Electrical Machines
Electrical Machines is one of the most important areas of study for students in further and higher education. As we become more aware of the finite energy resources available to us it is imperative that we use them in the most efficient manner. Engineers and technicians need to know which machines and motors are best suited for particular applications, how to generate and distribute power with the minimum losses and how electrical circuits behave at higher voltages and currents.

- Low cost start-up
- Low cost installation suitable for bench-top use
- Core system can be extended
- High level of electrical and mechanical safety
- Quick and easy machine coupling
- Easily portable machines and system components
- Modular concept provides flexibility for individual requirements
- Multi-output DC, single and three phase protected supply
- Choice of instrumentation available

All machines and motors are nominally rated at 250/300W and are bench mounted. All other modules like power supplies, loads, measuring instruments, etc. are available separately and can be mounted in a rigid insulating frame that can easily accommodate all available modules. Safety has been paramount during the development of this system and every effort has been made to protect both the user and the equipment. Safety 4mm sockets are used throughout for interconnections and guards are provided to cover rotating components. A detailed manual providing both theory and experimental procedures is provided in hard copy to help the student to gain a working understanding of the subjects listed.

Features

- Power Supply
- DC Machines
- Single Phase Machines
- Three Phase Machines
- Single Phase Transformers
- Three Phase Transformers
- Brake
- Command Motor Control
- Variable resistive Load
- Variable inductive Load
- Variable capacitive Load
- Measuring Instruments
- Accessories
- Furniture
### Electrical Machines

#### Ordering Information

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**A001 - Universal Power Supply**
- Circuit breaker protection
- Earth leakage breakers
- Input: 3-phase 400V (3P+N+T)
- Output Three phase nominally 0 - 400V AC line at 4A
- Output Single Phase nominally 0 - 230V AC line to neutral at 4A
- Output DC nominally 0 - 270V at 6A
- Fixed output: Three Phase 400V line, 230V Single Phase, DC 220V/10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Voltmeter & Ammeter
- Emergency Pushbutton
- Mains Lamp

**A002 - Variable AC/DC Supply 5A**
- Circuit breaker protection
- Earth leakage breakers
- Input: 220/240V AC, 50/60Hz, 5A
- Provides up to 240V AC or 220V DC at up to 5A
- Variable voltage control with voltmeter
- AC or DC selector switch
- Safety earth connection provided
- Connects via 4mm safety sockets

**A003 - Three Phase Earth Leakage Breaker**
- For use in systems where earth leakage breakers are not provided as part of the electrical installation but overcurrent protection has been installed
- Suitable for connection to 3-phase, five wire systems
- Provides a termination point for mains power on frame systems
- 4 pole, 30mA trip, earth leakage breaker
- Three phase power "on" indicators
- Single phase outlets on front panel
- Safety earth terminals
- Connects via 4mm safety sockets
- Input 380/415V 3-phase 50/60Hz with neutral and earth connections
- User connection terminal block provided internally
- Output 220/240V single phase from IEC shuttered sockets, fuse protected
- 3-phase on front panel connector for use with frames supplies A001
A190 - Single Phase Transformer
- Multi-windings for series and parallel connection
- Primaries: 2 x 110V windings
- Secondaries: 2 x 55V windings
- Power rating 300VA
- Frame or bench mounting
- Safety earth connection provided
- Connects via 4mm safety sockets

A193 - Single Phase Transformer
- Multi-windings
- Primaries: 1 x 230V windings
- Secondaries: 2 x 12V, 1 x 15V windings
- Power rating 100VA
- Frame or bench mounting
- Safety earth connection provided
- Connects via 4mm safety sockets

A195 - Three Phase Transformer
- Primaries/secondaries for Star or Delta connection
- 2 x 110V primaries per phase
- 2 x 66.5V secondaries per phase
- Power rating 300VA
- Frame or bench mounting
- Safety earth connection provided
- Connects via 4mm safety sockets

A197 - Three Phase Transformer
- Primaries for 380/415V AC Star or Delta connection
- 2 x 115V secondaries per phase
- Power rating 300VA
- Frame or bench mounting
- Safety earth connection provided
- Connects via 4mm safety sockets
A040 - Three Phase Squirrel Cage Motor
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Dual voltage machine, 380/415V, Star, 220/240V Delta
- Rated at 250W
- Rotates at up to 3000 rev/min at 50Hz (1500 ON REQUEST)
- Safety earth connection provided
- Connects via 4mm safety sockets

A050 - Three Phase Slip Ring Asynchronous Motor
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Nominal voltage: 220/380/400V (delta/star) / 50Hz;
- Nominal speed: 2800rpm;
- Nominal power: 0.2kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A0060 - Three Phase Dahlander Motor 2/4 Poles
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Nominal voltage: 230/400V; delta/star 50Hz;
- Nominal speed: 1400/2800rpm;
- Nominal power: 0.2/0.3kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

- Double ended shaft (ON REQUEST)
- Rotates at up to 1500 rpm (ON REQUEST)
- Temperature Sensor (ON REQUEST)
A065 - Asynchronous Machine 2/4 Pole Windings
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Nominal voltage: 220/230/400V, 50Hz;
- Number of stator windings: 3;
- Number of stator connections: 3;
- Nominal power: 0.3kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A070 - Three Phase Synchronous Motor/ Generator
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Can be used as a motor or generator
- Rated at 415/240V 200W
- Synchronous speed 3,000 rev/min@50Hz
- Power Requirement 380/415V Three Phase AC star or 220/240V delta
- Nominal rotor supply 100V DC
- Safety earth connection provided
- Connects via 4mm safety sockets

A080 - Reluctance Motor
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Nominal voltage: 220/230/400V (delta/star);50Hz;
- Nominal speed: 3000rpm;
- Nominal power: 0.3kW;
- Safety earth connection provided
- Connects via 4mm safety sockets
A090 - Capacitor Start Single Phase Induction Run
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Nominal voltage: 220/230V AC, single-phase/50Hz;
- Speed: 2800rpm;
- Nominal power: 0.3kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A100 - Repulsion Motor
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Motor with infinitely variable speed in both direction
- Nominal voltage: 220/230V, single-phase/50Hz;
- Nominal speed: +3000/0/-3000rpm;
- Nominal power: 0.20kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A120 - Single Phase Induction Motor
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Capacitor Start with starting relay;
- Nominal voltage: 220/230V AC, single-phase/50Hz;
- Speed: 2800rpm;
- Nominal power: 0.3kW;
- Starting capacitor;
- Safety earth connection provided
- Connects via 4mm safety sockets

A130 - Universal Motor
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Rated at 250 W continuous
- Maximum speed 6,000 rev/min
- Power Requirement 220V DC or Single Phase AC 50Hz supply
- Double ended shaft with 12mm diameter
- Safety earth connection provided
- Connects via 4mm safety sockets
DC Electrical Machines

A140 - DC Shunt Machine
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Operates as a DC shunt motor or generator
- Nominal voltage 220V;
- Nominal speed 3000rpm, Nominal power 0.25kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A150 - DC Series Wound Machine
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Operates as a DC series motor or generator;
- Nominal voltage 220V;
- Nominal speed 3000rpm, Nominal power 0.25kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A160 - DC Compound Wound Machine
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Operates as a DC series, shunt and compound motor or generator
- Nominal voltage 220V;
- Nominal speed 3000rpm, Nominal power 0.25kW;
- Safety earth connection provided
- Connects via 4mm safety sockets

A165 - DC Multi circuit Wound Machine
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Modularity and expansions over time
- Metal housing with internal connections explained by a clear synoptic
- Operates as a DC series, shunt and compound motor or generator
- Nominal voltage 220V;
- Nominal speed 3000rpm, Nominal power 0.25kW;
- Safety earth connection provided
- Connects via 4mm safety sockets
A170 - Shunt Excitation DC Generator
Brake and Generator with shunt excitation, mounted on oscillating frame.
Complete with arms, weights, counterweights and level indicator.
- High level of electrical and mechanical safety
- Quick and easy coupling with other machines in the same series
- Nominal voltage: 220V DC;
- Excitation voltage: 220V DC;
- Power 300W at 3000rpm;
- Safety earth connection provided
- Connects via 4mm safety sockets

A174 - Powder Brake
Magnetic powder brake as a mechanical load for torque detection of electric motors. A light excitation power is required and the full braking torque is available even at stand still. Linked to the machine via a free shaft and with cog coupling sleeve. Anti-vibration base plate included
- Rated torque: 35Nm
- Rated Current: 1A
- Natural ventilation

A176 - Electromagnetic Brake
Electromagnetic Brake, mounted on oscillating frame. Complete with arms, weights, counterweights and level indicator.
Brake as a mechanical load for machines in the 0.4kW range, complete with arms, weights, and counterweights. For direct test on motors up to 300W.
- Continuous rated braking: 300W at 3000rpm;
- Discontinuous rated braking: 500W at 3000rpm
- Safety earth connection provided
- Connects via 4mm safety sockets

A179 - Inertia Wheel
- Used with the Electrical Machine
- Fits onto non drive end of shaft to increase existing rotor inertia on synchronous generators and DC machines
- Provides additional inertia load on control systems to investigate their behaviour
- Mass 1.5kg
- Fits 12mm shaft diameter

A180 - Friction (Prony) Brake
Prony brake is a simple device to measure the torque produced by an engine. Tightening a screw around the output shaft of the engine the power is transferred through friction. The friction is increased by tightening the screw up to a reduction in the frequency of rotation of the shaft. In practice more engine power then can be applied until it reached the limit of the engine.
Torque range ±2Nm
Electrical Machines

Accessories for Torque & Speed

A210 - DC TACHOGENERATOR
This tachogenerator delivers a continuous voltage proportional to the rotating speed. Fits to mounting on-axis series electrical machines
- Provides DC output proportional to shaft speed
- Output 10VDC/1000 rev/min

ON REQUEST: Output 10VDC/1000 rev/min or 60VDC/1000 rev/min

A211 – PHOTOELECTRIC SWITCH
- M18 Plastic brass body right angle optic
- 3 wire, PNP output
- Operating voltage: 10-30Vdc
- Load current: 100mA
- Short circuit protection, IP67

A212 – OPTICAL INCREMENTAL ENCODER
Typical application is a motor control systems, the mounting system allows fixing of transducer on a shaft measurement acting on a simple screw
- Output frequency: up to 300 kHz
- Shaft Rotation Speed: 6000 RPM continuous
- Starting torque a 25° C: 0.025 Nm
- Moment of inertia: 40g cm²

A214 – LOAD CELL
Load cell or single point off-center in aluminum suitable to be used with our brakes for torque measurement
- Output signal: 2mV/V
- Capacity: 20Kg
- Combined error: ± 0.02% FS
- Power supply: 5V - 18V
- Material: Aluminum (A)
- IP Rating: IP65

A215 – ROTATING TORQUE METER
The Torque meter have been designed for measuring of static and dynamic torque on rotating machines, test benches and automatic tightening systems. Torque meters measure CLOCKWISE torque with POSITIVE output in tension or COUNTER CLOCKWISE torque with NEGATIVE output in tension
- Nominal Torque: 50Nm
- Nominal Sensitivity: 2mV/V
- Nominal Speed: 10000 rpm
A180C – TORQUE AND SPEED METER
- Provides manual control of torque and speed
- Constant torque and torque proportional with speed controls
- Digital display for speed or torque
- Speed range ±5000rpm.
- Torque range up to 100Nm
- Supply 220-240V AC at 5A, 50/60Hz
- Frame or bench mounting

INCLUDED:

A214 – LOAD CELL
Load cell or single point off-center in aluminum suitable to be used with our brakes for torque measurement
- Output signal: 2mV/V
- Capacity: 20Kg
- Combined error: ± 0.02% FS
- Power supply: 5V - 18V
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A211 – PHOTOELECTRIC SWITCH
- M18 Plastic brass body right angle optic
- 3 wire, PNP output
- Operating voltage: 10-30Vdc
- Load current: 100mA
- Short circuit protection, IP67

A185 – DIGITAL SPEED METER
- This module is a Digital Photo Tachometer.
- Measuring RPM is safe and accurate without attachment to object.
- It has wide measuring range and high resolution
- Analogue Output: 1V/1000 rpm
- Internal resistance: 1Mohm
- Digital display for speed
- Speed range ±5000rpm.
- Supply 220-240V AC at 5A, 50/60Hz
- Connects via 4mm safety sockets
- Frame or bench mounting

INCLUDED:

A211 – PHOTOELECTRIC SWITCH
- M18 Plastic brass body right angle optic
- 3 wire, PNP output
- Operating voltage: 10-30Vdc
- Load current: 100mA
- Short circuit protection, IP67
A230 - DC MOTOR SPEED CONTROLLER
- Suitable for use with DC motors
- Speed range 0 to 3,000 rev/min. Provides 300W output
- Adjustable IR compensation control for improved speed regulation
- Used as a drive when testing generators
- Acceleration & deceleration control
- Supply 220-240V AC at 5A, 50/60Hz
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A240 – VARIABLE FREQUENCY DRIVE (AC motor speed controller)
- Suitable for use with Three Phase Induction Motor
- Basic control functions are provided for:
  - Maximum & minimum speed settings.
  - Acceleration & deceleration times
  - Torque boost, Variable Frequency Control
- Output power up to 2kW
- Supply 220-240V AC at 5A, 50/60Hz
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A250 – SOFT STARTER MOTOR
This unit starts up and decelerates squirrel-cage asynchronous, single-phase and three phase motors smoothly with a low current.
Supply voltage: 400V three-phase
- Control: On/Off operated using a built-in push-button.
- Acceleration adjustment: from 1.1 to 5 seconds
- Deceleration adjustment: from 0 to 5 seconds
- Maximum current: 6A

A260 – SOFT STARTER MOTOR
This unit starts up and decelerates squirrel-cage asynchronous, single-phase and three phase motors smoothly with a low current. All settings can be performed without opening the unit.
Lamps indicate the “On” and “rated speed” operating statuses.
- Voltage: Ue 400V, 50/60Hz
- Uc 24-550VAC/DC, 50/60Hz
- Uimp 4kV
- Control: On/Off operated using a built-in push-button.
- Acceleration adjustment: from 1.1 to 5 seconds
- Deceleration adjustment: from 0 to 5 seconds
- Maximum current: 25A
Electrical Machines

Starter & Field Rheostat

A010 – Starter rheostar for DC Motor
Load resistor with one resistance element, enclosed in perforated sheet-steel case, wound on tubular ceramic core,

Technical Data
- Resistance: 0-50 ohm
- Rated current: 3,6 A
- Max. cont. load: 640W
- Safety earth connection provided
- Connects via 4mm safety sockets

A011 – Starter rheostat for slip ring and cage three-phase motor
Load resistor contains 3 separate continuously variable resistors with individual terminals. To be used for variable 3-phase, 1-phase or DC loads.

Technical Data
- Resistance: 3 x 0-50 ohm
- Rated current: 3 x 3,1 A
- Max. cont. load: 3 x 320W
- Safety earth connection provided
- Connects via 4mm safety sockets

A012 – Field rheostat for DC Motor
Load resistor have one resistance element, enclosed in perforated sheet-steel case, wound on tubular ceramic core,

Technical Data
- Resistance: 0-1600 ohm
- Rated current: 0,6 A
- Max. cont. load: 640W
- Safety earth connection provided
- Connects via 4mm safety sockets

A013 – Field rheostat for DC Generator
Load resistor have one resistance element, enclosed in perforated sheet-steel case, wound on tubular ceramic core,

Technical Data
- Resistance: 0-500 ohm
- Rated current: 1,1 A
- Max. cont. load: 640W
- Safety earth connection provided
- Connects via 4mm safety sockets

A011B - Load Resistor
Load resistor with six separate continuously variable resistors with individual terminals. To be used for variable 3-phase, 1-phase or DC loads.

Technical Data
- Resistance: 6 x 0-100 ohm
- Rated current: 6 x 1.8 A
- Max. cont. load: 1.9 kW
- Safety earth connection provided
- Connects via 4mm safety sockets

A014 - Resistive Load
The unit includes three adjustable single-phase rheostats mounted on the same shaft and connected in wye. The main function of rheostats in a control system is to adjust the current in a rotating machine winding when voltage drop is needed.

Technical Data
- For Electrical Machines upto 300W
- Number of rheostats: 3
- Rheostats rating: 12Ω, 50W
- Safety earth connection provided
- Connects via 4mm safety sockets
Variable Load

A020R - Resistance Load
Metal container, with screen printed front panel and graphical display of the components

- Three resistor switched load banks
- Seven resistor values per bank
- DC and single-phase 240V mode
- Three-phase delta 240V/three-phase star 400V, 300 watts
- Fuse protected at 0.5A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A020C - Capacitive Load
Metal container, with screen printed front panel and graphical display of the components

- Three capacitive switched load banks
- Seven capacitive values per bank
- Single-phase 240V mode
- Three-phase delta 240V/three-phase star 400V, 300 watts
- Fuse protected at 0.8A per bank
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A020L - Inductive Load
Metal container, with screen printed front panel and graphical display of the components

- Three inductive switched load banks
- Seven inductive values per bank
- Single-phase 240V mode
- Three-phase delta 240V/three-phase star 400V, 300 watts
- Fuse protected at 0.5A per bank
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting
A301 - ON/OFF Three phase Switch
- Direct Operating control
- Rated insulation voltage Ui: 690V
- Rated operational current 10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A302 - ON/OFF Mono phase Switch
- Direct Operating control
- Rated insulation voltage Ui: 690V
- Rated operational current 10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A303 - Three phase Inverter
- Direct Operating control
- Rated insulation voltage Ui: 690V
- Rated operational current 10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A304 – Mono phase Inverter
- Direct Operating control
- Rated insulation voltage Ui: 690V
- Rated operational current 10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting
Electrical Machines

Switches

A305 - Star/Delta Switch
- Star/Delta starter for 3-ph squirrel case induction motor
- Rated insulation voltage Ui: 690V
- Rated operational current 10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A306 - Pole inverter, Dahlander
- 2P/4P starter for 3-ph Dahlander motor
- Rated insulation voltage Ui: 690V
- Rated operational current 10A
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A307 – Wattmeter Switch
The wattmeter switch enabling the measurement of power on an unbalanced network, with a single wattmeter. 3 positions on the unit:
- 1 - Measure the current on phase R with voltage between R & T
- 0 - Wattmeter out of work.
- 2 - Measure the current on phase S with voltage between S & T.
- An inversion switch with fine lead wires is built-in to the case.
- Operating voltage: 400V 3-phase + N
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

A308 - Synchronizing Lamps
- Basic synchronizing by phase indicator lamps grouped in a triangle
- Can be connected for lamps-bright or lamps-dark technique
- A power switch is provided to connect the systems together
- Accommodates Single or Three Phase
- 380 - 415V operation
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting
### IEM300VD - DC Voltmeter
- Moving coil DC voltmeter
- Range 0 - 300V DC
- Meters are DIN standard 96 x 96mm
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

### IEM500VA - AC Voltmeter
- Moving iron AC voltmeter
- Ranges 0 - 500V AC
- Meters are to DIN standard 96 x 96mm
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

### IEM5AD - DC Ammeter
- Moving coil DC voltmeter
- Ammeter range 0 - 5A DC
- Ammeter is fuse protected
- Meters are to DIN standard 96 x 96mm
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

### IEM10AA - AC Ammeter
- Moving iron AC ammeter
- Ammeter range 0 - 10A AC
- Meters are DIN standard 96 x 96mm
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting
**IEM65HZ - AC Frequency Meter**
- Frequency measurements
- Frequency range 45 - 65Hz
- Max Voltage 500V
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

**IEM500VA/55HZ - AC Volt and Frequency Meter**
- Used with synchronous machines
- Frequency and voltage measurements
- Ideally suited to the application of synchronising generators and supplies
- Voltage range 0 - 500V
- Frequency range 45 - 55Hz
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

**IEM10/380COS - Power Factor Meter**
- Simmetric load
- Measuring range: cap. 0.5 - 1 - 0.5 ind.
- Current range: 0 - 10A
- Voltage range: 220V - 380V
- Frequency range: 40 - 65Hz
- Accuracy: class 1.5
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting

**IEM240/10WM - Single Phase Wattmeter**
- Selectable voltage ranges
- Current range: 0 - 10A
- Voltage range: 0 – 60 – 120 - 240V
- Accuracy: class 1.5
- Meter to DIN standard 96 x 96mm
- Safety earth connection provided
- Connects via 4mm safety sockets
- Frame or bench mounting
**DMM67 - AC/DC Multimeter**
- Auto ranging or manual
- Auto power off
- DC voltage: 400mV – 1000V
- AC voltage: 400mV - 1000V
- DC current: 400uA - 10A
- AC current: 400uA - 10A
- Resistance: 400Ω - 40MΩ
- Capacity: 4nF - 200µF
- Frequency: 10Hz - 40MHz
- CAT IV 600V, CAT III 1000V
- Battery 9V power

**DT26 - Hand-held Digital Optical/Contact Tachometer**
- Versatile measuring of shaft speed
- Non-contact by photo sensing
- Direct shaft contact through conical rubber drive
- Measurement range 99,999 rev/min non-contact, 20,000 rev/min contact
- Battery powered

**RST862 - Phase Sequencer**
- Waterproof design,
- Protection class : IP24
- Input Voltage : 100~600V AC
- Frequency Range : 45~70Hz
- Circuit Structure : All electronic (not mechanical)

**Accessories**
- Large size alligator clips for easy clipping onto switch-boards terminals

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**A945 & A947 - Couplings and Rubber Sleeve**
Complete set of spare part:
- Nr. 02 Coupling A945:
  - Internal diameter:
  - External diameter
  - Length:
- Nr. 1 Rubber Sleeve A947: length

**A946 – Protective Cover for machine coupling (Coupling Guard)**
This protection is applied over the joint to protect the rotating part.
It is provided with holes to fit the photocell for speed reading.

**A948 – Protective Cover for machine coupling (Shaft end Guard)**
This protection is applied to the shaft end coupled to another not engine.
It is provided with holes to measure the speed with a tachometer.

**A960 - Standard set of Patch leads**
The set consists of 30 leads in 3 different coded colors and lengths chosen to allow the realization of all experiments.
Leads are capable of 15A current intensity and are terminated on banana-banana plugs.
Electrical Machines

Furniture

**A900 - Work Bench**
- Steel holding frame and legs
- Feet with adjustable height
- Laminated wood work-plane with beveled edges
- Dimensions: 2000x1000x860 mm

**A905 - Work Bench for frame**
- Steel holding frame and legs
- Feet with adjustable height
- Laminated wood work-plane with beveled edges
- Dimensions: 1000x800x860 mm

**A920 – Motor stand on Wheels**
- Designed to transport a complete set of machine
- 4 wheels, 2 of them with a brake
- Dimension: 1200 x 470 x 500mm

**A930 - System Frame**
- Easy "lift-in/out" panel removal.
- Maximises bench space.
- Provides clear view of multi-panel experiments.
- Dimensions: 1000x800x860 mm

**A925 – Motor Stand on wheels and guide rail**
- Designed to transport a complete set of machine
- 4 wheels, 2 of them with a brake
- Dimension: 1200 x 470 x 500mm

**A942 – Guide Rail**
- Support for a complete set of machine

**A955 - Lead Storage**
The storage rack is designed to take the three lengths of patch lead used in the leads set. Frame or wall mounting.
A165SEZ - Sectioned DC Multi circuit Wound Machine
Cut-away motor, useful to show rotor, stator, windings, poles, fan, ball-bearings, etc. Students can study the internal parts of typical single-phase and three-phase Electrical Machines.

A040SEZ - Sectioned Three Phase Squirrel Cage Induction Motor
Cut-away motor, to show rotor, stator, windings, poles, fan, ball-bearings, etc. Students can study the internal parts of typical single-phase and three-phase Electrical Machines.

A070SEZ - Sectioned Three Phase Synchronous Machine
Cut-away motor, to show rotor, stator, windings, poles, fan, ball-bearings, etc. Students can study the internal parts of typical single-phase and three-phase Electrical Machines.

A050SEZ - Sectioned Three Phase Slip Ring Asynchronous Motor
Cut-away motor, to show rotor, stator, windings, poles, fan, ball-bearings, etc. Students can study the internal parts of typical single-phase and three-phase Electrical Machines.

A090SEZ - Sectioned Single Phase Induction Motor
Cut-away motor, to show rotor, stator, windings, poles, fan, ball-bearings, etc. Students can study the internal parts of typical single-phase and three-phase Electrical Machines.

A195SEZ - Sectioned Three Phase Transformer
Cut-away transformer, to show the windings, coils, terminals, insulation, iron core etc. Students can study the internal parts of typical single-phase and three-phase Transformers.

A190SEZ - Sectioned Single Phase Transformer
Cut-away transformer, to show the windings, coils, terminals, insulation, iron core etc. Students can study the internal parts of typical single-phase and three-phase Transformers.
Electrical Machines
• Electricité et électronique
• Contrôle des procédés
• Pneumatique et électropneumatique
• Technologie de l'automatisation
• Installations électriques domotique
• Électronique de puissance
• Machines électriques
• Moteurs et fluides pour machines
• Systèmes industriels d'entraînement
• Maintenance et simulation des pannes sur ordinateur
• Communications analogiques
• Réalisation de circuits imprimés
• Montage et réparation circuits imprimés
• Soudage et équipement
• Outils
• Laboratoire de physique
• Laboratoire de chimie
• Laboratoire de biologie
• Instrumentation électronique
• Instruments électroniques analogiques
• Instruments électroniques numériques
• Instrumentation électrique

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