PROGRAMMABLE LOGIC CONTROLLERS
MODULAR TRAINER

DL 2110-131K

The DL 2110-131K consists in an all-in-one modular trainer for the study of PLC applications. The modular frame is a tubular steel structure, treated with electrostatic painting. It is a three-level frame structure that allows easy and fast arrangement of the modules. All connection points are available through 2- or 4-mm terminals (according to the voltage). The components, as well as their terminals and access points, are identified with the respective symbols printed in silk-screen. It is available in two PLC options, with Allen-Bradley (AB) Mircro830 series **DL 2110-131K-AB** or Siemens S7-1200 series **DL 2110-131K-1200**.

Main characteristics

- The best solution for in compact trainer.
- The PLC training covers main tasks in many industrial processes.
- The modularity of the trainer gives the students the abilities to create automated systems according to several criteria.

AUTOMATION

Technical features

- PLC module options:
  - **DL 2110-131K-AB Allen-Bradley (AB) Mircro830 series:** the module includes front insulated panel and back cover, PLC and expansion AI/AO modules, DC Power input, DC Power switch and 2mm terminals for I/O interface. It has 10 digital inputs with two common terminals, 6 transistor digital outputs with 4 terminals for power supply, 4 analogue inputs (2 in Voltage and 2 in Current) with 2 common terminals and 4 analogue outputs (2 in Voltage and 2 in Current) with 4 common terminals.
  - **DL 2110-131K-1200 Siemens S7-1200 series:** the module includes front insulated panel and back cover, PLC and expansion AO modules, DC Power input, DC Power switch and 2mm terminals for I/O interface. It has 6 digital inputs with one common terminal, 4 transistor digital outputs with 2 terminals for power supply, 2 analogue inputs (1 in Voltage and 1 in Current) with 1 common terminal and 1 analogue output (in Voltage or in Current) with 1 common terminal.
  - PLC developing software can run on following operation system: Windows 7, 8 or 10.
- 7-inch HMI. Resolution: 800x480, 16bit colour, touch screen, 4 wires.
- AC power module, with protection switch and lights.
  - Power supply: single-phase from mains.
- DC power supply module with polarity inversion and over-current protection.
  - Outputs: 12 Vdc, 24 Vdc and 0 ÷ 10 Vdc.
- Module with switches for digital input signals simulation (retentive). It includes 8 fixed contact switches with retention, 1 NC/1 NO each, for simulating the logic levels.
- Module with switches for digital input signals simulation (pulse). It includes 8 contact pulse switches, 1 NC/1 NO each, for simulating the logic levels.
- Module with switches for digital input signals simulation (retentive and pulse). It includes 4 contact pulse switches, 1 NC/1 NO each and 4 contact retention switches, 1 NC/1 NO each for simulating the logic levels.
- Module with 8 led for light indication of output digital signals, suitable for PLC with NPN or PNP outputs.
- Module with 2 linear potentiometers for simulation of voltage or current signals (4 to 20 mA and 0 to 12 Vdc).
- Module for analogue signals measurement with possibility to measure 2 signals simultaneously. One of the inputs is suitable for current signals from 4 to 20 mA and the other for voltage signals from 0 to 10 Vdc.
- Module with step motor, with 4-bit electronic driver, with light indication for each bit.
- Module with 4 relays (24 Vdc/3 A), suitable for PLC with NPN or PNP outputs.
- Module with DC motor and photoelectric sensors, suitable for PLC with NPN or PNP inputs.
- Analogue to Digital converter module with 8 bits, with analogue signals input from 0 to 10 Vdc or from 4 to 20 mA.
- Digital to Analogue converter module with 8 bits, with maximum analogue output signals adjustable from 0 to 10 Vdc or from 4 to 20 mA.

Supplied with a set of 30 connection cables, 2 and 4 mm, and an experiment manual.

AUTOMATION

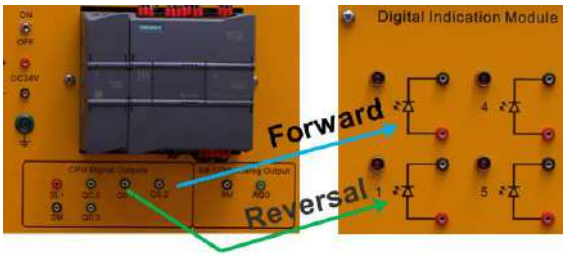
Experiments

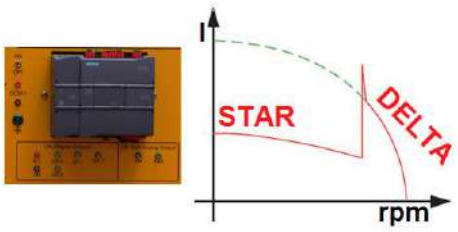
Motor start and stop control experiment

It is the most known and common control task implemented in this trainer. In order to optimise cost and space power equipment is not included, but with available connection cables (2 and 4 mm) and suitable modules, it is possible to expand the experiment using your local motors that could be available in the lab.

Motor forward & reversal control experiment

Another classical control application is the direction of rotation of a motor. By running such PLC application, students will get familiar bit-by-bit with integration of different commands in complex control diagrams. With this experiment, students will also understand the meaning of interlocking.



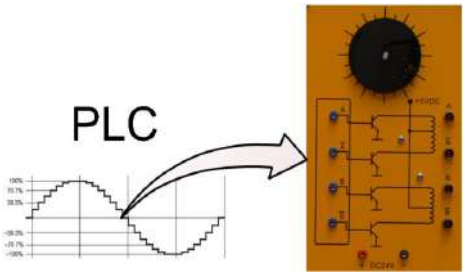


Three-phase synchronous motor Y/Δ control experiment

The switching between Start and Delta connections in a motor is a typical practical demand in running loaded motor when the transitory current is important.

Motor sequence start and stop control experiment

“Plurality of electric motors associated with a corresponding plurality of pumps” require intelligent sequential control. Only a small number of instructions is needed to implement such algorithm! The experiment shows how to control them sequentially and understand why.



Stepping motor control experiment

Because of accumulated experience in using this trainer, the student is guided to make complex control of stepping motor: single 4-step, double 4-step, and 8-step control.

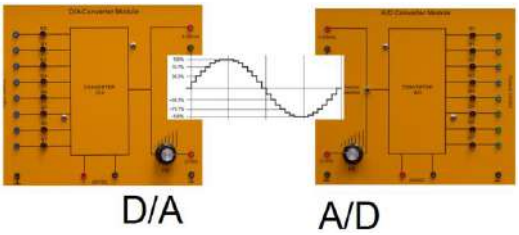
The step motor module offers a visual representation of the working principle of this device and the phase shifting method allows to control it in a simple way.

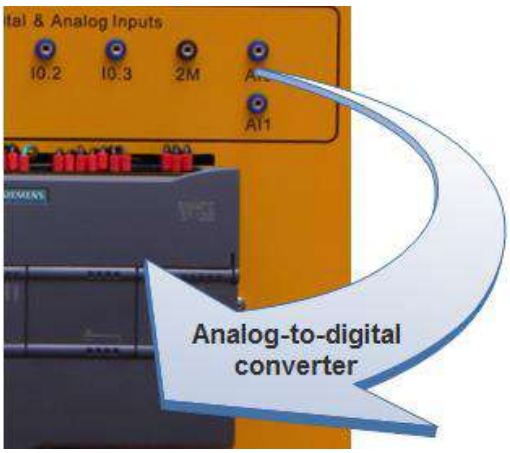
AUTOMATION

Touch Screen Experiment
This experiment deals with the-remote control from a Touch Screen and it focuses on using the touch screen (via Modbus communication protocol), to operate the start & stop control of a motor.

Digital-to-Analog (D/A) conversion experiment
All peripheral devices use interfaces where analogue output signals are controlled by processing devices.
With two output options (voltage or current outputs), through this experiment the student will understand the relationship between 8-bit input data and the quantity of analogue output.

Analogue-to-Digital (A/D) conversion experiment
To process digitally the world, every piece of analogue data (temperature level, light intensity, storm thunder, the colour of flower, flavour of fruits) need to be codified in digital data. So, the analogue-to-digital converter is the core module.
Through two input options (voltage or current), the student will understand with this experiment the relationship between analogue input signal and 8-bit output data.





PLC Analog input experiment
One of the strengths of the PLC is the integration of the ADC function inside of the microcontroller. It cannot cover all analogue applications, but it is adjusted to industrial standard signals (0-10VDC), or for some specific applications (like thermocouples).

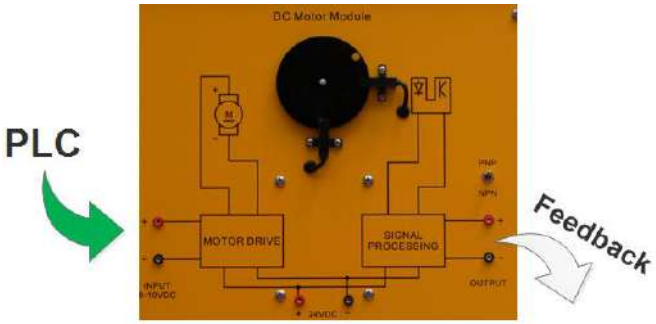
Through this experiment, students are trained to use internal analogue comparator of the PLC and to handle it in the algorithm for some specific purpose.

The use of Touch Screen to monitor the analogue parameter is a very well-known facility in industrial application.

AUTOMATION

PLC Analog output experiment

This experiment is helpful not only to understand the difference between analogue input and output, but it can be suitable to control actuators such as pumps, heaters, and proportional valves.



DC motor control experiment

Through a touch screen interface, student will be able to configure and control the speed of the motor.

The module allows students to add a feedback signal to a typical DC speed process control.

PLC high-speed counter experiment

High speed control function designed in PLC is well used to control many application events.

This trainer helps to learn the use of PLC high-speed count,

- using the PLC analogue output (0-10V) to control the DC motor speed,
- using the PLC high speed counter to measure the motor speed,
- using the touch screen to set the PLC output voltage, at same time display the motor speed.