DIDACTIC SYSTEM FOR AUTOMATED POWER FACTOR CORRECTION
DL FAT-SM

OBJECTIVE

The DL FAT-SM modular training system allows users to carry out theoretical-practical studies involving the use of devices with alternating electrical magnitude measurement instrumentation to analyze the measured values in an inductive load, or a three-phase induction motor in this case, it also allows power factor correction procedures to be performed via a capacitive correction bench. All these devices can be monitored by SCADA integrated into an HMI

DIDACTIC ACTIVITIES

1. Analysis of the operation of each module individually;
2. Analysis of the operation of each module as a whole;
3. Analysis of the operation of the three-phase induction motor and its connections;
4. Analysis of the operation of a capacitive correction bench and its applications;
5. Analysis of the behavior of inductive and capacitive loads in a three-phase network;
6. Performance analysis of the digital instrumentation device;
7. Analysis of the operation and topology of industrial networks
8. MODBUS network device integration;
9. Manual and automated power factor correction;
10. Using the Human-Machine Interface;
11. Mass storage of data.

ELECTRICAL ENGINEERING

TEAM COMPOSITION

RACK

A single-row, 45-degree angled anodized aluminum rack with four non-slip support bases, (H x W x D) 0.4 x 1 x 0.5 meters, allowing modules to be manually fixed and removed without the need for screws and tools.

RACK MODULES

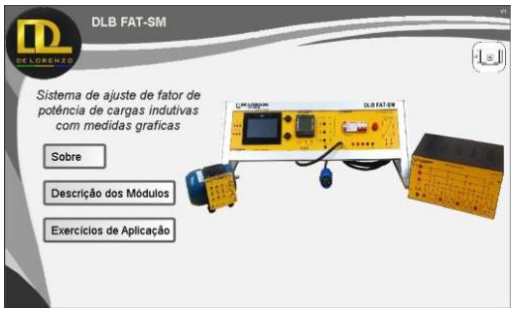
The equipment is built in modular form and is comprised of several modules to be used in the rack. The modules available in this equipment have the symbols of the components on their front in laser engraving (indelible) in TS-Structural insulating material with a thickness of 4 mm, safety terminals with different dimensions for control signal and power, two and four millimeters respectively. Each rack module also has a protective back cover, so they can be handled safely, protected and insulated, saving time for practical activities and group work. Finally, one QR code is available per module, allowing accessibility, support and other specification applications.

BENCH MODULES

The equipment is arranged in modules and is comprised of several modules to be used in the bench. The modules available in this equipment have the symbols of the components on their front in laser engraving (indelible) in TS-Structural insulating material with a thickness of 4 mm, safety terminals with different dimensions for control signal and power, two and four millimeters, respectively. Each bench module also has a protective case with electrostatic paint, so they can be handled safely, being protected and insulated, saving time for practical activities and group work. Finally, one QR code is available per module, allowing accessibility, support and other specification applications.

MONITORING SOFTWARE

The equipment comes with built-in monitoring software that helps and exemplifies connection topologies and centralizes measurement and control information in the system:



ADDITIONAL ACCESSORIES

- Connecting leads
- Software application included
- Activities Manual
- Technical Manuals.

REQUIREMENTS FOR USE AND INSTALLATION

- Environment that meets educational infrastructure standards for classrooms.
- A table with at least the following dimensions (L x W x H): 2 x 1 x 0.8 m.
- A three-phase network access point with 220V line, providing three phases, a neutral and a ground.

ELECTRICAL ENGINEERING

DIDACTIC MODULES

GENERAL POWER MODULE

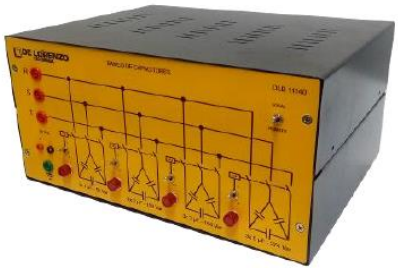
A power module with three-phase circuit breaker, with industrial three phase cable. It has a 24 VDC/5 A power supply and a power signal indicating LED.

HUMAN-MACHINE INTERFACE MODULE

A 7-inch color touchscreen HMI rack module with type RS485 data buses and Ethernet, both with MODBUS communication. It has a USB port for connecting the USB flash drive for data transfer. The supply voltage for the module is 24 VDC and has 2 mm safety terminals for connecting banana leads.

CORRECTION BENCH MODULE

Bench module housed in a suitable electrically insulated metal structure containing a set of four three phase delta-connected capacitive banks with reactive powers of 54, 109, 163 and 272 var at 220 VAC. Benches can be activated by four local retentive switches with LED indicators indicating activation and also allows remote activation via RS-485. It has 2 and 4mm safety terminals and circuit breaker.



THREE-PHASE MULTIMETER MODULE

Rack module consisting of a single-phase and three-phase bidirectional electrical multimeter with RS-485 data bus for communication and indication of inductive and capacitive reactance (with four-quadrant measurement). The module provides various types of electrical quantities such as phase and line voltage, current, active, reactive, apparent power, both single and three phase, frequency and demand. It has a 4” local human-machine interface for measurement display and parameterization.

ELECTRICAL ENGINEERING

3-PHASE INDUCTION MOTOR MODULE

A bench module housed in a suitable electrically insulated metal structure containing a three-phase induction motor with a teaching board indicating the electrical connection and 4 mm safety terminals for connecting banana leads. The abovementioned motor is a four-pole motor with a rated power of (¼ hp). Star and delta connections