

**Product Name :**  
Bench For The Study Of The Motor Automation-Educational  
Equipment

**Product Code :**  
LIM-CAT-L0043-00003



**Description :**

Bench For The Study Of The Motor Automation-Educational Equipment

**Technical Specification :**

Bench For The Study Of The Motor Automation-Educational Equipment

This educational system is a multipurpose bench for the study of PLC programming techniques used to start and control a three-phase asynchronous electrical motor using an inverter drive. It is based on didactic approaches and include all modules and components required for didactic studying of motor automation.

This trainer has modular structure and it consist of some didactic panels that is installed on a vertical frame. The modularity of this didactic system grant to the students a direct and immediate approach to the topics, offering the opportunity to study various subjects performing different experiments.

It is aimed to provide a progressive hands-on learning tool to be used in electric machines and automation courses to develop skills at various levels among others such as Electrical installations, Electric machines drive, Automation techniques, and PLC programming.

It offer to the students the possibility to perform the following experiments in:

**BASIC INDUSTRIAL INSTALLATIONS:**

Single-pole control auxiliaries

Study of the Contactor

Implementation of logic operators with contacts

Study of the self-supplied power contactor

Interlock between contactors

Sequential control of contactors

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Implementing an Exclusive-OR operator using classical relays

Implementing a static excitation delayed timer

Implementing a static de-excitation delayed timer

Study of the thermal relays

**THREE-PHASE ASYNCHRONOUS MACHINE STARTING:**

Manual STAR/DELTA starting control of a motor

Manual motor reversing control

Timed sequence control

Designing a pulse generator

Automatic STAR/DELTA starting control of a motor

Automatic STAR/DELTA starting control of a motor, with reverser

Counter-current braking of asynchronous motor

**THREE-PHASE MOTOR INVERTER DRIVE:**

Motor parameter setting / Auto-tuning

Open loop speed control

Jog speed control

Multistep control

Motor power curve

Motor torque-speed curve

Closed loop speed regulation

**AUTOMATION USING A PLC:**

Introduction to PLC programming

PLC automation basics

Automatic motor starting using a PLC

Motor automation and control using a PLC and a three-phase inverter

Multistep motor automation and control using a PLC and a three-phase inverter.

It is supplied with a theoretical and practical manual in English language.

The set of modules include the following:

**MOTOR SPEED CONTROL-Didactic equipment**

Three-phase inverter for the drive and the speed control of asynchronous motors. The speed set point can be defined directly on the inverter or manually adjusted using the potentiometer on the front panel and can be adjusted in open or closed loop using the actual speed reading from the optical encoder.

The acceleration and deceleration ramps can be set separately from 0 to 3200 seconds, and the direction of rotation can be selected using a dedicated switch. The front panel will also include a digital instrument that displays the speed, torque and generated mechanical power. The inverter settings can be programmed locally by RS485

It has the following technical specifications:

Rated power: 1.5 kW

Output voltage: 3 x 230 V

Output frequency: 0.1 to 500 Hz

Control interface: Two programmable relay outputs, four digital inputs, one analog input for speed feedback.

Control methods: Sinusoidal Pulse Width Modulation (PWM); Flux-field Current Vector Control; Set point setting (PID).

V/F control: V/f constant, Variable torque, Automatic torque boost, Vector control, PM Motor control, 5-point V/F

Custom setting and Auto-tuning.

RS485 Port (TSB or MODBUS RTU Protocol).

Direct current braking.

The unit is able to monitor the following parameters:

Frequency Output,

Clockwise and Counterclockwise Feed,

Output Current,

Input Voltage (DC Detection),

Output Voltage,

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Torque,  
Inverter Load Factor,  
Motor Load Factor,  
Braking resistor Load Factor,  
Input power,  
Output power,  
Input terminal status,  
Output terminal status,  
Overload/Regional setting,  
PID feedback value.  
Protection against minimum/maximum supply voltage,  
Thermal protection and output current limitation.  
It include:  
1 display for measuring speed and calculated torque,  
1 24Vdc output,  
3 switches for LOOP function (open/close), JOG function (on/off) and DIRection function (CW/CCW).  
**SQUIRREL CAGE THREE-PHASE ASYNCHRONOUS MOTOR**-Didactic equipment  
Induction motor with three-phase stator winding and squirrel cage buried in the rotor.  
Technical features:  
Power: 370 W  
Voltage:220/380 V ?/Y  
Current:2/1.1 A ?/Y

Speed: 2650 rpm,50 Hz

It is possible to couple the electrical machine with other electrical machines through the torque system device.  
It is supplied with a hooked module in aluminium with PVC label and safety terminals for the electrical connection.

A schematic diagram is shown on the hooked module.

Each machine is mounted on a base and is provided with:

Plate that brings its axis height to the standard measure (112 mm).

Plates for fixing to the base of the machine

InterRail Distance of the plates:160mm.

Four screws for fixing of the machine

**UNIVERSAL BASE FOR LECTRICAL MACHINES**-Didactic equipment

This item consist of a steel alloy varnished structure mounted on anti-vibration rubber feet, provided with slide guides for the fixing of one or two machines andwith a coupling guard. Complete with a device for the locking of the rotor of the slip ring asynchronous machines in the short-circuit test.

Composition:

Light alloy base, levelled on the upper supporting planes, with two guides for all the couplings of machines rated0.3 kW and 1 kW.

In the lower section high sensitivity shock absorbers is mounted, arranged to be fixed to a supporting plane.

Removable butt strap in varnished plate.

Flask for the blocked rotor test in varnished light alloy.

**ELECTROMAGNETIC BRAKE**-Didactic equipment

Smooth roll rotor and salient pole stator.

It is provided with two arms, one of which with graduated scale water level, weight, and balance weight for measuring the output torque of the motor.

It is housed in an aluminum box with PVC label and provided with a panel with safety terminals showing schematic diagram with possibility of assembling a loadcell.

It has the following technical specifications:

Supply voltage: 250 Vdc

Speed: 5000 rpm

Power: 450 W

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It is possible to couple the electrical machine with other electrical machines through a hub and spider elastic gear ring in polyurethane.

It is provided with safety terminals for the electrical connection, a thermal protection, and an encoder, fixed at one end, for the speed reading.

It is mounted on a base and is provided with:

Plate that brings its axis height to the standard measure (112 mm).

Two plates for fixing to the base of the machine

Four screws for fixing of the machine

InterRail Distance of the plates:160mm

Coupling Joint, Diameter: 40mm, length:40mm.

**PROGRAMMABLE LOGIC CONTROLLER- Didactic equipment**

It is a powerful and flexible system that control a wide variety of devices and meet the different needs of the automation industry.

The CPU, in a single compact device, combine a microprocessor, an integrated power supply, input and output circuits, thus creating a powerful on-board controller. After loading the program, the CPU contain the logic required for the monitoring and control devices used in the application.

The CPU monitor the inputs and change outputs according to the logic of the user program, which can include Boolean logic, counting and timing, complex math functions and for communicating with other intelligent devices. To communicate with the programming device, the CPU make available an integrated USB port and through it, the CPU communicate with the PC.

The front panel include:

Output voltage: 24Vdc available on two 2mm terminals

Power supply socket: single-phase from mains with switch to power on

Twelve switches (3 positions: unstable/off/stable) on 1 row for PLC inputs enabling

Twelve 2mm terminals for 12 digital inputs

Twelve 2mm terminals for inputs (common)

Sixteen 2mm terminals for 8 relay outputs (2 for each)

Eight 2mm terminals with 8 L5EDs for displaying the PLC output states

Four 2mm terminals with 2 switches (V or I) for analog outputs

One USB port

Two RS485 ports (1 male/1 female) with RTU Modbus protocol

Two variable voltage outputs (0 ÷ 10V) adjustable by potentiometers with four 2mm terminals

1 x 4mm terminal for Potential Earth (PE)

The controller include:

CPU with 8 digital inputs (24Vdc), 4 digital /analog inputs (in voltage, 0 ÷ 10V), 8 relay outputs, and LCD display, 4 lines x 16 characters

Additional expansion module with 2 analog outputs (0... 10V or 0...20mA).

The system is supplied with relevant software that provide an intuitive environment where it is possible to develop and to modify the logic of the application, including the necessary tools used to manage and configure project devices.

It also provide a complete online guide facilitating the search of information.

The software provide standard programming languages that allow the development of the control program in a practical and efficient way.

It is power supplied with an alternating voltage between 100 and 240Vac, 50/60Hz.

**TRANSFORMER-Didactic equipment**

This module has insulated panel and safety terminals.

Single-phase transformer for low voltage modules.

Primary:127/220 V

Secondary:2x12 V

Rated power: 100 VA.

3 safety terminals of 4 mm for primary+1 PE

3 terminals of 2 mm for secondary.

#### MUSHROOM BUTTON-Didactic equipment

This module has insulated panel and is mushroom type red emergency pushbutton for the manual control and the fast opening of the circuit in case of emergency. It is provided with 1NO and 1NC contacts.

Isolating rated voltage: 660 Vac

Thermal rated current 10 A.

#### PILOT LIGHTS-Didactic equipment

This module has insulated panel and include three signalling LED lamps, red, yellow, and green.

Red lamp indicate danger or alarm of a potential danger or of a situation, which requires an immediate action.

Yellow lamp indicate warning and a change or imminent change of operating conditions.

Green lamp indicate safety condition or of an authorization to proceed.

#### CONTACTOR-Didactic equipment (4 units)

This module has insulated panel and safety terminals.

It operate as a three-pole power switch by an electromagnet. It is provided with:

3 NO power contacts

1 NO auxiliary contact,

4 additional auxiliary contacts, 2NO and 2NC

Coils voltage: 24 Vac, 50/60 Hz

6 safety terminals, 4 mm

Isolating rated voltage: 660 V

Thermal rated current: 20 A

Thermal rated current of the auxiliary contacts: 10 A.

#### THERMAL RELAY-Didactic equipment

This module has insulated panel and safety terminals.

It consists of a three-phase protection against overload and phase loss through a high sensitivity differential device with protection against faulty string.

Compensation of the variation of the ambient temperature is between -25°C and + 60°C.

6 safety terminals +1 PE, 4 mm

Isolating rated voltage: 690 V

1 additional auxiliary contact, 1NO and 1NC

Thermal rated current of the auxiliary circuit: 10 A.

#### TIME RELAY-Didactic equipment (2 units)

This module has insulated panel and consist of a multi-voltage and multifunction electronic timer, delayed at the excitation and at the de-excitation.

Power supply: from 12 to 240 Vac, 50/60 Hz

Timer selection from: 0.1 to 2 sec., 1 to 20 sec., 0.1 to 2 min., 1 to 20 min.

Resettlement time: less than 50 milliseconds

Full scale adjustment accuracy:  $\pm 5\%$

Contacts: 1NO and 1NC.

#### DEMAND METER-Didactic equipment

The module consists of a three-phase network monitoring device. It has insulated front panel and it is suitable for the measurement of three-phase rms. and peak values of voltages and currents (for 3 and 4 wire connections) as well as active, reactive, and apparent power, active, reactive, and apparent energy, power factor, THD and frequency.

Input voltage: nominal 400 Vac (Three-phase: 80...690 V, 50...400 V per phase)

Input current: up to 10 A (5 A with 10:5 current transformers).

Operating frequency: 47...63 Hz

Auxiliary supply: 80...265 Vac, 50/60 Hz single-phase from mains.

On the front panel, it includes a RS485 port, an on/off switch and LCD display with the following features:

N. of reading points: 10 000, 4 digits

Energy count: 8-digit counter

Reading updates: 1, 1 seconds

This module has insulated front panel, 4 mm safety terminals.

This didactic panel is installed on a vertical frame.

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#### POWER SUPPLY-Didactic equipment

Suitable for supplying fixed and variable alternating current and fixed and variable rectified direct current, to easily carry out all the tests on the electrical machines and in general in an electric measurement laboratory. Housed in metallic box with PVC label.

The control devices and the safety connection terminals, according to the IEC standards, is arranged on the front panel, clearly interconnected through a schematic diagram.

Technical features:

Output voltages:

Variable AC:

3x0÷380 V, 2A

3x0÷240 V, 3A

Fixed AC:

3x380V+N, 10A

3x220 V, 3A

Standard fixed AC:

220 V, 3A

Variable DC:

0÷240 V, 4A

0÷225 V, 1A

Fixed DC:

220 V, 4A

Power supply:

3x380 V+N+PE, 50/60 Hz

The power supply is equipped with the following parts:

Key general switch

Magnetothermic differential three-switch

Magnetothermic differential single switch

Three-phase variator protection switch

Three-phase autotransformer protection switch

Commutator to supply fixed or variable

Magnetothermic main switch

Variable three-phase output switch

DC output switch

Three-phase output switch

Variable DC excitation output switch

Emergency pushbutton

Running pushbutton

Stop pushbutton

Supply warning light

Three-phase warning light

Voltage selection warning lights

Variable DC excitation warning light

Max speed connector

Knob for DC and AC output

Knob for DC excitation output

Magnetic-thermal protection for DC output.

Connecting leads with safety terminals

Three level work frame.

Bench For The Study Of The Motor Automation-Educational Equipment, Bench For The Study Of The Motor Automation-Educational Equipment Bulk Suppliers, Bench For The Study Of The Motor Automation-Educational Equipment Tools, Bench For The Study Of The Motor Automation-Educational Equipment Bench For The Study Of The Motor Automation-Educational Equipments, Bench For The Study Of The Motor Automation-Educational

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Equipment Manufacturers, Bench For The Study Of The Motor Automation-Educational Equipment Suppliers from India, China, Kenya.



## Laboratory instruments manufacturers India