ELECTRICAL POWER ENGINEERING

ENERGY MANAGEMENT
DL GTU104-S

Introduction:

In some countries, the electric energy consumption levels have reached levels that exceed the available supply. There is an increasing need to optimize and reduce this level of use and find alternative, more efficient and renewable power sources.
Electric companies use electric meters installed at the consumers facilities to measure the power delivered to them for billing purposes. Modern solid state electricity meters are able to measure both active and reactive power, demand and maximum use of power, or allow different rates to be applied in different periods of the day.

Most electrical installations act as inductive loads on the mains network. These loads include equipment with coils or windings, such as motors and transformers that produce a time delay between the voltage and current variables. Energy consumers, in particular larger ones such as industrial plants, are obliged, either by contract or for economic reasons, to compensate the reactive power consumed by their equipment.

The integration of distributed renewable energy systems tied to the main grid create a bidirectional flow of energy that needs to be properly managed, using metering and advanced power electronics conversion techniques.

In this laboratory, several types of user can be simulated using static and dynamic loads to study power factor compensation, energy consumption, load profiling and the optimization of electrical power use.

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Experiments

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Complex loads, energy and power consumption

- Three-phase consumers with star and delta connections (R, L, C, RL, RC and RLC loads).
- Dynamic load:
  - Study of an asynchronous motor as three-phase load
  - Power measurement in the case of energy-flow reversal.
- Active energy consumption
- Reactive energy consumption:
  - for symmetric and asymmetric RL loads.
  - in the event of a phase failure.
  - in the event of over-compensation (RC load).
  - for active loads.
- Maximum power demand.

Power factor compensation

- Manual power factor compensation:
  - Calculating parameters for compensation capacitors.
  - Compensation using various capacitors.
- Automatic power factor compensation.

Energy Management

- Load profiling and efficiency
- Mixed load energy consumption analysis with and without power factor compensation.

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List of modules

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DL 2102AL	Three-phase power supply	1
DL 1021/4	Three-phase asynchronous machine	1
DL 2108T02	Power circuit breaker	2
DL 2108T26	Brushless motor with controller	1
DL 2108T26BR	Braking resistor for brushless motor nominal 5.4Nm	1
DL 2109T29	Three-phase power meter	1
DL 2108T19	Reactive power controller	1
DL 2108T20	Switchable capacitor battery	1
DL 1017R	Resistive load	1
DL 1017L	Inductive load	1
DL 1017C	Capacitive load	1
DL 4236	Load Manager	1
DL HMI	HMI	1
DL HUBRS485F	Communication MODBUS	1
DL 1013A	Universal Base	1
DL 2600TTI	Three-phase isolation transformer	1
DL SCADA-WEB	SCADA Software	1
DL PCGRID	All-in-One Computer	1
TLGTU104	Cables	1
DL 1196	Holder for leads	1
DL T12090_SK	120x90 working bench	1
DL T06090	60x90 working bench	1
DL A120-3M-LED	Three-level work frame with LED light	1