

EMMS4
1kW
ELECTRICAL
MACHINES
MODULAR
SYSTEM

All available EMMS series:

- 300watts = EMMS3 MOD.3XXX
- 1.000watts = EMMS4 MOD.4XXX
- 2.000watts = EMMS5 MOD.5XXX
- 3.000watts = EMMS6 MOD.6XXX
- 6.000watts = EMMS7 MOD.7XXX
- 8.000watts = EMMS8 MOD.8XXX
- 10.000watts = EMMS9 MOD.9XXX

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1.1 - GENERAL DESCRIPTION

System Description

italtec, has designed a new system for the application of electrical machines in experimental lessons. This system is a complete and compact teaching mean, which can be accommodated on a standard 2 meter laboratory bench.

The machines are industrial-type units in compliance with the construction type B3. The whole machines range meets the international standards DIN-VDE 0530.

Particular advantages of EMMS system are:

- Clearly arranged and swift set up of complete circuits
- Safe operating by clear assignment of supply voltage and complete set of security devices:
 - no projections of rotating parts
 - protection of all rotating parts
 - low operation power, thereby minimising the risk of accidents
 - standard 4 mm CE safety sockets for all inputs/outputs connections
- very small space is required for use and for storage
- power supply module provides also metering facilities and circuit protections.
- durability by the use of high grade materials
- a step-by-step course of theory and experiments is described on each book included with each electrical machine
- machines based on industrial standards, with all real features
- all table top unit can be also used in a frame system
- compatible with all other our programs
- future-oriented thanks to the possibility to adapt to new technologies
- optional overload protection with temperature sensor.

EMMS consist of:

- universal power supply module used for all models of previous machines
- set of motors, generators, transformers, brakes etc. which are the equipment for practical execution of experiments and measures
- set of meter modules designed to cover the complete range of measurements with a small number of meters
- set of resistive, inductive and capacitive loads housed in separate modules, and designed to provide balanced or unbalanced loads.
- set of accessories as:
 - connection leads
 - tachometers
 - dynamometers
 - starting and excitation rheostat
 - optional modules for electronic regulation of Dc. and Ac. motors
 - optional computerised system for data acquisition and data management designed to plot curves and to store the complete test

Each machine is equipped with its own universal support, which allows a very easy way to match all machines. EMMS's machines are the same machines normally used for industry applications. Particular solutions has been used to simplify the student's approach and the system philosophy has been designed for educational purposes



Example of coupling

EMMS are available with 300W power or for 0,5kW, 1kW, 3kW, 6kW etc.

EMMS is available with different operative voltages as:

- main voltage (127/220V) 50-60Hz
- main voltage (230/400V) 50-60Hz
- main voltage (240/415V) 50-60Hz
- main voltage (24/48V) 50-60Hz

EMMS is available with 1500 rpm or 3000 rpm (4 poles or 2 poles)

All speed values are shown with an operating frequency of 50Hz. For 60Hz operation, speed values will be higher (around +20%).

2.1 - EXPERIMENT MANUALS

D.C. Motors & Generators

- Connection and study of industrial type of Dc. machines operation, used as motors and generators
- Operation with starter and field regulator
- Reversing rotation and speed regulation
- Measure of armature and excitation voltage and current
- Speed and torque detection
- Load characteristics with mechanical or magnetic brake
- Characteristic with variable R-load
- Adsorbed power, mechanical losses, iron losses, copper losses, efficiency
- Comparison between shunt, series and compound connections
- Shunt connection of two generators
- Operation with electronic speed control

A.C. 3-phase Machines

- Operation with connection to power
- Starting techniques: star-delta circuits, series resistance auto-transformer starter
- Reversing rotation and speed adjustment
- Measure of current and voltage values
- Load characteristics (recording with an electromagnetic brake or magnetic powder brake or DC brake generator)
- Draw of circular diagram and its practical use
- Real and reactive power, mechanical power
- Power factor ($\cos \phi$) efficiency and slip
- Adsorbed power
- Output power regulation
- Shunt connection and synchronisation between two three-phase synchronous generators
- Main synchronisation techniques
- "V" characteristics: stability – limits
- Operation as rotating capacitor / inductor
- Three-phase shifter operation
- Operation with electronic speed control
- Fault finding:
 - Winding break in a coil
 - Winding to winding short
 - Coil to coil short
 - Insulation fault.

A.C. Single Phase Motors

- Operation with connection to power
- Starting techniques according to the machine type
- Reversing rotation and speed adjustment
- Influence of brush position on the speed
- Measure of current and voltage values
- Load characteristics (recording with an electromagnetic brake or magnetic powder brake).

1-PH / 3-PH Transformers

- Operation with connection to power
- Star-Delta, Zig-Zag and Scott connections
- Current and voltage measure at open circuit
- Current and voltage measure at full load and short circuit conditions
- Shunt connection between two transformers
- Load distribution.



The machines of this system can be supplied with a suitable base that allows an easy and safe coupling with other machines. It is fast and easy to realise groups of machines.

Special didactic solutions have been introduced in order to simplify the approach of the student to the study.

Mod.6030B

Rail bed for all electrical machines, tabletop



3.1 - POWER SUPPLY MODULE

Mod.4000 Universal power supply. (4002+4004) (also available 220V 60Hz version).

- Power requirements: 380/400V, 3PH+N+G, 50Hz



Mod.4002 3-Ph/1Ph AC power supply 5+4A

- | **Mod.4004** DC power supply 2+5A

General protection with high sensitivity magneto thermal differential (0,03A) automatic circuit breaker. Mushroom emergency push -button
All outputs are protected by means of an automatic magneto thermal circuit breaker and fuses.

Dimensions: 2x 70x40x40h(cm)

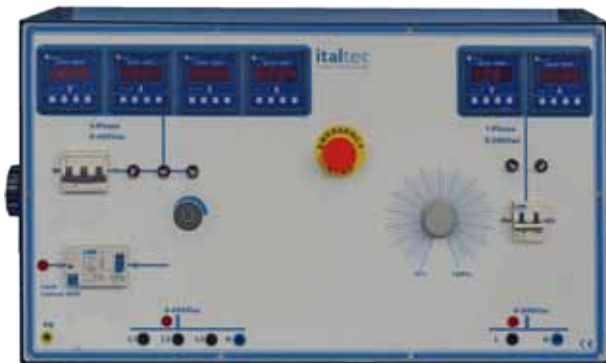
3 phase adjustable output: 0÷420V, 5A with
- 1 x A.C. voltmeter - 3 x A.C. ammeters

Single phase adjustable output: 0÷240V 4A with
- 1 x A.C. voltmeter - 1 x A.C. ammeter

DC variable output: 0÷230V, 2A with
- 1 x D.C. voltmeter - 1 x D.C. ammeter

D.C. fixed output: 220V, 5A
- with 1 x D.C. ammeter

Single phase triple output: fixed 230Vac 16A
- 1 x A.C. ammeter



Mod.4002D 3-Ph/1Ph AC power supply(Digital)



Mod.4004D -DC power supply (Digital)



Mod.4002-03-05 -3-Ph AC power supply 3+5A

3 phase adjustable output: 0÷430V, 3A with
- 1 x A.C. voltmeter - 3 x A.C. ammeters

Single phase adjustable output: 0÷240V 5A with
- 1 x A.C. voltmeter - 1 x A.C. ammeter



Mod.4004-02-05 -DC power supply

DC variable output: 0÷230V, 2A with
- 1 x D.C. voltmeter - 1 x D.C. ammeter

DC fixed output: 220Vdc 5A
- 1 x A.C. ammeter

4.1 - D.C. MACHINES

- Design: with typical industrial characteristics.
- Input/output with standard 4 mm safety sockets.
- Manual explaining theory and practice
- Other speed available like 3600rpm
- Other supply voltage available
- Protection against thermal overload

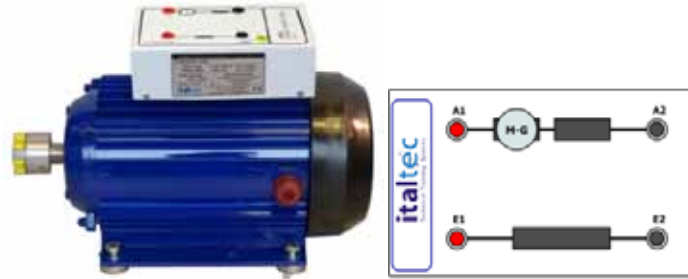
- Rail base and shaft joints available for fast and easy coupling.
- Optional double shaft ends
- *Accessories:*
 - STARTING RHEOSTAT
 - EXCITATION RHEOSTAT
 - POWER AND EXCITATION SUPPLY

Mod.4140 Shunt Wound Machine 3000rpm

Mod.4140-4 Shunt Wound Machine 1500rpm

Modes: self and externally excited Motor/Generator

- Nominal voltage: 220Vdc
- Excitation voltage: 100÷210Vdc
- Nominal speed: 3000/1500rpm
- Nominal power: 1,1Kw (mot.) 0,8kW(gen.)



Mod.4150 Series Wound Machine 3000rpm

Mod.4150 Series Wound Machine 1500rpm

Modes: series Motor/Generator.

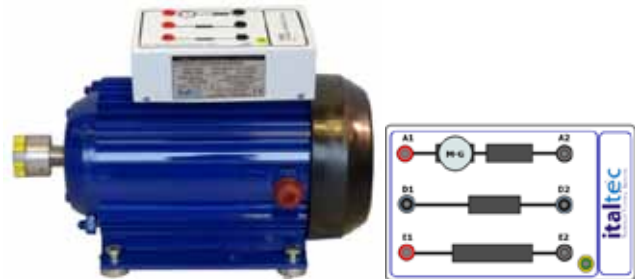
- Nominal voltage: 220Vdc
- Nominal speed: 3000/1500rpm
- Nominal power: 1,1Kw (mot.) 1kW(gen.)

Mod.4160 Compound Wound Machine 3000rpm

Mod.4160-4 Compound Wound Machine 1500rpm

Modes: self and externally excited Motor/Generator.

- Nominal voltage: 220Vdc
- Excitation voltage: 100÷210Vdc
- Nominal speed: 3000/1500rpm
- Nominal power: 1,1Kw (mot.) 1kW(gen.)



Mod.4165 Multi circuit Wound Machine 3000rpm

Mod.4165 Multi circuit Wound Machine 1500rpm

Modes: Shunt wound, compound wound, series wound Motor/Generator.

- Nominal voltage: 220Vdc
- Excitation voltage: 100÷210Vdc
- Nominal speed: 3000/1500rpm
- Nominal power: 1,1Kw (mot.) 1kW(gen.)



5.1 - A.C. MACHINES

- Design: with typical industrial characteristics.
- Input/output with standard 4 mm safety sockets.
- Manual explaining theory and practice
- available 2 and 4 poles version: 3/1,5Krpm
- Protection against thermal overload

- Rail base and shaft joints available for fast and easy coupling.
- Optional double shaft ends
- Also available: other voltage like 127/220V 60Hz version (speed is 20% higher)
- *Accessories:*
 - POWER AND EXCITATION SUPPLY

Mod.4040 -3Phase Squirrel Cage Motor 2Poles 2850rpm
Mod.4040-4 -3Ph Squirrel Cage Motor 4Poles 1420rpm

- Nominal power: 1,1kW;
- Voltage: 230/400V delta/star (D/Y)
- 2P Speed: 50Hz/2850rpm (60Hz: 3400)
- 4P Speed: 50Hz/1420rpm (60Hz: 1700rpm)
- Weight: 10Kg; -Shaft H: 90mm



Mod.4050 -3Ph Slip ring asynchronous motor 2Poles 2850rpm
Mod.4050-4 -3Ph Slip ring asynchronous motor 4Poles 1420rpm

- Nominal power: 1,1kW;
- Voltage: 230/400V delta/star
- Optional Voltage: 127/220V delta/star 60Hz
- 2P Speed: 50Hz/2850rpm (60Hz: 3400rpm)
- 4P Speed: 50Hz/1420rpm (60Hz: 1700rpm)
- Weight: 15Kg; - Shaft H: 90mm
- *Accessories:*
 - STARTING RHEOSTAT
 - POWER SUPPLY



Mod.4060 3Phase Dahlander Motor 2&4 Poles
- 2Poles 2800rpm - 4poles 1400RPM

- Nominal power: 1,1kW;
- Voltage: 400V star/star 50Hz
- Voltage: 230/400V delta/star (D/Y)
- 2P Speed connection: 50Hz/2800rpm (60Hz: 3400)
- 4P Speed connection: 50Hz/1400rpm (60Hz: 1700rpm)
- Weight: 10Kg; - Shaft H: 90mm
- Optional Voltage: 127/220V delta/star 60Hz



5.2 - A.C. MACHINES

- Design: with typical industrial characteristics.
- Input/output with standard 4 mm safety sockets.
- Manual explaining theory and practice
- available 2 and 4 poles version: 3/1,5Krpm
- Protection against thermal overload

- Rail base and shaft joints available for fast and easy coupling.
- Optional double shaft ends
- Other voltage available like 127/220V 60Hz n (speed is 20% higher)
- *Accessories:*
 - POWER AND EXCITATION SUPPLY

Mod.4070 3Ph salient poles Synchronous Generator 3000rpm

Mod.4070-4 3Ph salient poles Synchronous Generator 1500rpm

With salient pole rotor. Modes: motor, generator.

- Nominal power: 1,1kW(gen.)/1kW(mot.)
- Voltage: 230/400V (delta/star)
- Optional Voltage: 127/220V delta/star 60Hz
- Excitation voltage: 100÷210Vdc
- Current : (max) 3/1,7A
- 2P Speed: 50Hz/3000rpm (60Hz: 3600rpm)
- 4P Speed: 50Hz/1500rpm (60Hz: 1800rpm)
- Weight: 15Kg; - Shaft H: 90mm
- *Accessories:*
 - STARTING RHEOSTAT
 - POWER SUPPLY



Mod.4074 3Phase Synchronous Generator 2P

Mod.4074-4 3Phase Synchronous Generator 4P

Non-salient (smooth) pole rotor. Modes: motor, generator.

- Nominal power: 1,1kW(gen.)/1kW(mot.)
- Voltage: 230/400V (delta/star)
- Optional Voltage: 127/220V delta/star 60Hz
- Excitation voltage: 100÷210Vdc
- Current : (max) 3/1,7A
- Speed(2P): 50Hz/3000rpm (60Hz: 3600rpm)
- Speed(4P): 50Hz/1500rpm (60Hz: 1800rpm)
- Weight: 15Kg; - Shaft H: 90mm
- *Accessories:*
 - STARTING RHEOSTAT
 - POWER SUPPLY



Mod.4072 Single Phase Synchronous Generator 2P 3kRpm

Mod.4072-4 Single Phase Synchronous Generator 4P

With salient pole rotor.

- Nominal voltage: 220/230V
- Excitation voltage: 100÷210V DC
- Nominal power: 0,5 kW
- Speed(2P): 50Hz/3000rpm (60Hz: 3600rpm)
- Speed(4P): 50Hz/1500rpm (60Hz: 1800rpm)
- Weight: 15Kg; - Shaft H: 90mm



5.3 - A.C. MACHINES

- Design: with typical industrial characteristics.
- Input/output with standard 4 mm safety sockets.
- Manual explaining theory and practice
- available 2 and 4 poles version: 3/1,5Krpm
- Protection against thermal overload

- Rail base and shaft joints available for fast and easy coupling.
- Optional double shaft ends
- Other voltage available like 127/220V 60Hz n (speed is 20% higher)
- *Accessories:*
 - POWER AND EXCITATION SUPPLY



Mod.4080 3Ph Reluctance synchronized motor 2P 3kRpm
Mod.4080-4 3Ph Reluctance synchronized motor 4P 1,5kRpm

- Nominal power: 0,6kW;
- Voltage: 230/400V delta/star (D/Y)
- Speed(2P): 50Hz/3000rpm (60Hz: 3600)
- Speed(4P): 50Hz/1400rpm (60Hz: 1800rpm)
- Weight: 10Kg; - Shaft H: 90mm
- Optional Voltage: 127/220V delta/star 60Hz

Mod.4130 Universal Motor

Modes: AC motor DC series motor

- Nominal voltage: 220V DC/AC
- Nominal speed: 3000rpm
- Nominal power: 1kW (DC) / 0,6kW (AC)
- Weight: 10Kg; -Shaft H: 90mm



Mod.4090 Single Phase Ac Capacitor Run Motor Squirrel cage Motor

Mod.4090-4 Single Phase Ac Capacitor Run Motor Squirrel cage Motor

- Nominal power: 1,1kW
- Nominal voltage: 220/230Vac 50Hz
- Optional Voltage: 127/220V delta/star 60Hz
- Speed(2P): 50Hz/2800rpm (60Hz: 3400)
- Speed(4P): 50Hz/1400rpm (60Hz: 1800rpm)
- Cap.=36uF
- Weight: 10Kg; - Shaft H: 90mm



Mod.4095 Split phase motor 2P 220/230V 2800rpm

Mod.4095-4 Split phase motor 4P 220/230V 1400rpm

Single-phase motor with starting auxiliary phase, complete with centrifugal starting switch and starting and running capacitor

- Starting capacitor and run capacitor
- Nominal power: 1,1kW
- Nominal voltage: 220/230V AC 1Ph 50Hz
- Optional Voltage: 127/220V delta/star 60Hz
- Speed(2P): 50Hz/2800rpm (60Hz: 3400)
- Speed(4P): 50Hz/1400rpm (60Hz: 1800rpm)
- Weight: 10Kg; - Shaft H: 90mm



5.4 - A.C. MACHINES

- Design: with typical industrial characteristics.
- Input/output with standard 4 mm safety sockets.
- Manual explaining theory and practice
- available 2 and 4 poles version: 3/1,5Krpm
- Protection against thermal overload

- Rail base and shaft joints available for fast and easy coupling.
- Optional double shaft ends
- Other voltage available (ie 127/220V 60Hz speed is 20% higher)
- *Accessories:*
 - POWER AND EXCITATION SUPPLY



Mod.4120 Single Phase Ac Capacitor Start Motor 2800rpm
Mod.4120-4 Single Phase Ac Capacitor Start Motor 1400rpm
Single-phase motor with starting auxiliary phase, complete with starting switch and starting capacitor

- Nominal power: 1,1kW
- Nominal voltage: 220/230V AC 1Ph 50Hz
- Optional Voltage: 127/220V delta/star 60Hz
- Speed(2P): 50Hz/2800rpm (60Hz: 3400)
- Speed(4P): 50Hz/1400rpm (60Hz: 1800rpm)
- Weight: 10Kg; - Shaft H: 90mm

Mod.4122 Single Phase AC Capacitor Start/Cap. Run Motor 2800rpm
Mod.4122-4 Single Phase AC Capacitor Start/Cap. Run Motor 1400rpm
Single-phase motor with starting auxiliary phase, complete with starting switch and starting and running capacitor

- Starting capacitor and run capacitor
- Nominal power: 1,1kW
- Nominal voltage: 220/230V AC 1Ph 50Hz
- Optional Voltage: 127/220V delta/star 60Hz
- Speed(2P): 50Hz/2800rpm (60Hz: 3400)
- Speed(4P): 50Hz/1400rpm (60Hz: 1800rpm)
- Weight: 10Kg; -
- Shaft H: 90m



Mod.6030B
Rail bed for all electrical machines, tabletop



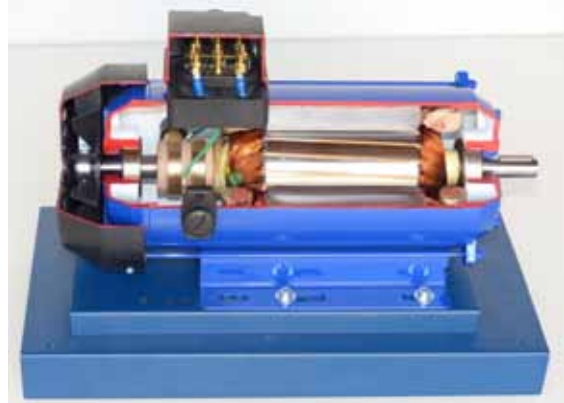
5.5 - SEC MACHINES

- Design: with typical industrial characteristics
- Complete with base plate

Mod.3040
Three Phase Squirrel Cage Motor



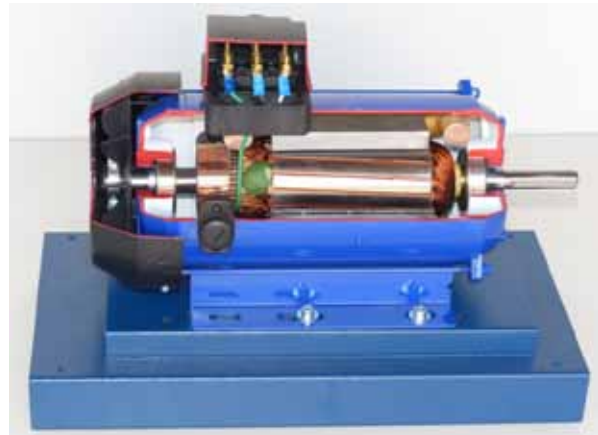
Mod.3070
Three Phase Synchronous Generator



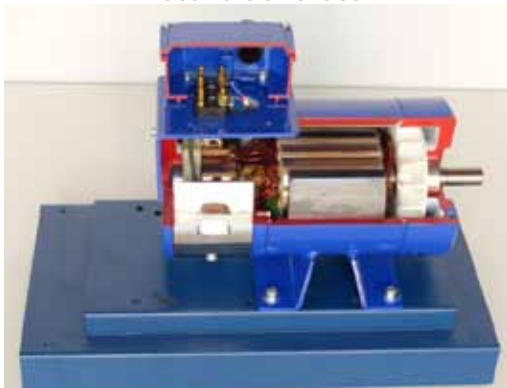
Mod.3122
Single Phase AC Motor
Capacitor Start/Run with centrifugal switch



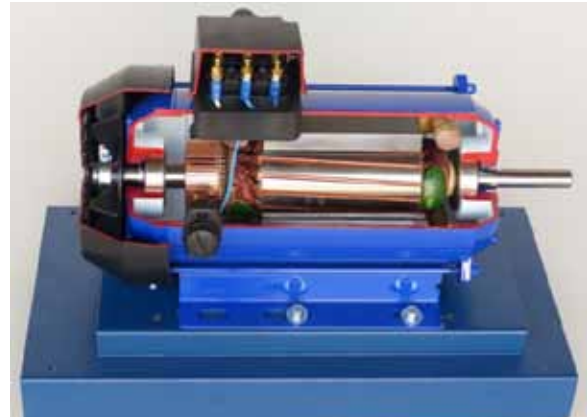
Mod.3130
Universal Motor AC/DC



Mod.3142
Permanent Magnet DC Machine
Motor /Generator



Mod.3160
External/Shunt, Series Compound
DC Machine - Motor /Generator



6.1 - TRANSFORMERS

Mod.4190

Single Phase Transformer

Primary and secondary windings are divided in several sections to allow many possibilities of connections.

- 230/115V primary/secondary.
- Primary: 2x115V Ac
- Secondary: 2x57,5V Ac
- Power: 1kVA
- Frequency 50/60 Hz
- also available: other power, other primary/secondary ratio



Mod.4195

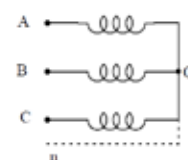
Three-phase Transformer

Primary and secondary windings are divided in several sections to allow many possibilities of connection.

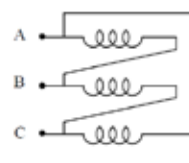
- Primary: 3x400 (3 x 2 x 115V)
- Secondary: 3x230 (3 x 2 x 66,5V)
- Power: 1kVA
- Frequency 50/60Hz
- also available: other power, other primary/secondary ratio

Primary/secondary connection

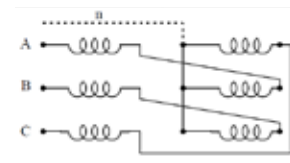
- STAR - STAR Yy
- DELTA - STAR Dy
- DELTA - DELTA Dd
- STAR - Zig-zag Yz
- DELTA - Zig-zag Dz



STAR (Y)



DELTA (D)



ZIG-ZAG (Z)

Training topics covered:

- Complete and simplified equivalent circuits
- Measurement of the individual variables
- Transformation of current and voltage
- Measuring the rush current using an oscilloscope
- Measurement and calculation of the no-load values
- Measurement and calculation of the short-circuit values
- Measurements with a variable load R, L & C
- Determining the efficiency
- Evaluating the measured values
- Phase angle between primary and secondary windings and the effect of asymmetric loading in the circuit groups Yy, Yd, Yz, Dy

7.1 - BRAKES & TORQUE METERS

- With base plate and coupling cog for easy engagement with other machine
- Input/output with standard 4 mm safety sockets
- Protection against thermal overload
- Imprinted terminal boards with the synoptic
- Two shaft ends on request
- Manual explaining theory and practice

Mod.4170 Electrodynamometer (brake/generator)

Brake and generator with separate excitation, mounted on oscillating frame in order to operate as a brake. The electro-dynamometer is complete with arms, weights, and counterweights, for usage with the classic mechanical scale method, with the graduated measuring rod and weights. As with all brakes, the torque measurement can be made with the aid of the arms and weight provided or by using the load cell and the reader Mod.4180C.

- Nominal voltage: 220V d.c.;
- Excitation voltage: 0÷ 210V d.c.
- Speed: 1000/3600 rpm;
- Power: up to 1,5kW at 3000 rpm;
- Coupling type: cog coupling
- Weight: 16 kg

Optional accessories:

- Load adjustable with steps.
- Excitation power supply.
- Encoder for detecting the speed in rpm.
- Load cell or torque meter for detecting the couple.
- Digital meter for displaying the speed and couple in Kgm or Nm.



Mod. 4174 Magnetic powder brake

Magnetic powder brake for test and measurement of the torque and power of electrical motors. Brake is complete with arms, weights, and counterweights, for usage with the classic mechanical scale method, with the graduated measuring rod and weights. For direct test on the brake of electrical motors 1/2kW, 1000/3000 Rpm.

- Couple: 0,3 - 12Nm. •Coupling type: cog coupling; •Weight: 9 kg

Optional accessories:

- Excitation power supply.
- Encoder for detecting the speed.
- Load cell or torque meter for detecting the couple.
- Digital meter for displaying the speed (rpm) and torque, both in Kgm or Nm.



Mod.4180 Electromagnetic Eddy Current Brake

Eddy current brake for test and measurement of the torque and power of electrical motors.

The brake is complete with arms, weights, and counterweights, for usage as the classic mechanical scale with weights. As with all brakes, the torque measurement can be made with the aid of the arms and weight provided or by using the load cell and the reader and digital display Mod.4180C.

For direct test on the brake of electric motors up to 1,5kW and 3000 Rpm.

- Excitation voltage: 0÷ 210V d.c.
- Speed: 1000/3600 rpm; •Weight: 16 kg

Optional accessories:

- Excitation power supply.
- Encoder for detecting the speed.
- Load cell or torque meter for detecting the couple.
- Digital instrument (Mod.4180C) for displaying the speed (rpm) and couple automatically, both in Kgm or Nm.



7.2 - BRAKES & TORQUE METERS

Mod.4203-07

Torque & Speed Meter with Load Cell

The meter can be equipped with a load cell or an optional torque transducer for torque detection and with a speed sensor. When used with brakes, it allows to measure the motor torque and speed. Both measurements can be shown on the digital display.

It can be calibrated both in kgm or Nm. The meter can be used with all brakes.

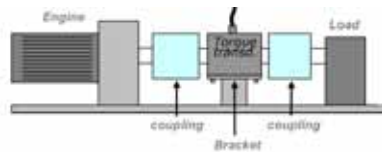
Optional accessories:

- RS485 interface.
- Management software

With *optional* PC RS485 port, it is possible to read on the PC screen: torque, speed and the instantaneous power, in real time while the motor is running. When a load is applied to the motor, it is possible to observe the increasing of torque and the decreasing of motor speed and get the power variation data.

From the PC it is possible to get all data and create the torque-speed graph for all machines under test.

Data can be printed or stored xls or pdf files.



Mod.4203-08

Torque & Speed Meter with management software

The meter can be equipped with a speed sensor and a load-cell (or a torque-transducer) for torque detection. When used with brakes, it allows to measure the motor torque, speed and power. Values are shown on digital display, it can be calibrated in kgm or Nm.

With *optional* PC RS485 port, it is possible to read on the PC screen: torque, speed and the instantaneous power, in real time while the motor is running. When a load is applied to the motor, it is possible to observe the increasing of torque and the decreasing of motor speed and get the power variation data.

From the PC it is possible to get all data and create the torque-speed graph for all machines under test.

Data can be printed or stored xls or pdf files. The meter can be used with all brakes.



Mod.6032P Basis for brakes with height-adjustable base for motors

For direct test and measurement with motors with different sizes and watts up to 12 Kw.

Height-adjustable base allows easy alignment of brake even with motors with different shaft height and different sizes and powers.

Optional cooling fan.



Mod.4186 Inertia wheel

For simulating heavy starting and energy storage.

Design: built into a machine housing with base plate.

- Flywheel mass: approx 25kg

8.1 - STARTERS, VARIABLE LOADS

- Practice and modular version table top
- Input/output with standard 4 mm safety sockets
- Manual explaining theory and practice
- also available: 0,3kW, 2 kW, 3kW, 6kW



Mod.4010
Starting rheostat
for Dc motor
Resistance: 0÷100%, linear



Mod.4011
Starting rheostat
for slip ring 3-phase motor
Resistance: 3x0÷100% linear continuously variable



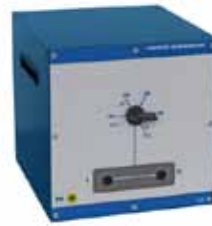
Mod.4012
Field regulator
for Ac. and Dc. motors
Resistance: 0÷100% linear, continuously variable



Mod.4013
Field regulator
for Ac. and Dc. generators
• Resistance: 0-100% linear, continuously variable



Mod.4016-R -
Load resistor
for d.c. generators
• Resistance: 20÷100% cont. variab.
• Nominal power: 200÷1000W



Mod.4010-4R Starting
rheostat for dc motor
Resistance:
4 steps+0W



Mod.4011-4R
Starting rheostat
for slip ring & squirrel cage 3-ph motor
• Resistance: 3 x 4 steps+0



Mod. 4020-R20T
Load resistive for dynamo and alternator;
Starter for DC motor; Speed control for slip-rings motor;
• Variable load 3x5÷100%;
• Power: 50W÷1000W
3-phase/ single-phase;



MOD4020-LC20T
Load for 3-phase alternator
Load inductives & capacitives;
Variable with 20 steps :
5% ÷100%;
Power: 50VA÷1000VA
Triphase / monophase;
(monophasé with 60 steps);



Mod. 4020-R110T
Load resistive for dynamo & alternator; Starter for DC motor.;
• Variable 3x 1%÷110%;
• 3Ph: variable with 110 steps from 1% to 110%
• Power: 10÷1000VA;
Triphase / monophasé;
(monophasé with 330 steps);



MOD4020-LC110T
Charge for triphase alternator
• Inductive & capacitive load variable with 3x 1%÷110%;
• 3Ph: variable with 110 steps from 1% to 110%
• Power: 10÷1000VA;
Triphase / monophase;
(monophasé with 330 steps);

8.2 - R.L.C. VARIABLE LOADS

- Practice and modular version table top
- Input/output with standard 4 mm safety sockets
- Manual explaining theory and practice
- also available: 0,3kW, 2kW, 3kW,6kW



Mod.4020-R Resistive Load Module 1kW

With 9 resistors in three identical groups to realise balanced or unbalanced 3-phase loads (star & delta) and single-phase loads. Each phase can be independently varied in 7 uniform steps from 0 to max current value for full power. Single-phase connection provides 21 regulation steps.

- Power variation: 0-100%

Mod.4021-R Resistive Load Module 1kW

Like Mod.4020-R but provides 20 balanced steps (5%-10%-15%-20%-25%-30% up to 100%). Monophase & Three-phase.

Mod.4020-L Inductive Load Module 1kVA

With 9 inductors in three identical groups to realise balanced or unbalanced 3-phase loads (star and delta) and single-phase loads. Each phase can be independently changed in 7 uniform steps from 0 to max current value of full load. Single-phase connection provides 21 regulation steps.

- Power variation: 0-100%



Mod.4021-L Inductive Load Module 1kVA

Like Mod.4020-L but provides 20 balanced steps (5%-10%-15%-20%-25%-30% up to 100%). Monophase & Three-phase.

Mod.4020-C Capacitive Load Module 1kVA

With 9 capacitors in 3 identical groups to realise balanced or unbalanced 3-phase loads (star and delta) and single-phase loads.

Each phase can be independently changed in 7 uniform steps from 0 to max current value of full load. Single-phase connection provides 21 regulation steps.

- Power variation: 0-100%



Mod.4021-C Capacitive Load Module 1kVA

Like Mod.4020-L but provides 20 balanced steps (5%-10%-15%-20%-25%-30% up to 100%). Monophase or 3-phase.

Mod.4020-RLC-02 (1kVA)

For single&three phase, Capacitive, resistive and inductive step-variable loads. Complete with variable starting rheostats for three-phase and direct current motors and with linear excitation rheostat.



9.1 - MEASURE MODULES

Analog and digital instruments:

- Input/output with standard 4 mm safety sockets
- Compact table top version or for vertical frame

- User Manual included
- High precision and reliability
- **also available for : 0,3kW, 3kW, 6Kw**

Mod.4200-VA

- DC VoltAmmeter

- with eight separate meters for Dc
- DC voltmeters: 10-50-150-300V DC
- DC Ammeters: 0,5A-2,5A-5A-10A;



Mod.4201-VA

- AC VoltAmmeter

- with eight separate meters for Ac
- AC voltmeters: 10-50-250-500V AC
- AC Ammeters: 0,5A-2,5A -5A-10A ;



Mod.4206

- DC Power meter

- for measurements of power dc
- Max Voltage: 300V
- Max current: 5A



Mod.4200-V

- DC Voltmeter

- with three separate meters for Dc
- DC C: -50-150-300V DC



Mod.4201-V

- AC Voltmeter

- with three separate meters for Ac
- AC Voltmeter: - 500V



Mod.4207

- Power factor meter

- for measurements of power factor
- -0,5 ind. -1-0,5 cap.
- -Voltage max: 500V;
- -Current: 5A;



Mod.4200-A

- DC Ammeter

- with three separate ammeters for DC
- DC Ammeters: 2,5A - 5A-10A



Mod.4201-A

- AC Ammeter

- with three separate meters for Ac
- AC ammeters: - 5A



Mod.4208

- Power Meters

- Max Voltage: 500V
- Max current: 5A - 5A



Mod.4211

- Frequency Meter

- Range: 45-65Hz
- Max Voltage : 500V c.a.



Mod.4209B

- 1&3ph Multimeter

- 3 input Voltage L-L & L-N; 30÷400V
- 3 Current I1, I2, I3 ; range:0,1÷10A
- Active, reactive, apparent power,
- Frequency,
- Power factor meter



9.2 - MEASURE MODULES

Digital instruments:

- Input/output with standard 4 mm safety sockets
- Compact table top version or for vertical frame
- User Manual included
- High precision and reliability
- also available for : 0,3kW, 3kW, 6Kw

Mod.4200-VAD

-DC VoltAmmeter

- Digital voltmeter 0,1V÷300V DC
- Digital milliAmmeter 0,1mA÷3A DC
- Digital Ammeter 0,1A÷10A DC



Mod.4201-AD

-AC Ammeter

- with three separate meters for Ac
- AC ammeters: 0,02÷ 10A



Mod.4201-VD

- AC Voltmeter

- with three separate meters for Ac
- AC voltmeters: 2÷500V AC



Mod.4201-MD

-AC/DC Multimeter

- Digital meter with graphic display.
- Voltmeter: 0 ÷ 500V a.c./d.c.
- Ammeter: 0÷ 10A a.c./d.c.
- Frequency meter: 0÷ 100Hz



Mod.4209

-3-Ph Multimeter

- 3 inputs for voltage 20÷ 500V AC
- 3 input for current 0,03÷10A AC
- Active, reactive, apparent power, Frequency, Power factor meter.
- -Optional RS485/USB for PC
- -Optional wireless PC connection
- -Optional software for PC Windows



Mod.4203-01

-3-Ph Multimeter

- 3 inputs for voltage 20÷ 600V AC
- 3 input for current 0,03÷10A AC
- Active, reactive, apparent power, Frequency, Power factor meter.
- -Optional RS485/USB for PC
- -Optional wireless PC connection
- -Optional software for PC Windows



Mod.4209-ACDC

-Multimeter AC /DC

- 3 inputs for voltage 20÷ 500V AC
- 3 input for current 0,05÷10A AC
- Active, reactive, apparent power, Frequency, Power factor meter.
- DC voltage: 100V÷ 500V DC current: 10A



Mod.4209-ACDCL

- DC voltage: 0÷200V DC
- Current: 10A

Software for windows

Software for connecting to Windows computers for the visualization, recording and export of all data collected by the instruments.

Digital and analog display (on PC video) of all 3-Phase line parameters (voltage, current, frequency, power factor, active power, reactive power, apparent power).



9.3 - MEASURE MODULES

Digital instruments:

- also available for : 1kW, 3kW, 6Kw
- Compact table top version or for vertical frame
- Optional software for PC Windows with data recording and export
- Optional wired/wireless PC Usb connection

Mod.4203-02

-DC digital VA

- Voltmeter: 0,1÷300V DC
- Ammeter: 0,01÷10A DC



Mod.4203-03

-AC digital VA

- Voltmeter: 0,1÷300V AC
- Ammeter: 0,01÷10A AC



Mod.4203-04

-DC digital VAW

- Voltmeter: 0,1÷300V DC
- Ammeter: 0,01÷10A DC
- Wattmeter: 0,1÷2000W.



Mod.4203-05

-AC digital VAW

- Voltmeter: 0,1÷300V AC
- Ammeter: 0,01÷10A AC
- Wattmeter: 0,1÷2000W



Mod.4203-06

-DC digital VA&TS

- Voltmeter: 0,1÷300V DC
- Ammeter: 0,01÷10A DC
- Torque and Speed meter



Mod.4203-07

-TS digital meter

- Torque meter
- Speed meter
- with speed sensor and a load-cell



Software for Windows

Software for connecting to Windows computers for the visualization, recording and export of all data collected by the instruments.

Digital and analog display (on PC's video) of all parameters (voltage, current, DC power, speed, torque, mechanical power).



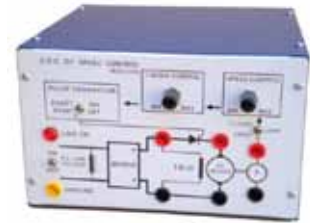
10.1 -SPEED CONTROL MODULES

Mod.4230 DC Speed Regulator Module

For experiment on open and closed loop regulation on Dc motors used as actuators in automation.

A current limiter with adjustable gain is included, for speed control and variable torque control.

- Operating voltage: 230Vac
- Input/Outputs: 4 mm CE safety sockets
- Unit type: Table top



Mod.4240 AC Speed Regulator Module

To execute experiment on regulation of Ac motors and as actuators for automation, robotics etc.

Frequency converter with industrial characteristics for all controls and regulations on three-phase motors.

- Operative voltages: 208/380/415V
- Input/Outputs: 4 mm CE safety sockets

Mod.4182 Digital Precision Tachometer

Digital Photo tachometer, for safe and accurate RPM measuring both with and without contact with shaft. It has a wide measuring range and high resolution.

- Test Range: 5 ~ 99999 RPM±0.05%
- Memory: Last value, Max value, Min value
- Detecting Distance: 50~150mm/2~6 inch



Mod.4185 Digital Speed Meter

Digital Tachometer for RPM measurement is safe and accurate without any contact with the machine shaft. It has wide measuring range and high resolution. It includes the speed sensor.

Mod.4301-B Soft-Starter

Soft starter for motors slip-ring and squirrel cage
Star-delta starter
Motor protection adjustable current
Direct-starting



Mod.4301-A Starter

Starter for motors slip-ring and squirrel cage
Star-delta starter
Motor protection adjustable current 1÷1,6A
Direct-starting

Mod.4301-C Soft-Starter

Soft starter for motors slip-ring and squirrel cage
Star-delta starter
Motor protection adjustable current



11.1 -ACCESSORIES

Mod.4183S Starting and Synchronizing module for synchronous motor

- With dc power supply 0÷220volt up to 3A
- Input/Outputs: 4 mm CE safety sockets
- Unit type: Table top



Mod.4184 Synchronizing indicator includes three indicator lamps, three line fuses, a three polar switch and 6 security sockets to detect the synchronism between two 3-phase generators when are shunt connected between them or with the main network.

- Operative voltage: 208/380/415V

Mod.4210 Tacho generator

Generator for r.p.m. detection, complete with base plate. In union with its rpm meter Mod.4210.C, it allows to read the motor speed.

Coupling type: cog coupling

- Output: 60mV/rpm



MOD.4210.C



Mod.4196 Connection Leads Set

Set of 30 leads in 3 different colours and lengths to allow all experiments provided in the manual. Up to 16A. Terminated with banana-banana plugs.

Mod.4196M-50

Cable Holder.

Mod.4215 Gear block

Device for block the rotor of the three-phase asynchronous motor cage and slip ring.

- Coupling type: cog coupling
- Dimensions: LxWxH: 16 x 14 x 15cm



Mod.4212 Shaft end guard

- Dimensions: LxWxH: 3 x 9 x 11,5cm
- Weight: 0,094 kg



Mod.4213 Coupling guard

- Dimensions: LxWxH: 6 x 9 x 11,5cm
- Weight: 0,139 kg



Mod.4214 Rubber coupling sleeve

- Material: rubber
- Dimensions: 40x45 (length x diameter)
- Weight: 0,036kg



Mod.4214A Coupling gear



11.2 -ACCESSORIES

<p>Mod.4302 Three-phase ON-OFF switch for direct start of 3ph induction squirrel cage motors.</p> 	<p>Mod.4303 3 phase D.O.L.s tarter possibility to invert the rotation direction.</p> 	<p>Mod.4304 Direct On Line – starting device for three-phase motors with four poles circuit breaker 4A</p> 
<p>Mod.4305 Voltmeter switch L1-N, L2-N, L3-N, L1-L2, L1-L3, L2-L3.</p> 	<p>Mod.4306 Protection by fuse 5A</p> 	<p>Mod.4307 Motor protective device 3-phase. Adjustable current</p> 
<p>Mod.4308 Start device for three-phase squirrel cage motor and slip ring motor, in star-delta configuration.</p> 	<p>Mod.4309 Start device for three-phase squirrel cage motor and slip ring motor, in star-delta configuration and to invert rotation direction.</p> 	<p>Mod.4310 Polarity reverser for 2 speeds 3 phase motors, "Dahlander" type.</p> 
<p>Mod.4311 Polarity switch for 2 speed motor with separate windings with star connection.</p> 	<p>Mod.6030 Mobile bed for all electrical machines, with 4 wheels</p> 	<p>Mod.6031 Mobile bed for all electrical machines and tabletop modules, with 4 wheels</p> 
<p>Mod.6030B Rail bed for all electrical machines, tabletop</p> 	<p>Mod.3299 Table Top Vertical Frame</p> 	