Megger



TAU3

True Three Phase Transformer Analyzer

USER MANUAL

EN - ENGLISH

Notice

The information presented in this manual is adequate for the intended use of the product. Use of the product or its individual instruments for purposes other than those specified herein requires confirmation of their validity and suitability from Megger. Refer to the warranty information below. Specifications are subject to change without notice.

WARRANTY

Products supplied by Megger are warranted against defects in material and workmanship for a period of 1 years following shipment. The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

Megger

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610-676-8500 (Telephone)

610-676-8610 (Fax)

www.megger.com

Table of Contents

Contents

Notice 2

Table of Contents 3

Item received 8

Warnings and safety precautions 15

Technical specifications 17

Connections and controls 20

PC software installation 21

PC software update 24

PowerDB installation 26

Initialization 27

About 28

Settings 29

- Measurements & Limits Settings 30
- Nameplate 31
- Turns Ratio 33
- Resistance 34
- Degmanetization 35
- Short Circuit Impedance 36
- Frequency Response Stray Losses 37
- Efficiency 38
- Regional 39
- OTLC Control 40
- Display 41

Table of Contents

Administrative & Maintenance 42

Quick Test....43

- Confirm Vector....44
- Turns Ratio & Magnetic Balance Test Setup 45
- Phases....46
- Nameplate 47
- Turns Ratio & Magnetic Balance Test Setup 48
- Turns Ratio & Magnetic Balance Test In Progress 49
- Turns Ratio Results Screen 50
- Magnetic Balance Results Screen....51
- Resistance & Demagnetization Test Setup 52
- Winding Resistance Test In Progress 53
- Demag in Progress....54
- Resistance Result Screen 55
- Short Circuit Impedance 56
- Short Circuit Impedance & Frequency Response Stray Losses Test In Progress 57
- Short Circuit Impedance Result Screen 58
- Frequency Response Stray Losses Result Screen 59
- Efficiency Test In Progress....60
- Efficiency Results Screen All Tests....61

All Test....62

Template Test Setup 63

Asset Template....64

Template Test All Tests 65

Find Set OLTC Tap 66

Template Test Setup 67

Testing with One Touch OLTC Enabled 68

Template Test All Tests 69

Dynamic Resistance Tests 70

Dynamic Resistance Test In Progress....71

Dynamic Resistance Summary Screen....72

Transition Graph 73

Transition Details 74

Heat Run 75

- Heat Run Test Setup 76
- Heat Run Timer Started Heat Run Test Result....77
- Heat Run Test Result....78

PowerDB Import 79

Service 80

Maintenance 81

Table of Contents

Introduction

Thank you for your purchase of the Megger TAU3 True Three Phase Transformer Analyzer. The TAU3 design emphasizes safety, reliability, and ease of use. It will provide you with the information you need to test power, distribution, and instrument transformers and make informed electromechanical maintenance decisions

Purpose of this manual

This document is the user manual for the Megger TAU3 True Three Phase Transformer Analyzer. It provides a description of the instrument as well as operating instructions. Read this manual before using the equipment, with special emphasis on all safety discussions.

Audience

This manual is for technical personnel who are familiar with the various transformer measurements performed by electrical test equipment and have a general understanding of their use and operation. Such personnel should also be thoroughly familiar with the hazards associated with the use of this equipment and should have received proper safety training.

If you find any discrepancies in the TAU3 manual or have any comments, please send them to Megger via fax, e-mail, or phone.

Megger

400 Opportunity Way

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USTechSupportGrp@megger.com

For technical support, please consult the Megger web site at www.megger.com for the local distributor near you.

TAU3 Models

Part Number	Description	Image
TAU3-BASIC	62.5 VAC / 10 ADC three phase switched multifunction turns ratiometer and winding resistance ohmmeter test set	
TAU3-ADV	125 VAC / 16 ADC true three phase multifunction turns ratiometer, winding resistance ohmmeter, and short circuit impedance/leakage reactance test set	
TAU3-PRO	250 VAC / 32 ADC true three phase multifunction turns ratiometer, winding resistance ohmmeter, and short circuit impedance/leakage reactance test set	
TAU3-EXP	250 VAC / 32 ADC true three phase multifunction turns ratiometer, winding resistance ohmmeter, and short circuit impedance/leakage reactance test set with select optional hardware and software accessories included	

TAU3-BASIC and TAU3-ADV Leads

Part Number	Description	Image
2008-15KIT2	16 A H & X leads. 5 m (15 ft)	
2008-30KIT2	16 A H & X leads. 9 m (15 ft)	
2008-60KIT2	16 A H & X leads. 18 m (15 ft)	
2008-100KIT2	16 A H & X leads. 30 m (100 ft) H leads and 18 m (60 ft) X leads	
2008-30XKIT2	16 A H & X lead extensions. 9 m (30 ft)	

Part Number	Description	Image
2008-15KIT3	16 A H & 32 A X leads. 5 m (15 ft)	
2008-30KIT3	16 A H & 32 A X leads. 9 m (15 ft)	
2008-60KIT3	16 A H & 32 A X leads. 18 m (15 ft)	
2008-100KIT3	16 A H & 32 A X leads. 30 m (100 ft) H leads and 18 m (60 ft) X leads.	
2008-30XKIT3	16 A H & 32 A X lead extensions. 9 m (30 ft)	

Part Number	Description	Image
1014-927	AC Power Cords	
CA-USB	USB 2.0 Cable	
1011-622	OLTC Tap Changer Cable	
2012-180	Cable Bag – Back Pack (qty 2)	
4702-7	Ground Lead	

Item received

Part Number	Description	Image
90012-878	Blank Thumb Drive	

Optional software accessories

Part Number	Description
SW-POWERDB	PowerDB Control
SW-CUSTOMAPP	Custom application control
SW-EFFICIENCY	Transformer load, no-load, and efficiency measurements
SW-FRSL	Frequency response stray losses
SW-DRM	Dynamic resistance measurements
SW-HEATRUN	Transformer heat run / cool down measurements

Optional hardware accessories

Part Number	Description	Image
TAU3-CAL-CERT	TAU3 Calibration Certificate	
1004-639	Safety Beacon – 18 m (60 ft)	
1014-928	Transit Case (for instrument)	

Item received

90029-537	USB Printer	
90029-573-P	USB Printer Paper (48 rolls)	
2005-249	1:1 Test Jig	
1011-622-A	OLTC tap changer cable adapters	
TRS1PLUS	TRS1+ turns ratio calibration standard	
TOS1	TOS1 resistance calibration standard	

ORDERING INFORMATION

Item (Qty)	Cat. No.
TAU3 BASIC and ADV lead sets	
16 Amp H leads with red jacket and red, yellow, blue, and white clamps (4 total)	
16 Amp X leads with black jacket and red, yellow, blue, and white clamps (4 total)	
5 m (15 ft) H and X leads	2008-15KIT2
9 m (30 ft) H and X leads	2008-30KIT2
18 m (60 ft) H and X leads	2008-60KIT2
30 m (100 ft) H and 18 m (60 ft) X leads	2008-100KIT2
Optional Lead Accessories	
TAU3 BASIC and ADV 16 A H and 16 A X lead extensions	
9 m (30 ft) H and X extensions	2008-30XKIT2
Included Accessories - BASIC, ADV, PRO, EXP	
AC Power Cords (US, EU, UK)	1014-927
USB 2.0 Cable	CA-USB
OLTC Tap Changer Cable	1011-622
Cable Bag – Backpack	2012-180
Ground Lead 4.5m (15 ft)	4702-7
Thumb Drive	90012-878
Included accessories - EXP	
Second Cable Bag - Backpack	2012-180
OLTC Tap changer cable adapters	1011-622-A
USB printer	90029-573
Safety beacon - 18 m (60 ft)	1004-639
Included accessories - PRO	
Second Cable Bag - Backpack	2012-180
Optional Software Accessories	
PowerDB control	SW-POWERDB
Custom application control	SW-CUSTOMAPP
Transformer efficiency measurements	SW-EFFICIENCY
Frequency response stray losses measurements	SW-FRSL
Dynamic resistance measurements	SW-DRM
Transformer heat run measurements	SW-HEATRUN

Item (Qty) For Price List	Cat. No.
TAU3 PRO and EXP lead sets	
16 Amp H leads with red jacket and red, yellow, blue, and white clamps (4 total)	
32 Amp X leads with black and white stripe jacket and red, yellow, blue, and white clamps (4 total)	
5 m (15 ft) H and X leads	2008-15KIT3
9 m (30 ft) H and X leads	2008-30KIT3
18 m (60 ft) H and X leads	2008-60KIT3
30 m (100 ft) H and 18 m (60 ft) X leads	2008-100KIT3
Optional Lead Accessories	
TAU3 PRO and TAU3 EXP 16 A H and 32 A X lead extensions	
9 m (30 ft) H and X extensions	2008-30XKIT3
Optional Hardware Accessories	
Calibration Certification	TAU3-CAL-CERT
Safety Beacon – 18 m (60 ft)	1004-639
Transit case (for instrument)	1014-928
USB Printer	90029-573
USB Printer Paper (x48 rolls)	90029-573-P
1:1 Test Jig	2005-249
OLTC Tap changer cable adapters	1011-622-A
Motor current monitor	1014-929
Temperature probe kit	1014-931
TRS1+ Calibration Standard	TRS1PLUS
TOS1 Calibration Standard	TOS1
15 kV TX probe adapter	210.00012
25 kV TX probe adapter	210.00011

Warnings and safety precautions

Safety

Warnings and safety precautions

F **WARNING!**

Death, serious injury, or fire hazard could result from improper use of this instrument. Read and understand this manual before installing this instrument.

Usage of this instrument must comply with the National Electric Code and any additional safety requirements applicable to your country and company policies.

Qualified personnel MUST perform operation and maintenance of this instrument. The National Electrical Code defines a qualified person as one familiar with the construction and operation of the equipment and the hazards involved.

Safety Precautions

Take the following safety precautions whenever the instrument is used:

- **Wear safety glasses and insulated gloves when making circuit connections**
- **Hands, shoes, floor/ground must be dry when making any connection to a powered line**

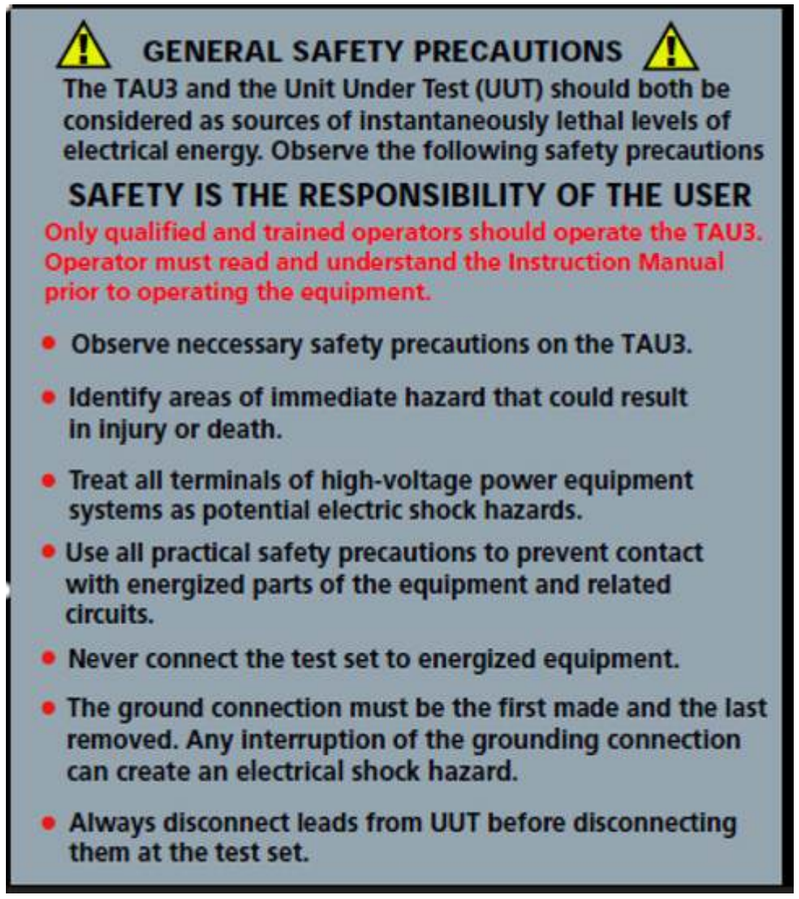
These warnings and safety precautions are to be used where appropriate when following instructions in this manual.

G **CAUTION!**

The equipment could be impaired from improper use not specified in this user guide. Read the complete manual before use.

G **CAUTION!**

Do not use detachable mains supply cords with inadequate electrical ratings.



Max Technical Specifications

Specifications - Valid from -20 ° to +50 °C

Input power

100-240 V AC, 47-63 Hz, 1200 W
±10% Mains supply voltage fluctuations Overvoltage category II

Output power

Voltage	3-phase, 1-100 V
Frequency	DC, 40-480 Hz
Current	0.1 mA – 1 A @ 100 V
Current	0.1 mA – 32 A @ 24 V

Regulatory

Safety	IEC 61010-1:2010 + AMD1:2016
EMI/EMC	IEC 61326-1:2012
RoHS2	EN50581
Vibe/Shock	MIL-STD-810G
Ingress protection	IP65 (Lid closed)

Transformer testing standards

IEEE	C57.152-2013
IEC	60076-1:2011
AS/NZS	6076 1:2014
CIGRE	445 2 011
GOST	3484.1-88

Dimensions 55.8 x 28.7 x 19 cm
22 x 11.3 x 7.5 in

Weight 17 kg 38 lbs

Case

Rugged case with built in wheels and handle

Backpack lead bag for leads and accessories

Internal/external data storage

Up to 10 000 sets of three-phase results internal storage

Transferable via USB 2.0 drive

Communication/control software

USB Interface for PC Control with custom GUI

Touch screen (optional)

25.6 cm 10.1 in

1024 x 600 Resolution

1000 NITS

Printer (optional)

51 mm (2 in) thermal printer

Prints all measurement data displayed on GUI

Environmental

Operating	-20 ° to 50 °C (-4 ° to 122 °F)
Storage	-30 ° to 70 °C (-22 ° to 158 °F)

Relative Humidity 0-90 %, non-condensing

Indoor and outdoor use in dry locations
Elevation 2000 m MAX
Pollution degree 2

TTR

Turns ratio measurement methods

3-phase step up

3-phase step down

1 phase step up

1 phase step down

Turns Ratio Range and Accuracy

Step Down Excitation

25-100 V		
		±0.05 % 0.8 – 1000
		±0.10 % 1001 – 2000
		±0.30 % 2001 – 15000
		±0.60 % 15001 – 50000
1-24 V		
		±0.10 % 0.8 – 1000
		±0.20 % 1001 – 2000
		±0.60 % 2001 – 15000

Step Up measurement

25-250 V	
	±0.05 % 0.8 – 200 (most Power Tx)
1-24 V	
	±0.10 % 0.8 – 200

Excitation current resolution

Resolution	0.1 mA, 0.1 mA – 100 mA
	1.0 mA, 101 mA – 11 A

Excitation current accuracy

	±1 % Reading, ±0.1 mA
Frequency accuracy	±1 % Reading, ±0.1 Hz
Phase range	Range 0 – 360 °
Phase accuracy	±0.05 °
Max voltage output	90 VACpk

Voltage accuracy Typical ±0.1 % reading, ±0.1 mV
Guaranteed ±0.5 % reading

Specified accuracy for external verification only and does not impact AC tests accuracy (TTR, Magnetic Balance, SCI, FRSL, or Losses)

WR

Resistance measurement methods

1 phase wye, delta, zigzag

2 phase wye w/neutral

3 phase wye w/neutral

Dual winding excitation

DC Open circuit voltage

Up to 100 V

DC Measurement voltage

Up to 100 V

ADV/PRO/EXP Resistance accuracy

1.0 µΩ to 30 kΩ

±0.1 % reading, ± 1µΩ

30+ kΩ

±0.5 % reading

BASIC Resistance accuracy

1.0 µΩ to 30 kΩ

±0.2 % reading, ± 1µΩ

30+ kΩ

±0.5 % reading

Resistance resolution 5 digits

DC voltage accuracy ±0.05 % reading, ±0.1 mV

DC current accuracy ±0.05 % reading, ±0.1 mA

Current and resistance ranges

Typical with 9 m (30 ft) leads

Current	Min Ω	Max Ω
32 A	1.0 µΩ	400 mΩ
16 A	1 mΩ	1.0 Ω
8 A	1.0 Ω	2.0 Ω
1 A	2.0 Ω	20 Ω
100 mA	1.0 Ω	100 kΩ

Dynamic resistance measurement method

Dynamic voltage
Dynamic current

Dynamic resistance

Dynamic Resistance Speed

Speed 20 kHz

SCI FRSL

Impedance measurement methods

1 Ø

Frequency range 40 – 480 Hz

Impedance measurement range

0.1 Ω - 700 Ω

Impedance accuracy ±1% reading, ±0.10 mΩ

Reactance measurement range 0.1 Ω - 700 Ω

Reactance accuracy ±1 % reading, ±0.10 mΩ

Inductance accuracy ±1 % reading, ±10 µH

Power factor range 0.1 % – 100 %

Power factor accuracy

±5 % reading

AC Current accuracy ±0.2 % reading, ±0.1 mA

Efficiency

Total losses accuracy ±10 %

Motor current measurement (optional)

9 V battery power

Measuring range: 3.0 A/30 A

Frequency range: DC to 60 Hz

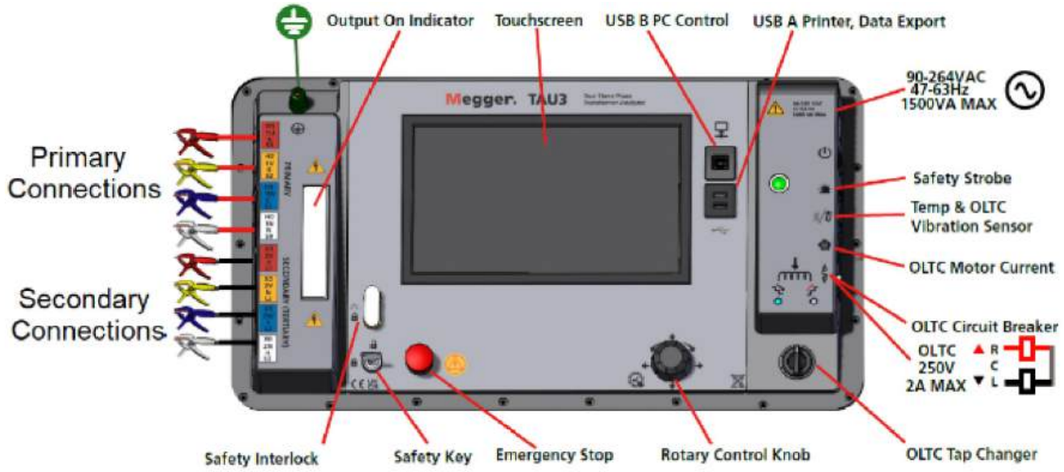
Resolution: ± 50 mA / ± 100 mA

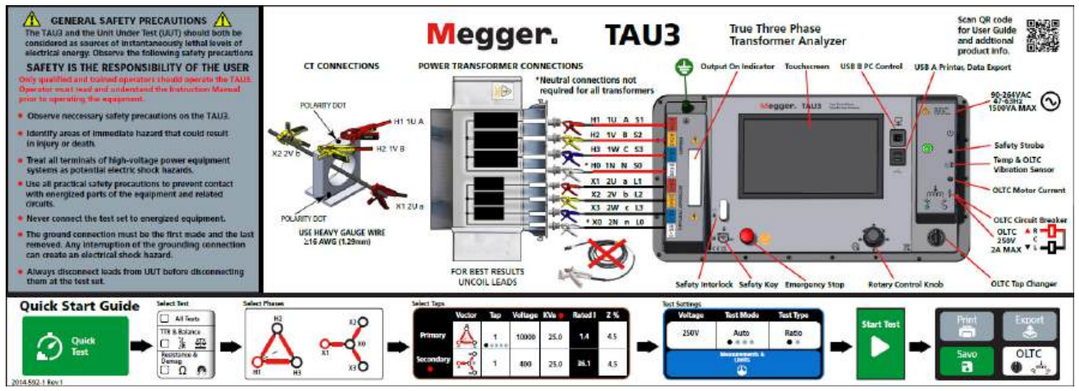
Accuracy: ±1 % reading

Temperature probe measurement (optional)

Range: -20 °C to 110 °C

Accuracy: ±1 % reading. ± 1.0 °C





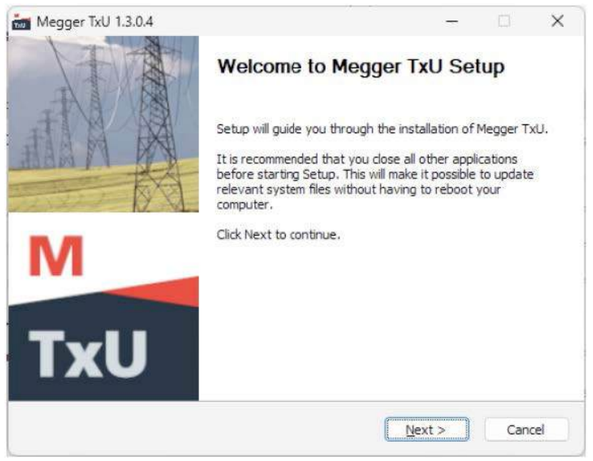
Before installing PC software, contact your IT department. Your IT department can assist with install and provide administrator approval if required.

Control of the TAU3 is possible from the built-in touchscreen or from a USB connected PC with the PC software installed. To install the PC SW:

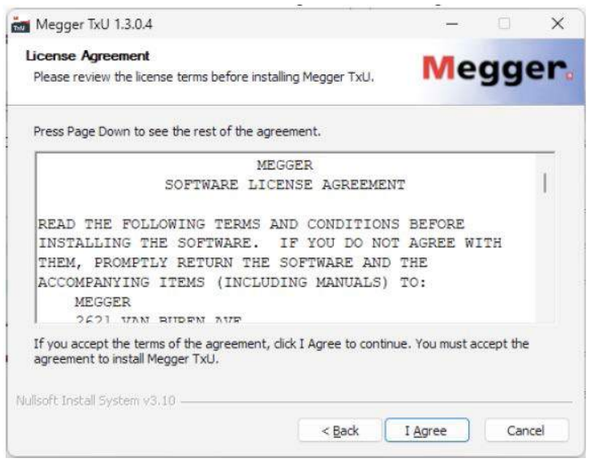
1. Locate the TAU3 PC software installer
    a. From the TAU3
        i. Connect the TAU3 to a PC with the included USB cable
        ii. Turn on the TAU3
        iii. After initialization, a CD drive will appear on the PC which contains the software
        iv. Locate the file named Megger_TxU_installer_X.xxx.exe. X.xxx is the version.
    b. From the internet
        i. Go to www.megger.com/TAU3
        ii. Download the latest PC installer
2. Double click to launch the installer
3. Select a language for the install and click OK.



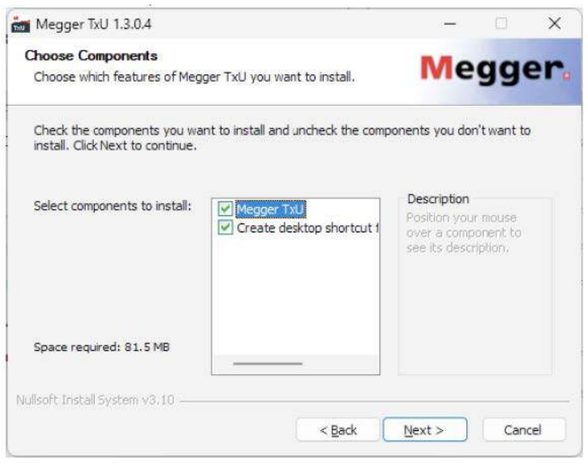
4. Click Next on the welcome screen



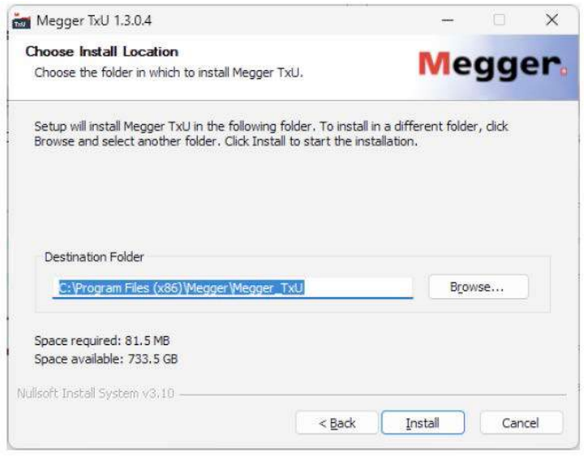
5. Review the license agreement and click I Agree



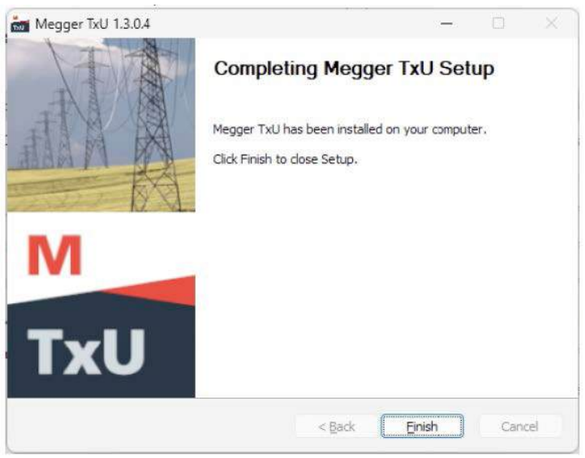
6. Choose components and select Next. Defaults recommended.



7. Select Install Location and click Install. Defaults recommended.

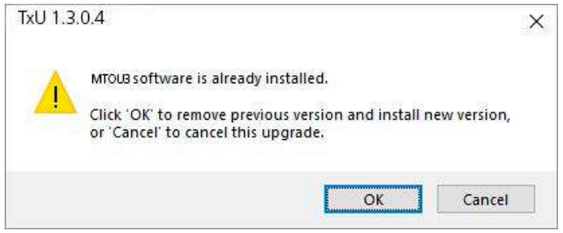


8. Click Finish to complete the install.



When updating to a new version of the TAU3 software, the installer will remove the installed version of software.

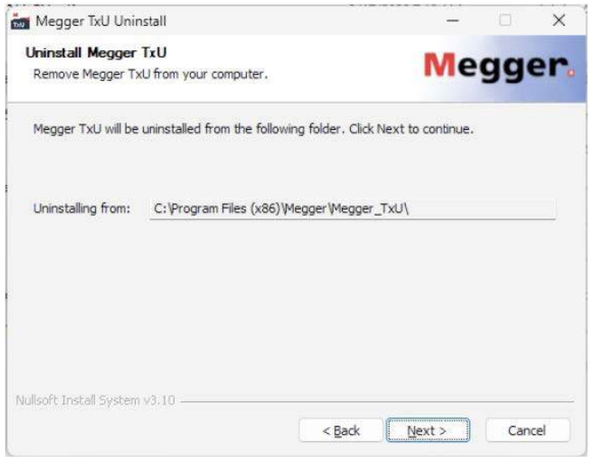
1. Locate the updated TAU3 PC software installer
    a. From the TAU3
        i. Connect the TAU3 to a PC with the included USB cable
        ii. Turn on the TAU3
        iii. After initialization, a CD drive will appear on the PC which contains the software
        iv. Locate the file named Megger_TxU_installer_X.xxx.exe. X.xxx is the version.
    b. From the internet
        i. Go to www.megger.com/TAU3
        ii. Download the latest PC installer
2. Double click to launch the installer
3. Click OK to remove the previous TAU3 version



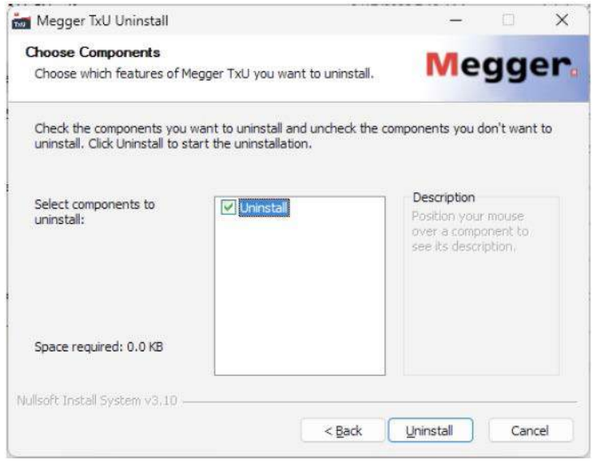
4. Click Next on the welcome screen



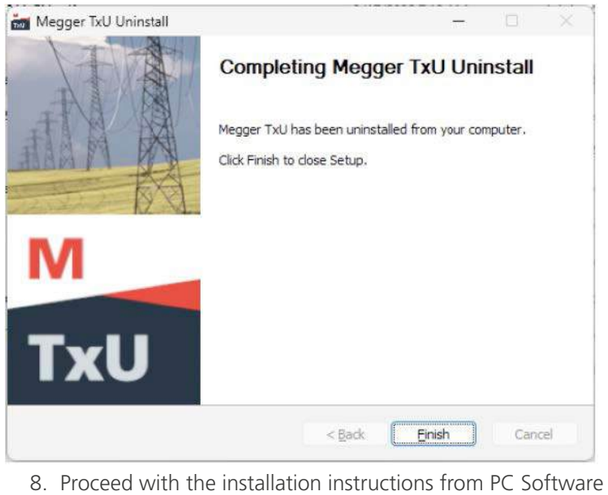
5. Click Next on the uninstall TAU3 software screen



6. Click Uninstall



7. Click Finish



8. Proceed with the installation instructions from PC Software Installation

PowerDB Installation

PowerDB can import TAU3 data. In addition, PowerDB can control the TAU3 with the optional SW-POWERDB license.

To install PowerDB, download the latest version from www.powerdb.com. Follow the instructions on screen to install PowerDB.

Initialization

After turning on the TAU3, the Megger logo will display, followed by a progress screen during system initialization.

Home Screen

After the TAU3 has initialized, the display will show the home screen.



There are six options to select from the Home Screen.

- About
- Settings
- Quick Test
- Results
- Asset Template
- Template Test
- Diagnostic **(Included with EXP model, optional in all other models)**

Through the software, you will see the following buttons.

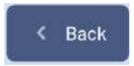
Accept - Used to confirm choices/changes



Reject/Cancel - Used to cancel changes



Back - Used to return to the previous screen



Home - Used to return to Home screen



The about screen provides detailed information about the TAU3.

Scan the QR code to go to the TAU3 product page on www.megger.com



In addition, the following options are available:

- User Guide
  - Access the user guide of the TAU3

- 1:1 Lead and Instrument check
  - Performs a guided lead and instrument check

- More actions
  - Display additional actions the user can take



In addition, the following options are available:

- Export logs
  - Used to update the TAU3 to a different software version or to apply a license file. Insert a USB drive with the appropriate .mender or .lic file and follow the directions on screen to complete the update

- Updates
  - Used to update the TAU3 to a different software version

- Device Self-Check
  - Used to perform hardware verificationof the TAU3

Settings

The settings screen provides options to configure the TAU3 to meet regional and testing needs.



There are five options on the settings screen

- Measurement & Limits
  - Configure nameplate and set limits for output and measurement verification
- Administrative & Maintenance
  - Perform lead calibration and restore factory settings
- OLTC Control
  - Configure the tap changer controller for on load tap changers
- Regional
  - Configure the TAU3 to the region it is being used
- Display
  - Adjust brightness of the display

Measurements & Limits Settings

The measurements & limits settings are separated into ten sections. Swipe left or right, or click the area below the cancel and accept buttons to change sections



General

- Line Frequency
  - Set to 50 or 60 Hz for excitation and short circuit impedance testing.
- Test Buzzer
  - Enable or disable a countdown before each test.
- Verify Connection
  - Enable or disable connection verification before each test. Disable if only one side of the transformer is connected to the TAU3. Will be automatically enabled after power cycle.
- Verify Tap Changer
  - When enabled and performing template tests on multiple OLTC taps, the TAU3 will perform a multistep process to ensure that the OLTC is properly connected to the TAU3.
- Error Limited OLTC
  - When enabled and performing turns ratio template tests on multiple OLTC taps, the TAU3 will automatically stop if the percent error limited is exceeded.
- Auto Continue
  - When enabled, the TAU3 will boot to the test setup screen of the last test that was being run.
- One Touch OLTC
  - When enabled, the One Touch OLTC option will be enabled by default when performing Template Tests that have an OLTC.
- Color Rating on Results
  - Enable to emphasize measurements that exceed limits.
- Show USB Thumb Drive
  - When enabled, a USB drive containing the PC software will appear when the TAU3 is connected to a PC.
- Output Indicator Brightness
  - Change the output brightness of the warning indicator.
- Export Folder
  - Changeo the default folder where results are exported on a PC.

Nameplate

Configure the default nameplate used when performing tests

- Standard
  - Choose from ANSI, IEC, Australian, or GOST
- Primary Vector
  - Choose the default primary vector from the dropdown
- Secondary Vector
  - Choose the default secondary vector from the dropdown
- Primary L-L Voltage
  - Enter the default primary line to line voltage
- Secondary L-L Voltage
  - Enter the default secondary line to line voltage
- Capacity Display
  - Choose from KVA or MVA
- Impedance Display
  - Choose from Z% or Z Ω
- Primary Winding Material
  - Choose from Copper or Aluminum
- Secondary Winding Material
  - Choose from Copper or Aluminum
- Primary Tap Changer
  - Choose from DETC, N/A, or OLTC
- Secondary Tap Changer
  - Choose from DETC, N/A, or OLTC
- Primary Tap Labels
  - Choose from A,B,C | 1,2,3 | 1R,N,1L | +1,0,-1
- Secondary Tap Labels
  - Choose from A,B,C | 1,2,3 | 1R,N,1L | +1,0,-1
- Primary number of taps
  - Choose the default number of primary taps
- Secondary number of taps
  - Choose the default number of secondary taps
- Tap Phase Shift
  - Choose from On or Off
- # of OLTC Nominals
  - Choose the number of OLTC nominals to display
- Roud Tap Voltages
  - Choose from 1 V, 5 V, or 10 V
- Winding Temperature

- Enter a default winding temperature

- Temperature Rise
  - Enter the default temperature rise of the transformer. This will automatically update Correct Winding to Temperature setting
- Correct Winding to Temperature
  - Set to On or Off. When enabled, winding resistance, short circuit impedance, and efficiency results will be automatically calculated to the corrected temperature
- Auto Transformer / VREG Labels
  - Set to use H1/H2 or S, L
- 1P Primary/Secondary Connections
  - Choose to use the H1-H2/X1-X2 or H1-H0/X1-X0 connections
- Additive/Subtractive Labels
  - Choose from Additive/Subtractive, Reversed/Normal, or No Label

Turns Ratio

Configure the turns ratio settings used when performing tests

- Max Test Voltage
  - Set maximum induced voltage limit
  - Maximum induced voltage will be limited based on model
- Mode
  - AUTO (recommended)
  - 3Ø up (Not available in BAISC model)
  - 3Ø down (Not available in BAISC model)
  - 1Ø up
  - 1Ø down
- Ratio Display
  - Choose from TNR or TTR
- Ratio Error Limit
  - Set the turns ratio evaluation criteria. 0.5% recommended.
- Phase Deviation Display
  - Set the default phase deviation display. Absolute will show total deviation of the measured phase compared to the excited phase. Relative will show total deviation of the measured phase compared to the excited phase less the expected deviation of the measured phase.
- Phase Unit
  - Choose from degrees °, minutes ‘, or ms
- Phase Deviation Limit
  - Set the default phase deviation limit. Recommended 0.5°

Magnetic Balance

Configure the magnetic balance settings used when performing tests

- Imbalance Limit
  - Set imbalance limit. Recommended 3.0%
- Show on Quick Test
  - When enabled, magnetic balance will be automatically performed with each turns ratio quick test
- Show on Template test
  - When enabled, magnetic balance will be automatically performed with each turns ratio template test
- Preferred Winding
  - Choose from Auto, Primary, or Secondary.
    - When set to Auto, the wye with neutral (YN or yn) winding will be tested. If both or neither windings are wye with neutral, the primary winding will be tested

Resistance

Configure the winding resistance settings used when performing tests

- Max Current
  - Set the maximum current limit. Applies to primary and secondary windings
  - Maximum current will be limited based on model
- Stability %
  - Set the stability criteria for winding resistance tests
- Stability time
  - Set the time the stability % must be maintained to indicate a measurement is stable
- Auto Save
  - When enabled, results will automatically save when stability time and % criteria have been met
  - When performing winding resistance on multiple OLTC taps in template tests, Auto Save will be disabled for the first tap of each phase. After saving the first tap, the test will automatically save for the remaining taps for that phase.
- Max Winding Difference
  - Set the maximum resistance difference evaluation criteria. Recommended 2.0%
- Winding Difference Calculation
  - - ANSI/IEC
    - Diff % = ((Rmax - Rmin) / Ravg) x 100
  - - CEE
    - Determine |Max Phase Error| from
    - AVG = (Phase 1 + Phase 2 + Phase 3)
    - Phase 1 Error = Phase 1 - AVG
    - Phase 2 Error = Phase 2 - AVG
    - Phase 3 Error = Phase 3 - AVG
  - - Diff % = (|Max Phase Error| / AVG) * 100
- Dual Winding Excitation
  - When enabled, primary and secondary will be energized and measured simultaneously
- YN/ZN excitation
  - Choose from Phase to Neutral or Phase to Phase
- Make Before Break
  - Set current sag (10%) time limit during OLTC transitions. 5 ms recommended
- Hard Break
  - Set limit for hard breaks during winding resistance tests
  - **200 ms recommended. This setting is used to protect the operator during inadvertent lead disconnections during winding resistance tests**

Demagnetization

Configure the demagnetization settings used when performing tests

- Phase
  - Select a phase or all phases. Recommended B Phase
- Auto Demag After Resistance
  - When enabled, the TAU3 will automatically demagnetize the transformer after a resistance test has been performed
- Auto Demag After DRM
  - When enabled, the TAU3 will automatically demagnetize the transformer after a dynamic resistance test has been performed
  - **Optional setting. Included with DRM software and EXP model**

Short Circuit Impedance

Short Circuit Impedance

Configure the short circuit impedance settings used when performing tests

Not available in the BASIC model

- % Error Limit
  - Set the evaluation criteria used for short circuit impedance tests. Recommended 3.0%
- Impedance
  - Choose from Z % or Z Ω used in nameplate entry

Frequency Response Stray Losses

Frequency Response Stray Losses

Configure the frequency response stray losses settings used when performing tests

Not available in the TAU3-BASIC

Optional software for the ADV and PRO model. Included in the EXP model

- Frequencies to Test
  - Select the frequencies used for frequency responses of stray losses test
    - 8
    - 16
    - 32
    - 40
    - 50
    - 60
    - 80
    - 100
    - 200
    - 300
    - 400
    - 480
- Show on Quick Test
  - When enabled, the frequency stray losses tests will be automatically performed with each short circuit impedance quick test
- Show on Template Test
  - When enabled, the frequency stray losses tests will be automatically performed with each short circuit impedance template test
- Inductance Error Limit
  - Set the evaluation criteria used for inductance. Recommended 2.5%
- Rs Error Limit
  - Setthe evaluation criteria used for Rs. Recommended 15%

Efficiency

Configure the efficiency settings used when performing tests

Not available in the TAU3-BASIC

Optional software for the ADV, PRO, and EXP model

- Show on Quick Test
  - When enabled, , the efficiency tests will be listed during quick tests
- Show on Template Test
  - When enabled, the efficiency tests will be listed during template tests
- Correct to Load %
  - Choose the default load % used for correction of efficiency results

Dynamic Resistance

Optional software for the BASIC, ADV, and PRO model. Included in the EXP model.

- Excitation mode
  - 1 ϕ Open
  - 1 ϕ Shorted
  - 3 ϕ Shorted
- Motor Current Measurement
  - Choose from enabled or disabled
- Motor Current Sensitivity
  - Choose from 1 mV / 10 mA or 1 mV / 100 mA
- Stability %
  - Set the stability % used to determine when to monitor for dynamic resistance

Stability Time

- Set the time required at the stability % before monitoring for dynamic resistance

Regional

Select the preferred language, number format, date format, and time format for the TAU3. Date and time can be set on the TAU3. When controlled by a PC, the TAU3 will use the PC date and time.



OTLC Control

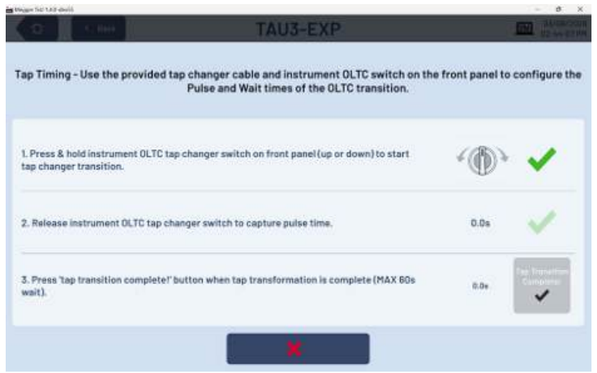
Never connect the TAU3 directly to the motor drive of the OLTC. Only connect the TAU3 to the OLTC control circuit.

Set the pulse and wait time for OLTC control. Pulse is the duration required to initiate a tap change. Wait is the amount of time the tap changer requires to complete the tap changer initiation.



Select the Tap Timing button to use the OLTC controls on the TAU3 to se the pulse and wait time.

Follow the directions on screen



Choose from dark or light mode

Display

Use the slider to adjust the brightness of the TAU3 display

Calibrate the touchscreen if required



Administrative & Maintenance

After clicking on the Administrative & Maintenance setting, a password dialog box will appear.

Enter the password 2621 to proceed.



Lead calibration is used for accurate impedance and efficiency test results. A one-time lead calibration is typically required when using leads different than the default 9 m (30 ft) calibration. Follow testing best practices when calibrating the leads by fully uncoiling and extending leads.

Restore factory settings is used to reset the TAU3 back to the original settings from the factory.

User will be prompted to confirm.



Quick Test

After selecting quick test, test options will display on the left hand side of the screen. Enter a Test ID for test identification.



Confirm vector automatically detects the vector of the connected transformer.

Confirm Vector



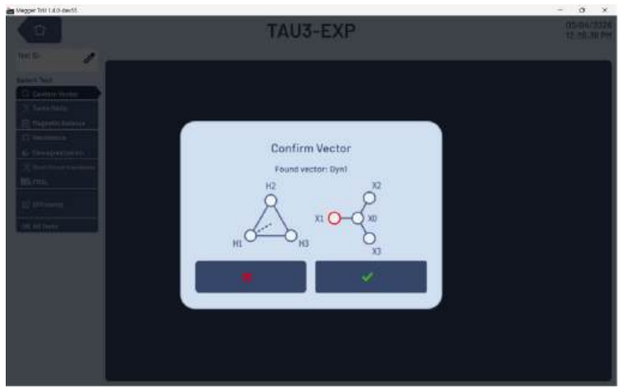
Select Start Confirm Vector to begin the test

When confirm vector is completed, the vector found will be displayed. Verify the vector matches the nameplate of the transformer under test and select Accept. If the vector does not match the nameplate, select Reject.

It is the responsibility of the user to confirm that the vector matches the transformer under test. Megger accepts no responsibility for incorrectly identified vectors.

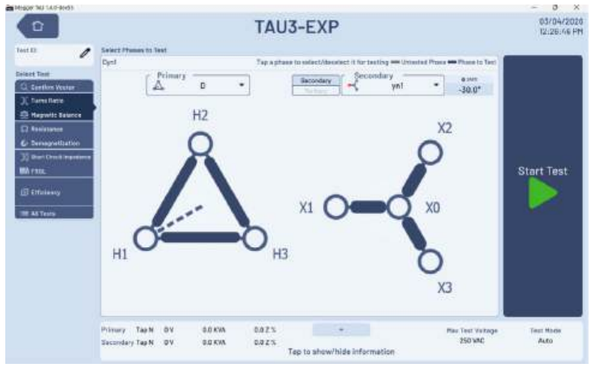
Clicking accept will select the vector found and progress quick test to TTR test setup.

Clicking reject will return to the confirm vector screen.



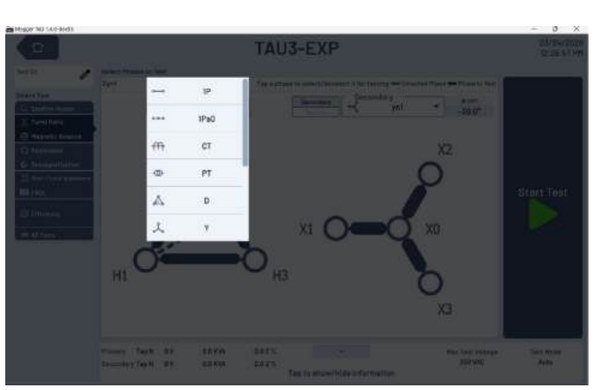
Turns Ratio & Magnetic Balance Test Setup

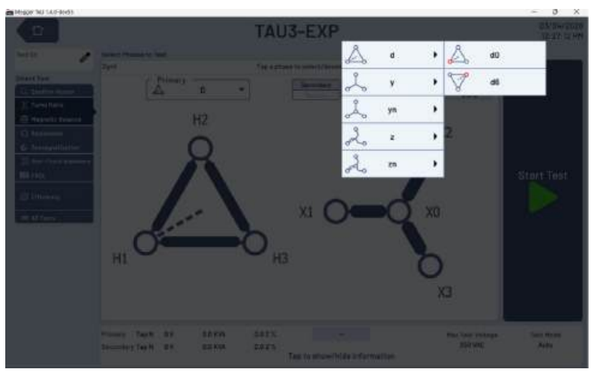
Select TTR & Balance, Resistance & Demag, Short Circuit Impedance & FRSL, Efficiency, or All Tests to display the Select Vector, Select Phases to Test, and Select Taps to Test sections.



Vector

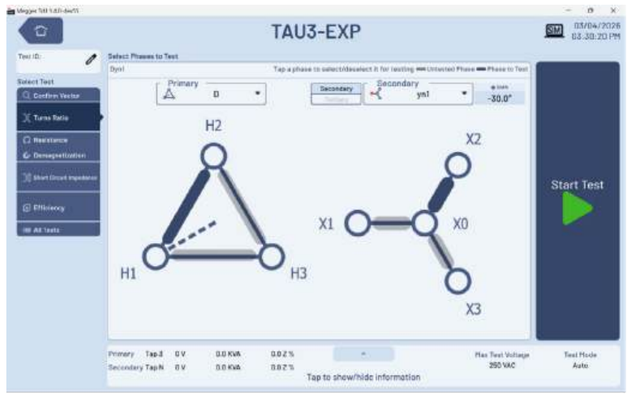
To change vectors, select the dropdowns. Secondary can also be changed to Tertiary.





Phases

Click on the individual phases to disable/enable them for testing. Note the legend at the top of the Select Phases to Test window indicating which phases will be tests and which phases will not be tested..



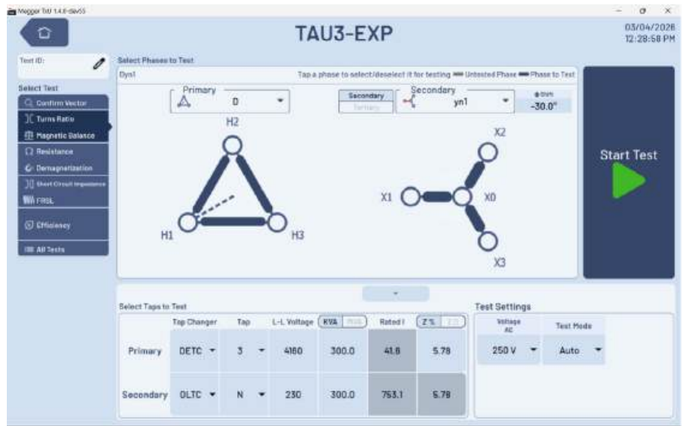
Nameplate

Nameplate

To enter nameplate information or adjust test settings, click the area where “tap to show/hide information” is displayed. The nameplate section will populate with default settings from Measurement & Limits. Enter tap information for the transformer for evaluation against limits. Base KVA can be changed to Base MVA.

Entering tap voltages for two taps of a winding will automatically calculate tap voltages for the remaining taps of the winding.

Entering L-L voltage and base KVA/MVA will calculate RATED I for the transformer



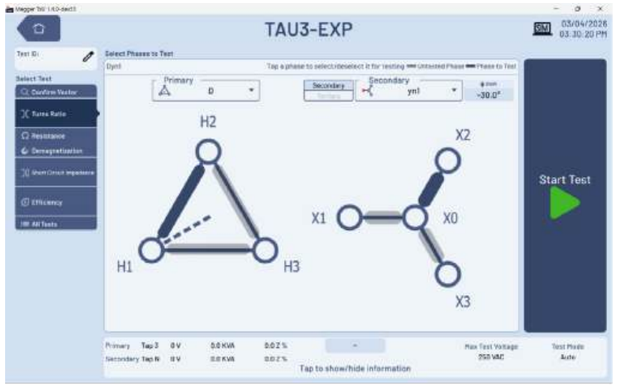
Turns Ratio & Magnetic Balance Test Setup

Turns Ratio & Magnetic Balance Test Setup

If Magnetic Balance is disabled in settings, only TTR will display in the Select Test section.

Voltage and Test Mode settings are available when Turn Ratio and Magnetic Balance is selected.

Test Mode Auto will determine the best method for testing the transformer: 3O or 1O, step up or step down. Changing the test mode fill force the TAU3 to test in a specific mode, which can be useful for troubleshooting transformer problems.

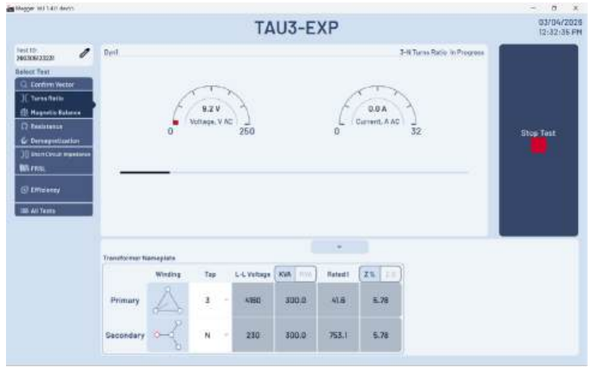


Click Start to begin testing.

Turns Ratio & Magnetic Balance Test In Progress

Turns Ratio & Magnetic Balance Test In Progress

Test voltage and current are displayed, along with a progress bar.



Turns Ratio & Magnetic Balance Test In Progress

Test voltage and current are displayed, along with a progress bar.



Click the Turns Ratio card to see the individual phase results for turns ratio

Click the Magnetic Balance card to see the individual phase results for magnetic balance

Click Start Resistance to proceed to the resistance test

Click Test Setup to return to the test setup

Click Export to export the results to a USB drive or to your PRC

Click Print (not displayed) to print the results to the optional 2" printer.

Turns Ratio Results Screen

Turns Ratio Results Screen

Ratio Display, % Error, and Phase Deviation options can be adjusted as desired.

Click the small arrow to display page two with induced/excitation voltage and excitation current.





Magnetic Balance Results Screen

Magnetic Balance Results Screen

Click the small arrow to see page 2 of the magnetic balance results





Resistance & Demagnetization Test Setup

Voltage DC, Primary A DC, Secondary A DC, Stability %, Stability Time, and Auto Save settings are available when Resistance & Demagnetization is selected.

Primary test current is determined by the RATED current of the primary winding. The TAU3 will select 10% of rated current, or the maximum output of the TAU3, whichever is lower. TAU3 BASIC maximum primary current is 10 A.

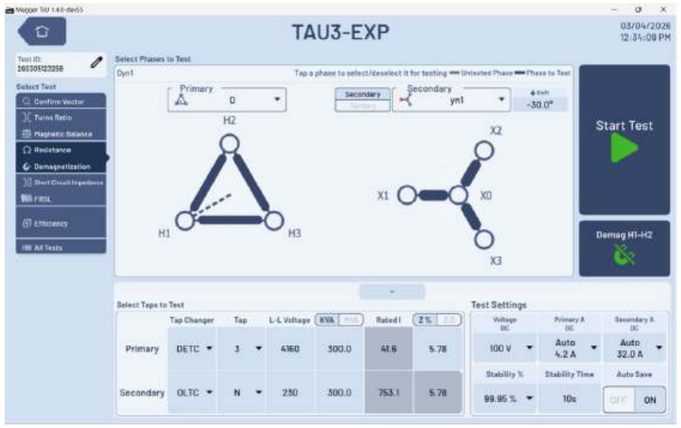
TAU3 ADV, PRO, and EXP maximum primary current is 16 A.

Like primary test current, secondary test current is determined by the RATED current of the secondary winding. The TAU3 will select 10% of rated current, or the maximum output of the TAU3, whichever is lower. TAU3 BASIC maximum secondary current is 10 A. TAU3 ADV maximum secondary current is 16 A.

TAU3 PRO and EXP maximum secondary current 32 A.

Click Start Test to start the winding resistance test.

Click Demag to start the demagnetization routine.



Winding Resistance Test In Progress

Winding Resistance Test In Progress

Resistance, current, stability %, and stability time will be displayed for each winding. When the stability % exceeds the set limit, a timer will start. When the timer exceeds the setting for both windings, the Save button will turn green. If Autosave is enabled, the result will automatically save, and the next phase will be tested. If no more phases remain to be tested, the winding resistance test will finish by discharging the transformer. Discharge is indicated by flashing yellow lights of the output indicator.

Do not disconnect the leads from the transformer or TAU3 during discharge. In the event of power loss during winding resistance tests or discharge, the TAU3 will continue to discharge the transformer passively, indicated by red LEDs on the output indicator. When discharge is complete, the LEDs will turn off, and the leads can be removed.



Demag in Progress

If Auto Demag after Resistance is enabled, or if Demag is selected from the Resistance & Demagnetization screen is clicked, the Demag in progress screen will be displayed.

Demag is performed by applying +DC voltage and measuring the time it takes for the transformer core to begin saturation. Polarity is then reversed, and time is measured until saturation occurs in the opposite direction. Based on these initial tests, +DC and -DC voltage is applied in decreasing time intervals until the transformer is demagnetized.



Resistance & Demag Test Complete

After resistance and demag is complete, the cards will be added to the quick test results if there are previous turns ratio results. Results that exceed limits will be highlighted in red. Select the individual card to view the results.



Resistance Result Screen

Resistance Result Screen

Phases that fail will be highlighted in red. There will be an option to retest phases that fail above the Test Setup button.

Options will be displayed for changing the primary and secondary winding material, difference limit evaluation, winding temperature, corrections, and Correct to °C



Demagnetization Test Complete Screen

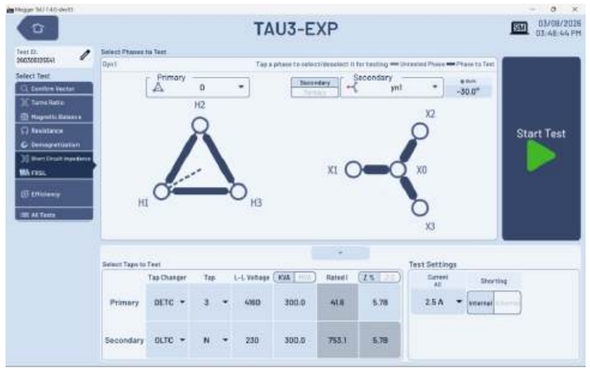
The phase(s) that was demagnetized, along with before and after remanence and demag time will be displayed.



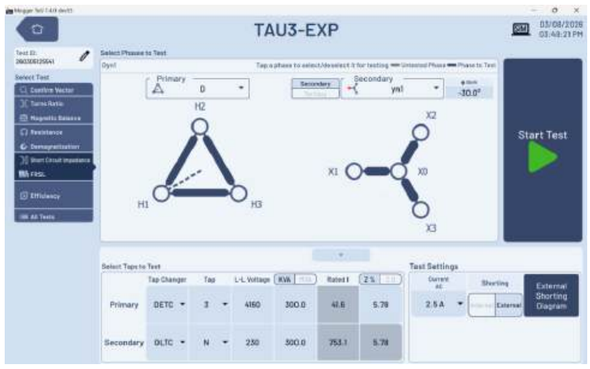
Short Circuit Impedance

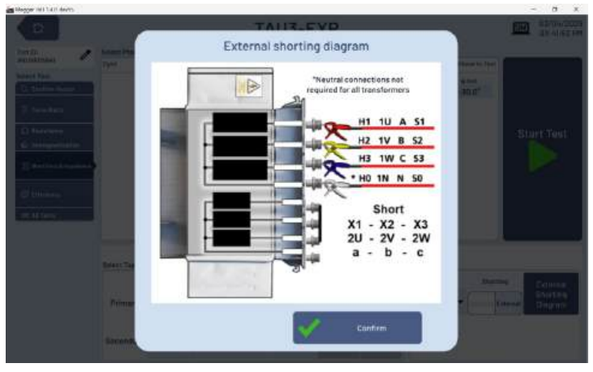
Short Circuit Impedance

Current AC and shorting options will be displayed when Short Circuit Impedance / Leakage Reactance and Frequency Response Stray Losses is selected. Test Current cannot be changed.



Selecting external shorting will show a new button, external shorting diagram, which will show a shorting diagram when selected

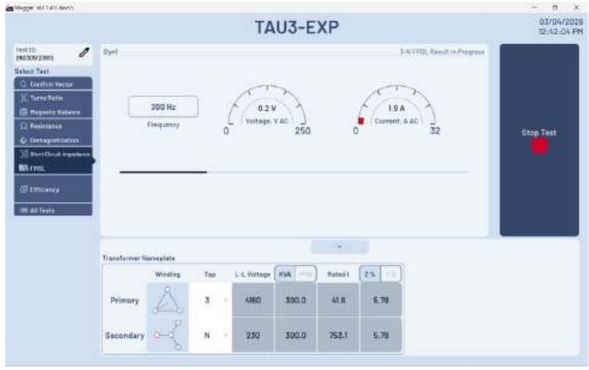




Short Circuit Impedance & Frequency Response Stray Losses Test In Progress

Short Circuit Impedance & Frequency Response Stray Losses Test In Progress

Frequency, voltage, and current along with a progress bar will be displayed during short circuit impedance & frequency response stray losses tests.



Short Circuit Impedance & Frequency Stray Losses Test Complete

After short circuit impedance & frequency results stray losses is complete, the cards will be added to the quick test results if there are previous turns ratio or resistance results. Results that exceed limits will be highlighted in red. Select the individual card to view the results.



Short Circuit Impedance Result Screen

Short Circuit Impedance Result Screen

% Error can be adjusted. If the efficiency software is enabled on the TAU3, the start efficiency button will be displayed.

Primary winding, secondary winding, Winding °C, Corrections, an Correct to °C can be adjusted.

Select the arrow to view the second page of results with detailed test information.





Frequency Response Stray Losses Result Screen

Frequency Response Stray Losses Result Screen

Use the small arrow to view the second page of results with detailed test information.

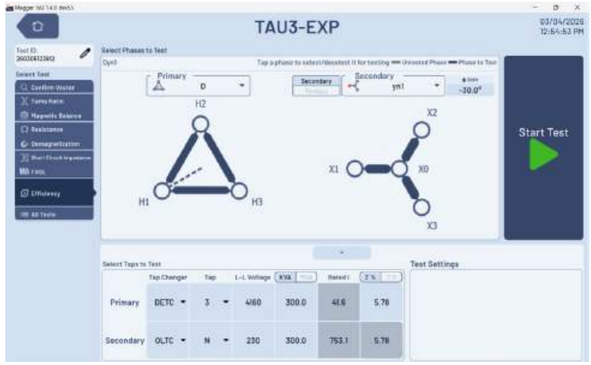




Efficiency Test Setup

There are no adjustable settings for the Efficiency Test.

Click start to begin the test.



Efficiency Test In Progress

Efficiency Test In Progress

Voltage and current will be displayed while testing efficiency.



Efficiency Test Complete

The following screen will be displayed in turns ratio, resistance, or short circuit impedance tests have been run before efficiency.

Click the efficiency card to view detailed test information.



Efficiency Results Screen All Tests

Efficiency Results Screen All Tests

Total losses will be displayed per phase, along with three phase efficiency %. Click the small arrow to view additional test data.





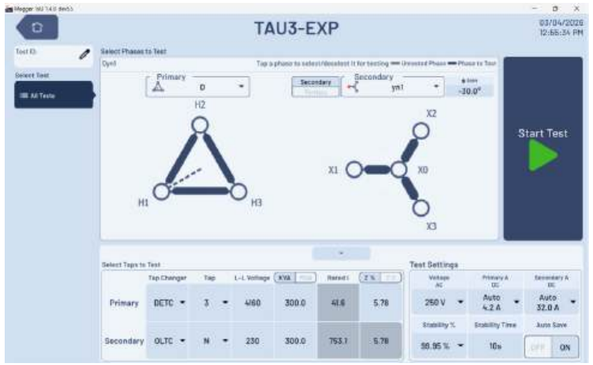
All tests

In addition to running each test individually, All Tests can be selected.

Voltage AC, Primary A DC, Secondary A DC, Stability %, Stability Time, and Auto Save options will be displayed.

Depending on the Tau3 model, software features enabled, and tests enabled in settings, clicking start test will progress through tests in the following order:

- Turns Ratio
- Magnetic Balance
- Winding Resistance
- Demagnetization
- Short Circuit Impedance
- Frequency Response Stray Losses
- Efficiency



Results

After testing is complete, results will be available for review in the results screen. Results can be sorted by Asset ID, Vector, Test ID, Date, Tests performed, and # of results. In addition, results can be filtered.

Tests Performed will show icons for the tests saved for the test ID. TTR, Magnetic Balance, Resistance, Short Circuit Impedance, and Frequency Response Stray Losses icons in green indicate results that are within limits. A demag symbol in green indicates a successful demagnetization of the transformer and NO resistance test was performed after demagnetization. Icons in red indicate results that are not within limits OR resistance was performed after demagnetization without another demagnetization.

Select a result to view the test information. Selecting a check box will enable delete, export, and test options.

Select multiple check boxes to delete or export multiple results.

Select the check box in the table header row to select all results.



Asset Template

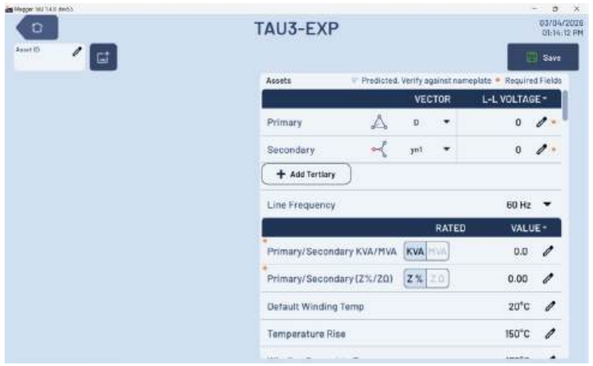
Asset templates are used for comprehensive testing of transformers.

Enter an Asset ID for identification of the asset.

Continuing entering information, using the scroll bar on the right-hand side.

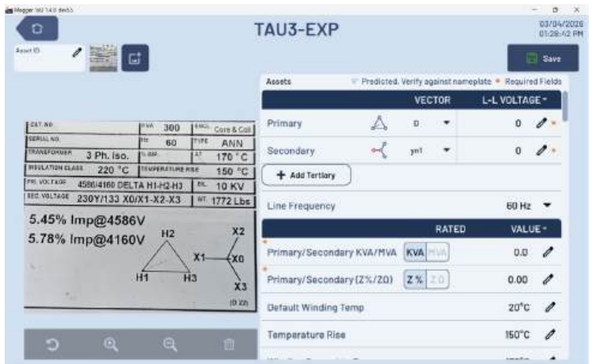
When entering tap voltages, the reset tap voltage can be used to clear the data.

At the bottom of the list, there is an option to add additional rows of data.



Asset Pictures

Up to five pictures can be added to the Asset ID. Once added, use fingers to scroll or pinch to zoom in/out.

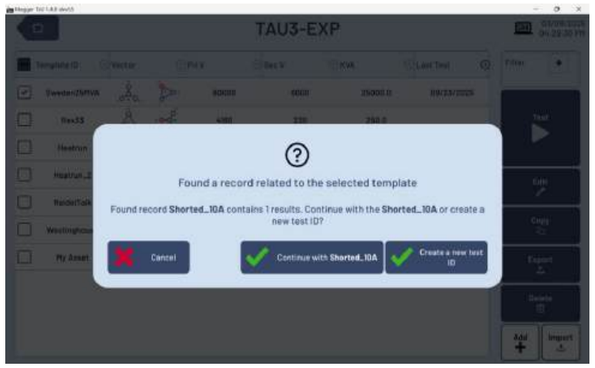


Template Test

Asset templates can be sorted by Asset Id, Vector, Primary Voltage, Secondary Voltage, KVA, and last test date and time. Select an Asset ID to proceed to the template test screen.



If a test result exists for the Asset ID, the software will ask to cancel, create a new test ID, or continue with the last test ID.



Template Test Setup

The template test screen is nearly identical to quick test. Enter a Test ID to track testing.



Find Set OLTC Tap

If the transformer has an OLTC, the first test option will be find/set OLTC tap. Click Find/Set OLTC Tap to have the TAU3 identify which tap the OLTC is currently on.



Find/Set OLTC Tap Result

After completing Find/Set OLTC, the found tap will be displayed. In addition, instructions will be displayed for automatically setting the OLTC to a different tap position. Follow the directions on screen to automatically set the tap position.

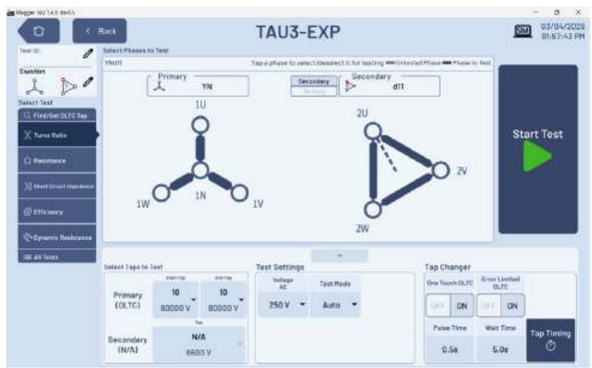
Click Use Tap to use the tap that was found.



Template Test Setup

If the transformer does not have an OLTC, then testing will be identical to Quick Test.

If the transformer has an OLTC, start and end tap options will be presented. If start and end tap are the same, testing will be identical to Quick Test. If start and end tap are different, testing will change depending on the One Touch OLTC option.



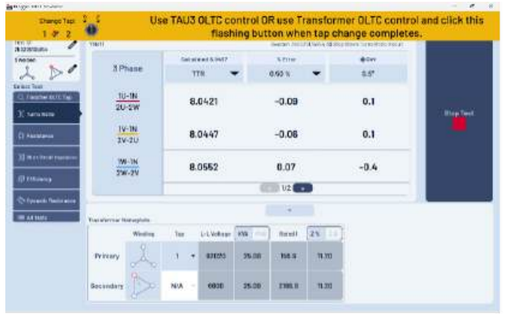
Testing Without One Touch OLTC Enabled

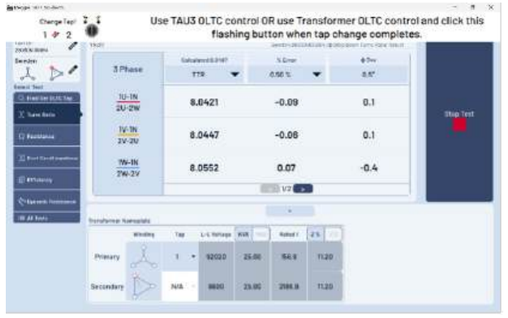
If testing without one touch OLTC enabled, after a tap has completed testing, a flashing yellow bar will be displayed at the top of the screen (turns ratio example below).

When the yellow bar is flashing, either:

- Physically change the tap changer at the tap changer cabinet then click the flashing yellow button

- Use the TAU3 tap change control to change the tap. This assumes that the TAU3 tap changer control is connected to the OLTC

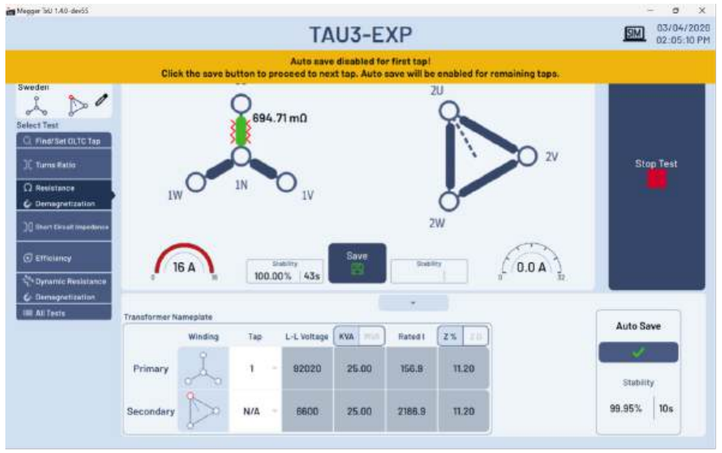




Testing with One Touch OLTC Enabled

Testing with One Touch OLTC enabled assumes that the TAU3 tap changer control is connected to the OLTC.

When enabled, the TAU3 will automatically change the tap changer tap after testing has completed on a tap. The exception is the first tap of each phase for winding resistance. Save must be clicked before the taps will be automatically changed.



Template Test All Tests

Template Test All Tests

When performing All Tests in a template test with multiple OLTC taps selected, the procedures is as follows:

- Preliminary Demagnetization
    - o Used to ensure accuracy of AC tests. Can be cancelled

- Tap Changer Verification
    - o The TAU3 will automatically confirm proper connection to the tap changer by performing a series of TTR tests and tap changes. Can be cancelled.

- AC tests
    - o The TAU3 will perform AC tests, **depending on model and software features enabled** (TTR, Magnetic Balance, Short Circuit Impedance, Frequency Response Stray Losses, and Efficiency)

- Winding Resistance
    - o Phase A end to start tap
    - o Phase C start to end tap
    - o Phase B end to start tap

- Demagnetization

Dynamic Resistance is not included at this time.

Dynamic Resistance Tests

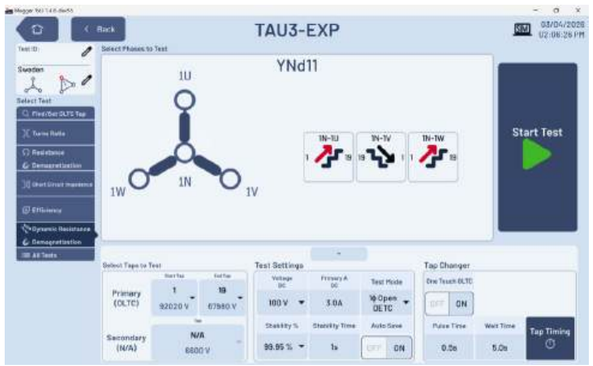
Dynamic Resistance Tests

Test setup is similar to other template tests. Select different start and end taps to enable the Start Test button.

Voltage DC, Primary or Secondary A, Test Mode, Stability %, Stability Time, and Auto Save options are available for adjustment.

OLTC tap changer direction will be dependent on start and end tap.



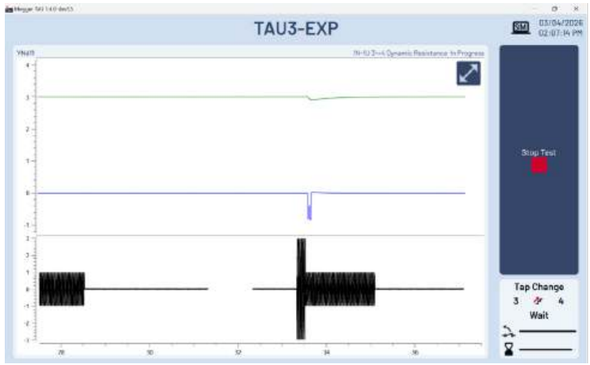


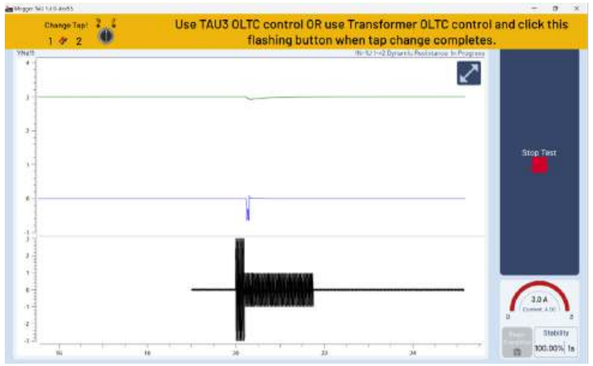
Dynamic Resistance Test In Progress

Dynamic Resistance Test In Progress

If using One Touch OLTC, the TAU3 will automatically change the tap and capture the dynamic resistance test result.

If not using One Touch OLTC, the user will need to change the tap and click the flashing yellow button to move to testing the next tap.





Dynamic Resistance Summary Screen

Dynamic Resistance Summary Screen

Dynamic Resistance results will vary based on the OLTC tested. Below are results from a resistive type OLTC.

Preventitive Auto/Reactor type will not show transition resistor timing or transition resistor ohmic values.

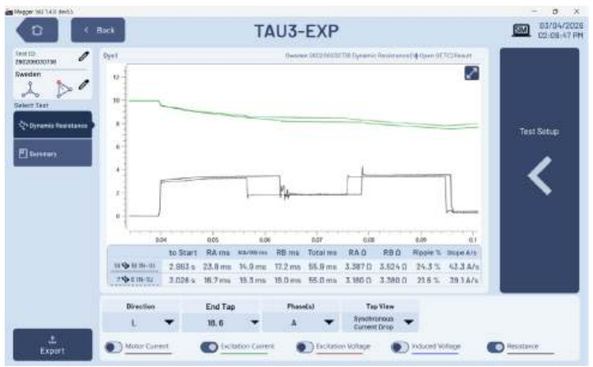




Min/Max Display

Clicking on a Min/Max value from the summary screen will display two transitions:

- The Min or Max transition
- The transition that is closest to average (dotted lines)



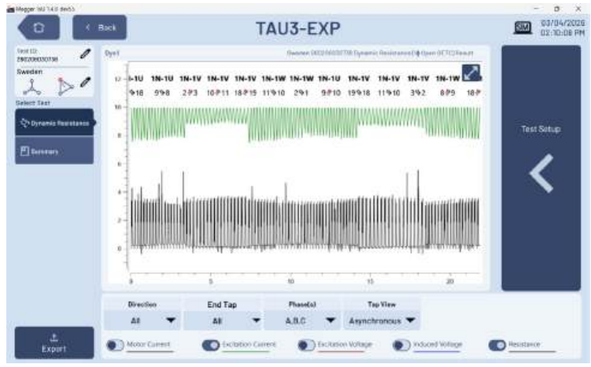
Transition Graph

Transition Graph

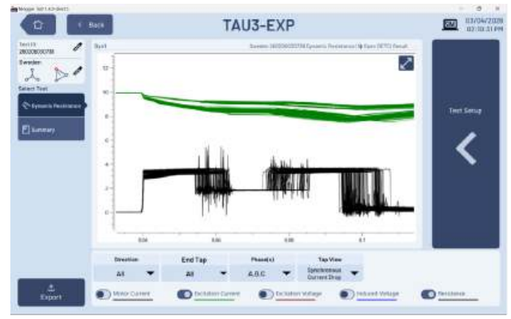
Clicking the Transition Graph button will display all transitions recorded.

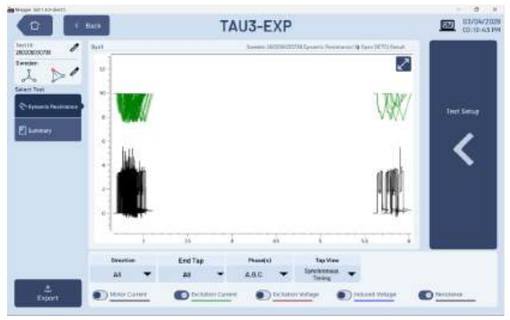
Transitions can be sorted by direction, end tap, and phases.

Motor current, excitation current, excitation voltage, induced voltage, and resistance traces can be toggled on or off.



Graphs can be displayed asynchronously (above), synchronous on current drop, or synchronous on timing for various ways of examining the transitions





Transition Details

Clicking Transition Detials will show detailed tap by tap information. Use the small arrow to see page 2 with more information.



Diagnostic

After selecting Diagnostic, a list of tests will be displayed



Heat Run

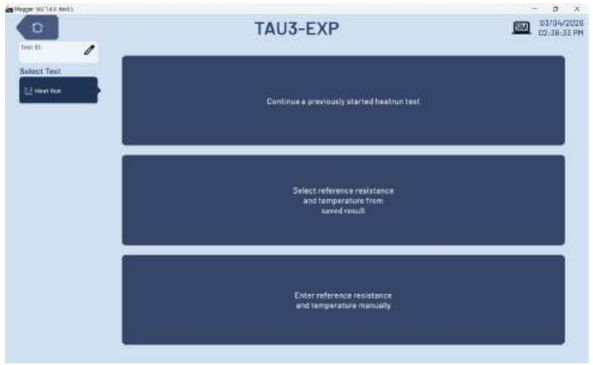
Heat Run

Heat run testing calculates winding resistance temperature back to time 0, or the time of shutdown. This test is typically performed in transformer manufacturing factories.

When first testing heat run, choose one of the following options:

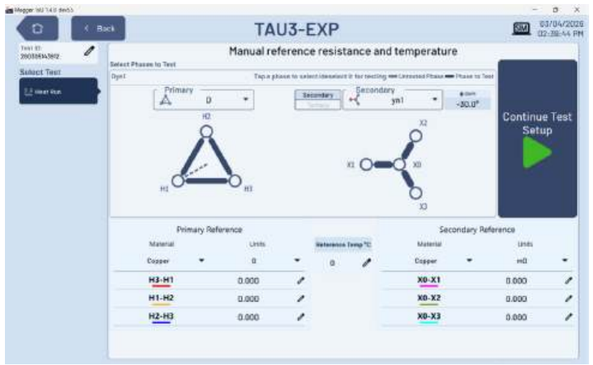
- Select reference resistance and temperature from saved results
- Enter reference resistance and temperature manually

If heat run tests already exist for the asset, select continue a previously started heat run test.



Heat Run Reference Temperature and Resistance

Enter reference results manually. This part can be skipped and the values can be entered after the test completes.



Heat Run Test Setup

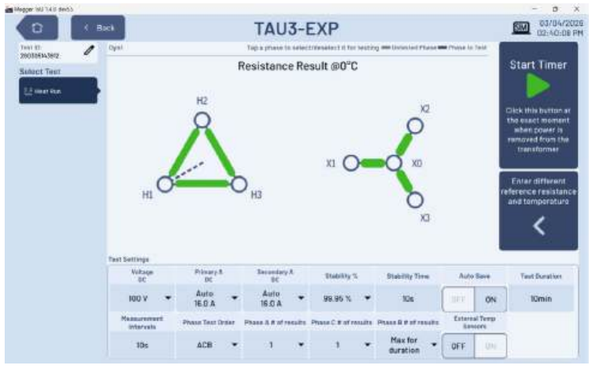
Heat Run Test Setup

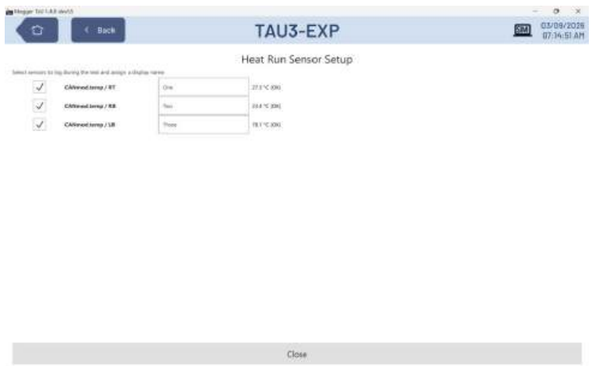
Select the phases to test.

Configure the parameters of the heat run test. Voltage DC, Primary A DC, Secondary A DC, Stability %, Stability Time, and Auto Save are the same settings used for traditional winding resistance tests. Test Duration, Measurement Intervals, Phase Test Order, Phase A # of results, Phase C # of results, and Phase B # of results are Heat Run test specific and can be configured based on testing needs. External sensors can be turned on and configured as needed.

Reference resistance values can be updated using the labelled button.

Click Start Timer at the exact moment that power is removed from the transformer.



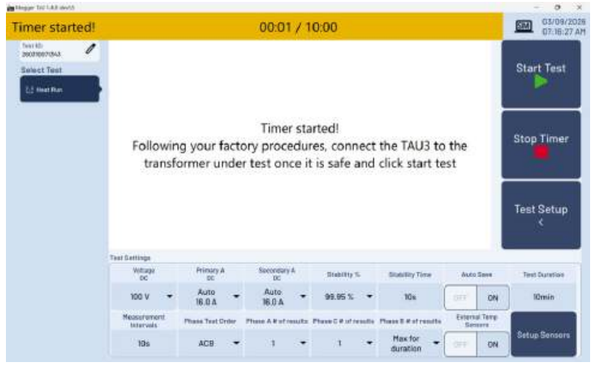


Heat Run Timer Started Heat Run Test Result

Heat Run Timer Started

After clicking start time, the following screen will be displayed.

Click Start Test once the TAU3 has been safely connected to the transformer



Heat Run Test In Progress

Depending on settings, the heat run test will progress through the phases selected.

It is expected that the resistance measurements will change as the transformer windings cool. Save can be clicked at any time to save a result.

When the last phase is being measured, the TAU3 will automatically save results based on the measurement interval selected. A graph will be displayed of the continuous resistance measurements.

The Heat Run test will automatically stop shortly after the test duration time has been reached.



Heat Run Test Result

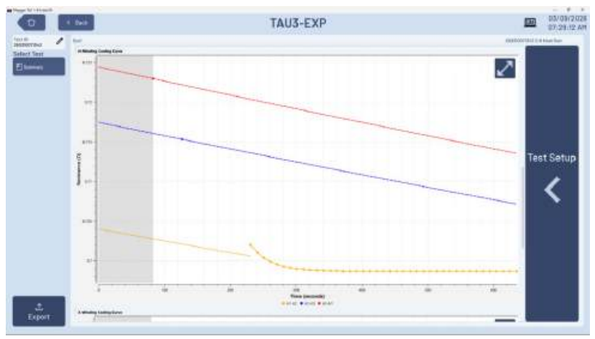
The reference temperature and resistance measurements will be displayed and can be adjusted as desired.

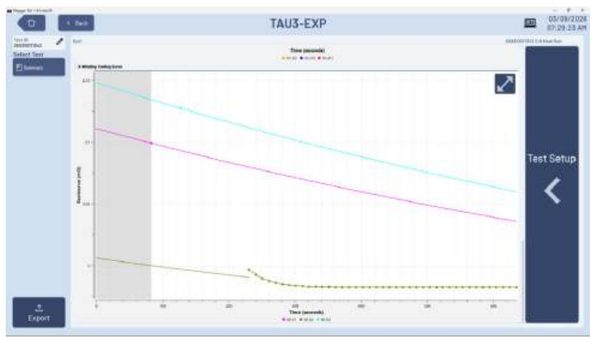
Primary Time 0 calculations of resistance and temperature will be displayed.

Graphs for temperature and resistance for primary and secondary winding are also displayed.

Heat Run Test Result







PowerDB Import

PowerDB Import

The combined 3Ø form can be used to import TAU3 data into PowerDB.

PowerDB Control

The combined 3Ø form can be used to configure and run tests with the TAU3.

Service

If immediate assistance is required, please contact the customer service by telephone or email:

+1 670 676 8500

vfcustomersupport@megger.com

Troubleshooting

The Troubleshooting Guide is designed to evaluate the reasons for a TAU3 malfunction. The possible test set malfunctions and causes are listed below. Electronic circuit repairs should not be attempted in the field. Refer to Repair section.

TAU3 does not turn on

- **Check that the power cord is fully inserted into the TAU3.**
- **Check that the power source is outputting voltage at acceptable levels and frequency.**
- **Check that the power cord is fully inserted into the source.**
- **Check that the power switch is in the correct position (I).**
- **Set the power switch to off (O)**
  Wait 30 seconds
  Set the power switch to on (I)
- **Try another power cord**

Lead check

- **Connect the leads as described below**
  H1 to X1
  H2 to X2
  H3 to X3
  H0 to X0
- **Select Dd0, Yy0, or YNyn0 and perform a test**
- **Verify ratio between 1.0005 and 0.9995**

TAU3 Reports test failed, but still provides data

- **Check lead connections. Reference Nameplate to ensure leads are connected to the correct bushing.**

Printer not working

- **Check battery is inserted into printer**
- **Charge printer battery using supplied charger**
- **Check printer paper is inserted properly**
- **Check USB cable is plugged into printer**
- **Check USB cable is plugged into TAU3 USB port**
- **Check printer is turned on by holding power button**
- **Try other USB ports**

OLTC moving in wrong direction

- **Check the OLTC wiring diagram and ensure leads are connected to correct terminals.**

Cannot connect TAU3 to PC

Contact your IT department for primary assistance when connecting any device to your PC.

- **Check USB cable is fully inserted into the TAU3**
- **Check USB cable is fully inserted into PC**
- **Check the TAU3 is powered on**
- **Check TAU3 SW is installed**
- **Check TAU3 is running**
- **Move USB cable to another USB port on your PC**
- **Try another USB Cable**
- **Try another PC**

Maintenance

Only qualified persons familiar with the hazards involved with high-voltage test equipment should perform maintenance. Read and understand Sections 1, 2, 3, 4, and 5 before performing any service.

The TAU3 requires only periodic inspection. Inspect all hardware items to ensure all are in good condition.

The TAU3 may be cleaned periodically. In so doing, do not allow water to penetrate panel holes. An all-purpose, household spray cleaner can be used to clean the panel. Polish with a soft, dry cloth. Clean the cables and mating panel receptacles with isopropyl or denatured alcohol applied with a clean cloth.

Calibration

A complete performance and calibration check should be made at least once every year. This will ensure that the TAU3 is functioning properly over the entire measurement range. The TAU3 calibration is performed on each new or repaired unit before sending it to a customer.

Repairs

Any service or repair of this equipment should be performed only by qualified persons who are aware of electrical hazards and the necessary precautions required to prevent injury.

Megger offers a complete Repair and Calibration Service and recommends that its customers take advantage of this service for routine maintenance or in the event of any equipment malfunction.

In the event Service is required, contact your Megger representative for a product Return Authorization (RA) number and shipping instructions.

Ship the product prepaid and insured and marked for the attention of the Megger Repair Department. Please indicate all pertinent information, including catalog number, serial number, and problem symptoms.

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Part No: TAU3_UG_EN_NEW

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