

**Specifications:-****DC Motor/ Generator with the facility of Separate/ Compound/Series Excitation (01 No.)**

- Power: Min.300 W
- Voltage (Armature): Min.220 Vdc
- Voltage (Separate Excitation): Min.220 Vdc
- Rpm.: Min.3000
- DC motor operation should also be performed by this unit
- Should be IM B3 form of construction
- Should have IP 22 protection
- Should be included with thermal protector in this unit

3-Phase Cage Motor Asynchronous Type (01 No.)

- Power: Min.500 W
- Voltage: Min.230/400V, 50Hz
- Rpm.: Min.2850 for 2 poles
- Should have Delta-star connection
- Should be IM B3 form of construction
- Should have IP 44 protection
- Should be included with thermal protector in this unit

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



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3-Phase Wound Rotor Motor Asynchronous Type (01 No.)

- Power: Min.500 W
- Voltage: Min.230/400V, 50 Hz
- Rpm.: Min.2900 for 2 poles
- Voltage (Rotor): Min.400V
- Should have Delta-star connection
- Should be IM B3 form of construction
- Should have IP 22 protection
- Should be included with thermal protector in this unit

3-Phase Motor/ Generator Synchronous Type with Starting Function Asynchronous Type (01 No.)

- Power: Min.350 VA
- Voltage: Min.230/400V, 50 Hz
- Rpm.: Min.3000 for 2 poles
- Voltage (Excitation): Min.220 Vdc
- Synchronous motor operation should also be performed by this unit
- Should have Delta-star connection
- Should be IM B3 form of construction
- Should have IP 22 protection
- Should be included with thermal protector in this unit

1-Phase Motor Asynchronous Type with Starting Capacitor (01 No.)

- Power: Min.300 W
- Voltage: Min.230V, 50 Hz
- Rpm.: Min.2900 for 2 poles
- Should be IM B3 form of construction
- Should have IP 44 protection
- Should be included with thermal protector in this unit

AC/DC Motor Universal Type (01 No.)

- Power: Min.260/330 W
- Voltage: Min.230 Vac, 50 Hz / 230 Vdc
- Rpm.: 3000

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- Should be IM B3 form of construction
- Should have IP 22 protection
- Should be included with thermal protector in this unit

Power Supply Unit Tabletop Type (01 Set)

- For general electric measurements and of measurements on electric machines
- Power Supply: 3ph, Neutral, Protective Earth, 50-60 Hz

Variable Resistive Load (01 No.)

- Should have 3 separate resistive sectors
- Should have 21 values of DC or single-phase active power
- Should have 7 values of three-phase active power
- Should have safety terminals and protection by fuses
- Power supply (AC): Min.230/400V
- Power supply (DC): Min.220V
- Active power: Max.460W

Variable Inductive Load (01 No.)

- Should have 3 separate inductive sectors
- Should have 21 values of single-phase reactive power
- Should have 7 values of three-phase reactive power
- Should have safety terminals and protection by fuses
- Power supply: Min.230/400V, 50 Hz
- Apparent power: Max.460 VA

Variable Capacitive Load (01 No.)

- Should have 3 separate capacitive sectors
- Should have 21 values of single-phase reactive power
- Should have 7 values of three-phase reactive power
- Should have safety terminals and protection by fuses
- Power supply: Min.230/400V, 50 Hz
- Apparent power: Max.460VA

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Transformer 1-Phase (01 No.)

- Power: Min.760 VA
- Voltage (primary winding): Min.230V, 50 Hz
- Voltage (secondary winding 1): Min.0-53-200-400V
- Voltage (secondary winding 2): Min.0-115-230V
- Should have IP 22 Protection
- Should be included with thermal protector in this unit

Tachogenerator (01 No.)

- Can be used to measure the speed of rotation of "M" and "M-B" electric machines
- The output signal can be converted into rpm by tachometer voltmeter
- Can be used for DC motor drive in closed-loop Configurations
- Output voltage: Min.0.06 V per revolution
- Rpm.: Max.5000
- Output voltage 1: Min.300 Vdc at 5000 rpm.
- Output voltage 2: Min.10 Vdc at 5000 rpm.
- Should have IP 44 Protection

DC Starting Rheostat Rotor Starting Stator Starting (01 No.)

- Linear rheostat
- Power: Min.3 x 500 W
- Current: Min.3 x 3.16 A
- Resistance value: Min.3 x 50Ω
- Terminals: Min.9

Shunt Field Rheostat Generator (01 No.)

- Linear rheostat
- Power: Min.500W
- Current: Min.0.31A
- Resistance value: Min.5000Ω
- Terminals: Min.3

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Shunt Field Rheostat Motor (01 No.)

- Linear rheostat
- Power: Min.500 W
- Current: Min.1.55A
- Resistance value: Min.200Ω
- Terminals: Min.3

Series Field Rheostat Motor (01 No.)

- Linear rheostat
- Power: Min.500 W
- Current: Min.3.16 A
- Resistance value: Min.50Ω
- Terminals: Min.3

Electrical Measurements Modules (01 Set) Set of devices:

- 2 Modules: 1 three-pole power switch
- 1 Module: 1 phase sequence indicator with lamps
- 1 Module: 1 synchronization device for parallel connection of three phase lines or generators

Set of digital instruments:

- 1 Module:1 tachometer Min.240 Vdc @ 4000 RPM Auxiliary power Min.110-240 VAC – 50/60 Hz
- 2 Modules (Each module includes): Current Measurement: Max.5A. Should include 3 CT 5/5A. The range can be expanded with 3 external CT x/5A; THD Total Harmonic Distortion for currents;
- Over current: Min.50A for 1 sec.; Current Accuracy: Min.0.5%
- Voltage Measurement: Min.3-ph + N.; 400 V phase to N and 690 V ph. to phase, 45-66 Hz; Voltage Accuracy: Min.0.5%; THD Total Harmonic Distortion for voltage
- Frequency: Min.45-66 Hz.
- Power Measurement: Min.3.5 kVA / kW / kVAh
- Other parameters measured: Power factor, Voltage Asymmetry, Energies meter: kWh / kVAh / kVAh and Counter Hour

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Other features:

- Auxiliary power Min.110-240 VAC – 50/60 Hz
- Graphic LCD display, 128 x 80 pixel, backlit, with 4 grey levels
- Four keys for parameters visualizing and settings
- Possibility to create up to 4 programmable pages, each with 4 selectable measures among the measured parameters.
- Two programmable relays with max/min alarm functions, selectable among the measured parameters
- Graphical Menu and Messages in 5 languages: English, Italian, Spanish, French and Portuguese
- Communication port: RS485 for data networking
- All connections are provided with safety plugs (\varnothing 4 mm)

Module (Each module includes):

- 2 multifunction instruments, with the following features:
- VDC max.: 600 V; precision: \pm 0.2 %
- IDC max.: 20 A; precision: \pm 0.5 %; overload 2 x 20 A (3 min)
- Power DC max.: 10 kW
- Displays: visualize V, I, W. LCD, backlit, 3 lines, 4 digit per line
- Automatic decimal point. Five levels of illumination.
- All connections 4 mm \varnothing safety terminal

Multifunction Measuring Instrument (01 No.)

- Multifunction Instrument in an isolating table-top box;
- Connections from front and sides, with electrical international symbols;
- Power connections should be carried out with 4mm safety terminals;
- Programmable connections with dia. 2mm connectors;
- It should measure 1-phase / 3-phase electrical parameters. More than 300 TRMS parameters, such as: voltages, currents, active, reactive and apparent powers, power factor, frequency, V and I harmonic analysis up to 31^o harmonic;
- Measurements of imported/exported total and partial active energy, inductive/capacitive reactive energy, total and partial apparent energy;
- Measurements class for voltages and currents: 0.2% and currents up to 10A;
- Auxiliary power: 110/250VAC, 50/60Hz

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- Graphic LCD display, 128 x 80 pixel, backlit with 4 grey levels;
- Four keys for parameters visualizing and settings;
- Possibility to create up to 4 programmable pages, each with 4 selectable measures among the instrument measures;
- It should include a module with 2 relay outputs for local/remote alarms;

Software for Multifunction Measuring Instrument (01 No.)

- The software should allow to visualize the measurements from the instruments as “virtual instruments”
- Sample the user-defined measurements and save them in different formats like MS-Access, ASCII text and MS-Excel
- Trace graphs of the sampled measurements
- Apply alarm limits to the sampled measurements
- Save on disk the alarms and events sequence of the instruments network
- Visualize and modify the instrument set parameters with the possibility of saving them on disk, recall and print the settings
- Visualize a graph of the voltages and currents harmonic content, using the measurements given by the instrument
- Possibility to program up to 4 pages with parameters selected by the user
- Change the menus and commands language of the program

Tabletop Vertical Frame (01 No.):

- Tabletop Vertical Frame for the Modules of Electrical Measurements

Cables (01 Set): Set of 40 Cables

Safety Terminals, Ø4mm, Different Lengths and Colors

Cable Holder (01 No.)

- Should be lightweight unit made of structural aluminium profile
- The cable support (both sides) are to be made of plastic grids, so to avoid damaging the cables insulation.

Cabinet (01 No.)

- Cabinet made of SS & Powder Coating

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Experiments to be done:**Induction motor**

- Starting experiment of the 3 phase induction motor
- Y- Δ starting of three phase squirrel cage induction motor
- Forward / Reverse operation of three phase induction motor
- Slip measurement of the three phase induction motor
- Load experiment of the three phase induction motor
- Forward / Reverse operation of the single phase induction motor
- Characteristic experiment of the single induction motor
- Operation of universal motor
- Power factor of the three phase induction motor
- Rotor characteristic of the three phase wound-rotor motor

Synchronous machine

- Non-load experiment of the synchronous generator
- Load experiment of the synchronous generator
- Starting method of the synchronous motor
- Phase and load characteristic experiment of the synchronous generator

DC Motor

- Starting method of the DC shunt motor
- Non-load experiment of the DC shunt generator
- Load experiment of the DC shunt & compound generator
- Load experiment of the DC shunt & compound motor
- Efficiency measurement of DC shunt motor by loss separation method
- Forward / Reverse operation method of DC motor

1 Phase Transformer

- Measuring Coil Resistance of Transformer
- Measuring Coil Resistance of Transformer
- Impedance of Transformer Current Ratio and Impedance of Transformer
- Voltage Regulation Curve of Transformer
- Polarity of Transformer
- No-Load & Load Experiment of a 1 Phase Transformer

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- Short Experiment of a 1 Phase Transformer
- Parallel Operation of a 1 Phase Transformer



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