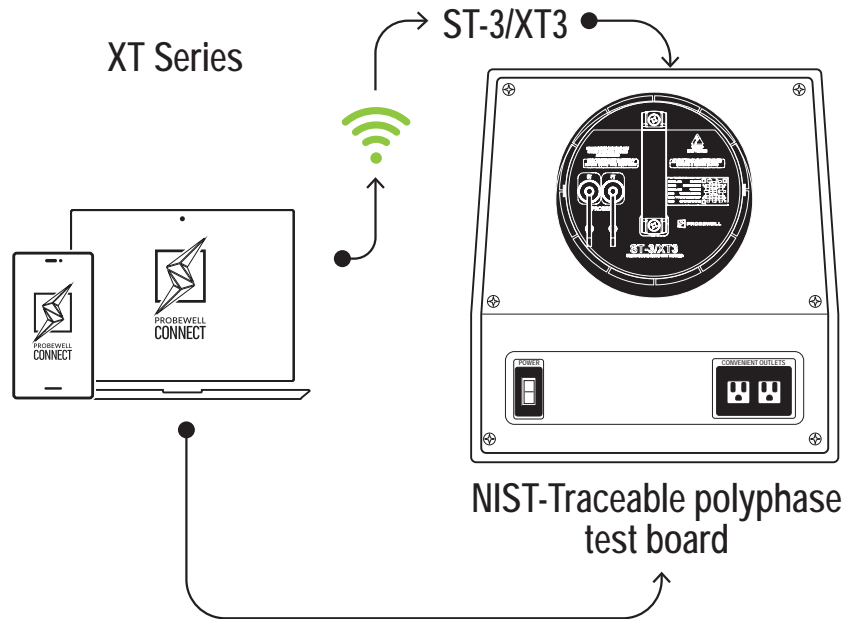
- ST-3/XT3 unit
- NIST-traceable polyphase test board or standard that can supply from 120 to 480 V and 0 to 50 A on each line
- Voltage, amps and phase angles fully programmable for each line
- Computer (with Windows 10 or above)

### Description

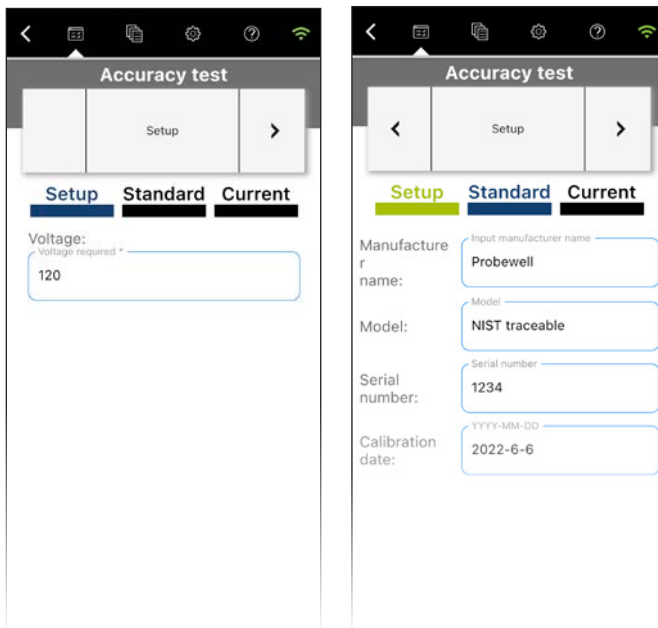
The ST-3/XT3 provides a built-in test mode that aims at validating the accuracy of the device by comparing it to a high-accuracy, NIST-traceable polyphase test board or standard.

This test is meant to be done in a lab environment and at a rate of once or twice per year, depending on the customer's guidelines for equipment validation. At the end of the sequence, a complete accuracy validation report can be saved in PDF and CSV file format on the host computer. The test voltage and current test points are all fully configurable.

For additional information on how to set up the XT3 site tester for accuracy validation, please refer to the ST-3/XT3 user guide.



### Operation



#### Step 1: Initial configuration

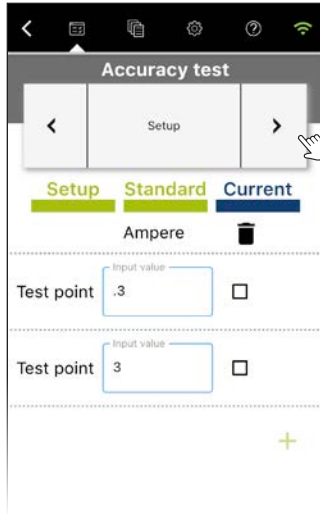
Fill in the following information:

##### Setup

- Voltage: supply voltage (between 120 and 480 VAC)

##### Standard

- Manufacturer name: Name of manufacturer of the test board
- Model: Model name of the test board
- Serial number: Unique serial number of the test board
- Calibration date: Date at which the latest calibration was done on the test board



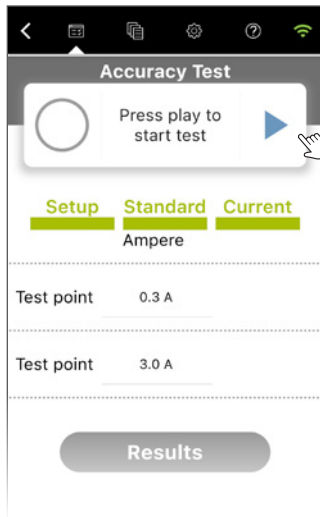
### Step 2: Test points setup

#### Current

Enter all current values (in amps) for each test point at which the XT3 unit should be tested.

- Easily add a test point by tapping the plus sign icon.
- Easily remove a test point by selecting it and tapping the garbage can icon.

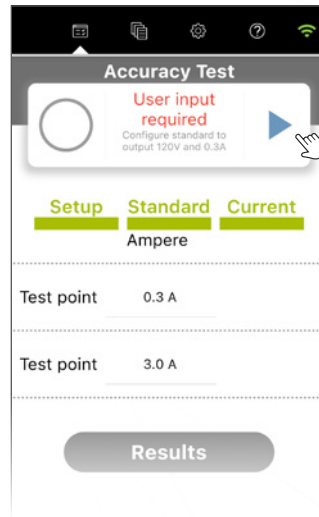
Click the right arrow in the control panel when the Test Point setup is complete



### Step 3: Start test

Tap the **Play** (start test) button to begin the test sequence.

When prompted, configure the test board to supply the current value in amps associated with the first test point in the sequence and click **Continue**.

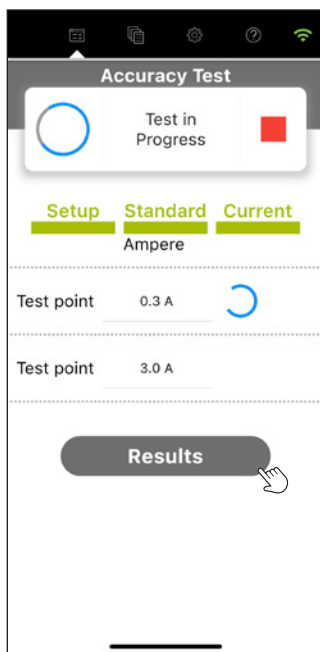


### Step 4: Test execution

While the test is being performed, the measurement displays are updated to lines.

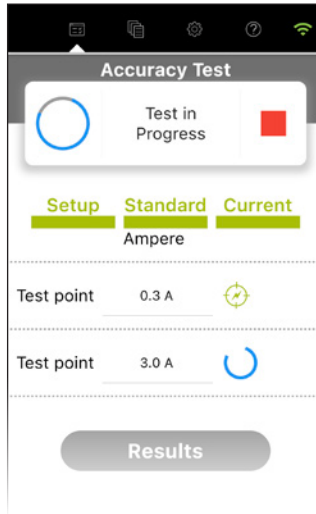
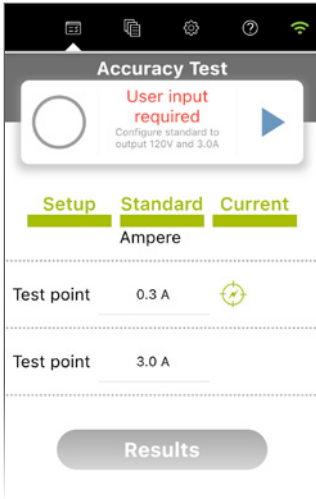
For each configured test point, the application acquires a set of 50 measurements and provides an error percentage by comparing with the nominal values provided by the test board.

Click **Results** to display the following information:



- Voltage reading (for first step)
- Voltage accuracy (for first step)
- Current reading (for each step)
- Current accuracy (for each step)
- Average, min. and max. values for accuracy

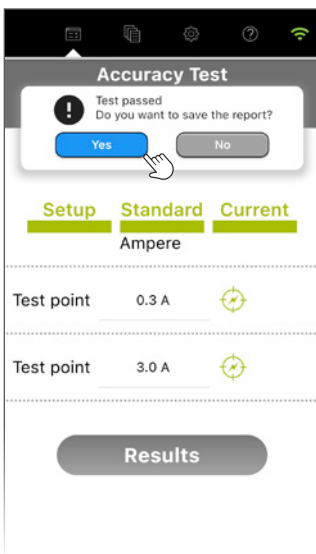
	Meas	Phase			Avg	Unit
		A	B	C		
Voltage 120 V	Voltage	0.14	0.07	0.09	0.10	V
	Accuracy	99.89	99.94	99.93	99.92	%
Current 0.3 A	Current	0.30	0.30	0.30	0.30	A
	Accuracy	0.29	0.27	0.37	0.31	%
Current 3.0 A	Current	-	-	-	-	A
	Accuracy	-	-	-	-	%
<b>Accuracy</b>						
	Avg	Max	Min	Unit		
Current	0.31	0.37	0.27	%		
Voltage	99.92	99.94	99.89	%		



### Step 5: User input required (optional)

When prompted (waiting for user), configure the test board to supply the next current value and click on **Continue**.

To save the test results, click on the **Yes** button.

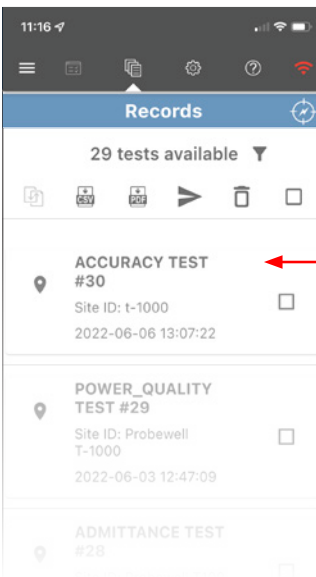


### Step 6: Test end

When the sequence has been completed for each configured test point, the test ends automatically and the results are displayed.

If the device should appear to fall out of its specified accuracy range, please contact Probewell Lab's support department (support@probewell.com).

The user can then opt to save the accuracy report. To save the test results, click on the **Yes** button in the control panel.



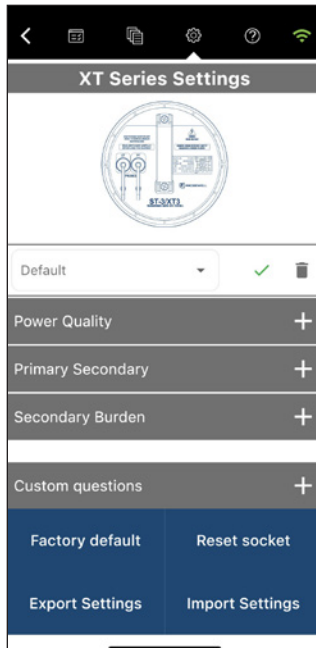
	Meas	Phase			Avg	Unit
		A	B	C		
Voltage 120 V	Voltage	0.14	0.07	0.09	0.10	V
	Accuracy	99.89	99.94	99.93	99.92	%
Current 0.3 A	Current	0.30	0.30	0.30	0.30	A
	Accuracy	0.29	0.28	0.38	0.32	%
Current 3.0 A	Current	2.64	2.64	2.64	2.64	A
	Accuracy	12.02	12.05	12.02	12.03	%
Accuracy	Avg	Max	Min	Unit		
Current	6.17	12.05	0.28	%		
Voltage	99.92	99.94	99.89	%		


### Step 7: Accessing the Accuracy records

Unlike the WT Series, the Accuracy test report for the XT Series can be viewed in the test list, in the Records section

## XT Series Settings

System Settings allow the user to configure how the XT Series tester performs tests. It contains various basic usability settings.



- Factory default**      The XT Series tester comes with factory default settings that are suitable for most operations. Tap the **Factory Default** to restore the initial factory settings
- Reset socket**      Tap the **Reset socket** button to de-energizes the meter, reset the current meter configuration and return to the Setup screen 
- Export Settings**      The XT Series tester settings that can be customized, saved as a backup or shared with other users as needed.
- Import Settings**      A XT Series user can import a backup settings or a standardized company-wide settings to streamline the deployment process.
- Profile**      The XT Series tester comes with factory default settings that are suitable for most operations.

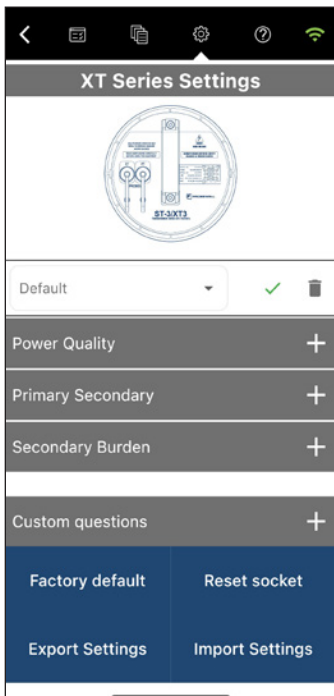
The device settings can be easily changed to suit the operator's needs by using the Settings tab in the app.

These settings can then be saved to a profile and reused as needed.
- Power Quality**      Change the pass/fail parameters or other meter parameters
- Primary Secondary**      Change the pass/fail parameters or other meter parameters
- Secondary Burden**      Change the pass/fail parameters or other meter parameters
- Custom questions**      Add up to 8 predefined questions relating to the XT test (these will be included in the report)



Add a setting profile for both the WT or the XT Series Settings. Use the drop-down menu to add a profile or activate one by selecting its name in the list.

## XT Series Profile



### Profile

Both the WT and XT Series testers comes with factory default settings that are suitable for most operations.

The settings for both devices can easily be changed, individually, to suit the operator's needs by expanding the Settings tab in the app.

These settings can then be saved to a profile and reused as needed.

- Default:** The default factory settings for both devices are suitable for most operations.
- Add a setting profile:** Click the drop-down menu and select "Add a setting profile", input a relevant name and click **Done**, the profile will be created with all the current field value (Figure 1).
- Select a profile:** Click the drop-down menu and select the name of the needed profile (Figure 2).
- Modify a profile:** To modify a profile, start by selecting the profile, make the required changes in the settings and click the green checkmark ✓ to save the changes, (Figure 3).
- Delete a profile:** To delete a profile, click the drop-down menu and click the name of the profile and click the garbage can 🗑️ to delete it (Figure 4).

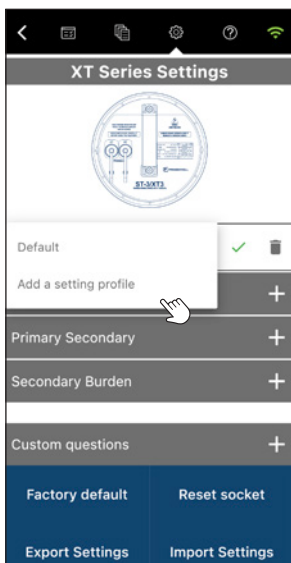


Figure 1

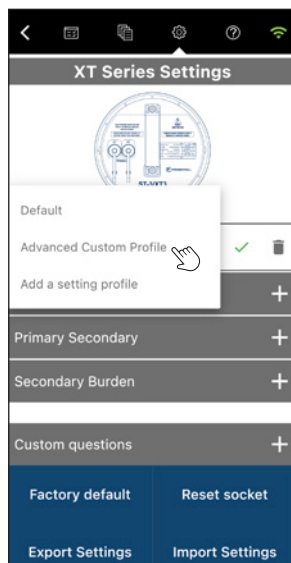


Figure 2

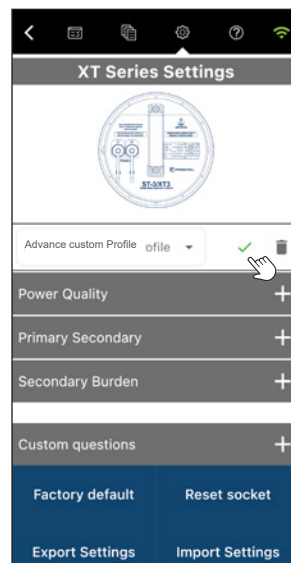


Figure 3

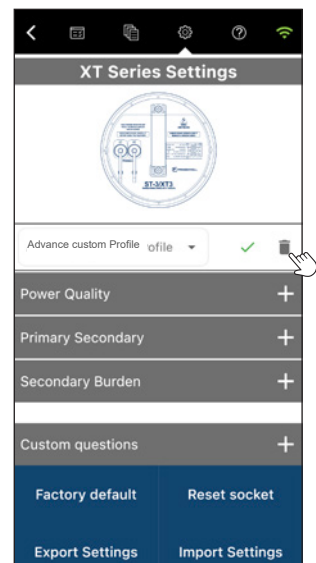


Figure 4

## Power Quality Parameters

**Power quality**

**U**  
Min: 90 Max: 495

**I**  
Min: 0 Max: 22

**∠ I A**  
Wye: 0 Delta: 0 s\*: 5

**∠ I B**  
Wye: 120 Delta: 90 s\*: 5

**∠ I C**  
Wye: 240 Delta: 180 s\*: 5

**∠ U B**  
Wye: 120 Delta: 90 s\*: 5

**∠ U C**  
Wye: 240 Delta: 180 s\*: 5

**THD %**  
U Max %: 10.0 I Max %: 10.0

**Harmonic %**  
U Max %: 5.0 I Max %: 5.0

Vector Angle display format:  
0-360  ±180

Show Fundamental

Vector Graph rotation:  
Counter clockwise  Clockwise

Reference phase:  
 A  B  C

### Default values

#### Power quality test

U ..... 90 V ≤ U ≤ 495 V  
 I ..... 0 A ≤ I ≤ 22 A  
 ∠UB..... 120 ° ± 5 °  
 ∠Uc..... 240 ° ± 5 °  
 THD U Max ..... 10%  
 THD I Max ..... 10%  
 Harmonic U Max ..... 2%  
 Harmonic 1 Max ..... 2%

## Primary/Secondary Analysis Parameters

**Primary Secondary**

**Primary U**  
Min V: 90 Max V: 600

**I**  
Min A: 0 Max A: 6000

**CT**  
Double wraps Rogowski   
Ratio Err %: 5.0

Use CT Accuracy

**PT**  
Ratio Err %: 5.0

Use PT Accuracy

### Default values

Primary..... 90 V ≤ U ≤ 600 V  
 ..... 0 A ≤ I ≤ 6000 A  
 | CT Ratio err (%) | ..... ≤ 0.6 %  
 | PT Ratio err (%) | ..... ≤ 0.6 %

## Secondary Burden Parameters

### Default values

Primary.....0 A ≤ I ≤ 6000 A  
 | CT Burden Effect (%) | ..... ≤ 0.5 %

## Custom Questions

### Up to 8 predefined questions

Add up to 8 predefined questions relating to the XT test. These will be included in the report

- Tap on the *Add Custom Question* button to add a question.

Select one of the 4 types of preset questions (Text field, Drop-down menu, Checkbox (Multiple) Radio (Single)), let's use Checkbox for this example

1. In the text field below the drop down menu, fill in your question
2. In the next field, input answer option number 1
3. Tap on the **Plus sign icon** to add answer option number 2.
4. Once you are done, tap the **green checkmark** at the top of the section to save the question

The question is added under *Question(s) list & summary*:

- Tap on the *Add Custom Question* button to add another question.
- Tap the **pencil icon** to edit an existing question.
- To delete a question, select it first and tap the **trash can icon** at the top of the *Custom questions* section.

## Factory Default & Reset Socket

### Default values

**Factory default:** Resets the settings of the XT Series tester to the factory default values. Previously saved configurations are erased. The XT Series tester's factory default settings are suitable for most operations.

**Reset socket:** Tap the **reset socket** button to de-energizes the meter, reset the current meter configuration and return to the Setup screen .

**Export Settings:** Users can export settings for backup purposes or simply share them with their peers to establish consistent settings and organize the inspection process.

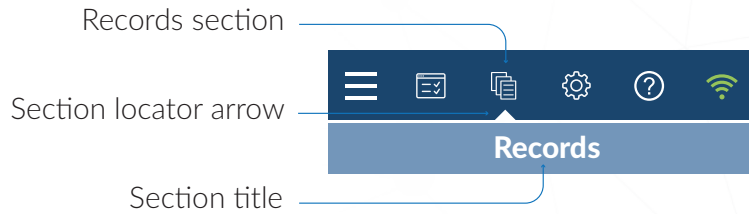
**Import Setting:** Users can use the import settings to restore their personal settings from a backup. It is also possible to provide a single settings file to all field technicians to standardize the parameter of the inspection process.





## Records

### Records Header



A test record is created when the operator opts to save the data of a test conducted with either an Optical Pickup or a Metercam.

#### Test modes that support data logging are:

Quick Test

Full Test

Custom Test

Line Monitor

Demand Test

4 Quad Test (VARh)

4 Quad Test (Wh)

Accuracy

Power Quality (PQ)

Real-Time Waveform

Phasors

Total Harmonic Distortion

Primary / Secondary Analysis

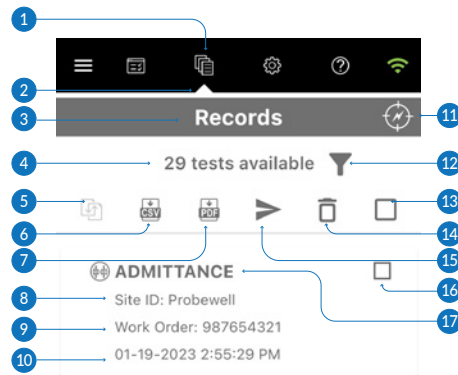
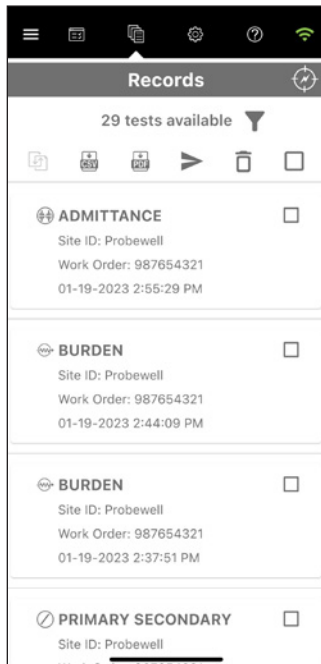
Secondary Burden

Admittance

Accuracy

The test results can be accessed by tapping on the Records tab at the top of the screen.

## Records Toolbar



- |                    |                 |
|--------------------|-----------------|
| 1. Records section | 9. Work Order   |
| 2. Section ID      | 10. Timestamp   |
| 3. Section title   | 11. WT Accuracy |
| 4. Number of test  | 12. Filter icon |
| 5. Merge reports   | 13. Select All  |
| 6. CSV format      | 14. Delete      |
| 7. PDF format      | 15. Send        |
| 8. Custom site ID  | 16. Select test |
|                    | 17. Test type   |

- Not available
- Available option

- |   |   |
|---|---|
| 1.  Records section icon:                 | Record icon   |
| 2. Section locator arrow:                 | Lets you know what section you are in at a glance   |
| 3. Section title:                         | The app has 4 main sections: Tests, Records, Settings and Help  |
| 4. Number of tests:                       | Number of tests saved in the device   |
| 5.  Merge reports:                        | Available as soon as two or more reports are selected and allows the user to merge several reports together |
| 6.  CSV format:                           | Select and export your report in CSV format   |
| 7.  PDF format:                           | Select and Export your report in PDF format   |
| 8. Custom site ID:                        | Site or meter name as designated by the user  |
| 9. Work Order:                            | Display the work order assigned by the utility  |
| 10. Timestamp:                            | Date and time the test is performed   |
| 11.  WT Accuracy Report:                  | Find the latest WT Series tester Accuracy report here   |
| 12.  Filter option:                       | To help find specific records, a filter can be applied to search by Site ID, Meter ID, Test Type and Date   |
| 13. <input type="checkbox"/> Select all:  | Select all the tests by tapping the menu checkbox   |
| 14.  Trash can icon:                      | Delete any selected item  |
| 15.  Paper plane icon:                    | Send the report by email  |
| 16. <input type="checkbox"/> Select test: | Individual test selection checkbox  |
| 17. Test type:                            | The type of test that has been performed  |

### WARNING

The Delete button deletes all test reports selected. Please ensure that the test data has been properly exported and backed up before deleting them from the device. This procedure is explained in the "Emailing Reports" section of this document.

The Test List screen lists all available test results that are currently stored on a mobile phone or a tablet. Test records are sorted by date; newer tests being at the top of the list. The test record list shows the following basic information for each test result:

- Test Type: Name of the type of test performed
- Meter ID: WT Series only
- Site ID: Site identifier (if provided)
- Work Order: Work Order number assigned by utility for traceability purpose (if provided)
- Timestamp: Date and time of the test

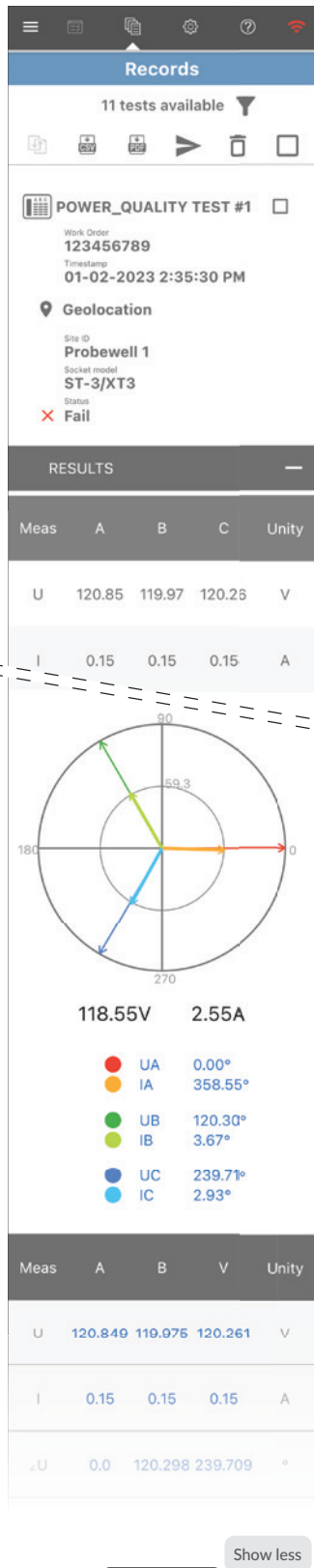
The operator can scroll through the record list to reach older test results.

Tapping the name of an element in the list displays the test report summary.



## Records viewer Description

The test report details screen is composed of 8 distinct sections:



### 1. Records toolbar for test sharing options

Includes: From left to right: Merge report, CSV format, PDF format, send option, delete and select.

### 2. Test ID section

Includes: Test Type, Work Order number, Timestamp, Geolocation (when available), Site ID, Socket model, Pass or Failed status.

- Results
- Sensor
- Custom questions
- Notes
- Images

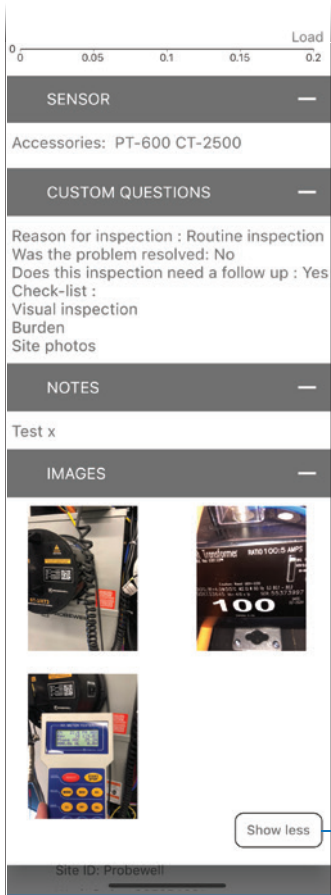
If the test has associated GPS data, the **geolocation icon** is available. Tapping on this button launches Google Map (if installed on device) and shows the test location on a 2D map. This functionality requires that the mobile device have internet access.

### 3. Results section

Includes: All test results data (table and graph when available), as well as meter or site specifications and percent error readings

### 4. Show less button

Collapse all the sections and goes back to the Records list



#### 4. Sensor section

Includes: Information on the type of sensor (optical pickup or metercam) and the number of pulses or revolutions that were recorded at each step of the test.

#### 5. Questions section

Includes: User-defined questions and their corresponding answers filled in at the end of the test.

#### 6. Notes section

Includes: Additional note from the field technician (if provided) that is added at the end of the test in the "Notes" field under the customer questions.

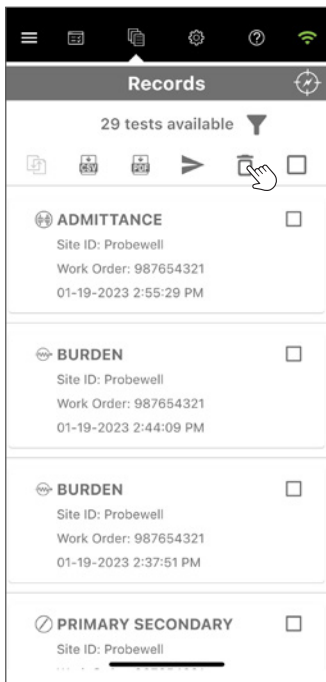
#### 7. Images Section


Includes: If any images has been added to the report, they would be displayed under this section. Up to three images can be added to the report.

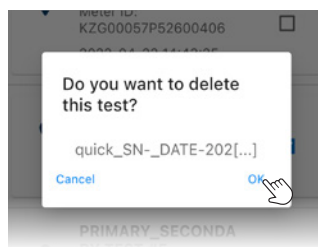
#### 8. Show less button

Colapse all the sections and goes back to the Records list

## Deleting Individual Records



On iOS and Android, an individual report can be deleted by selecting the checkbox on the targeted report entry in the list and tapping on the trash can icon .



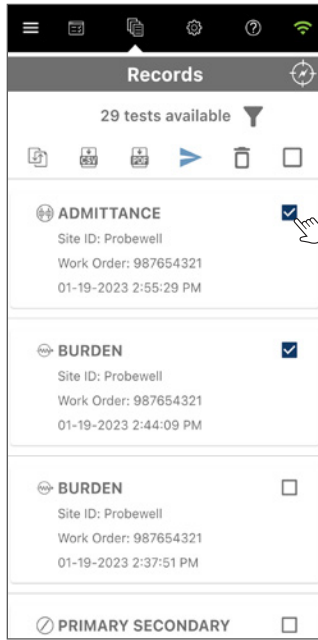
The application requires additional validation to complete the deletion process. Once a report has been deleted, it is completely removed from the device memory and is no longer accessible.



Please ensure that test data has been properly exported through emails and stored securely before deletion. This procedure is explained in the "Emailing Reports" section of this document.



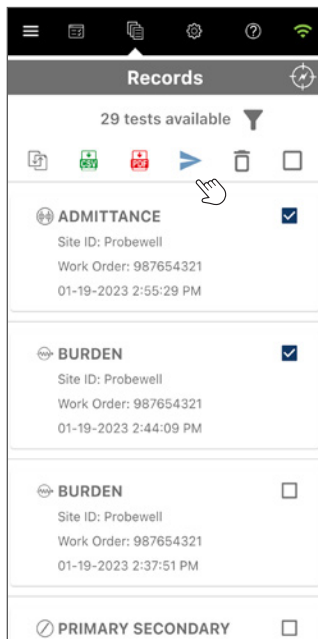
# ✈️ Emailing Reports



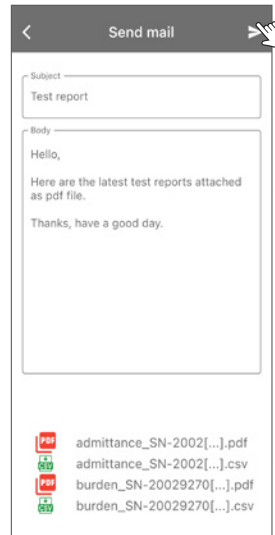
As soon as a single test report is selected, the format option buttons for CSV or PDF are activated, allowing the user to generate a report in one or both of the formats. The **Send Mail** button in the report toolbar also becomes available,

Select a format and tap the **Send Mail** button to begin sending an email. This automatically opens an email and populates the subject and content of the message.

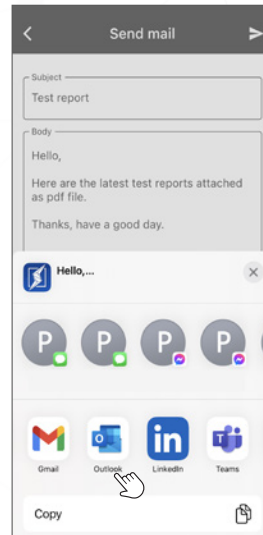
If the mobile device cannot reach the internet when the email is sent, the message will go to the Outbox and will automatically be sent when the mobile device is connected to the internet again (either via WiFi or cellular data).



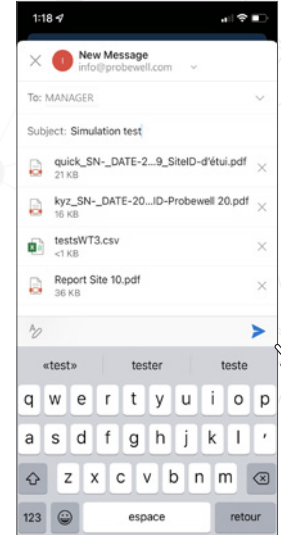
## iOS and Android



Edit the subject and the content of the email and tap to continue.

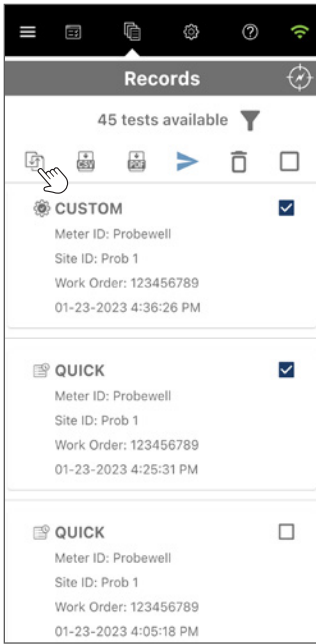


Select the mail application (iOS only), Android will use the default mail application.

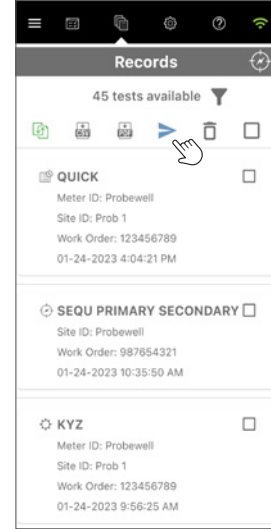
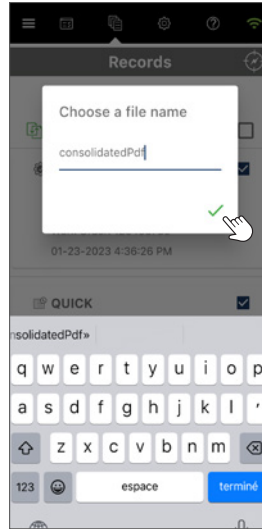
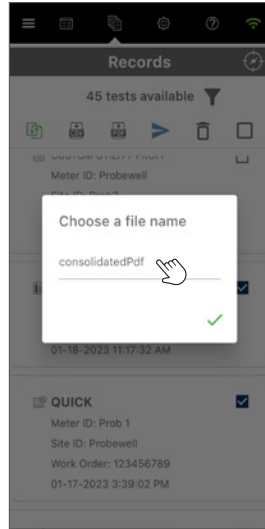


Enter the recipient's email address, then the subject and click send.

## Merging and Sending Reports



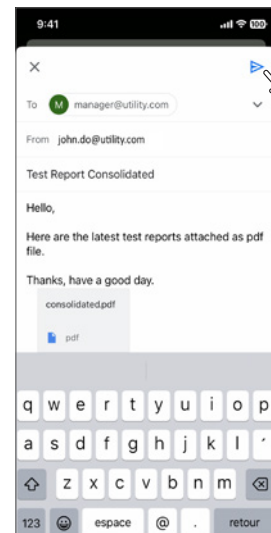
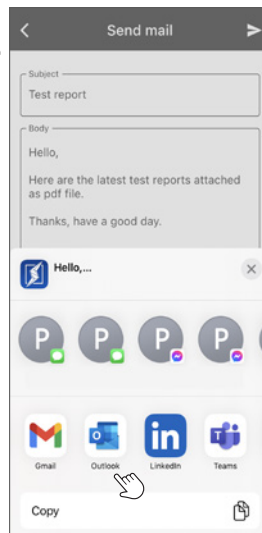
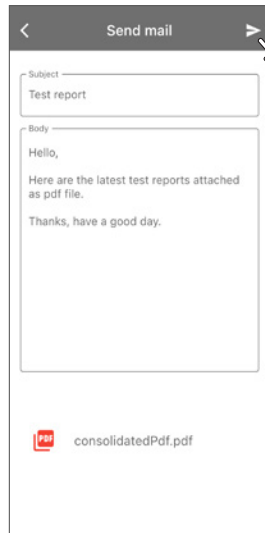
You have the option of merging two or more reports into a single one. As soon as more than one report is selected, the Merge Reports button becomes available. Tap the Merge icon Reports button and follow the steps below.



Click on the text field to start editing the merged report's name.

Edit the name of the merged report and tap done to continue

The merge report icon is highlighted in green, meaning that a PDF format of the report has been created. The send email icon is now available. Tap the icon to send.



Edit the subject and the content of the email and tap send to continue.

iOS only: Select the mail application.

Enter the recipient's email address, then the subject and tap send.



## Specific operation modes

The WT Series tester supports operation modes that allow it to test additional functionalities of electrical meters.

### Wh/VARh

The Wh/VARh measurement mode lets the WT Series tester evaluate the electrical meter's resistive and reactive operations separately.

The measurement mode can be modified from the test-specific settings in the Quick, Full and Custom test modes. This is a temporary setting that is reset to its default value (Wh) when the WT Series tester is power cycled.

#### Wh

In Wh operation mode, the **LL** and **HL** load subtests are done at 0° lag (current and voltage in phase) and the **PF** load subtest is done at 60° lag.

#### VARh

In VARh operation mode, the **LL** and **HL** load subtests are done at 90° lag and the **PF** load subtest is done at 30° lag (current lagging on voltage).

**i** Before conducting a test with a solid-state meter, please validate that the meter's output pulse settings are set to match the WT Series tester measurement mode. That is, if the WT Series tester is set to test the meter in Wh mode, the meter must be programmed to pulse in increments of resistive energy. If the WT Series tester is set to test the meter in VARh mode, the meter must be programmed to pulse in increments of reactive energy. Please refer to the meter manufacturer's technical reference guide for instructions.

**i** There are several recognized methods for calculating the VAR measurements of solid-state meters. When the harmonic content becomes noticeable, the VAR reading may vary considerably depending on the selected calculation method. In-depth analysis of VAR calculation falls beyond the scope of this guide. The WT Series testers use the vector method (using VA RMS) for VAR calculations.

## Reverse Flow Testing

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In its typical operation mode, the meter measures the total energy being delivered to the customer by the grid. Some residential installations are equipped with renewable energy systems. In such cases, the renewable energy system may harvest more energy than is needed by the installation. The energy surplus may be delivered back to the power grid and the electric meter must be able to measure reverse energy flow to affect billing accordingly.

On the WT Series tester, reverse flow testing is available in Wh and VARh measurement mode, with or without the optical pickup. Reverse flow testing is not available when a Metercam is connected. The WT Series tester's internal current generator can reverse the current flow and thus test the accuracy of a solid-state meter in received flow.

To configure Reverse flow testing, enable the Reverse option in the Settings tab under the System section. The option can also be set temporarily from within the test mode view. In the test report, the Power and Energy measurements are preceded by a backward arrow to indicate reverse flow.



Before conducting a test with a solid-state meter, please validate that the meter's output pulse settings are set to match the WT Series current flow mode. That is, if the WT Series tester is set to test the meter in forward current flow, the meter must be programmed to pulse in increments of positive flow. If the WT Series tester is set to test the meter in backward current flow, the meter must be programmed to pulse in increments of negative flow. Please refer to the meter manufacturer's technical reference guide for instructions.





# Appendix A

## Troubleshooting

Under specific circumstances, the Probewell Connect app may display a warning or error message requiring further action from the user. A list of the most common troubleshooting topics is included below. If the problem persists, please contact Probewell Lab Inc.'s technical support.

ISSUE	DESCRIPTION	FIX
<b>CANNOT PAIR WITH SOCKET</b>	The application cannot connect to the XT or WT Series tester's wireless network.	<ul style="list-style-type: none"> <li>• Make sure the XT or WT Series tester is turned on.</li> <li>• Check if the fan inside the socket is spinning.</li> <li>• Scan the QR code that is located directly on the tester. If using a QR code printed on the included plastic card, please validate that the serial number written on the card matches the serial number on the unit.</li> </ul>
<b>FIRMWARE VERSION WARNING</b>	The application gives a warning about the WT Series tester's firmware version not matching the application version.	<ul style="list-style-type: none"> <li>• Go to the Firmware Update section of this document for information on how to update the firmware of the WT Series tester.</li> </ul>
<b>METER BARCODE NOT READABLE</b>	The application cannot get a proper reading on the meter barcode.	<ul style="list-style-type: none"> <li>• Make sure the meter barcode is readable and not damaged.</li> </ul>
<b>METER BARCODE NOT RECOGNIZED</b>	The application reads the meter barcode, but cannot recognize the structure of the barcode	<ul style="list-style-type: none"> <li>• Make sure the meter barcode matches the AEP barcode standard.</li> </ul>

To find the exact meaning of an error code, please visit the Probewell support portal: <https://support.probewell.com>

# Appendix B

## Parameters for Data Logging Option for the WT Series

The following describes all the different data fields contained in the .CSV (comma-separated values) report file.

1- TEST#	This test # is given to each subsequent test conducted in the field. The unit can store up to 100 tests. Once the tests have been uploaded to your PC and deleted from the remote, the test # restarts at 1.	c) YES	This will be returned when the %HL and %LL error difference is outside the acceptable error margin; a creep test has been run and the technician answers YES to the question: Does the meter creep?
2- REC#	This is a permanent record number, it cannot be modified or deleted (already stored in remote). This number is incremented at each new logged test. It starts at 1 and goes up by 1 up to 99999 then restarts at 1.	d) NO	This will be returned when the %HL and %LL error difference is outside the acceptable error margin; a creep test has been run and the technician answers NO to the question: Does the meter creep?
3- DATE/TIME	Stamp date and time of the test	e) N/S	Not supported
4- REMOTE#	MT-1/WT Remote Serial Number (same as the SOCKET#)	18- 33 Q & A	8 custom questions and answers
5- SOCKET#	MT-1/WT Socket Serial Number (already stored in socket)	34- RevHL	Revolutions run during HL test
6- FORM	Meter form	35- RevLL	Revolutions run during LL test
7- PHASE	Phase tested	36- RevPF	Revolutions run during PF test
8- TA	Testing Amperage of meter tested	37-Weighting factor	Weighted error ratio as defined in configuration
9- Kh	Kh of meter tested	38- AmpHL	Load in amps applied during HL test
10- MODE	Mode in which test was conducted. Result can be full, quick or custom (single).	39- AmpLL	Load in amps applied during LL test
11- SENSOR	Indicates what type of sensor was used during the test. Result can be <b>Optical Pick-up</b> or <b>Metercam</b> .	40- AmpPF	Load in amps applied during PF test
12- METER ID:	Tested meter's serial number as entered by the technician in the field.	41- WhHL	Watt hours recorded during HL test
13- %HL	Result of HL test in registration percentage	42- WhLL	Watt hours recorded during LL test
14- %LL	Result of LL test in registration percentage	43- WhPF	Watt hours recorded during PF test
15- %WT	Weighted average in registration percentage as calculated with the configured ratio.	44- VOLT	Line voltage recorded at end of all tests
16- %PF	Result of PF test in registration percentage	45- FREQ	Line frequency recorded at end of all tests
17- CREEP	Status and result of creep test. There are 5 possible answers:	46- Latitude	GPS coordinates (latitude)
a) N/A	This will be returned when the %HL and %LL error difference falls within the acceptable error margin and no creep test needs to be run.	47- Longitude	GPS coordinates (longitude)
b) SKIP	This will be returned when the %HL and %LL error difference is outside the acceptable error margin, but the technician decided not to run a creep test.	48- Altitude	GPS coordinates (altitude)



# Appendix C

## Parameters for Data Logging Option for the XT Series

The following tables describe all the different data fields contained in the CSV report file for each test. CSV stands for comma-separated values. The cell number and the field name at each line of the table match the line number in the CSV file. Each section has its own information: [Site], [System], [Accessories], [Test Data], [Questions] and [Geolocation]. An empty line in the CSV file is used to separate each section.

For a description and details of each test, please refer to the ST-3/XT3 and Probell Connect user manuals.

We suggest using the Field Name keyword instead of a CSV cell number given possible future updates.

### Power Quality (PQ) Test

Field name	Field name description	Field name	Field name description
[Site]	Site information section. I Contains information related to the material site test.	U THD	Voltage line total harmonic distortion.
Site ID:	A unique identifier for the service to be tested entered at the beginning of the test by the user, referencing a site.	I THD	Current line total harmonic distortion.
Form:	Meter base form of the installation.	Freq	Line frequency
Wiring:	Wiring scheme of the installation, could be: Single Phase, Wye or Delta for polyphase.	U Line Cycle	Voltage line cycle data array in volts.
CT Primary:	Nominal primary current value at the current transformer.	I Line Cycle	Current line cycle data array in amps.
CT Secondary:	Nominal secondary current value at the current transformer.	U Harms	Voltage harmonics array in % relative to fundamental.
CT Max Burden:	Nominal max. burden value at the current transformer.	I Harms	Current harmonics array in % relative to fundamental.
CT Accuracy:	Nominal accuracy value at the current transformer.	A.....	Phase A data results cells B23-P23.
PT Primary:	Nominal primary voltage value at the voltage transformer.	B.....	Phase B data results cells B24-P24.
PT Secondary:	Nominal secondary voltage value at the voltage transformer.	C.....	Phase C data results cells B25-P25.
PT Max Burden:	This parameter is not used in this test.	U Phase Order:	Voltage phase order - cell B27
PT Accuracy:	This parameter is not used in this test.	I Phase Order:	Current phase order - cell B28.
[System]	System information section.	Line Cycle	
Serial Number:	ST-3/XT3 serial number.	Sample Rate:	Line cycle sampling period in seconds - B29.
Firmware:	ST-3/XT3 firmware version.	[Questions]	This section contains preprogrammed questions (up to 8 max.) with answers from the user. If you don't have preprogrammed questions, the fields are empty.
Date:	Date of test performed.	Question/Answer	Questions answered at the end of the test. The user's answers will appear here with the questions.
[Test Data]	Test data section. This section includes all data related to the test.	[Geolocation]	This section contains the GPS coordinates related to the test in the field. The information comes from your mobile device at the save session.
U	Secondary RMS voltage at the meter base.	Longitude	Longitude GPS. Longitude GPS coordinates value.
I	Secondary RMS current at the meter base.	Latitude	Latitude GPS. Latitude GPS coordinates value.
P	Resistive power in watts.	Altitude	Altitude GPS. Altitude GPS coordinates value.
Q	Reactive power VAR.		
S	Total Apparent power VA.		
U Angle	Phase angle between line voltage A and this line voltage.		
I Angle	Current angle for this line.		
PF	Power factor		



## Primary/Secondary Test

Field name	Field name description	Field name	Field name description
[Site] .....	Site information section. Contains information related to the material site test.	[Test Data].....	Test data section. This section includes all data related to the test.
Site ID:.....	A unique identifier for the service to be tested entered at the beginning of the test by the user, referencing a site.	CT .....	CT section for results.
Form:.....	Meter base form of the installation.	I prim.....	Primary current.
Wiring:.....	Wiring scheme of the installation, could be: Single Phase, Wye or Delta for polyphase.	I sec.....	Secondary current at the meter base.
CT Primary:.....	Nominal primary current value at the current transformer.	Ratio.....	Measured transformer ratio.
CT Secondary:.....	Nominal secondary current value at the current transformer.	Ratio error.....	Ratio error in %.
CT Max Burden:.....	Nominal max. burden value at the current transformer.	Angle.....	Phase angle between primary and secondary.
CT Accuracy: .....	Nominal accuracy value at the current transformer.	A.....	Phase A CT data results, cells B35-F35.
PT Primary: .....	Nominal primary voltage value at the voltage transformer.	B.....	Phase B CT data results, cells B36-F36.
PT Secondary: .....	Nominal secondary voltage value at the voltage transformer.	C.....	Phase C CT data results, cells B37-F37.
PT Max Burden: .....	This parameter is not used.	PT.....	PT section for results.
PT Accuracy:.....	Nominal accuracy value at the voltage transformer. This parameter is only used for Primary/Secondary Analysis.	U Prim.....	Primary voltage.
[System].....	System information section.	U sec.....	Secondary voltage.
Serial Number: .....	ST-3/XT3 serial number.	Ratio.....	Measured transformer ratio.
Firmware: .....	ST-3/XT3 firmware version.	Ratio error.....	Ratio error in %.
Date:.....	Date of test performed.	Angle.....	Phase angle between primary and secondary.
[Accessories].....	This section gives information about the accessories connected to the ST-3/XT3 during this test.	A.....	Phase A PT data results, cells B41-F41.
CT detected:.....	This field indicates if a ST-3/FLEX-CT is connected and detected.	B.....	Phase B PT data results, cells B42-F42.
CT model:.....	ST-3/FLEX-CT model.	C.....	Phase C PT data results, cells B43-F43.
CT serial number:.....	Serial number of the CT accessory.	[Questions] .....	This section contains preprogrammed questions (up to 8 max.) with answers from the user. If you haven't preprogrammed questions, the fields are empty.
CT Acc. Calib Date: .....	Calibration date of the PT accessory.	Question/Answer.....	Questions answered at the end of the test. The user's answers will appear here with the questions.
PT detected: .....	This field indicates if a ST-3/PT-600 is connected and detected.	[Geolocation].....	This section is the GPS coordinates related to the test in the field. The information comes from your mobile device at the save session.
PT model:.....	Model number (PT-600).	Longitude .....	Longitude GPS. Longitude GPS coordinates value.
PT serial number:.....	Serial number of the PT accessory.	Latitude .....	Latitude GPS. Latitude GPS coordinates value.
PT Acc. Calib Date: .....	Calibration date of the PT accessory.	Altitude.....	Altitude GPS. Altitude GPS coordinates value.
Field name .....	Field name description.		

## CT Secondary Burden Test

Field name	Field name description	Field name	Field name description
[Site].....	Site information section. Contains information related to the material site test.	A.....	Phase A section of the Burden Test results.
Site ID:.....	A unique identifier for the service to be tested entered at the beginning of the test by the user, referencing a site.	Burden Load .....	Secondary burden load of phase A (in ohms)
Form:.....	Meter base form of the installation.	Burden load values.....	These lines are the load value in ohms (0, 0.1, 0.2, 0.5, 1, 2, 4, 8) applied during the test. The maximum load applied depends on your CT Max Burden configuration value, which will reflect the amount of measurement lines for the B-F column results.
Wiring: .....	Wiring scheme of the installation, could be: Single Phase, Wye or Delta for polyphase.	I sec .....	Secondary current for phase A at the meter base in amps.
CT Primary:.....	Nominal primary current value at the current transformer.	I sec results.....	These lines are the values of phase A from secondary current test in amps.
CT Secondary:.....	Nominal secondary current value at the current transformer.	I prim .....	Primary current for phase A.
CT Max Burden:.....	Nominal max. burden value at the current transformer.	I prim results.....	These lines are the values of phase A from primary current test in amps.
CT Accuracy: .....	Nominal accuracy value at the current transformer.	Burden Effect .....	Effect of the applied burden on secondary reading % for phase A.
PT Primary: .....	Nominal primary voltage value at the voltage transformer.	Burden Effect results...	These lines are the values of phase A of burden effect in %.
PT Secondary: .....	Nominal secondary voltage value at the voltage transformer.	Rating Error.....	Ratio error in % for phase A.
PT Max Burden:.....	This parameter is not used in this test.	Rating Error results .....	These lines are the values of phase A of ratio error in %.
PT Accuracy:.....	This parameter is not used in this test.	Phase Error .....	Phase difference between primary and secondary in minutes and seconds of arc for phase A.
[System].....	System information section.	Phase Error results.....	These lines are the values of phase A of difference between primary and secondary
Serial Number: .....	ST-3/XT3 serial number.		
Firmware: .....	ST-3/XT3 firmware version.	<b>Field name</b>	<b>Field name description</b>
Date:.....	Date of test performed.	B.....	Phase B section of the Burden test results.
[Accessories].....	This section gives information about the accessories connected to the ST-3/XT3 during this test.	Burden Load .....	Secondary burden load of phase B (in ohms)
CT detected:.....	This field indicates if a ST-3/FLEX-CT is connected and detected.	Burden load values.....	These lines are the load value in ohms (0, 0.1, 0.2, 0.5, 1, 2, 4, 8) applied during the test. The maximum load applied depends on your CT Max Burden configuration value, which will reflect the amount of measurement lines for the B-F column results.
CT model:.....	ST-3/FLEX-CT model.	I sec .....	Secondary current for phase B at the meter base in amps.
CT serial number: .....	Serial number of the CT accessory.	I sec results.....	These lines are the values of phase B from secondary current test in amps.
CT Acc. Calib Date:.....	Calibration date of the PT accessory.	I prim .....	Primary current for phase B.
PT detected:.....	This field indicates if a ST-3/PT-600 is connected and detected.	I prim results.....	These lines are the values of phase B from primary current test in amps.
PT model:.....	Model number (PT-600).	Burden Effect .....	Effect of the applied burden on secondary reading % for phase B.
PT serial number:.....	Serial number of the PT accessory.	Burden Effect results...	These lines are the values of phase B of burden effect in %.
PT Acc. Calib Date: .....	Calibration date of the PT accessory.	Rating Error.....	Ratio error in % for phase B.
[Test Data].....	Test data section. This section includes all data related to the test.	Rating Error results .....	These lines are the values of phase B of ratio error in %.
		Phase Error .....	Phase difference between primary and secondary in minutes and seconds of arc for phase B.
		Phase Error results .....	These lines are the values of phase B of difference between primary and secondary



## CT Secondary Burden Test (continued)

Field name	Field name description	Field name	Field name description
C.....	Phase C section of the Burden test results.	[Questions] .....	This section contains preprogrammed questions (up to 8 max.) with answers from the user. If you haven't preprogrammed questions, the fields are empty.
Burden Load.....	Secondary burden load of phase C (in ohms).	Question/Answer.....	Questions answered at the end of the test. The user's answers will appear here with the questions.
Burden load values.....	These lines are the load value in ohms (0, 0.1, 0.2, 0.5, 1, 2, 4, 8) applied during the test. The maximum load applied depends on your CT Max Burden configuration value which will reflect the amount of measurement lines for the B-F column results.	[Geolocation].....	This section is the GPS coordinates related to the test in the field. The information comes from your mobile device at the save session.
I sec.....	Secondary current for phase C at the meter base in amps.	Longitude .....	Longitude GPS. Longitude GPS coordinates value.
I sec results.....	These lines are the values of phase C from secondary current test in amps.	Latitude .....	Latitude GPS. Latitude GPS coordinates value.
I prim.....	Primary current for phase C.	Altitude.....	Altitude GPS. Altitude GPS coordinates value.
I prim results.....	These lines are the values of phase C from primary current test in amps.		
Burden Effect.....	Effect of the applied burden on secondary reading % for phase C.		
Burden Effect results...	These lines are the values of phase C of burden effect in %.		
Rating Error.....	Ratio error in % for phase C.		
Rating Error results.....	These lines are the values of phase C of ratio error in %.		
Phase Error .....	Phase difference between primary and secondary in minutes and seconds of arc for phase C.		
Phase Error results.....	These lines are the values of phase C of difference between primary and secondary		

## Admittance Test

Field name	Field name description	Field name	Field name description
[Site] .....	Site information section. Contains information related to the material site test.	Meas.....	Measurement data. The three (3) columns (B, C, D) are the phases A, B and C. Column E is the test unit for the following tests.
Site ID: .....	A unique identifier for the service to be tested entered at the beginning of the test by the user, referencing a site.	Admittance.....	Admittance result. Next three (3) columns (B23, C23, D23) are the results in milliseconds (unit column E23) for phases A, B and C.
Form:.....	Meter base form of the installation.	Current .....	Current result. Next three (3) columns (B24, C24, D24) are the results in ampere (unit column E24) for phases A, B and C.
Wiring:.....	Wiring scheme of the installation, could be: Single Phase, Wye or Delta for polyphase.	[Questions] .....	This section contains preprogrammed questions (up to 8 max.) with answers from the user. If you haven't preprogrammed questions, the fields are empty.
CT Primary: .....	Nominal primary current value at the current transformer.	Question/Answer.....	Questions answered at the end of the test. The user's answers will appear here with the questions.
CT Secondary:.....	Nominal secondary current value at the current transformer.	[Geolocation].....	This section is the GPS coordinates related to the test in the field. The information comes from your mobile device at the save session.
CT Max Burden:.....	Nominal max. burden value at the current transformer.	Longitude .....	Longitude GPS. Longitude GPS coordinates value.
CT Accuracy: .....	Nominal accuracy value at the current transformer.	Latitude .....	Latitude GPS. Latitude GPS coordinates value.
PT Primary: .....	Nominal primary voltage value at the voltage transformer.	Altitude.....	Altitude GPS. Altitude GPS coordinates value.
PT Secondary: .....	Nominal secondary voltage value at the voltage transformer.		
PT Max Burden: .....	This parameter is not used in this test.		
PT Accuracy:.....	This parameter is not used in this test.		
[System].....	System information section.		
Serial Number: .....	ST-3/XT3 serial number.		
Firmware: .....	ST-3/XT3 firmware version.		
Date:.....	Date of test performed.		
[Test Data].....	Test data section. This section includes all data related to the test.		

# Appendix D

## Customer Service

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### Warranty and repairs

If your XT Series site tester or WT Series meter tester becomes defective while under warranty (two years after the original date of purchase). Probewell Lab Inc. will repair or replace it. If the unit becomes defective after the warranty has expired, Probewell Lab Inc. will repair it, but will charge the cost of labor and spare parts.

### Before returning a unit for repairs

Please do not return your tester without contacting customer service at 1-866-626-1126 or sending an email to [info@probewell.com](mailto:info@probewell.com). You will be given a detailed shipping procedure to follow.

### Technical questions

Your comments or suggestions are always welcome and will be taken into consideration when designing the next generation of our product.

If you have a technical question regarding the Probewell Connect application, the WT Series or XT Series tester or need any further assistance, please use one of the following means to contact our technical support:



**1-866-626-1126**



Email Support: [support@probewell.com](mailto:support@probewell.com).



[Support Portal knowledge base](#)



[Open a support ticket](#)



Request a personalized training webinar: [sales@probewell.com](mailto:sales@probewell.com)



[www.probewell.com](http://www.probewell.com)



We believe that field testers should be easy to use, portable and safe.

Probewell generates added value for utility companies and their customers by means of innovative metering solutions that provide accurate data-driven insight as well as flexibility and efficiency.

Through our expertise and constant innovation, we develop cutting-edge field testing technologies that deliver a premier solution for utility companies when it comes to quality, ease of use, sturdiness and customer satisfaction.

Leverage proven technologies to streamline your testing.

## Probewell Lab Inc.

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