



1. SYSTEM OVERVIEW

The Complete Training System for Transformers is an advanced, modular, and fully integrated training platform designed for comprehensive instruction in transformer technology and electrical power engineering. The system supports theoretical understanding and practical experimentation across a wide range of transformer types, electrical loads, and measurement techniques.

It includes a complete suite of hardware modules, loads, measuring instruments, power supplies, structured learning content, and an online digital education platform with full teacher–student environments.

2. TRAINING TOPICS COVERED

The system enables hands-on learning in the following areas:

- Electrical safety procedures and protective measures
- Configuration of power generation systems based on circuit diagrams
- Use of commercial measurement instruments (multimeter, oscilloscope, measuring interfaces)
- Voltage equation and equivalent circuit analysis
- No-load, load, and short-circuit testing of transformers
- Determination of inductance, magnetic coupling, and leakage reactance
- Investigation of losses, voltage regulation, and efficiency

A complete experimental guide with detailed procedures is included in both printed and digital interactive formats. **PDF-only documentation is not permitted**; the digital software must support teacher and student modes with and without answers.

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.



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3. SYSTEM COMPONENTS

3.1 Transformer Modules

3-Phase Transformer – 0.3 kVA

- Universal compatibility for all circuit configurations
- 4-mm safety socket connections
- Power: 300 VA
- Primary: 3 × 400/230 V, 50 Hz
- Secondary: 3 × 2 × 115 V

Scott Transformer

Designed for conversion between two-phase and three-phase systems via Scott connection; also usable as a 3-phase isolating transformer.

- 4-mm safety socket interface
- Power: 2 × 150 VA
- Primary: 2 × 115/200/230/346/400 V, 50 Hz
- Secondary: 2 × 115/230 V

Single-Phase Transformer – 0.3 kVA

- 4-mm safety socket connections
- Power: 300 VA
- Primary: 230 V, 50/60 Hz
- Secondary: 2 × 115 V

Toroidal Core Transformer – 0.3 kVA

- 4-mm safety socket interface
- Power: 300 VA
- Primary: 230 V, 50 Hz
- Secondary: 2 × 115 V

Single-Phase Autotransformer – 0.3 kVA

- 4-mm safety socket connections
- Power: 300 VA
- Primary: 230 V, 50 Hz
- Secondary: 115/230/240 V

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3.2 Electrical Load Modules

Resistive Load – 0.3

Three circular rheostats (step-wound), synchronized adjustment; suitable for series, parallel, delta, and star connections.

- Resistance: $3 \times 1800 \Omega$
- Series resistance: $3 \times 47 \Omega$
- Current rating: $3 \times 1 \text{ A}$

Capacitive Load – 0.3

Three groups of MP capacitors suitable for star/delta/series/parallel circuits.

Capacitance options:

- $3 \times 1/2/4 \mu\text{F}$, 450 V
- $3 \times 8 \mu\text{F}$, 400 V

Inductive Load

Three multi-tap inductors:

- 0.2/0.4/0.6 H (0.65 A)
- 0.8/1.0/1.2 H (0.5 A)
- 2.4/4.8/6.0 H (0.25 A)

Suitable for series, parallel, star, and delta circuits.

3.3 Measurement Instruments

Professional Multimeter

Key features:

- Automatic socket blocking
- Fuse break / overload warnings
- Automatic/manual range selection
- TRMS AC & AC+DC
- 4½-digit display (12,000 count)
- EMC-compliant design
- Safety test leads included

Technical specifications:

- DC/AC voltage: 100 mV–1000 V
- DC/AC current: 1 A–10 A
- Resistance: 100 Ω –40 M Ω
- Frequency: 100 Hz–30 kHz

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- Temperature: $-250\text{ }^{\circ}\text{C}$ to $+1372\text{ }^{\circ}\text{C}$
- Resolution: $10\text{ }\mu\text{V}$; $100\text{ }\mu\text{A}$; $10\text{ m}\Omega$; 0.01 Hz ; $0.1\text{ }^{\circ}\text{C}$
- Overload capacity: $1000\text{ V} / 10\text{ A}$
- Power: $2 \times 1.5\text{ V R6}$
- Weight: approx. 400 g

3.4 Four-Channel Data Acquisition & Analysis System

A multifunctional measuring interface integrating oscilloscope, wattmeter, multimeter, recorder, and energy analyzer.

Key Capabilities

- 4 isolated channels (U/I), CAT III 300 V
- Up to 1 MS/s sampling per channel
- Mathematical channel functions ($A+B$, $A \times B$, etc.)
- Instantaneous, RMS, average, and vector analysis
- FFT, integration, differentiation, time functions
- Built-in signal generator (10 mHz – 20 kHz , $\pm 10\text{ V}$)
- 16-bit ADC resolution
- USB-C and WLAN connectivity (AP/client mode)
- On-device TFT display ($3.5''$, color)
- Micro SD data logging ($100,000$ values per series)
- Compatible with LabVIEW and MATLAB
- FPGA-based real-time processing
- CAT III 300 V safety category

Electrical Ranges

- Voltage: $25/70/250/700\text{ VAC}$; $\pm 36/100/360/1000\text{ VDC}$
- Current: $0.7/1.6/7/16\text{ AAC}$; $\pm 1/\pm 2.5/\pm 10/\pm 16\text{ ADC}$

3.5 Data Acquisition Software

PC-based software with plug-and-play module detection and automatic parameter configuration.

Software features:

- Real-time graphical display (analog/digital instruments, tables, plots)
- Manual/automatic recording modes
- Advanced data evaluation (fits, FFT, integrals, formulas)
- XML-based experiment files
- Integrated logbook

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- Export to Excel/LibreOffice
 - 150 experiment templates
- Free updates

3.6 Power Supply Units

Adjustable Transformer 0...260 V, 4 A

- Input: 230 V \pm 10 %, 50–60 Hz
- Output: 0–260 V / 4 A (5 A short-term)
- 4-mm safety sockets
- Safety switch 5 A

3-Phase Voltage Supply 400 V / 2.5 A

- Input: 3 \times 400 V \pm 10 %, 50–60 Hz
- Output:
 - 3 \times 0–400 V AC
 - 1 \times 0–250 V DC
 - 2.5 A (3 A short-term)
- Dual digital displays (current/voltage)
- 3-phase indicator lamps
- 19" rack casing

3.7 Accessories

Equipment and Storage

- Electrical Power Engineering Tray
- Mobile Experiment Stand with rails
- Additional equipment board
- Assembly hardware

Connecting Accessories

- Set of 10 safety bridging plugs (black)
- Set of 10 bridging plugs with taps (black)
- Set of 10 safety bridging plugs (yellow/green)
- Set of 32 safety connecting leads, 32 A
- Set of 10 yellow/green safety leads, 32 A

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