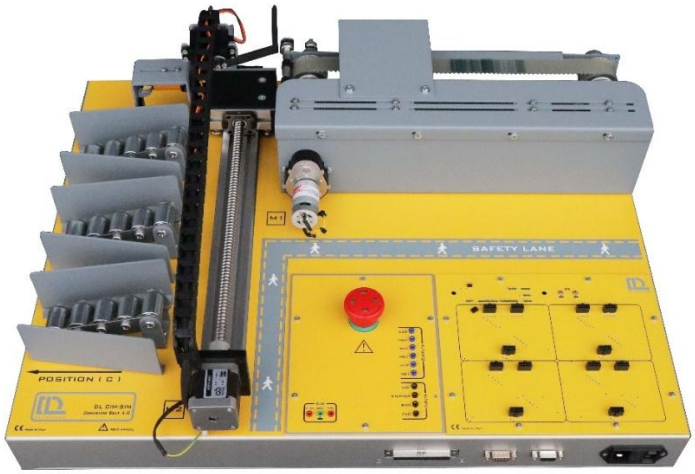
INDUSTRY 4.0

KIT FOR THE STUDY OF A CONVEYOR BELT



DL CIM-SIM

The design and construction of electronic circuits to solve practical problems is an essential technique in the fields of electronic engineering and computer engineering.

With this training system, students can learn about the properties of a conveyor belt used in industrial environments. Sensors and actuators are included to develop a complete course on the main features of conveyor systems and their applications.

The student will be able to interact with the hardware in a simple and intuitive way through a CAI software that explains step by step how the system works.

The trainer for the study of a conveyor belt is composed of two main elements:

- A **boards kit** to study the hardware characteristics and the control techniques of a conveyor belt. The secondary boards include all the components, sensors and actuators needed to understand and manage the operation of a conveyor belt.
- **Real hardware simulator** of a conveyor belt unit used in a real industrial environment. Through this simulator, the student can learn how to operate and control a production line by using a PLC and an open source micro-controller. Its structure allows the connection of the board kit components, making them compatible with each other.

The system is provided with a SCADA software for the study of automation and industry 4.0 concepts, and can be combined with other trainers in the family to simulate a scaled down industry 4.0 factory.

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System description:

BOARDS KIT

LEARNING EXPERIENCES

Kit composed of sub-boards for the propaedeutic study of the different elements that compose a conveyor belt system. The sub-boards can interact with each other through a dedicated motherboard, allowing the student to perform interactive practices on different topics related to automation such as:

- Controlling an LCD display through a microcontroller
- Detect an object using an infrared sensor.
- Monitoring a RGB sensor.
- Controlling a DC motor through a power driver.
- Controlling a stepper motor
- Action control and interlock function using a push button panel.
- Writing on a seven segment display

CIRCUIT BLOCKS

- Base board
- LCD display mini board
- DC motor driver mini board
- DC motor mini board
- Inputs mini board
- Seven segment display mini board
- Stepper motor mini board with driver
- IRD sensor mini board
- RGB sensor mini board
- Micro-controller mini board

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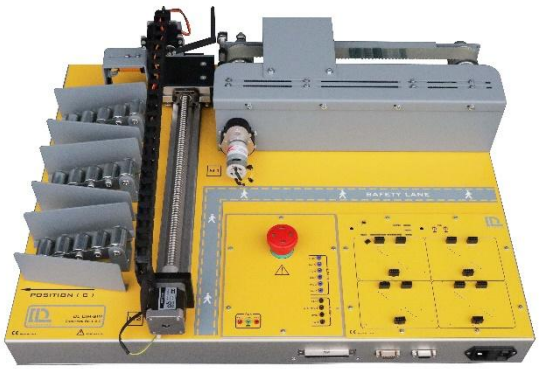
HARDWARE SIMULATOR



DIDACTIC EXPERIENCE

This system is mainly used for teaching, demonstrating and experimenting with different control methods of a conveyor belt.
The student will improve the skills necessary for HW designing and SW programming of an electromechanical system.
A real PLC (supplied with the trainer) controls the sequential operation of the system, as in real automated processes, allowing the development, implementation and optimization of an application in the industrial field:

- Controlling a conveyor belt through a push button panel.
- Using a PLC to control the conveyor belt movement.
- Monitoring and identifying a processed part on the conveyor belt.
- Tracking the position of a part placed on the conveyor belt.
- Identifying and verifying the colour of a part.
- Identifying a defective part and placing it in the correct location at the end of the line.

The system interfaces with SCADA software for monitoring and control.

TECHNICAL FEATURES

- Power supply: 90V-230V ±10%, 50/60Hz
- DC motor driving the belt:
  - Speed: 10 rpm
  - Nominal voltage: 12Vdc
- Stepper motor linear actuator:
  - Nominal voltage: 12Vdc
- Servo motor:
  - Nominal voltage: 5Vdc
- Control box including:
  - Motor drivers.
  - Sensor and actuators input and outputs accessible through 2mm connectors.
  - Slots to insert system sub-boards.
- Compatible with Arduino UNO boards:
  - ATMEGA328 Processor
  - 32KB flash memory
  - 1KB EEPROM memory
  - 2KB SRAM memory
  - 23 general purpose I/O ports
- IR position sensors
- RGB Sensor
- RFID detector

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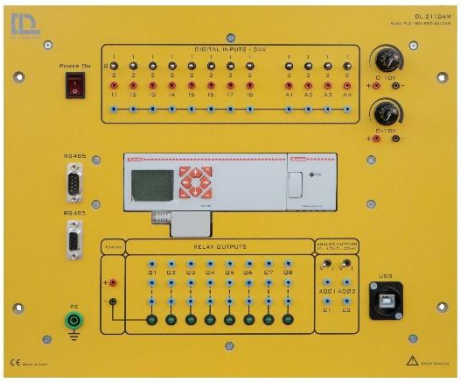
ACCESSORY INCLUDED:



DL 2110AM

Programmable logic controller 12/10

PLC inputs:

- 8 digital inputs
- 4 digital/analog inputs

PLC outputs:

- 8 relay outputs
- 2 analog outputs (V/I outputs selectable)

Two voltage output 0-10 V controlled by potentiometer.
12 digital level switches
8 LEDs for displaying output states
24 V_{DC} Fixed voltage output
Programmable by USB port
Communication: Modbus RTU RS485

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