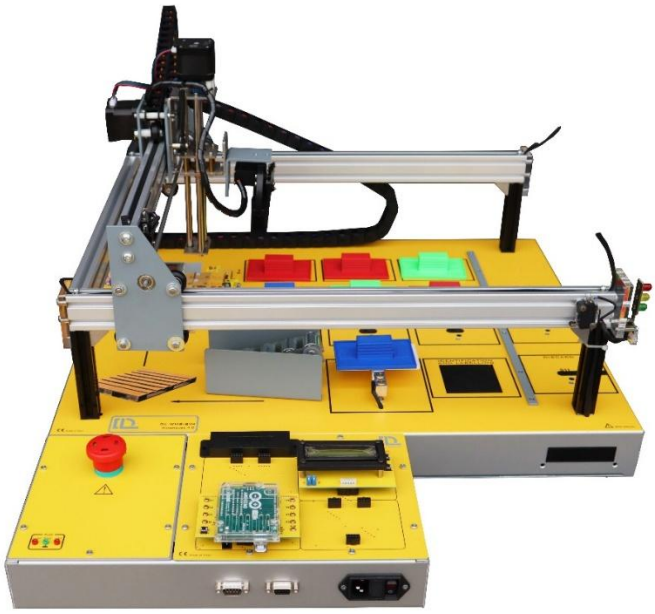
INDUSTRY 4.0

KIT FOR THE STUDY OF A WAREHOUSE MANAGEMENT SYSTEM



DL WMS-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 semi-automatic warehouse that can be found in industrial environments.
Sensors and actuators are included to develop a complete course on the main features of a semi-automatic warehouse and its management.

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 warehouse management system is composed of two main elements:

- A **boards kit** to study the hardware characteristics and the control techniques used in a semi-automatic warehouse. The secondary boards include all the components, sensors and actuators needed to understand and manage the operation of a semi-automatic warehouse.
- **Real hardware simulator** of a semi-automatic warehouse used in a real industrial environment. Through this simulator, the student can learn how to operate and manage a semi-automatic warehouse. 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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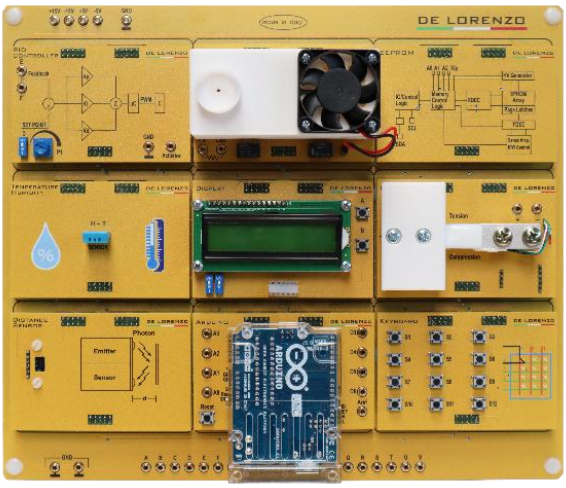
System description:

BOARDS KIT



LEARNING EXPERIENCES

Kit composed of sub-boards for the propaedeutic study of the different elements that compose a semi-automatic warehouse. 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 a LCD display through a microcontroller.
- Measuring weight with a strain gauge.
- Monitoring external temperature.
- Monitoring external humidity.
- Implementing a closed loop ON-OFF controller for a temperature-humidity cycle.
- Implementing a closed loop PID controller for a temperature-humidity cycle.
- Performing measurements with a distance sensor.
- Interfacing a keypad to a microcontroller.
- Data storage on an external memory device.

CIRCUIT BLOCKS

- Base board
- LCD Display mini board
- Weight sensor mini board
- Distance sensor mini board
- Temperature and humidity sensor mini board
- PID controller mini board
- Keypad mini board
- Temperature-humidity cycle mini board
- EEPROM mini board
- Micro-controller mini board

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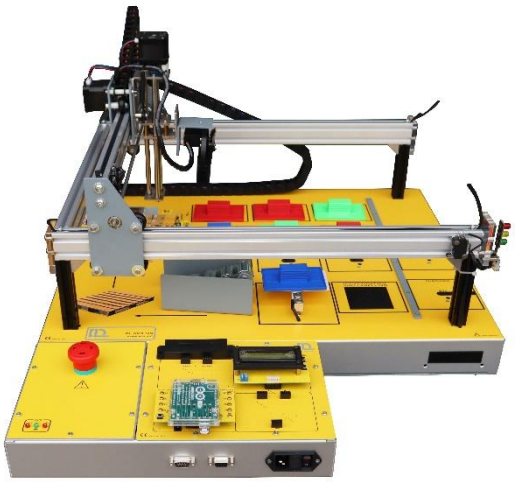
HARDWARE SIMULATOR



DIDACTIC EXPERIENCE

This system is mainly used for teaching, demonstrating, and understanding the main features and operation of a pick and place system and a semi-automated warehouse.
The study of the semi-automatic warehouse allows the development, implementation and optimization of an application in the industrial field such as:

- Identification and weight of an item.
- Manually assign a position to an item.
- Automatically assign a position to an item.
- Automatic inventory update
- Manually picking an item from warehouse
- Automatically picking an item from warehouse

The system interfaces with SCADA software for monitoring and control.

TECHNICAL FEATURES

- Power supply: 90V-230V ±10%, 50/60Hz
- Horizontal warehouse divided in zones:
  - 1 position for parts acceptance
  - 1 position for discarded parts
  - 9 positions for storage
  - 1 position for product identification
  - 1 position for product weighing
  - 1 position for product expedition
- 3-axis Cartesian robot consisting of:
  - 3 Stepper motor linear actuators
    - Nominal voltage: 12Vdc
  - 1 gripper with servo motor
- Control box including:
  - Motor drivers.
  - 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
- Strain gauge weighing sensor: weigh up to 1Kg with a 5g resolution.
- RFID detector

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