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ELECTRICAL ENGINEERING



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Amtec Techniquip applies 30 years of knowledge & experience in the design, manufacture and import of educational engineering equipment, accessories, instrumentation and consumables.

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During this time, we have been a market leader in innovation, bringing many new concepts and products to the educational industry while expanding our comprehensive range of quality teaching equipment to a level unsurpassed by any other company in the industry.

This includes unique new methods of introducing and educating the learners in all facets of modern engineering. Our products are visual and demonstrational to best teach and explain concepts from basic engineering, all the way up to research and thesis levels in the most advanced forms of engineering.

Amtec Techniquip's commitment to the end user...

AMTEC offers a personal approach to each and every end user as we are always available to meet and discuss any requirements face-to-face basis to provide a tailor-made solution.

AMTEC have a large footprint throughout Southern Africa and regularly visit the countries and provinces we service while also keeping our customers up-to-date with any new products and innovations we bring to the market.

AMTEC supplies expert training on all our products. Our team of experts offer training at the end user or alternately at our head office in Jhb. All our products are supplied with their relevant manuals, course materials and exercise guides.

AMTEC offers unmatched after-sales service and customer support. All our equipment is supplied complete with ICT (Installation, Commissioning & Training). Our sales and support teams are at the end user's disposal should any assistance be needed during the life of a product.

AMTEC offers an extended Service and Maintenance plan to make sure that your equipment and apparatus are maintained to ensure a long lifespan with little or no downtime.

AMTEC makes use of only quality components to ensure reliability and longevity of all our manufactured equipment. This provides the end user with peace of mind and a product that will stand the test of time in an educational environment.

AMTEC has the manufacturing capability to R+D and manufacture "one-off" designs and customise any equipment within our range to meet the end users requirements. We have many accessories, add-ons and tooling that can work in conjunction with our equipment and trainers.

AMTEC offers a 24-month factory warranty on all our products supported by the backing of our local & international suppliers.



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AMTEC UNIQUE SOLUTIONS FOR UNIQUE CUSTOMERS



AMTEC TECHNIQUIP manufactures and imports a wide variety in our standard range of equipment, and we have also supported many large Corporations, Industrial companies and Private Training centers throughout Southern African with tailored, bespoke solutions for their individual requirements. Some examples of Projects undertaken by AMTEC:

- Schneider Electric collaboration for Electrical panels and desktop trainers as part of an Educational Upliftment initiative in neighboring African countries.
- Mercedes Benz East London Plant Electrical and Mechanical trade test center equipment.
- SAB South African Breweries Training center Rosslyn Renovation and extension of U-shaped cubicles.
- Anglo Platinum Rustenburg Training center PLC individual cubicles.
- Sasol Colliery Trade test center Standerton Full house of Trade Testing equipment.
- Lephalale TVET 4 sided cubicles with interchangeable Electrical panels.





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AMTEC UNIQUE SOLUTIONS FOR UNIQUE CUSTOMERS



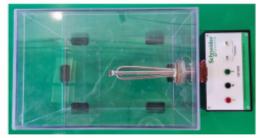










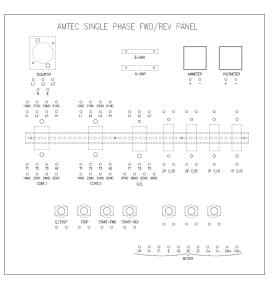




AMTEC PANEL OVERVIEW

AMTEC TECHNIQUIP Electrical panel overview

- Electrical grade phenolic board is being used according to SANS specs for resistance (Fire retardant and self-extinguishing)
- Silk-screen printed ABS panel layout also available
- Connections are available via 6mm brass studs (High Conductivity and low resistance) or connection via 4mm plug in sockets
- High Quality components are used which are aligned with International standards
- Electrical lock out via key switch or electrical isolator 2m mains lead included with workstation
- Studs are spaced for safe and easy connection
- AMTEC labels our panels and connections points with CNC engraving, offering a professional and longer-lasting finish
- We can alter or re-arrange some of these points and labels to cater to customers needs and requirements
- We are able to supply a PDF of a panel layout prior to manufacture









AMTEC PANEL CONFIGURATIONS

AMTEC Techniquip nas a variety of panel configurations available to aid a lecturer in training a student for fault finding, repairs and panel wiring.

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Fault finding Panels/ Starters: (FF)

- Pre-wired fully functional electrical panel
- Student identify, locate and repair faults
- Includes pre-wired faults in a lockable fault box, which is triggered by toggle switches
- Includes wiring diagram of panel and preset faults
- All AMTEC electrical panels are available in this FAULT FINDING configuration
- Additional components such as Motors, Workstations and PLCs may be added on request





- All components connections are wired to brass studs at bottom of panel
- Student required to ring-out and identify studs & then hard wires entire panel
- Studs may be labeled by engraving for identification
- This configuration saves material costs as it uses less wire
- Includes wiring diagram of panel and preset faults
- All AMTEC electrical panels are available in this STUDS AT THE BOTTOM configuration
- Additional components such as Motors, Workstations and PLCs may be added on request

Plug in Lead: (PI)

- All components connections are wired to plug in lead sockets
- Sockets may be labeled by engraving for identification
- This configuration saves time as students do not need to hard wire the panel
- This configuration saves on material costs as it uses no wire buy reuseable plug in leads
- Includes wiring diagram of panel and preset faults
- All AMTEC electrical panels are available in this PLUG IN configuration
- Additional components such as Motors, Workstations and PLCs may be added on request



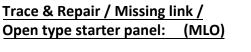




Unwired Panel: (UN)

- All components wired to studs which are located along side their respective components
- Student wires Entire panel by connecting studs
- Studs may be labeled by engraving for identification
- Includes wiring diagram of panel
- All AMTEC electrical panels are available in this UNWIRED configuration
- Additional components such as Motors, Workstations and PLCs may be added on request





- Trace and repair type Pre-wired Panel
- Identify faults and repair faults by connecting the missing link studs
- This is an open/bare type of wired electrical starters
- Studs may be labeled by engraving for identification
- Includes wiring diagram and fault sheet
- All AMTEC electrical panels are available in this MISSING LINK configuration
- Additional components such as Motors, Workstations and PLCs may be added on request

ANTEC STAR DELTA AUTOMATIC STARTER

Trace & Repair / Missing link / Enclosure panel: (MLE)

- Enclosed type Pre-wired Panel
- Enclosed type simulates industry specified starters in enclosures as one would find in industry.
- Identify faults and repair faults by connecting the missing link studs
- Studs may be labeled by engraving for identification
- Includes wiring diagram of panel & fault sheet.
- All AMTEC electrical panels are available in this ENCLOSED MISSSING LINK configuration
- Additional components such as Motors, Workstations and PLCs may be added on request





AMTEC PANEL LIST

List of current available Training Panels:

COMBINATION TYPE PANELS:

Amtec has designed a number of combination / multiple task panels to enable end users to cut costs and complete various tasks on a single panel.

<u>Combination Wiring Type Starter Panel A:</u>

Single Phase FWD/REV (Manual (Rotary Switch), Semi-Auto & Fully Auto / Oscillating Sim) Three Phase FWD/REV (Manual (Rotary Switch), Semi-Auto & Fully Auto / Oscillating Sim) Star/Delta (Manual (Rotary Switch), Semi-Auto & Fully Auto)

Pole Changing (Manual (Rotary Switch), Semi-Auto & Fully Auto)

Sequence Starting Direct On Line



<u>Combination Wiring Type Starter Panel B:</u>

Auto Transformer

Single Phase FWD/REV (Manual/Rotary Switch, Semi-Auto & Fully Auto / Oscillating Sim) Three Phase FWD/REV (Manual/Rotary Switch, Semi-Auto & Fully Auto / Oscillating Sim) Star/Delta (Manual/Rotary Switch, Semi-Auto & Fully Auto) Pole Changing (Manual (Rotary Switch), Semi-Auto & Fully Auto) Sequence Starting Direct On Line

<u>Task specific Panels:</u>

- Single Phase FWD/REV Panel (Manual/Rotary Switch, Semi-Auto & Fully Auto)
- Three Phase FWD/REV Panel (Manual/Rotary Switch, Semi-Auto & Fully Auto)
- Star / Delta Combination Panel (Manual/Rotary Switch, Semi Auto & Fully Auto)
- Pole Changing / Two Speed Panel (Manual/Rotary Switch, Semi-Auto & Fully Auto)
- Sequence Starting Combination Panel (Allows 7 various sequence starting techniques)
- Energy Metering / KWH Combination Panel (Includes 3 x 1PH, 1 x 3PH & Load Balancing)



AMTEC PANEL LIST

Task Specific Training Panels

Available in various configurations with connections via brass studs or plug in sockets:

- Trace & Repair / Missing Link
- Panel Wiring
- Panel Wiring
 Fault Finding

(240V / 400V Control Circuits) (240V / 400V Control Circuits) (240V / 400V Control Circuits)

- PLC Controlled Motor Starter Panel (Various available & Custom projects can be built)
- Demountable Motor Control Panel
- Single Phase Manual FWD/REV Panel
- Single Phase Semi-Auto FWD/REV Panel
- Single Phase Fully Auto / Oscillating FWD/REV Panel
- Three Phase Manual / Rotary Switch FWD/REV Panel
- Three Phase Semi-Auto FWD/REV Panel
- Three Phase Fully Auto / Oscillating FWD/REV Panel
- Star-Delta Manual / Rotary Switch Starter Panel
- Star-Delta Semi-Auto Starter Panel
- Star-Delta Fully Auto Starter Panel
- Star-Delta / FWD/REV Starter Panel
- Enclosed / Open Type Branded Star-Delta Starter (Full, MCE, ZEST, LOVATO, TELE, ABB)
- Pole Changing / Two Speed Manual / Rotary Switch Starter Panel
- Pole Changing / Two Speed Semi-Auto Starter Panel
- Pole Changing Fully Automatic / Oscillating Starter Panel
- Automatic Slip Ring Resistance Starter Panel (Two Stage Start)
- Automatic Slip Ring Resistance Starter Panel (Three Stage Start)
- Liquid Resistance Starter Panel c/w Dipper Unit
- Plug in Neutral Slip Ring 4 Step Joystick Panel
- Slip Ring Hoist Panel
- 4 Step Joystick PLC Slip Ring Panel
- Fully Automatic Auto Transformer Starter
- Sequences Starter 1 7 Tasks
- Relay / Alarm Training Panel
- Relay / Alarm Panel with Relay Tester
- 3 Heat, 5 Heat Simmerstat Panel with BC Lamps
- Basic Switching Training Panel



AMTEC PANEL LIST

Task Specific Training Panels Continued...

- CT/PT(VT) Training Panel (16V) Basic
- CT/PT(VT) Training Panel (110V)
- CT/PT(VT) Training Panel (110V) includes Transformer Calculations
- Limit / Pressure Switch Panel
- Single Phase Configurable Transformer Panel (For Star- Delta Configs)
- Three Phase Configurable Transformer Panel (For Star-Delta Configs)
- Three Phase Industrial Transformer 1.1KVA Star-Delta Configurable
- Energy Meter / KWH Meter Panel (3 x Single Phase Meters)
- Energy Meter / KWH Meter Panel (1 x Three Phase Meter)
- Energy Meter / KWH Meter Panel c/w Range Extension
- Load Balancing Panel
- Ward Leonard Motor / Generator Set
- AC Motor / DC Generator Panel & Motor Set
- DC Motor / AC Generator Panel & Motor Set
- DC FWD/REV Rotary Switch Starter Panel
- DC FWD/REV Face Plate Starter Panel
- DC FWD REV 4 Step Joystick Controller Panel (Millright)
- VFD / VSD Training Commissioning / Programming Panel
- Cable Phasing Panel
- Direct On-Line Starter Panel
- Stove Trainer Panel
- Inverter / UPS Training Panel



Please enquire about your motor and load configurations for your Electrical panels



AMTEC PANEL AND WORKSTATION ACCESSORIES

Amtec Techniquip manufacture a large range of Trade-test, Combination and Specialty panels. These are available on a variety of workstations depending on customers needs and workshop requirements.

- AMTEC can offer many options on workstations, but are also able to work together with customers to R+D and customize a solution that will best work for their requirements.
- AMTEC offer numerous additional accessories to customize the workstations:
 - o PAPILS Plug in lead set we offer complete sets of plug in leads for 1 and 3 phase applications
 - o PAOORT Relay Tester
 - o PA00CT Continuity Tester
 - o OW18A Multimeter panel mounted for convenience
 - WAC004 Heavy duty Lockable castor-wheels can be added to most workstations to make them easy to move, store or rearrange
 - Fixed Motor shelves, Mobile Motor trolleys, Fixed Motor plates various options are available for mounting of the motors required for panel tasks
 - o Panel mounted
 - PAAV240 Voltmeter 240VAC
 - PAAV400 Voltmeter 400VAC
 - PAAVDC Ammeter 240VDC
 - Plug sockets three phase or single phase
 - o Panel backing to increase the safety of panels enclosing rear of panels





AMTEC WORKSTATIONS

AMTEC training panels can be mounted to various Workstations configurations as follows:



Amtec Double-sided Compact Workstation



Amtec Blue enclosure for Table-top trainers



Amtec Double Cubicle Workstation



Amtec Compact Workstation with Motor mount



Amtec Cube - 4 sided Workstation



Amtec Hinged Workstation



Amtec Laboratory Workstation with Motor mount



Amtec Hanging frame



Page 11 Amtec Benchtop Workstation



AMTEC NEW-LOOK DESKTOP MODULES AND WALL MOUNTS

AMTEC Techniquip has developed a new range of modular desktop panels, enclosures and workstations. Modern design, laser-engraved and powder-coated.

Chat to our sales team to get more info!





AMTEC SECTIONED EQUIPMENT



Amtec has designed and manufactured a number of motor testing sets with education and learners in mind. Motor Testing sets allow for a visual experience to understand the internal construction and workings of various electric motor available on the market today. Motors are sectioned and painted various colours to identify the "cut line" and various components within the sectioned unit. Motors are supplied complete with an A3 poster detailing the various components or parts used in the motor.

FEATURES:

- User Manual and A3 poster of exlopded sectioned motor.
- Epoxy powder coated table top frame.
- Painted various colours to define the various cuts and /or compoents.
- Safe & Easy to Use.
- Supplied Standard with Amtec's 24 month warrantee.

AMTEC offers sectioned equipment such as Pumps, Valves and Gearboxes





All machines are of industrial nature and suitable for continuous operation and are available in 0.2 KW or 0.3 KW most suitable for training, research and educational applications. AMTEC motors are provided complete with silkscreen printed junction box with connection available via:

- BRASS STUDS
- PLUG IN SOCKETS
- **POWER CABLE 2 METER**

DC electrical machines:

- Design: with typical industrial characteristics
- Complete with base plate and coupling cog for easy engagement with other machine
- Input/output with standard 4 mm safety sockets
 - ò UNIVERSAL MOTOR
- Imprinted terminal boards with the synoptic

MOD.3130E Universal Motor Modes: AC motor DC series motor • Nominal voltage: 220V DC/AC • Nominal speed: 3000rpm

Nominal power: 0,3kW (DC) / 0,2kW (AC)

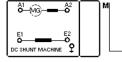
- Two shaft ends on request
- Manual explaining theory and practice
- Protection against thermal overload
- also available: 1kW, 3kW



MOD.3140 Shunt Wound Machine

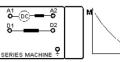
Modes: Motor, self- and externally excited generator;

- Nominal voltage: 220V
- Excitation voltage: 220V
- Nominal speed: 3000rpm
- Nominal power: 0,25Kw (mot) / 0,2kW(gen)









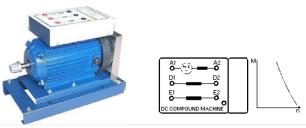
MOD.3150 Series Wound Machine

- Modes: series motor
- Nominal voltage: 220V
- Nominal speed: 3000rpm
- Nominal power: 0,2kW

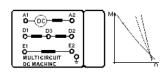
MOD.3160 Compound Wound Machine

Modes: Motor, self-and externally excited generator.

- Nominal voltage: 220V
- Excitation voltage: 220V
- Nominal speed: 3000rpm
- Nominal power: 0,25kW(mot)/0,2kW(gen) •







MOD.3165 Multi circuit Wound Machine Modes: Shunt wound motor/generator, series wound motor, compound wound motor/generator.

- Nominal voltage: 220V
- Excitation voltage: 220V
- Nominal speed: 3000rpm
- Nominal power: 0,25kW (mot)/0,15kW (geRage 14



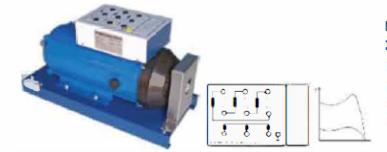
Common characteristics for all electrical machines:

- Design: with typical industrial characteristics
- Complete with base plate and coupling cog for easy engagement with other machine
- Input/output with standard 4 mm safety sockets
- Imprinted terminal boards with the synoptic
- Two shaft ends on request
- Manual explaining theory and practice
- Protection against thermal overload
- alse available: 1kW, 3kW

MOD.3040 3-Phase Squirrel Cage Motor

- Nominal voltage: 220/380V, delta/star / 50Hz
- Nominal speed: 2800rpm
- Nominal power: 0,37kW
- Cosφ = 0,69





MOD.3050

3-phase Slip Ring Asynchronous Motor

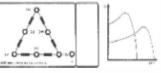
- Nominal voltage: 230/400V (delta/star)/ 50Hz
- Nominal speed: 2800rpm
- Nominal power: 0,2kW

MOD.3060

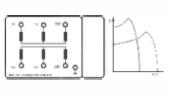
3-Phase Dahlander Motor 2/4 Poles

- Nominal voltage: 400V (star-star) / 50Hz
- Nominal speed: 2800/1400 rpm
- Nominal power: 0,29/0,22kW
- . Cosp=0,8/0,7









MOD.3065 3-Phase motor 2/4 Poles Two separate windings

- Nominal voltage: 400V (star/star) / 50Hz
- Nominal speed: 2800/1400rpm
- Nominal power: 0,6/0,4kW



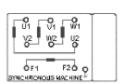
MOD.3070 Three Phase salient poles Synchronous Generator Modes; motor, generator.

- Nominal vol age: 220/380V/ 50Hz (delta/star)
- Excitation voltage: 200Vdc
- Nominal speed: 3000rpm
- Nominal power: 0,25kW(gen)/0,2kW(mot)











MOD.3074 Three Phase Synchronous Machine

Non-salient pole rotor.

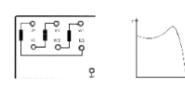
Modes: motor, generator

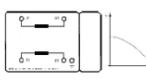
- Nominal voltage: 220/380V/ 50Hz (delta/star)
- Excitatio voltage: 200Vdc
- Nominal speed: 3000rpm
- Nominal power: 0,25kW(gen)/0,2kW(mot)

MOD.3080

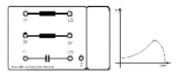
- 3-phase Reluctance Motor
- Nominal voltage: 220V/380V (delta/star)/ 50Hz
- Nomi al speed: 3000rpm
- Nominal power: 0,2kW
- Cosφ=0,6













MOD.3090

Single Phase a.c. Capacitor Run Motor

Single Phase Synchronous Generator

Nomina voltage: 230Vac/50Hz

Non-salient pole rotor. • Nominal voltage: 230V • Excitation voltage: 200V DC • Nominal power: 0,25 kW

Speed: 2800rpm

MOD.3072

Nomina power: 0,37kW

Speed: 3000rpm

• Cosq=0,94





Universal Motor

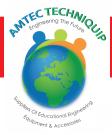
- Modes: AC motor/ DC series motor.
- Nominal voltage: 220V DC/AC
- Nominal speed: 3000rpm
- Nominal power: 0,3Kw (DC) / 0,2kW (AC)

**AMTEC can also supply Motor Test Benches, Sectioned motors, Dissectible Motor sets and Motor Test benches.

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Please contact us if you have a special requirement or need more information on the motors, motor training panels, accessories and sectioned equipment we can supply.



AMTEC MOTOR TEST UNITS

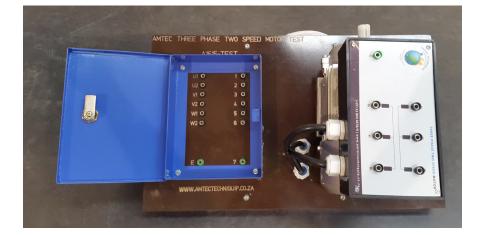
OVERVIEW

Amtec has designed and manufactured a number of motor testing sets with education and technicians in mind. Motor Testing sets allow for the following Tests to be performed on various motor available on the market today:

- Visual Inspections.
- Mechanical Inspections.
- Electrical Inspection.

Trainer includes a lockable junction box allowing the trainer to perform the following:

- Switch the internal motor windings so they are never the same for various learners.
- Add Short Circuit Bridges to the internal motor windings.
- Add Closed circuit bridges to the internal motor windings.



FEATURES:

- User Manuals, test & fault sheet for the various inspections.
- Epoxy powder coated table top frame.
- Lockable epoxy powder coated winding junction box.
- Prewired and assembled.
- Various leads for manipulation of the windings.
- Connections to winding are made via 4mm safety plug in sockets.
- Safe Relaible & Easy to Use.
- Supplied Standard with Amtec's 24 month warrantee.

Motor Test Sets Available:

- A1612-TEST Single Phase Squirrel Cage Motor Test Unit(Twin Capacitor type).
- A1613 TEST Single Phase Squirrel Cage Motor Test Unit (Single Capacitor Type).
- A1614-TEST Three Phase Squirrel Cage Motor Test Unit.
- A1615-TEST Pole Changing / Two Speed Motor Test Unit.
- A1616-TEST Three Phase Asynchronous Slip Ring Motor Test Unit.
- A1617-TEST Direct Current Compound Excitation Motor Test Unit.





AMTEC VSD / VFD TRAINER PANEL

AMTEC Techniquip manufactures a variety of VSD Trainer Panels from fundamental principles to Advanced fault recogniion.

Amtec Variable Speed Drive Training Panel

This panel covers the principles of hard wiring and programming of Variable Speed Drive Units Available with the following options (on request):

- Most Switching Methods covered
- Various VSD types Available
- Panel available prewired with faults / as below / missing link type
- Electrical lock out / key control and indication lamp.
- 16 A 3 phase Plug
- Connections available via 6mm Brass studs or 4mm plug in sockets
- Workstation which includes frame (refer to workstation for options)
- 0.55Kw 3 phase 220/380 V motor
- Main and Control circuit diagrams
- Flywheel and protective cover





AMTEC DEMOUNTABLE / DISSECTABLE MOTOR SET

Amtec Demountable Motor Set

A unique and robust motor training system for the study of the construction, operation, control and characteristics of electrical machines commonly in use.

Components supplied allow the assembly and coupling of 2 machines.

Motors are rated at 0.37KW, F80, and are available in both high and low voltage systems.

Cage Rotor

Slipring Brushgear

Centrifugal Switch Set

4x Glass-Filler Nylon End Shields

DC Rotor

DC Brushgear

Clamping Set

Experiment Manual

COMPONENTS

- **Slipring Rotor**
- Allen Keys
- Coupling Set

Assembly Bolt & Nut Sets

4x Aluminium Stators

(Split Phase, Capacitor, 3 phase, DC)

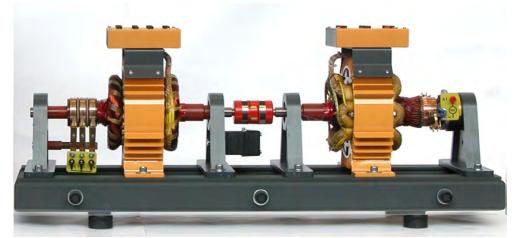
ELECTRICAL ASSEMBLY COMBINATIONS

Split Phase Motor 3 ph	Universal Motor	Capacitor Start and/or Run Motor 3
Cage Motor	3 ph Slip Ring Motor 1	ph Synchronous Motor
3 ph Alternator	ph Alternator DC	DC Generator
DC Shunt Motor	Series Motor	DC Compound Motor





DELORENZO DISSECTIBLE ELECTRICAL MACHINE



DL 10280SD

The system is a complete kit of components suitable for assembling the rotating electric machines, both for direct current and for alternating current. It allows the students to carry on a critical and well analyzed assembly, in order to understand the production techniques before performing practical tests of the operating characteristics.

The system is supplied at 220/380 AC 50 Hz and 220 DC.

APPLICATIONS

- Assembly, operation and tests on electrical machines:
- Study of the magnetic field
- Principles of the electromagnetic induction
- Separately shunt, series and compound excited dc motors
- Separately shunt, series and compound excited dc generators
- Induction motors: three-phase slip ring and squirrel cage, single-phase repulsion and with capacitor
- Dahlander connection
- Three-phase synchronous motor
- Induction regulator and phase transformer
- Alternator
- Universal motor

DL 10280SD Components

- 1. Baseplate
- 2 Four removable bearing housings
- 3. Coupling
- 4. Elastic buffer
- 5. Optical speed transducer
- 6. Clamping screws
- 7. Keys
- 8. Dc stator, with salient poles
- 9. Ac stator, with three-phase winding
- 10. Commutator rotor
- 11. Brush holder with two brushes
- 12. Squirrel cage rotor
- 13. Slip ring rotor
- 14. Brush holder with 3 pairs of brushes





EXPERIMENTS for the manual configuration

Image: Notion of the set of the	lr.	Experiment											
Image: Flux produced by the poles X													
2 Main magnetic field X			10280	10281	10282N	10283	10284	10285	10185	10310	10300A 10284	10116	10125
2 Main magnetic field X		Flux produced by the poles	X	X	X			-					
3 Intensity of the magnetic field X		Main magnetic field	X	X	X								
4 Induced voltage X			X	X	X								
5 Inter pole effect X			X	X	X			-					
6 No-load magnetic neutral axis X <t< td=""><td></td><td></td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td></t<>			X	X	X				-				
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AMTEC SNAPTRICITY TRAINING KIT

The Snaptricity set allows the reuse os electronic components to teach a variety of fundamentals in electronics.

Snaptricity set SCR750:

- 138 pages of electronics basic principles curriculum
- Student and lecturers guide
- Covers a range of topics capacitors, transistors, motors, intergrated circuits, diodes, series circuits, parallel circuits, solar energy, electromagnetism etc.
- Contents and modules of the trainer cover the following topics:
 - Basic Components and Circuits
 - Motors & Electricity
 - Resistance
 - Capacitors
 - Transistors
 - Oscillators & electronic Sound
 - Integrated Circuits
 - Electromagnetism & Radio
 - Meters, Transformers & FM Radio
 - Diodes & Applications
 - Electronic Switches
 - Electromagnetism
 - Sun Power

Summary of Components included:

LED's PNP Transistor NPN Transistor Microphone Speaker Whistle Clip Music IC Alarm IC Spacewar IC Power Amplifier High Frequency IC Inductor Antenna Ammeter Transformer FM Module Diodes 7 Segment Display Recording IC Relay SCR Solar Cell Electromagnet Vibration Switch Spring Sockets Computer Interface



DELORENZO DL 2152 ELECTRONICS TRAINING KIT



The kit includes a set of components allowing a full course on general electronics to be developed. All components are mounted on a printed circuit board fixed to metal tacks anchored on transparent plastic material modules, allowing consequently the vision of the components and the related symbol silk-screened on the PCB, the mechanical protection of the component, the electrical safety against accidental contacts and easy replacement of damaged components.

All the modules are ready to be placed on a rubber circuit designer included in the kit. The set of modules is housed in briefcases.

From the educational point of view, the student is trained in component recognition and in acquiring the manual skill necessary to realize a circuit following the diagrams reported in the handbook.

Examples of performable exercises

- Check of the fundamental laws of the electric networks
- Study of circuits in transient and steady conditions
- Characteristic measurements for different kinds of filters
- Half and full-wave rectifiers
- Applications of rectifier diodes and Zener diodes
- Measurement of pnp and npn transistor
- Study and applications of UJT and JFET transistors
- Realization of different types of amplifiers
- Study of SCR and its dc and ac applications
- Realization of circuits with DIACs and TRIACs
- Analysis of operational amplifiers and their applications

List of components

- 4 linear potentiometers
- 24 resistances, 2W
- 1 VDR
- 10 capacitors
- 3 inductances
- 4 diodes and 1 Zener diode
 - 1 switch
- 1 rectifying bridge
- 2 integrated circuits
- 1 UJT
- 1 DIAC
- 4 transistors
- 1 JFET
- 1 TRIAC
- 1 SCR
- 30 cables of different lengths (10, 25, 50 cm)
- 1 rubber circuit designer Page 24
- 2 briefcases



DL 2160 Kit for general electricity



The kit is composed of a set of components and devices that allow a practical demonstration of the most important laws of electricity and electromagnetism.

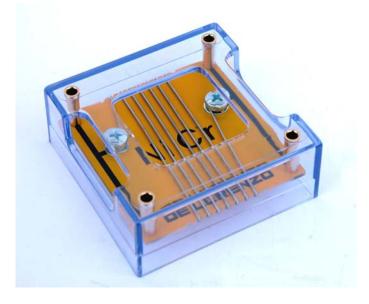
All the components are mounted on metal or plastic bases complete with terminals for an easy connection of the test circuits through multiple jack cables.

The kit is supplied with a manual that outlines the different subjects of the practical exercises in a simple and progressive way. It is to be underlined the importance of the suggested method, which is based on the direct observation and quantification of the phenomena to highlight the fundamental scientific laws.

Due to the simplicity of its components and to the guided testing procedures contained in the manual, this kit is suitable for courses both in electrophysics and electrical engineering. The tests can be carried out by students under full safety conditions.

Example of performable exercises

- Compass
- Magnetic field
- Magnetic flux and induction
- Electromagnetism
- Magnetic circuits
- Hysteresis cycle
- Electric motor
- Electrodynamic actions
- Electromagnetic induction
- Faraday's law
- Lenz's law
- Emf of self induction

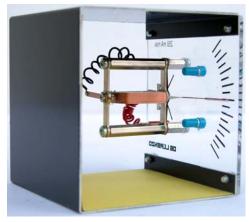




- Emf of mutual induction
- Electric current
- Direct current
- First law of Kirchhoff
- Electric current intensity
- Electromotive force (emf) of a generator
- Difference of potential or electric voltage
- Ohm's law
- Electric resistance
- Electric resistivity
- No-ohmic resistor
- Voltage drop
- Internal resistance of a generator
- Series and parallel generators
- Series and parallel resistance
- Electric power and energy
- Potentiometer
- Current shunt
- Second law of Kirchhoff
- Analysis of an electric network through Kirchhoff's laws
- Mesh currents
- Effect superposition
- Thevenin's theorem
- Electric efficiency
- Norton's theorem
- The relay
- Joule effect
- Thermoelectric effect
- Thermocouple
- Eddy currents
- Electric field
- Capacitors, capacitance
- Single phase alternate current
- Pure resistance
- Pure inductance
- Pure capacitance
- Phase shift between two signals
- Series RL and RC circuits
- Active, reactive and apparent power
- Series resonance

- Inductive reactance depending on frequency
- Capacitive reactance depending on frequency
- Parallel RL and RC circuits
- Series and parallel capacitors
- Parallel resonance
- Miniature transformer
- Electrolytic dissociation and conduction in solutions









AMTEC CROCODILE CLIP SIMULATION SOFTWARE

Allows for the design and simulation of curcuits using over 150 types of components, with the ability to test and refine your designs as you work.

Technology

A complete simulator for electronic design. It covers...



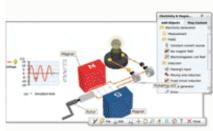
• **Electronics** — design and simulate circuits using over 150 types of component, testing and refining your design as you work.

• **PCB design** — convert your circuits into 3D PCB simulations, whose layouts can be exported for manufacture.

• **PIC programming** — program simulated PIC or PICAXE chips using simple flowcharts, before exporting to chips.

Mechanisms — experiment with a range of mechanical inputs

Science



A range of virtual labs that let you simulate physics and chemistry experiments safely and easily.

• **Electricity and Magnetism** - simulate power generation and transmis-sion, and analogue electrical circuits.

• **Light and Sound** - experiment with sound, water and light waves, and ray diagrams.

- Force and Motion investigate projectiles, oscillations, gravity and motion.
- **Electrochemistry** experiment with electrolysis, using a range of electrodes and solutions.

Inorganic & physical chemistry - simulate reactions safely and easily with over 100 chemicals.

Mathematics



• **3D Shapes** — investigate 3D shapes easily, fold and unfold nets, and measure properties.

• **Statistics** — experiment with statistics and probability, using tools that include 3D games and a line-up of people.

A colourful mathematical modelling tool, which lets you experiment with sta-tistics, probability, 3D shapes and coordinates.

Coordinates - learn about 2D and 3D coordinates, with custom games.





Voltage Detector

AMTEC MEASURING **INSTRUMENTS**

Insulation tester

Digital Loop & PSC tester



Phase rotation meter



LUX Meter



Sound level meter



Digital and Analog Oscilloscope



Earth Resistance tester





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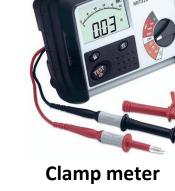
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Line and Voltage Detector









AMTEC PLUG-IN DIDACTIC TRAINER



Amtec Techniquip has developed and designed a modular solution for the study of domestic, industrial circuits & Electrical Machines. The system was developed with cost effectiveness and training in mind. The system can be purchased in 5 Core Sets depending on the application requirements, however the modularity of the system allows it to be enhanced at any time by adding any of the various modules mentioned in list of components available. The user is also able to purchase equipment and components according to their specific curriculum or learning outcomes. All the components and units are supplied with a comprehensive detailed manual providing both theory and experimental procedures, available in hard and soft copy formats.

Safety and longevity have been a priority in the design of the equipment, ensuring the protection of the user and the components. All connections are made via 4mm plug in sockets. The components, frames and enclosures are manufactured with a high quality finish and epoxy powder coated to ensure a long lasting lifespan.

All the components and machines are nominally rated at 370W and are either bench or frame mounted. They are purpose designed to replicate the characteristics of larger machines and circuits used commonly in industry.



The system is designed with the following benefits:

- Modular Concept provides flexibility for individual requirements, expansion is always available.
- Low Cost
- Portability and convenient storage
- Electrical & Mechanical Safety Built in
- All Components and solutions are provided with in depth Training guides and manuals

The modular set provides solutions for the following topics:

- Domestic Installations & circuits
- Industrial Installations & circuits
- Study of Single Phase Machines
- Study of Three Phase Machines
- Measuring Instruments
- Transformers (Single Phase & Three Phase)

Domestic Installation Core Set:

The System has been designed to replicate domestic installation and its circuits. The sets are supplied complete with Training manual.

1) AMPIDOM1 – Amtec Didactic Domestic Installation & appliance Core Training Set

- Workstation with Single Frame
- Power Supply Unit
- One Way Switching Module
- Two Way Switching Module
- Intermediate Switching Module
- Fluorescent Lighting Module
- Double Energy Saving Down Lights Module
- Double Incandescent Lamp Module
- Lighting MCB Module
- User Manual

2) AMPIDOM2 – Amtec Didactic Domestic Installation & appliance Core Training Set

Training set is comprised of didactics workstation, power supply unit and 17 modules, set includes the following:

- Workstation
- Power Supply Unit
- DB / Distribution Board Module (includes earth leakage, Isolates and circuit breakers)
- Lighting Set of Modules (mentioned above)
- Lighting arrestor module
- Geyser Simulation Module with Isolator module
- Stove Plate Module with isolator Module
- Heat Switching Module (3 Heat & 5 Heat Switch)
- KWH meter Module
- Plug Top Module



Industrial Installation Core Set:

The System has been designed to replicate industrial installations and its relevant circuits. The sets are supplied complete with Training manual.

The sets are aimed at wiring principles and techniques used industry for starting of electric motors / machines.

1) AMPIMS1 – Amtec Didactic Industrial Installation Core Training Set

The AMPIMS1 Set is designed to wire the following industrial motor circuits:

- i) Direct On-Line Starting of a single phase & three phase motor
- ii) Star / Delta Starting of a three phase motor (with timers and push buttons)
- iii) Starting of motors in sequence
- iv) Single Phase Reversing Motor Circuit
- v) Three Phase Reversing Motor Circuit

Training set is comprised of didactic workstation, power supply unit and 16 modules, set includes the following:

- Workstation
- Power Supply Unit
- 1 x Lock Out Isolator Module
- 3 x 400V Contactor & NO/NC Auxiliary Module
- 2 x Electronic Timer (Multi Type) Module
- 2 x Thermal Overload Module
- 2 x Start / Stop Push button Module
- 1 x Forward / Stop / Reverse Module
- 1 x Emergency Stop Module
- 1 x Industrial Indicator Module (Lamp)
- 1 x Double Pole MCB Module
- 1 x Triple Pole MCB Module
- 1 x Earth / Neutral Bar Module
- 1 x Three Phase 220/380V Motor Unit
- 1 x Three Phase 400/660V Motor Unit
- 1 x Single Phase Electric Motor Unit

2) AMPIMS2 – Amtec Didactic Advanced Industrial Installation Core Training Set

The AMPIMS1 Set is designed to wire the following industrial motor circuits with measuring instruments:

- i) Direct On-Line Starting of a single phase & three phase motor
- ii) Star / Delta Starting of a three phase motor (with timers and push buttons)
- iii) Starting of motors in sequence
- iv) Single Phase Reversing Motor Circuit
- v) Three Phase Reversing Motor Circuit
- vi) Starting of Three Phase motor with Auto Transformer
- vii) Starting of a 3 Phase Slip Ring motor
- viii) Study of Single Phase & Three Phase Transformers



Training set is comprised of didactic workstation, power supply unit and 20 modules, set includes the following:

- Workstation
- Power Supply Unit
- 1 x Lock Out Isolator Module
- 3 x 400V Contactor & NO/NC Auxiliary Module
- 2 x Electronic Timer (Multi Type) Module
- 2 x Thermal Overload Module
- 2 x Start / Stop Push button Module
- 1 x Forward / Stop / Reverse Module
- 1 x Emergency Stop Module
- 1 x Industrial Indicator Module (Lamp)
- 1 x Double Pole MCB Module
- 1 x Triple Pole MCB Module
- 1 x Earth / Neutral Bar Module
- 1 x Auto Transformer Module
- 1 x Slip Ring Resistor Module
- 1 x Triple Transformer Module
- 1 x Triple Ammeter 0 5A Module
- 1 x Triple Voltmeter 0 500V Module
- 1 x Three Phase 220/380V Motor Unit
- 1 x Three Phase 400/660V Motor Unit
- 1 x Single Phase Electric Motor Unit
- 1 x Three Phase Slip Ring Motor

Alternative Industrial Option:



Set is comprised of a grid type frame and power supply unit mounted to a workstation.

Components sets or individual components from the list mentioned previously are mounted to the frame. The circuits are physically wired to the components. Page 32



AMTEC INDUSTRIAL PLUG-IN DIDACTIC TRAINER MODULES

Motor starter control, Electrical machines and Measuring instrumentation available for Modular Plug-in Trainer:

- Contactor N/o 230 VAC
- Electronic Timer 230VAC
- Single pole Circuit breaker
- Double pole Circuit breaker
- Triple Pole Circuit breaker
- Thermal Overload
- Voltmeter
- Ammeter
- Frequency meter
- Single-phase watt meter
- Three-phase phasemeter
- Resistive load
- Inductive load
- Capacitive load
- Earth and Neutral Bar
- VSD Variable speed drive unit
- CT current transformer
- VT/PT Voltage/ potential transformer
- Single phase transformer
- Three phase transformer
- Auto transformer
- HMI Human interface
- Rectifier
- Isolator
- Three-phase power supply
- DC power supply

- Universal Relay
- Thermal Relay
- Time Relay
- Start Stop Button
- Emergency push button
- Emergency stop Steel Latching
- Fwd/Stop/Rev Button
- Three pole switch
- Star/delta Starter rotatory switch
- Pole switching for Dahlander /2 speed motors
- Single phase motor
- Three phase motor
- Slip ring 380V motor
- DC compound motor
- DC shunt motor
- DC series motor
- Limit switch
- Single phase Fwd/Rev switch
- Three phase Fwd/Rev switch
- Direct starter with inversion
- Inductive proximity sensor
- Capacitive proximity sensor
- Photoelectrical barrage sensor
- Photoelectrical reflecting sensor
- Level magnetic sensor
- Probes / level sensor
- Position sensor
- Triple Pilot light/Industrial indicator
- Pulse counter



AMTEC DOMESTIC PLUG-IN DIDACTIC TRAINER MODULES

Domestic and Civil instrumentation available for Modular Plug-in Trainer:

- Voltmeter
- Ammeter
- Single phase KWh Meter
- Three phase kWh Meter
- Multimeter
- Surface DB Complete
- 1 way switch
- 2 way switch
- Intermediate Switch
- 3 pin wall plug
- Fluorescent
- 3, 5 Heat Switch
- Pool Timer
- Motion detector
- Smoke detector
- Temperature controller
- Brightness controller
- Universal dimmer
- Shutter Actuator
- Valve Actuator
- Blinker
- Twilight switch
- Photovoltaic energy kit
- PLC controller
- HMI controller
- Gas detector
- Passive infrared sensor

- Electronic Timer 230VAC
- Single MCB
- Double pole MCB
- Three Pole MCB
- Overload 2.5
- Start Stop Button
- Start Stop Start Button
- Emergency stop Steel Latching
- 3 Pilot light/ Industrial indicator
- Earth and Neutral Bar
- Halogen lamps and single-phase transformer
- Low consumption fluorescent lamp
- Metal Halide lighting
- Sodium Vapor lighting
- Mercury lighting
- Downlight 220V
- Emergency light
- Fluorescent
- Bell/door opener
- Brass Batton
- Alarm
- Stove
- Geyser



AMTEC DOMESTIC TRAINER

AMTEC Techniquip has a variety of Domestic Training panels covering the principles of Fault finding and Wiring found in most household scenarios. These panels aid a lecturer in up-skilling students for real-life situations of fault finding, panel wiring, lighting and appliance repairs. These panels are available in BASIC and ADVANCED forms and may be mounted on a workstation or built into a cubicle style. Panels are assembled on electrical phenolic board and may be configured with a choice of plug-in connections or hard-wiring via brass studs.

Basic Domestic and Commercial Training panel:

- Geyser simulator with isolator
- Stove top with control via 3 and 5 heat and simmer switches
- DB Board
- Basic lighting and Light switch configuration
- Power plug points
- Day/Night switch
- 1 and 2 way switching
- kWh Meter
- Transformer bell



Amtec Advanced Domestic Appliance Trainer

Amtec Combination Panel Domestic Appliance and Advanced Lighting Trainer





AMTEC DOMESTIC TRAINER

Domestic lighting

- Basic lighting trainer
 - o Light fittings
 - o 1 and 2 way switching
 - o Intermediate switching
 - o Basic Wiring
- Advanced lighting trainer
 - o Downlighters 24V and 240V
 - Light switching panel
 - Metal Halide/ Sodium Vapor/ Mercury
 - o Flouresent
 - o BC lights
 - Stove top with control
 via 3 and 5 heat and simmer

ADVANCED LIGHTING



COMBINATION DOMESTIC AND INDUSTRIAL LIGHTING





AMTEC COC INSTALLATION WIRE WAY TRAINER

OVERVIEW

Unit has been manufactured according to the latest trade test requirements. Allowing the user to construct, wire and test a number of various domestic / industrial circuits. Trainer is supplied on a double sided station to allow construction to be done simultaneously on either side of the station. Trunking, PCV conduit / Steel Bosal type wire ways are mounted directly to the superwood board. These are then wired and connections are made to the various components supplied.

Allowing testing of the construction, wiring and neatness of the learner.







- FEATURES:

- Supplied complete with user manuals, wiring diagrams and test sheet
- Set is not limited to trade Test Constructions and allows for construction of various / user defined circuits.
- Includes pre-constructed obstructions and pre built wire ways that can be removed and rebuilt
- Includes distribution Board
- Electrical Lock out Isolator and Mains lead to ensure user safety
- Epoxy powder coated a-Frame type workstation (double sided.
- Superwood boards are easily and can be replaced locally for low cost.
- Easy, Safe and reliable
- Supplied complete with Amtec's 24month Warrantee.

OPTIONAL ACCESSORIES:

- PM00CW Lockable Castor Wheels
- Advanced set of Conduit bundle and accessories / fittings
- Advanced set of Steel Bosal bundle and accessories / fittings
- Bench Vice
- Pipe Benders
- Hickey



AMTEC INSTALLATION, WIRING AND INDENTIFICATION TESTING PANEL



Overview:

The AMTEC Installation and Wiring Panel simulates single phase and three phase installation as found in the field

Wiring according to SANS

Combination of PVC and steel conduit

Includes pre-wired faults in a lockable fault box, which is triggered by toggle switches Load is simulated with

stove element

Panels can be customized and designed to customers requirements

Panel layouts can also be customized for wall mounting, workstations or cubicle style.





AMTEC DOMESTIC APPLIANCES

AMTEC TECHNIQUIP provide Domestic Appliance trainers used to teach the principles of fault finding and repairing the inner workings of common household appliances. AMTEC can supply recognized brand name appliances in two configurations:

- Sectioned and Operational fault finding appliances: Sectioned with perspex covers to allow students to see moving parts and understand internal operations. These trainers include lockable fault boxes with predetermined switchable faults.
- Plug-In Configuration appliances: Designed to simulate real operating appliances. Allows students the ability to build a complete unit from scratch. Uses 4mm Plug-In leads to do connections.

Various types of appliances available:

- Stove
- Geyser
- Washing machine
- Microwave
- Fridge
- Deep Freezer
- Toaster
- Kettle









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AMTEC TOOLS, ACCESSORIES AND CONSUMABLES

AMTEC supply a wide variety of related tools, accessories and instrumentation

- Silicone reinforced, stackable plug-in leads available in
 - Various colours Red, Black, Blue, Green, White, Brown, Grey, Purple
 - o Various sizes, styles and lengths
- Lugs, Ferrules, Sockets and binding posts
- Crocodile clips, Banana plug sockets and leads
- Tool Boxes
- Soldering Iron
- Trunking, PVC and steel conduit
- Conduit
- Meters Clamp meter, LCR, Megger, DMM, Oscilloscope
- Machine tools
- Wire and Consumables
- Gauges and Measuring instruments









AMTEC AST-R SWITCHING AND SIMULATION TRAINER



OVERVIEW:

Trainer assists the user in identification, testing and wiring of various switches found in industry and domestic installations. The unit is a perfect tool for the introduction to switch theory and practical's. Wiring can be confirmed by means of LED lamps included on the unit.

The trainer covers the following switching techniques:

- Three Heat Switching
- Five Heat Switching
- Simmerstat Switching
- SPST Switch
- SPDT Switch
- DPDT Switch

FEATURES:

- Supplied complete with user manuals, wiring diagrams and test sheet.
- Supply voltage available via switched 4mm safety sockets.
- Internal connections are made to the switches via 4mm safety sockets.
- Electrically Insulated materials used.
- Allows for connection up to 3A ac (max) loads / LED incorporated LED lamps
- Wiring of configurations done via 4mm safety stackable leads.
- Results can be confirmed by Lamps.
- Epoxy powder coated enclosure.
- Safe, reliable & easy to use.
- Voltage tests can be measure via analogue / digital multimeter
- Supplied Standard with Amtec's 24 month warrantee.



AMTEC TX-1 TRANSFORMER TRAINER



Easy and safe single phase rebuildable transformers

Overview:

This is a safe rebuild able single phase transformer trainer supplied complete with various primary and secondary coils

The core is made from Silicum sheets, in a "U" shape.

Units are assembled on a base of 230x150mm on rubber feet. Two braces clamp the parts into place and can easily be opened.

- TX1 Primary Supply coil 220V, 800VA 440 turns . Imax =4A. Fuse protected.
- TX2 Secondary coils 5 units, Numbeor of turns 6;12;24;48 and 96, Imax 3,3 to 50A.
- TX3: Secondary with 2 coils in Series, each of 1000 turns 0.8A.
- TX4: Secondary with 2 coil in series, each 220 turns 3.6A -220/110V

Dimensions: Approximately 350mm high x 300mm long x 200mm wide 10kg



AMTEC ATX-R SINGLE AND THREE PHASE TRANSFORMER TRAINER

OVERVEIW:

AMTEC Transformer trainer assists the user in identification, continuity testing and wiring of Single Phase & Three Phase Air cooled double wound Transformers.



Single Phase Transformer Configuration Trainer

Allows for the user to learn and understand single phase "multi tap" transformer theory with positive and negative tapings manipulating the output voltages and proving the theory in practice.

Three Phase Transformer Configuration:

Allows the user to learn and understand three phase "Multi Tap" Transformers theory. The transformer can be configured in the following three phase configurations via the various input tapping's available on the transformer -10% -400Vac - +10%

The Transformer has multiple configurations via the various configurations and tapping that are available on the trainer.

FEATURES:

- Supplied complete with user manuals, wiring diagrams and results sheet.
- Supply voltage available via switched 4mm safety sockets.
- Internal connections are made to the transformer via 4mm safety sockets.
- Electrically Insulated materials used.
- Allows for connection up to 1Aac (max) loads.
- Wiring of configurations done via 4mm safety stackable leads.
- The input and output voltages can be easily measured with a multi-meter.
- Epoxy powder coated enclosure.
- Safe, reliable & easy to use.
- Voltage tests can be measure via analogue / digital multimeter
- Supplied Standard with Amtec's 24 month warrantee.



AMTEC VARIAC / VARIABLE AUTOTRANSFORMERS

- Bare for references finishing with a "N"
- With a stainless steel case for references finishing with "A" or "P"

• Protected by a case, fitted with 4 casters, circuit breaker and ON/OFF LED for references finishing with a "PE" Covered (P and PE) units have a mains cable at the primary and safety terminals at the secondary.



AMTEC THREE PHASE AND SINGLE PHASE RESISTIVE, CAPACITIVE AND INDUCTIVE LOADS

Load banks are available with resistive, inductive, and capacitive load elements. Resistive units test power sources without changing the power factor. Inductive and capacitive load elements can be used to simulate for non-unity loads and to adjust the power factor of circuits.





AMTEC TOOLS, ACCESSORIES AND CONSUMABLES

AMTEC supply a wide variety of related tools, accessories and instrumentation



PVC fittings and conduit









Electrical components



Electronic components

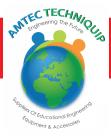


Electrical Consumables



Electrical wires and cables:

- GP wire
- Solid wire
- Armored cable
- Unarmored cable
- Surfix cable
- Cabtyre
- Panel flex
- Bare copper



AMTEC AUTOMATION

AMTEC HMI / PLC TRAINERS

AMTEC Techniquip manufactures a variety of HMI & PLC Trainers for the fundamentals to advanced fault recognition.

Amtec Basic HMI Trainer:

- Designed to teach students connectivity to HMI and HMI Programming
- Includes Manuals
- Includes Software
- Includes Cables from PC-HMI
- Variety of HMI's available (Delta, Lovato, Schneider, Siemens etc.)
- Includes Program that Tests all components on HMI are functional
- On request, free of charge includes Training basic and advanced







AMTEC PLC TRAINERS



Amtec PLC Trainer – Programming, Interface & Simulation



Amtec Techniquip has designed and developed PLC Trainers using various PLCs used in industry. The PLC Trainers are prewired so as to allow the unit to withstand everyday use in the classroom, workshop or laboratory. The Trainer has both Switches and LED Lamps for use as a stand-alone unit, however the unit can also be interfaced to external equipment.

All units are supplied with the software and programming cable.

Intermediate PLC desktop trainer that focuses on Programming, Interface and Simulation. It is enclosed in a powder coated sheet metal enclosure, with a silk-screen printed façade labelling all components and connection points

- Schneider PLC Zelio including software and data cable
- Inputs triggered by 8xx SPST switches for demonstration of various PLC logics, Ladder diagrams and Function block diagrams
- 8xx Corresponding 16mm pilot lights to signal trigger with SPST switches
- 4xx 16mm pilot Indication lights
- Easy connection via plug in safety sockets and leads
- Unit can be used stand-alone or can be interfaced to various hardware such as motor, signal tower, conveyor belt, elevator simulator and other PLC controlled modules.
- Desktop unit for use in the classroom, laboratory or workshop
- Supplied with complete user manual and sample exercises
- 24V dc supply for user safety
- Mounted to robust epoxy powder coated enclosure.
- Safe & Reliable
- Supplied with Single phase plug for connection to mains

Optional Accessories

Amtec HMI Simulation Module – Allows the user to interface the various I/O's to and HMI with preloaded virtual experiments

PLC Brands Available:

Dimensions & Weight:

- Delta 300mm (l) x 250mm (d) x 150mm (h)
 - Schneider

- 4.5Kg

- Siemens
- Lovato
- Mitsubishi



AMTEC PLC TRAINERS

Amtec PLC Trainer – Programming, Simulation, Interface and Wiring Type



OVERVIEW

Amtec Techniquip has designed and developed PLC / Programmable Logic Controller Trainers using various PLC's used in industry. The PLC is prewired so as to allow the unit to withstand everyday use in the classroom, workshop or laboratory. The trainer includes a number of components commonly used as input devices and output devices to allow the unit to be a stand-alone set allowing the user to familiarise himself / herself with programming a PLC, Loading the program, and connecting the PLC to various components. The unit can also be used as a stand-alone module and interfaced to external equipment.

Advanced PLC desktop trainer that focuses on Programming, Interface, Simulation and Wiring. It is enclosed in a powder coated sheet metal enclosure, with a silk-screen printed façade labelling all components and connection points

- Schneider PLC Zelio including software and data cable
 - Control components used for demonstration of various PLC logics, Ladder diagrams and Function block diagrams
 - are available as follows:
 - 12xx Digital Inputs
 - 8xx Relay Outputs / Digital
 - 6xx Switches as SPST & Push-to-make function
 - o 1xx Plunger limit switch
 - o 1xx Roller limit switch
 - o 1xx Lever limit switch
 - 8xx Coloured pilot lights
 - 1xx Electromagnetic counter
 - o 1xx 24V DC Buzzer
 - o 2xx 24V DC Motor
 - Trainer is set up to simulate:
 - o PLC Motor control
 - o Traffic light intersection
 - o Elevator simulation
 - Mini process control
- Easy connection via plug in safety sockets and leads
- Unit can be used stand-alone or can be interfaced to various hardware such as motor, signal tower, conveyor belt, elevator physical simulator and other PLC controlled modules.
- Desktop unit for use in the classroom, laboratory or workshop
- Supplied with complete user manual and sample exercises
- 24V dc supply for user safety
- Mounted to robust epoxy powder coated enclosure.
- Safe & Reliable
- Supplied with Single phase plug for connection to mains

OPTIONAL ACCESSORIES:

Amtec HMI Simulation Module – Allows the user to interface the various I/O's to and HMI with preloaded virtual experiments



Amtec Traffic Light simulator:

- Designed for application of programs to real life situations
- Includes Manuals
- Includes Software
- Includes communication Cables from PC-PLC
- Variety of PLCs available (Delta, Lovato, Schneider, Siemens etc.)
- Includes simulation example programs
- Includes Program that Test all components on PLC are functional
- On request, free of charge includes Training basic and advanced

Amtec Combination PLC STAR/DELTA FWD/REV:

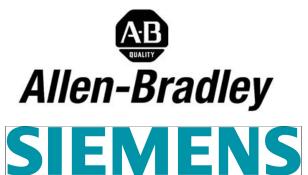
- Designed for various motor starting sequences via PLC
- Includes Manuals
- Includes Software
- Includes Cables from PC-PLC
- Variety of PLCs available (Delta, Lovato, Schneider, Siemens etc.)
- Includes Program that Test all components on PLC are functional
- On request, free of charge includes Training basic and advanced





Amtec is in partnership with major PLC brands:











AMTEC PLC TRAINERS

AMTEC Conveyor belt PLC module

De Lorenzo Elevator PLC module



AMTEC Signal tower PLC module

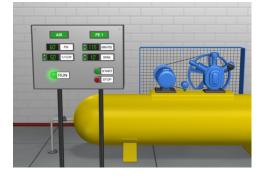


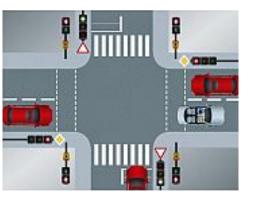


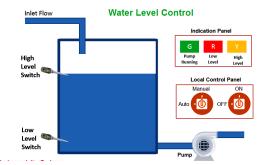
DL 2122M

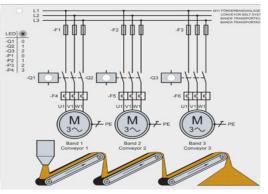
Simulated PLC Scenarios

- HMI controller
- Alarms
- Gas detector
- Passive infrared sensor
- Perimeter sensor
- Blinker
- Motion switch
- Day/night switch
- Position sensor
- Capacitive proximity sensor
- Photoelectrical barrage sensor
- Photoelectrical reflecting sensor
- Level magnetic sensor
- Pulse counter
- Smoke detector
- Temperature controller
- Brightness controller
- Shutter actuator
- Infrared transmitter











AMTEC MEASURING

Bluetooth Digital Multimeter

OW18A/OW18B



- + 3 5/6 bit resolution
- + Data Logger + Multimeter + Thermometer
- + BLE 4.0 wireless transmission, more stable, less power consumption
- + Chart and Diagram mode helps to analyze the data tendency
- Flashlight function lightens the darkness
- + Support NCV non-contact voltage sense
- + True RMS test supported
- + Widely supported on Android, iOS and Windows
- Build-in offline record function supports non-stop up to 7 days non-stop recording

		Measurement Range	Resolution	Accruacy	
DC Voltage		60.00mV / 600.0mV (EU)	0.01 mV	+(0, 50% +2, -fi-)	
		600.0mV / 6.000V / 60.00V / 600.0V	0.1 mV	±(0.5%+2 dig)	
		1000V	1 V	±(0.8%+2 dig)	
AC Voltage		6.000V / 60.00V / 600.0V	1 mV	±(0.8%+3dig)	
		750V	1 V	±(1%+3dig)	
	μΑ	60.00uA / 600.0µA	0.01µA	+(0.0%+2dia)	
DC Current	mA	60.00mA / 600.0mA	0.01mA	±(0.8%+2dig)	
	Α	20.00A	0.01A	±(1.2%+3dig)	
	μΑ	60.00uA / 600.0µA	0.1µA	±(1%+3dig)	
AC Current	mA	60.00mA / 600.0mA	0.01mA		
	Α	20.00A	0.01A	±(1.5%+3dig)	
Resistance		600.0Ω / 6.000kΩ / 60.00kΩ / 600.0kΩ / 6.000MΩ	0.1Ω	±(0.8%+2dig)	
		60.00MΩ	0.01 MΩ	±(2%+3dig)	
Capacitance		60.00nF / 600.0nF / 6.000µF / 60.00µF	0.01nF	±(2.5%+3dig)	
		600.0µF / 6.000mF / 60.00mF	0.1µF	±(3%+5dig)	
Frequency		9.999Hz / 99,99Hz/999.9Hz / 9.999kHz / 99.99kHz / 99.9kHz / 9.999MHz	0.001Hz	±(0.8%+2dig)	
Duty Ratio		0.1% - 99.9% (typical value : Vrms=1V, f=1kHz)	0.1%	±(1.2%+3dig)	
Duty Ratio		0.1% - 99.9% (≥1kHz)	0.170	±(2.5%+3dig)	
Tomporature (CC/2E)		- 50 °C~ +400°C	1°C	±(2.5%+3dig)	
Temperature (°C/°F)		-58 °F - +752 °F	1 T	±(4.5%+5dig)	
Display		5999			
Frequency Response		(40 - 1000) Hz			
Shift Rate		3 times/s			

Bluetooth Module	√ (only in OW18B)	Auto Ranging	4
True RMS	4	LCD Backlight	1
Diode Test	1	Automatic-manual Range Selection	4
Auto Power-off	4	Input Protection	4
On-off Warning	4	Input Impedance	≥10MΩ
Low-battery Indicator	4	Safety Compliance	600V CATIV, 1000V CATIL
Data Hold	4	NCV	4
Relative Measurement	4	Dimension (W×H×D)	196 x 88.5 x56 (mm)
Flashlight	V-	Weight (without package)	0.30 kg



Digital Clamp Meter

- CM240



+ Performance Specifications

	Range	Accuracy	
AC Voltage	2V / 20V / 200V	± (1.2%+5-digit)	
AC Voltage	600V	± (1.5%+5-digit)	
	200mV	± (0.8%+5-digit)	
DC Voltage	2V / 20V / 200V	± (0.8%+5-digit)	
	600V	± (1.0%+5-digit)	
	2.000A	± (4%+20-digit) ≤ 0.4A, ± (3%+15-digit)	
AC Current	20.00A	\pm (3%+15-digit) \leq 0.4A, \pm (2%+10-digit)	
	200.0A / 400A	± (2%+5-digit)	
	200.0Ω	± (1.2%+5-digit)	
Resistance	2.000kΩ / 20.00kΩ / 200.0kΩ	± (1%+3-digit)	
resistance	2.000ΜΩ	± (1.2%+5-digit)	
	20.00ΜΩ	± (1.5%+5-digit)	
Features			
Display Count	2000		
Auto Range	V		
Data Hold	4		
Jaw Capacity	28mm		
Diode	1		
Continuity Buzzer	م		
MAX Mode	v		
Low-battery Indicator	4		
Auto Power-off	1		
General			
Power	2 x 1.5V AAA batteries		
Dimension (W x H x D)	65 x 177 x 28 (mm)		
Weight (without package)	186 g		
Safety Rating	600V, CAT III		



AMTEC PLUG IN LEADS AND SOCKETS





SMARTSIM

ILS SAR

DL OPENLAB-SSEM

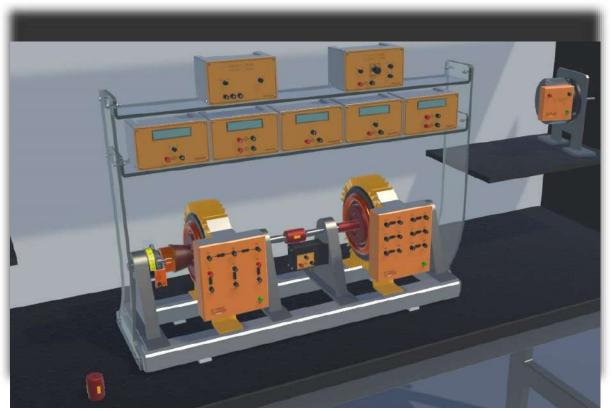
SMART SIMULATOR FOR ELECTRIC MACHINES TRAINING



DELORE Page 54 O



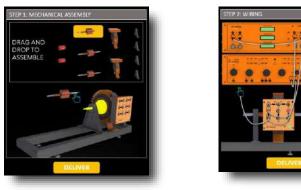
SMART SIMULATOR FOR ELECTRIC MACHINES TRAINING



DL OPENLAB-SSEM

The DL OPENLAB SMARTSIM is a software that has been developed to teach main topics related to electric machines in a unique and effective way. With this software, students can improve their individual experience studying electric machines in practice. Students will be able to carry out several experiments dealing with the following topics:

- mechanical assembly,
- wiring, tests and measurements.





This software will be able to reproduce the features and behaviours of DE LORENZO Electric Machines Laboratory – DL OPENLAB.

With this type of software developed by DE LORENZO, students can learn in their own rhythm and teachers have more time to support the class, manage and improve the process because - unlike any other simple simulator - it grants the following benefits:



1) EFFECTIVE GUIDE FOR STUDENT: possibility to access learning topics, with theory, instructions and experiment proposals. The software includes a virtual version of the DL OPENLAB system;



2) AUTOMATIC VALIDATION OF STUDENTS' TASKS: the software automatically verifies if the student completed successfully each task in order to allow him/her to go ahead with the next one;



3) TRACKING OF STUDENTS' PROGRESS: the teacher can verify the students' progress any time consulting the specific summary in the software or exporting it to a spreadsheet.

STUDEN	IT'S PRO	GRESS SUMMARY					
STUDENT		DAVINCI			\Box		
			_ / /		• / 🗛		
				5			
Timestamp	ACTIVIT Topic	Experiment Done		3 of 60		s	
Timestamp 20-04-2020 10:15						s	
Timestamp 20-04-2020 10:15 20-04-2020 10:28	Topic	Experiment Done				s	

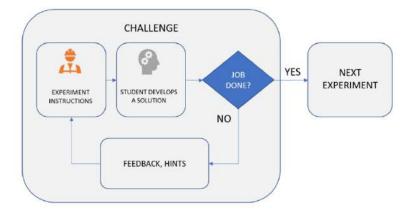


How does it help the professor?

With this software, the teacher spends less time explaining topics, verifying students' activities and helping students do identify mistakes that do not allow the successful completion of the experiment. That means that the professor has more time to manage the class, make improvements and help students who need more attention. The two following points grant such benefits:

1) The software automatically verifies the experiments carried out by the students and it gives relevant feedbacks:

Like in a game that has different phases with challenges and missions, the DL OPENLAB-SSEM software includes practical experiments that need to be successfully completed to let the student access the next one. The teacher does not need to verify continuously if the student carried out the experiment. Moreover, many questions students would make about "what could be wrong" are automatically "answered" by the software when the student does not perform the experiment successfully. The image below summarizes this process.



2) The software tracks the students' progress and it allow exporting reports:

At any time, the professor may verify how many and – specifically - which experiments the student has completed. That report can be used to track students' activities and it can be considered as an evaluation tool. This report can be generated and displayed directly in the system or it can be exported to a spreadsheet (see image below).

Timestamp	Student	Торіс	Experiment
20-04-2020 10:15	Da Vinci	Basic Ideas	1. Flux produced by the poles
20-04-2020 10:28	Da Vinci	Basic Ideas	1.2 Main poles
20-04-2020 10:38	Da Vinci	Basic Ideas	1.3 Interpoles



DIDACTIC EXPERIENCE AND APPLICATION

The software guarantees a complete experience in the field of electrical machines. Students can approach this topic starting from the basic concepts, such as the analysis of magnetic fields and fluxes, up to advanced experiments based on characterization of machines and efficiency analysis.

Through this system, it is possible to assemble a relevant number of electric machines to carry out the following didactic experiences:

- Study of the magnetic field
- Principles of the electromagnetic induction
- Separately shunt, series and compound excited DC motors
- Separately shunt, series and compound excited DC generators
- Induction motors: three-phase slip ring and squirrel cage, single-phase repulsion and with capacitor
- Dahlander connection
- Synchronous three-phase motor, induction regulator and phase shifter, alternator, universal motor

SET OF ASSEMBLED MACHINES

The system is based on a set of components that allow the assembly of the rotating machines. The set consists of the following components:

- 1. Base plate
- 2. Supports with bearing
- 3. Coupling joints
- 4. Flexible coupling
- 5. Electronic speed transducer
- 6. Assembling screws
- 7. Wrenches
- 8. DC stator
- 9. AC stator
- 10. Rotor with commutator
- 11. Brush holder with 2 brushes
- 12. Squirrel cage rotor
- 13. Slip-Ring rotor
- 14. Brush holder with 6 brushes

The system also includes adjustable DC and AC power supplies, instruments, loads, starting devices, etc., in order to perform all the experiments of the electric machines.





LEARNING TOPICS

This software covers 6 topics and proposes 45 experiments for the students. The experiments are listed below, grouped by learning topics.

1	Flux produced by the poles
2	Main magnetic field
3	Intensity of the magnetic field
4	Induced voltage
5	Inter pole effect
6	No-load magnetic neutral axis
7	Rotating magnetic field

8	3-phase squirrel cage motor, 2 poles, 24 VΔ
9	3-phase squirrel cage motor, 2 poles, 42 VY
10	3-phase squirrel cage motor, 2 poles, 24 V $\Delta\Delta$
11	3-phase squirrel cage motor, 2 poles, 42 VYY
12	3-phase squirrel cage motor, 4 poles, 24 V Δ
13	3-phase squirrel cage motor, 4 poles, 42 VY
14	3-phase Dahlander motor, 4/2 poles, 42 V∆/YY
15	Split phase motor
16	Capacitor start and run motor
17	3-phase motor with wound rotor, 2 poles, 42 VYY
18	Phase shifter
19	Induction regulator
20	3-phase synchronous induction motor, 2 poles, 24 V Δ
21	3-phase synchronous induction motor, 2 poles, 24 V $\Delta\Delta$

DIRECT CURRENT MOTORS

22	DC motor with separate excitation
23	DC motor with shunt excitation
24	DC motor with series excitation
25	DC motor with compound excitation, long shunt
26	DC motor with compound excitation, short shunt

COMMUTATOR MOTORS FOR ALTERNATING CURRENT

27	Single phase series motor
28	Repulsion motor

SYNCHRONOUS MACHINE29Synchronous motor winding resistance30Synchronous motor no-load test

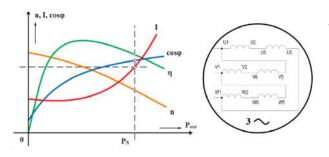
31	Synchronous motor short-circuit characteristics
32	Synchronous motor short-circuit test
33	Synchronous motor Behn - Eschenberg's method
34	Synchronous motor load test
35	Synchronous motor conventional efficiency
36	Parallel connection of the alternator with the mains
37	Alternator as synchronous motor

DIRECT CURRENT GENERATORS 38 DC generator winding resistance 39 DC generator test of the no-load motor (Swinburne) 40 DC generator no-load e.m.f. 41 DC generator excitation characteristics 42 Separate excitation dynamo Shunt excitation dynamo 43 44 Series excitation dynamo 45 Compound excitation dynamo



DESCRIPTION OF PERFORMABLE EXPERIMENTS

Here follows a short description of some of the performable experiments.

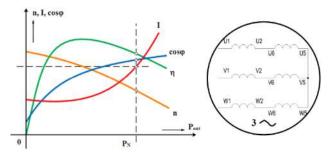


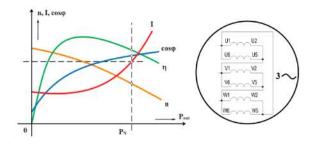
Three-phase squirrel cage motor, 2 poles, 24 VA

This experiment studies the behavior of the threephase squirrel cage motor in load condition with the stator windings connected in delta.

Three-phase squirrel cage motor, 2 poles, 42 VY

The main objective of this experiment is to study the characteristic curve of a three-phase squirrel cage motor with the stator winding connected in star by performing a direct test using an electromagnetic brake.





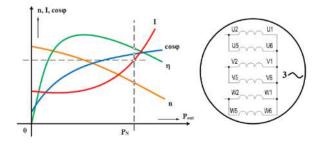
Three-phase squirrel cage motor, 2 poles, 24 V $\Delta\Delta$

Applying the same concepts studied up to this point, the student can plot the load characteristics of the three-phase squirrel cage motor connected in double delta.



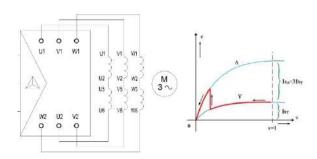
Three-phase squirrel cage motor, 2 poles, 42 VYY

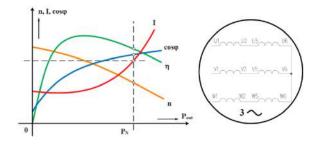
Following the same procedure with the stator winding connected in double star, the student will trace the curves for the absorbed current I, the power factor $\cos\varphi$, the speed n and the efficiency η as a function of the output power P.



Three-phase squirrel cage motor, 4 poles, 24 V Δ

In addition to recording the operation characteristics of the motor, the student will learn how to start the motor using a star-delta starter.





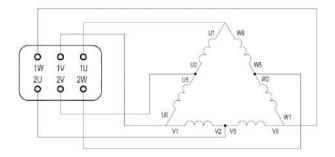
Three-phase squirrel cage motor, 4 poles, 42 VY

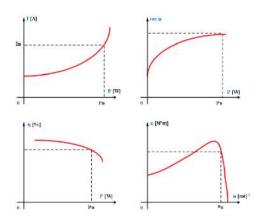
In this experiment, the student will learn the load operation of a three-phase motor with 4 poles.

Three-phase squirrel cage motor, 4/2 poles, 42V Δ /YY

In previous experiments, it has been demonstrated that by changing the number of poles it is possible to vary the speed of a squirrel cage motor. The student will learn about two-speed Dahlander motor configuration and its operation.





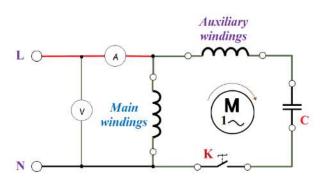


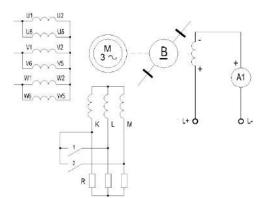
Split phase motor

The split phase motor, also known as a resistance start motor, has a single cage rotor and its stator has two windings known as main winding and starting winding. The main objective of this experiment is to study the characteristics of the motor with the main winding only, and to draw the curves of current I, efficiency η , torque C, output power P and power factor.

Capacitor start and run motor

The objective is to study the characteristics of the motor with permanently connected capacitor. The student will learn how to properly select and connect a capacitor to the auxiliary windings so that the current through the main winding lags behind the current of the auxiliary windings by an angle of 90°.





Three-phase motor with wound rotor, 2 poles, 42 VYY

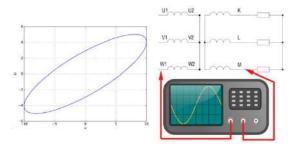
The student will record the load characteristics of the motor with a wound rotor and the stator connected in double star.

With the knowledge acquired up to this point, it will be easy to draw the diagram of the mechanical characteristic M = f(n) and to observe the behavior of an induction motor with a different type of rotor.



Phase shifter

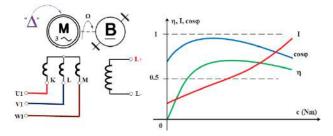
The objective is to study how the phase between the stator and rotor voltages varies as a function of the rotating angle and to identify the null phase shift condition using Lissajous' ellipse by setting the oscilloscope to XY mode.



Induction regulator

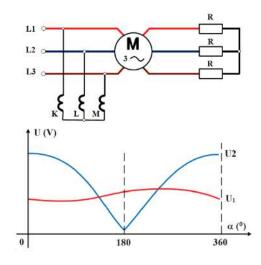
The objective is to study the operation of a threephase voltage regulator. By using a locking and rotating module with a graduated disc, the rotor can be turned by means of the hand-wheel until the load current results null with minimum indication of the voltmeter.

The student will measure the absorbed current at constant load and draw the current and voltage curves as a function of the angular phase shift.



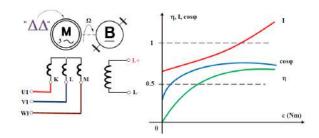
Three-phase synchronous induction motor, 2 poles, 24V $\Delta\!\Delta$

Following the same procedure as in previous experiment, the diagram of the absorbed current I, the power factor $\cos \phi$ and the efficiency η as a function of the output torque *C* will be traced with the stator wired in delta-delta configuration.

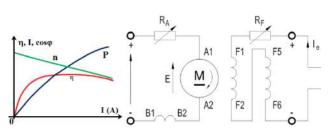


Three-phase synchronous induction motor, 2 poles, 42V Δ

This experiment studies how to start and synchronize the induction motor using the starting rheostat and studies the load characteristics of the motor at synchronous speed.





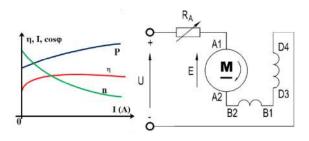


DC motor with separate excitation

Now, it is time to work with DC motors. The first application refers to a separately excited DC motor, where the field winding is powered by an external independent source. The DC motor operation characteristics will be studied as a function of the excitation voltage.

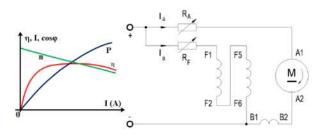
DC motor with shunt excitation

By performing this experiment, the student will learn how to connect the armature and field windings in parallel and compare the behavior with the previous experiment.



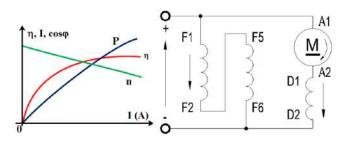
DC motor with compound excitation, long shunt

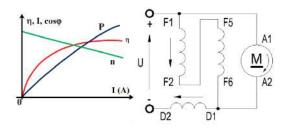
By combining the operational characteristic of both the shunt and series excited DC motor, we obtain the DC compound excitation motor. The operation of the motor is studied with cumulative and differential excitation.



DC motor with series excitation

Unlike in the DC shunt motor, the DC series motor has very poor speed regulation. The main objective of the experiment is to draw the characteristics of the output power P, the speed n, and the efficiency η as a function of the absorbed current I.





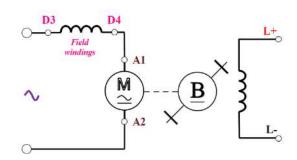
DC motor with compound excitation, short shunt

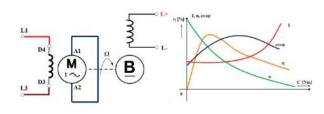
This experiment shows why the compound motor responds better to heavy load changes than a shunt motor.



Single-phase series motor

The single phase series motor, also known as a universal motor, is a rotating machine similar to a DC motor, but designed to operate either from DC or single-phase AC.



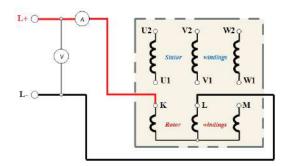


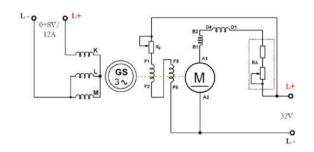
Repulsion motor

The repulsion motor combines a stator of a singlephase motor with a rotor similar to that of a DC motor. The main benefit of the repulsion motor is that the armature is separated from the line. The main objective of this experiment is to record its operation characteristics.

Measure the windings resistance of the alternator

This experiment calculates the voltage drops across the rotor winding resistance of an induction motor using the Ohm's law. The winding resistance value of the alternator is useful to calculate the conventional efficiency.





No-load test of the alternator

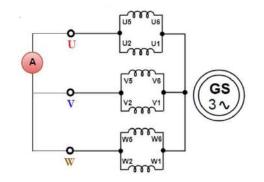
The main objective of this experiment is to determine the mechanical and iron losses of the alternator and to record its magnetization characteristic using a DC motor as prime mover.

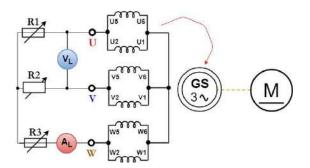


Short-circuit characteristic of the alternator

The short-circuit test of the synchronous generator provides information about its current capabilities. It is performed by driving the generator at its rated speed while the terminals of the armature winding are shorted.

This characteristic diagram is essential for the application of the indirect testing method of the alternator.



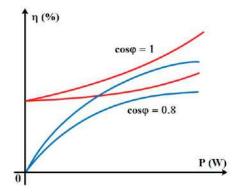


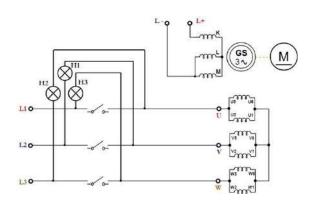
Load test of the alternator

This test compares the behavior of a synchronous generator connected to a variable external load with its no-load operation.

Conventional efficiency of the alternator

The conventional efficiency of a synchronous machine is determined by measuring the losses at different power factors, using the results from the previous experiments.





Parallel connection of the alternator with the mains

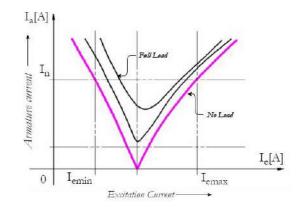
This experiment studies an operation which is frequently performed in a power station. The synchronization of a generator consists of electrically coupling the generator output to another source of electric energy and operating the generator such that its output adds to the other source.

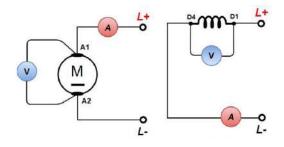


"V" curve of the synchronous motor

The V-curve of a synchronous machine shows its performance in terms of variation of the armature current with the field current when the load and the input voltage of the machine are maintained constant.

The student will trace different V curves for particular resistant torque applied to the motor axis.





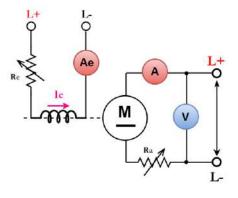
Test of the no-load motor (Swinburne)

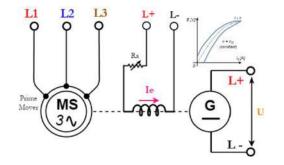
In order to design rotating DC machines with higher efficiency, it is important to study the losses occurring in them. Swinburne's method consists of operating a dynamo as a DC motor with no load to determine its mechanical and iron losses.

This is done by increasing the armature voltage U while measuring the armature current Ia and the excitation current Ie.

Measure the windings resistance of the DC generator

This experiment demonstrates how measuring the internal resistance of a DC machine can be used to establish the integrity of the machine windings and internal connections.





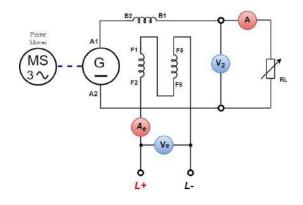
This experiment studies the magnetization characteristic of a separately excited DC generator using a three-phase synchronous motor as prime mover.

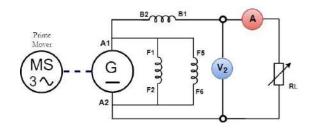


Separate excitation dynamo

The main objective of this experiment is to record the external and regulation characteristics of a separate excitation generator to determine its conventional efficiency.

This is done by measuring the output voltage U as a function of the load current, with constant excitation current $I_{e.}$





Shunt excitation dynamo

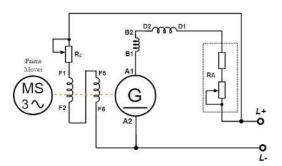
The previous experiment is replicated with a different configuration of the DC generator. Using the results from the previous experiments, the student will plot the external and regulation characteristic of the generator connected in shunt.

D2 000 D1

Series excitation dynamo

Determining the external characteristic of a DC generator connected in series is to observe how the voltage slightly drops as the load increases. The student will use these results to calculate the conventional efficiency of the dynamo.

the MS G A2 B1 E2



Compound excitation dynamo

This experiment follows the same procedure as the previous ones with the generator in compound excitation connection. After performing this last experiment, the student will be able to make comparative analyses between all the different DC generator configurations.

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