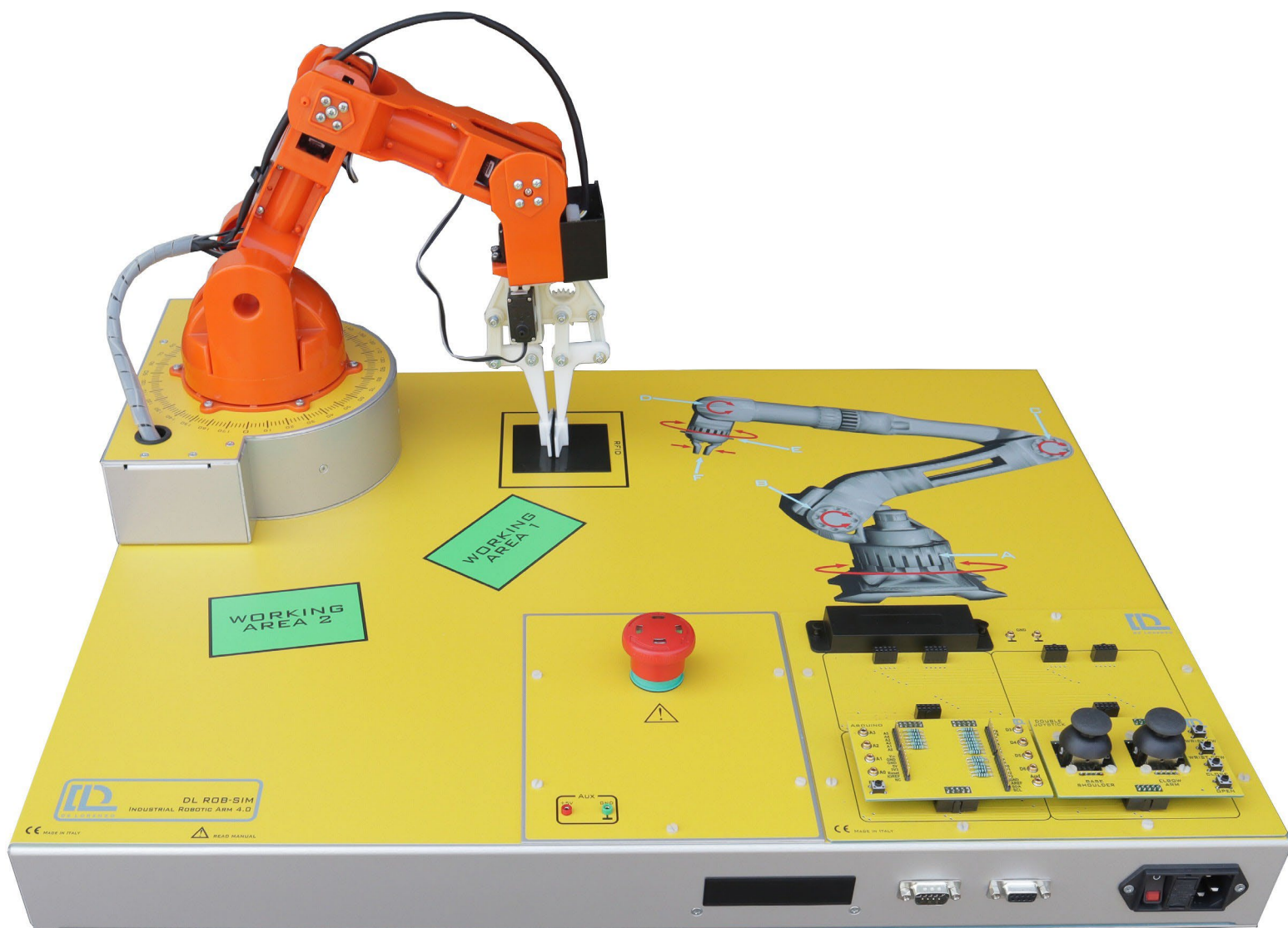




DL NGL-ROBSIM

Module for the study of 5-axis robotic arm

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

With this board system, students can study the properties of a 5-axis robotic arm used in industrial environments. Sensors and actuators are included for the development of a complete course on robotic control systems.

The system is equipped with SCADA software for studying automation and industry 4.0 concepts and can be combined with the other simulators of the family to simulate a simplified industrial 4.0 factory.



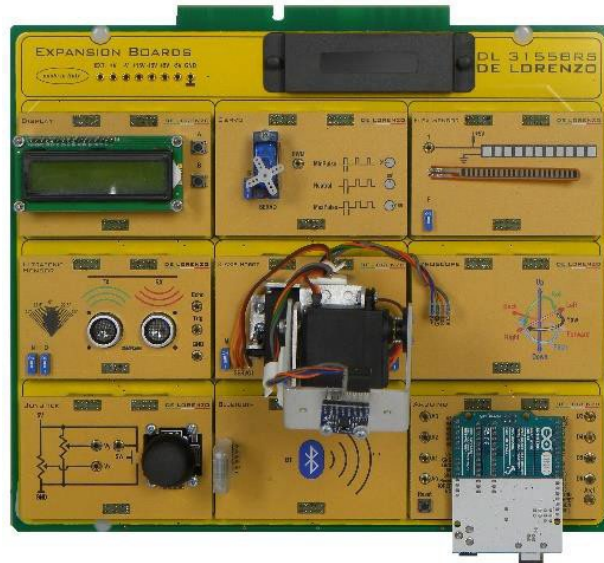
The system for studying the control systems of a 5-axis robotic arm consists of two main elements:

- A **kit of boards** for studying the hardware characteristics and control techniques of a robotic system through an advanced open-source microcontroller. Sub-boards include all the components, sensors, and actuators needed to develop a didactic robotic arm.
- A real **hardware simulator** of a 5-axis robotic arm used in industrial environments. Through this simulator, the student will be able to learn how to operate a robotic arm through a programmed microcontroller. Its structure allows the connection of the components included in the kit of boards, making them compatible with each other.

The integration of a 5-axis robotic arm in an industrial process is possible through a **SCADA** software, which allows a study on the concept of automation and Industry 4.0.

With the card and the respective simulator, the **DL NGL** interacts through a gateway software allowing the passage of information between devices that use different communication protocols, guaranteeing the compatibility between them by their interoperability and by providing a common interface for their communication. The end user can monitor, interact, acquire, and analyse the data generated by interactions to manage and optimize the entire industrial process.

KIT OF BOARDS



EDUCATIONAL EXPERIENCES

- Characteristics of a joystick controller and interfacing with the microcontroller
- Study of the servomotor and its controller
- Introduction to the Bluetooth standard and implementation of its interface with the microcontroller
- Analysis of the flexural sensor and its interface with the microcontroller
- Study of an ultrasonic proximity sensor
- How to control an LCD display through the I²C communication interface
- How to measure orientation and angular velocity using a gyroscope
- Basic control technique: control of a servo using a joystick
- Basic control technique: Display of the servo position on the LCD display

CIRCUIT BLOCKS

- Motherboard
- Joystick sub-board
- LCD display sub-board
- Servo motor sub-board
- Ultrasonic sensor sub-board
- Flexural sensor sub-board
- Gyroscope sub-board
- Bluetooth sub-board
- Microcontroller sub-board
- Two-axis robot sub-board

HARDWARE SIMULATOR



EDUCATIONAL EXPERIENCE

This system is mainly used to teach, demonstrate and experiment with different methods of controlling a 5-axis robotic arm.

The student will improve the skills necessary for the HW designing and SW programming of an electromechanical system.

The study of the electric manipulator allows the development, implementation and optimization of an application in the industrial field:

- Study of the robot components.
- Real-time arm control via Joystick.
- Step-by-step programming of movements.
- Registration of movements.
- Programming of positioning in the Cartesian plane.
- Communication via Bluetooth.

The system interfaces with the SCADA software for monitoring and control.

TECHNICAL CHARACTERISTICS

- Power supply: 90V-230V $\pm 10\%$, 50/60Hz
- Range of angles/distances:
 - 1st axis: 180°
 - 2nd axis: 180°
 - 3rd axis: 180°
 - 4th axis: 180°
 - 5th axis: 180°
 - 6th axis: Opening of the gripper (max. 55 mm)
- Specifications of the servo:
 - Dimensions: 40 x 19 x 43 mm
 - Weight: 55g
 - Operation speed: 0.17-0.13sec / 60 degrees (4.8-6.0 V no load)
 - Stall torque: 13-15 kg-cm at 4.8/6 V
 - Operating voltage: 4.8 – 7.2 V
- Compatible with Arduino UNO board:
 - Processor ATMEGA328
 - Flash memory da 32KB
 - EEPROM memory 1KB
 - SRAM memory 2KB
 - 23 I/O general purpose ports
- RFID detector
- Possibility of interfacing with SCADA supervision SW.

NECESSARY ACCESSORY:

DL 2555ALG – DC POWER SUPPLY



- $\pm 5 V_{DC}, 1 A$
- $\pm 15 V_{DC}, 1 A$