

POWER TRANSMISSION LINE AND DISTRIBUTION TRAINER

EM-80028

EDU-LABS



FEATURES

Using the Power Transmission Line trainer set it will be possible to assemble an absolute power transmission system. From a transformer with tapping switch to the power circuit breaker and 415KV power transmission line model including line termination with surge impedance.

Various experiments are able to carried out on this power transmission systems, no lad operation with natural load, symmetrical and unsymmetrical short circuit, parallel and series compensation of the transmission line as well as neutral-point connection.

SPECIFICATIONS

The equipment covers the learning objective via experiment such as:

- Symmetrical load and unsymmetrical load connection
- Voltage and frequency control by inverter unit
- Characteristic of transformer feeder
- RL circuits in transmission line
- RC circuits in transmission line
- RLC circuit in transmission line
- Earth fault compensation and its characteristics
- Excitation voltage controller with motor generator
- Characteristic of generator voltage
- Measuring power in each line.

EXPERIMENTS MODULE

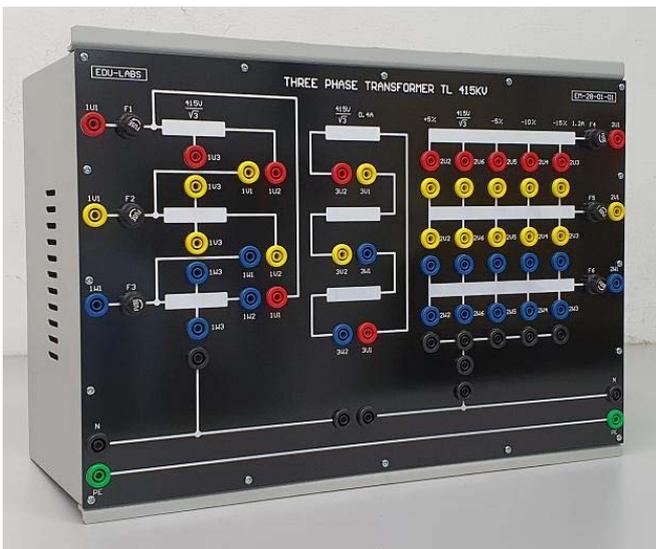
THREE PHASE POWER SUPPLY MODULE EM-30-09-02-01



- Power Input Requirement: Three Phase 240V/415V, 50Hz
- Connection: 3P+N+PE Output terminations by using 4mm terminals socket.
- Input fed with AC 5 pin plug 32A AC Plug and Socket.

- Pilot lamps provided to indicate all live supplies.
- With On/Off Switch
- Fuse Protection
- Fixed Single Phase AC Power Supply: 3 x 240V AC; 8A AC (Phase To Neutral; R-N, B-N, Y-N)
- Fixed Three Phase AC Power Supply: 3 x 450V AC; 8A AC (Phase To Phase; R-Y, Y-B, B-R)
- Adjustable Single Phase & Three Phase AC / DC Power Supply (Simultaneously):
 - 3 x 0 ~ 450VAC; 8A AC (Phase To Phase)
 - 3 x 0 ~ 240V AC; 8A AC (Phase To Neutral)
 - 1 x 0 ~ 450VDC; 8A DC (DC Output)
- Three Phase 5 Pin AC Plug 32A with 1.5m length 5 core power cable.
- Terminals: 4mm Safety Socket
- Unit Type : Bench Top B3

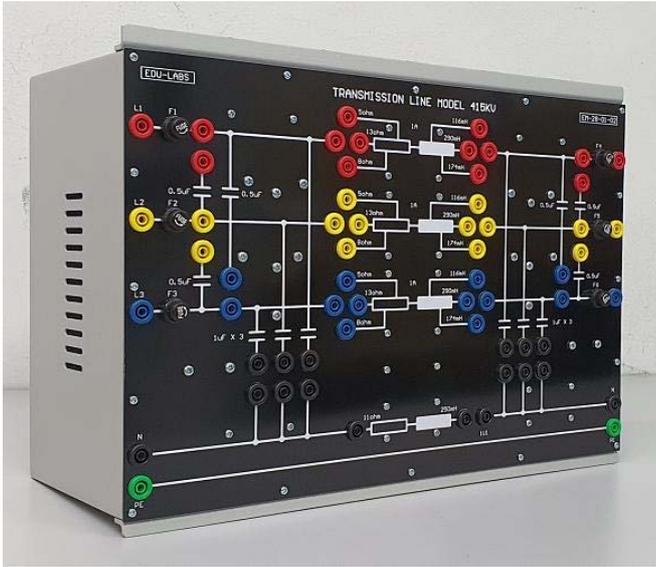
THREE PHASE TRANSFORMER TL 415KV EM-28-01-01



Three phase model of a 415kV overheads transmission line for measuring steady state operating conditions (no-loads, matching, short-circuit) with the following specification:

- Quad bundle 4 x 240/40, with surge impedance 240 and natural load 600MW, lengthy 360km During symmetrical operation tapping, enable the carryings out of investigation a length of 144km respective, 216km. Earth return line resistance=11 ohm, LE = 250mH for unsymmetrical load a 360 km line length. Scale factor 1/1000 for current and voltage.
- Length : 360km 216km 144km
- Resistance : 13ohm 8ohm 5ohm
- Inductance : 290mH 174mH 116mH
- Capacitance : 5 μ F 3 μ F 2 μ F
- Terminals : 4mm Safety Socket
- Unit Type : Panel H3

TRANSMISSION LINE MODEL 415KV
EM-28-01-02



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TRANSMISSION LINE CAPACITOR TL 415KV
EM-28-01-03



- 3 phase in star connection, corresponds to 50% of the operating capacitance of the transmission line model 415KV
- Capacitance: 2.5µF x 3
- Terminals: 4mm Safety Socket
- Unit Type : Panel H1

POWER CIRCUITS BREAKER
EM-10-01-01



- Three phase ON-OFF switch for transmission line Model 415KV.
- Contact load capacity: 415VAC, 12A.
- Terminals: 4mm Safety Socket
- Unit Type : Panel H1

**EARTH FAULT COMPENSATION
EM-28-01-05**



- Inductance with 10-20 tapings for earth fault compensation in the 415KV transmission line model (Petersen coil).
- Inductance: L 0.005 ~ 2H
- Rated voltage: 240V, 50/60 Hz
- Rated current 0.5 A
- Terminals: 4mm Safety Socket
- Unit Type : Panel H1

**VARIABLE FREQUENCY DRIVE
EM-30-14-02**



- Three phase asynchronous motor speed control by PWM technique
- The Torque and Speed are able to be constant via the unit to easy control in testing operation during loads change.
- Input Voltage: 415V, 50/60 Hz
- Output voltage: 0~415V
- Output frequency: 1~50Hz
- Power: 1.5KW
- Terminals: 4mm Safety Socket
- Unit Type : Panel H2

**EXCITATION VOLTAGE CONTROLLER (VARIABLE AC/DC POWER SUPPLY)
EM-30-09-04-01**



- DC power supply unit suitable to supply 0~240VDC, 0~5A adjustable for excitation voltage in synchronous as generator operation

- Power Input Requirement: Single Phase 240VAC, 50Hz
- Connection: 3 Pin Power Cord (UK Type)
- On/Off Switch With Indicator
- Fuse Protection.
- Fixed Single Phase AC Power Supply: 240VAC, 50Hz (Channel 1)
- Adjustable Single Phase AC/DC Power Supply (Simultaneously) :
 - 0 ~ 250VAC, 0 ~ 15A AC (Channel 2) Complete With AC Voltmeter & AC Ammeter
 - 0 ~ 250VDC, 0 ~ 15A DC (Channel 3) Complete With DC Voltmeter & DC Ammeter
- Protection: Fuse
- Terminals: 4mm Safety Socket
- Unit Type : Bench Top B2

**RESISTIVE LOAD UNIT
EM-30-07-01**



- Compose of three resistances with possibility to connect in star/delta or parallel, controlled by three switches with 7 Steps variable per phased
- Power: 3X100W
- Voltage: 415/240V (Star/Delta)
- Protection: Fuse
- Terminals: 4mm Safety Socket
- Unit Type : Bench Top B1

**INDUCTIVE LOAD UNIT
EM-30-07-02**



- Compose of three inductances with possibility to connect in star/delta or parallel, controlled by three snitches With 7 steps variable per phase
- Power: 3X100VAR
- Voltage: 415/240V (Star/Delta)
- Protection: Fuse
- Terminals: 4mm Safety Socket
- Unit Type : Bench Top B1

**CAPACITIVE LOAD UNIT
EM-30-07-03**



- Compose of three capacitances width possibility to connect in star/ Delta or parallel, controlled by three switches with 7 steps variable per phase
- Max Power: 3X100VAR
- Voltage: 415/240V (Star/Delta)
- Protection: Fuse
- Terminals: 4mm Safety Socket
- Unit Type : Bench Top B1

**CONNECTING SAFETY TEST LEAD SET
EM-30-15-03**



- The set consists of 2 type lead set and 2 type bridging plug set in 5 different coded colors and lengths chosen to allow the realization of all experiment manual.
- Leads are capable of 15A current safety plugs.
- Safety Terminal Socket (4mm): 25cm x 15 units; 50cm x 20 units; 100cm x 15 units
- 19mm Bridging Plug Set x 10 units
- 19mm Bridging Plug Set (Stackable) x 10 units

**MAGNETIC CONTACTOR MODULE
EM-10-03-01**



- Modular Design
- 3 Pole Magnetic Contactor
- Auxiliary Switch (NCx2, NOx2)
- Unit Type : Panel H1
- Terminals: 4mm Safety Socket

**CURRENT LIMIT PROTECTION MODULE
EM-10-04-01**



- Modular Design
- Connection: 3P+N+PE.
- Switch Load: 415Vac,10A
- Current Setting Range: 4 ~ 6.3A (Adjustable Current Limiting)
- Complete with START and STOP Push Button
- Unit Type : Panel H1
- Terminals: 4mm Safety Sockets (Color Coded)

**DIGITAL AC AMMETER
EM-30-13-04**



- Measurement range : AC 0 ~ 5A
- Display : 3 ½ digits 14.2 mm LED
- Accuracy : $\pm 0.3\% \pm 1$ digit
- Resolution : 0.01A
- Input impedance : $< 0.1\Omega$
- Power source : 240VAC, 50/60 Hz
- Terminals: 4mm Safety Sockets
- Unit Type : Panel H1

**DIGITAL AC VOLTMETER
EM-30-13-03**



- Measurement range : AC 0 ~ 600V
- Display : 3 ½ digits 14.2 mm LED
- Accuracy : $\pm 0.2\% \pm 1$ digit
- Resolution : 1V
- Input impedance : $1M\Omega$
- Power source : 240VAC, 50/60 Hz
- Protection: Fuse
- Terminals: 4mm Safety Sockets
- Unit Type : Panel H1

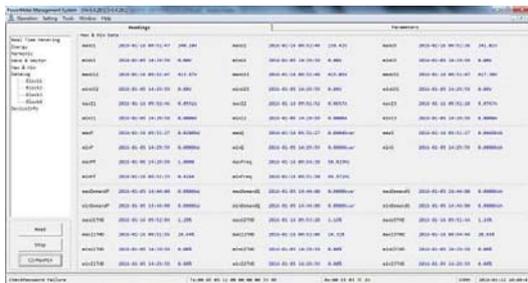
**THREE PHASE POWER QUALITY METER
EM-30-13-16**



- Display Type: HD LCD Display
- Real-Time Measurement
 - Phase voltage: V1, V2, V3, Vlnavg Line voltage: V12, V23, V31, Vllavg Current: I1, I2, I3, Iavg, In Active power: per phase and total active power Reactive power: per phase and total reactive power Apparent power: per phase and total
- Energy And Demand

- Four quadrant active energy: Import, Export, Total, Net Four quadrant reactive energy
- Power Quality Analysis
 - Voltage unbalance Current unbalance Voltage THD (Total harmonic distortion), Odd-even harmonic distortion Voltage individual harmonics, Crest factor Current THD, Odd-even harmonic distortion Current individual harmonics, K factor
- Communication
 - Ethernet 10/100M network port RJ45
 - RS485 communication port
 - MODBUS RTU communication protocol
- Settable Logging Interval
 - Logging from 1min to 60min, interval settable
- Software Accessibility
 - 4 Tariffs (DataLog) Sharp, peak, flat, valley in different season and schedule
- Protection: Fuse
- Power Supply: AC240VAC, 50Hz
- Terminals: 4mm Safety Socket
- Unit Type : Panel H2

**POWER MANAGEMENT SOFTWARE
EM-30-13-16-PMS**



- PC management software; web browse data
- True-RMS measuring parameters
- ANSI and IEC 0.2 accuracy class
- Power quality analysis
- 4 quadrant energy
- Data logging
- Measure individual harmonics from 2nd to 49th
- TOU, 4 Tariffs, 6 Seasons, 6 Schedules
- Communication
 - Ethernet 10/100M network port RJ45
 - RS485 communication port
 - MODBUS RTU communication protocol

**CONNECTING SAFETY TEST LEAD SET
EM-30-15-01**



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- 19mm Bridging Plug Set x 10 units
- 19mm Bridging Plug Set (Stackable) x 10 units

**THREE PHASE INDUCTION MOTOR
EM-30-02-01**



- Power: 370W
- Voltage: 240/415VAC
- Current: 1.5A
- Speed: 1500rpm
- Frequency: 50Hz
- Cooling Method: Self Cooling
- Terminals: 4mm Safety Socket
- Base Plate: Attachable To Break Load Unit

**THREE PHASE SYNCHRONOUS MACHINE
EM-30-03-02**



- Motor & Generator Operation
- Power : 370W
- Voltage: 240/415VAC
- Current: 1.5A
- Excitation voltage 200VDC
- Excitation current: 1.5A
- Speed: 1500rpm
- Frequency: 50Hz
- Cooling Method: Self Cooling
- Terminals: 4mm Safety Socket
- Base Plate: Attachable To Motor Unit

**COMPUTER DESKTOP SYSTEM
EM-30-13-16-PC (OPTIONAL)**



- Processor: Intel® Core™ i3-9100
- Memory: 4GB 2400MHz
- HDD: 500GB 7200RPM
- Graphic Card: Intel UHD Graphics 630
- Operating System: W10 Home
- Keyboard: USB wired Windows 8 keyboard
- Pointing device: USB wired optical mouse
- Network interface: Integrated Ethernet 10/100 BASE-T
- Device Type LED-backlit LCD monitor - 24"
- Full HD (1080p) 1920 x 1080
- Pixel Pitch 0.2745 mm

**ADJUSTABLE FLAT SCREEN MONITOR HOLDER
EM-30-13-16-MTH (OPTIONAL)**



- Weight Up To 10kg
- Triple arms for full motion and added support
- Great for corners
- Folds flat to the wall
- Easy slide on installation
- Safety locking screw
- Cushioned pads for PC Monitor protection and improved audio

**EXPERIMENTAL TABLE
EM-30-16-01-02**



- 5' Standard Desktop
- Dimension:
- Length : 1500mm
- Width : 800mm
- Height : 850mm

**EXPERIMENT PANEL FRAME
EM-30-16-02-02**



- Din Standard A4 With Two Shelves
- Side Frame: T Shape
- Dimension:
- Length : 1450mm
- Width : 20mm
- Height : 300mm

Note: Due to products continuous development process, layout and specification may change without prior notices.