

TTRU1 - ADV, PRO, EXP

Handheld transformer turns ratiometer



- Single phase source and measurement for single phase, three-phase, and instrument transformer testing:
 - Turns ratio, excitation current, and polarity
 - Up to 250 V, ± 0.05 % accuracy
 - Short circuit impedance
- Accuracy guaranteed from -20 °C to 50 °C
- Easily manage data with custom transformer entry, auto saving, USB export, and PowerDB import
- AA battery operated
 - NiMH USB-C rechargeable batteries included

DESCRIPTION

Power through transformer electromechanical tests with the new TTRU1, the latest handheld transformer turns ratiometer from Megger. In addition to routine polarity validation and turns ratio tests for power, distribution, and instrument transformers, the TTRU1 can measure short circuit impedance (leakage reactance) with the same one time connection. Guided by colour-coded leads, clamps, and customisable on-screen vectors that match the transformer nameplate under test, the easy to follow setup ensures the right result the first time - just click start and let the patent pending internal shorting and lead compensation do the work! Perform over 1000 turns ratio tests on a single NiMH AA battery charge. When it's time to recharge the batteries, connect to any standard USB wall charger, or connect to your PC. When connected to the PC, TTRU1-EXP results can be directly downloaded.

STANDARD FEATURES

- Battery operated with USB-C rechargeable AA NiMH batteries included
- Pass/Fail ratio evaluation
- Automatic results storage
- USB drive save and export
- Full colour Hi-bright LCD screen
- Additive/Subtractive polarity detection
- Excitation current

- Auto screen dimming and power off
- Instrument self-check
- Belt loop carry bag
- Microsoft[®] Excel[®] export
- Customisable transformer vector list and voltages
- Guided three-phase transformer tests
- PowerDB import
- Phase deviation

ADDITIONAL FEATURES

- TTR Up to 250 V AC, ± 0.05 % accuracy
- USB PC download and update
- Onboard results navigation
- Customisable asset nameplates
- USB printer
- Hand crank and solar battery pack
- Short circuit impedance

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STEP UP TRANSFORMER TESTING

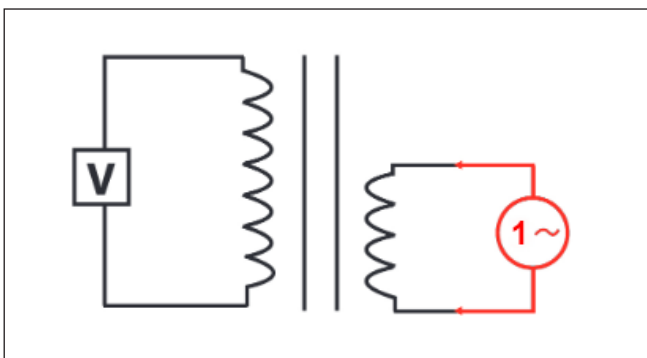
Patented in 1950, popularised in 2019, and perfected in 2022, the technology within the TTRU1 provides reliable results by removing the inaccuracy associated with test voltage and leads. The TTRU1 automatically applies the proper test voltage and shorting connections, ensuring repeatable results.

SAFE WITH SINGLE PHASE STEP UP

Safety is the first priority at Megger, which is why the TTRU1 is CE Certified to IEC 61010 - Safety requirements for electrical equipment for measurement, control, and laboratory use. During a test, software will perform safety checks before applying full test voltage. In addition, the TTRU1 utilises modern hardware to protect the asset and operator in the event of faults.

PROBLEMS TYPICALLY FOUND WITH THE TTRU1

- Loose connections
- Turn-to-turn shorts
- Broken strands
- Winding deformation
- Tap changer contact problems
- Core problems



DETAILED DESCRIPTION

The TTRU1 is designed to test distribution, instrument (CTs and PT/VTs), and power transformers. With minimal input from the user, the TTRU1 uses patent pending step up excitation to deliver the required AC voltage and current to obtain accurate results.

Reduce training time with the intuitive full colour Hi-bright LCD user interface of the TTRU1. The configurable vector list saves information for transformers routinely

tested, simplifying selection of common transformer configurations and results interpretation. When exported, results are grouped by file name, producing an XLSX/PDF report that is easy to read, email, or import into PowerDB. If you need results on the spot, use the optional USB printer!

Perform up to 1000 TTR tests on a single charge with AA NiMH batteries installed from the factory. When it is time to charge the batteries, connect the provided USB-C cable to any wall charger or computer USB port.

When you connect the TTRU1-EXP to your PC, not only can you charge the NiMH batteries, but you can also download results and access the user manual and data sheet. Always have the necessary documentation on hand!

TTR - Turns ratio testing

When compared to traditional single phase step down test instruments, you are no longer required to know the proper test voltage required to obtain a valid result when using the TTRU1. The TTRU1 utilises single phase step up ratio technology, providing safe, repeatable, and reliable results.

Additive/Subtractive polarity recognition

Polarity recognition provides confidence in transformer results by performing vector group validation during every test. Results on screen show if the connected distribution transformer is additive or subtractive.

Excitation current

Included with the TTR test, the excitation current test is extremely useful in locating problems such as defects in magnetic core balance, magnetic core structure, shifting of windings, failures in the turn-to-turn insulation, or problems in tap changers.

Phase angle deviation - PRO/EXP

Phase angle deviation is the phase relationship between in-phase vectors of the high side versus the low side windings. Phase deviation denotes the quality of the core and the winding, and when functioning properly should exhibit very low values ($< 0.1^\circ$). Shorted or partial shorted turns and/or a deteriorated or damaged core can cause significant changes in the phase deviation values.

Custom vector list and voltages

Increase efficiency by saving up to 10 commonly used transformer vectors and voltages found in the power network. Recall saved transformer vectors and test with confidence that setup and evaluations are correct.

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Guided three-phase transformer tests - PRO/EXP

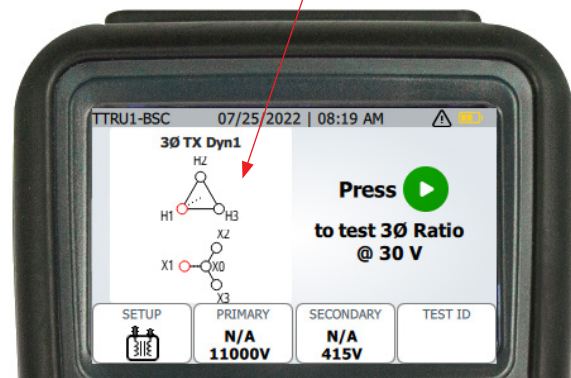
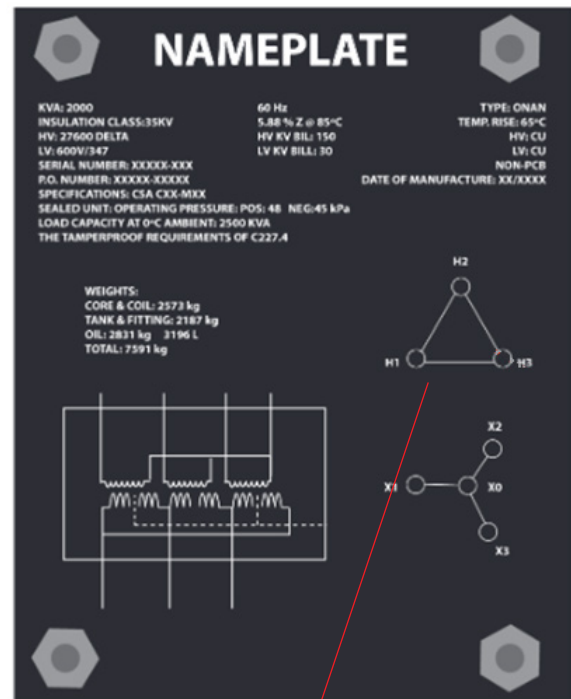
When testing three-phase transformers, the TTRU1 will provide phase-by-phase connection instructions, ensuring that each phase is properly tested and evaluated.

Short circuit impedance - EXP

Single phase patent pending internal shorting and lead compensation means that the connection requirements for short circuit impedance tests are same as all the other tests – completed with one ladder climb.

Custom asset nameplates – PRO/EXP

Further boost productivity by entering complete asset nameplate information. Ideal for transformers with multiple tap positions such as voltage regulators, a complete asset nameplate ensures the correct evaluation criteria for each tap position.



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SPECIFICATIONS

Input power

6 x IEC LR6 1.5 V alkaline (AA)

6 x IEC HR6 1.2 V NiMH rechargeable (AA)

Battery life

1000 TTR tests on a single charge

Storage: 1+ years NiMH, 5+ years alkaline

Battery charging

USB-C when set to NiMH batteries

Protection against alkaline charging

PowerEx PRO NiMH battery charging: 0 to 45 °C.

Output

Voltage Single phase, 1-50 V

Current 0.1 mA – 1 A

Frequency range 40 – 480 Hz

Regulatory

Safety IEC 61010-1:2010 + AMD1:2016

EMI/EMC IEC 61326-1:2012

RoHS2 EN50581

Vibe/Shock MIL-STD -810G

Ingress IP54

Transformer testing standards

IEEE C57.152-2013

IEC 60076-1:2011

AS/NZS 6076 1:2014

CIGRE 445 2011

GOST 3484.1-88

Dimensions

22.8 x 10.5 x 7.5 cm 8.98 x 4.1 x 2.95 in

Weight

1 kg 2.2 lbs

Case

Heavy duty over-molded case with built-in connection for hook strap. Carry case with quick start guide, belt loop hook, and pouches for included lead set and accessories.

Internal/external data storage

Up to 10 custom vector storage

Up to 10 000 sets of single phase results internal storage

Transferable via USB 2.0 drive

USB-C connection to PC (EXP ONLY)

Communication/control software

USB Interface for PC download with custom GUI

Display

Full colour 88 mm (3.5 in) 320 x 240 px Hi-bright LCD screen with 'auto dim' and 'auto off' to preserve battery life

Printer (optional)

51 mm (2in) 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

TTR

Turns ratio measurement

methods

Single phase step up

Single phase step down

Turns ratio range and accuracy

Step down excitation

25-50 V

±0.05 % 0.8 – 1000

±0.10 % 1001 – 2000

±0.30 % 2001 – 15000

±1.0 % 15000 +

1-24 V

±0.10 % 0.8 – 1000

±0.20 % 1001 – 2000

±0.60 % 2001 – 15000

±2.0 % 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 – 1000 mA

Excitation current accuracy

±1 % Reading, ±0.1 mA

Frequency accuracy

±1 % Reading, ±0.1 Hz

Phase range

0 – 360 °

Phase accuracy

±0.05 °

Max voltage output

45 V AC peak

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SCI

Impedance measurement

methods Single phase

Impedance measurement

range 0.1 Ω - 700 Ω

Impedance accuracy ± 1 % reading, ± 0.01 %
 ± 1 % reading, ± 0.10 m Ω

Reactance measurement

range 0.1 Ω - 700 Ω

Reactance accuracy ± 1 % reading, ± 0.01 %
 ± 1 % reading, ± 0.10 m Ω

Inductance accuracy ± 1 % reading, ± 10 μ H

Power factor Range 0.1 % – 100 %

Power factor accuracy ± 5 % reading, ± 0.1 %

AC current accuracy ± 0.2 % reading, ± 0.1 mA

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TTRU1 Selection Guide			
Model	TTRU1-ADV	TTRU1-PRO	TTRU1-EXP
Full colour Hi-bright LCD screen		■	
Max turns ratio	50 000 Down	50 000 Down/100 Up	50 000 Down/200 Up
Max induced voltage	62.5 V	125 V	250 V
Max Current	1 A		
Pass/Fail ratio evaluation		■	
Additive/Subtractive polarity validation		■	
Excitation current measurements		■	
Automatic results storage		■	
Auto dim and power off battery saving		■	
Self-check diagnosis		■	
USB drive save and export		■	
Battery operated NiMH or alkaline		■	
USB-C NiMH battery charging		■	
Soft carry bag with belt loop hook		■	
Microsoft Excel export		■	
Customisable transformer vector list and voltages		■	
PowerDB Import		■	
Go/No Go short circuit, open circuit, inductance		■	
Guided three-phase transformer tests			■
Customisable asset nameplates			■
Onboard results navigation			■
Phase deviation			■
Short circuit impedance			■
USB-C connection results download, updates			■
USB printer		Optional	■
Hand crank / solar battery charger pack		Optional	■

■ = INCLUDED

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ORDERING INFORMATION

Item (Qty)	Cat. No.	Optional hardware accessories	
1 Phase Handheld Turns Ratiometer	TTRU1-ADV	Calibration certification	TTRU1-CAL-CERT
	TTRU1-PRO	Backpack lead bag	2012-180
	TTRU1-EXP	USB NiMH battery charger with outlet adapter	90041-006
Included Accessories - ADV, PRO, EXP			
Soft carry case	1012-063	USB printer	90029-573
USB C to A cable	90041-001	USB printer paper (x48 rolls)	90029-573-P
USB C to C cable	90041-002	USB outlet adapters (US, UK, CE)	90041-003
2 m (6 ft) H and X leads	1015-031	TRS1+ calibration standard	TRS1PLUS
USB drive	90012-878	Hand crank and solar battery pack	90041-007
Included Accessories- EXP			
Backpack lead bag	2012-180	Magnetic strap	1010-013
Hand crank and solar battery pack	90041-007	12V Car accessory outlet adapter	90041-004
USB printer	90029-573	15kV Tx probe adapter	210.00012
Optional leads			
3 m (9 ft) H and X leads	1015-032	25kV Tx probe adapter	210.00011
6 m (20 ft) H and X leads	1015-033	Bushing adapter	MC7144
9 m (30 ft) H and X leads	1015-035	Hard sided case	1015-532
3 m (9 ft) H and X leads with banana connectors for CT/PT testing	1015-037		

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