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Engino E20.1

Engino Education STEM & Robotics Mini Set (Model E20.1) Instruction Manual

INTRODUCTION

The Engino Education STEM & Robotics Mini Set, Model E20.1, is designed for students aged 6-9. This kit integrates STEM subjects with robotics, providing a hands-on learning experience. It includes Engino Qboidz plastic parts and robotic components such as the ERP MINI Controller, DC motors, an LED, a touch sensor, and IR sensors. The set supports the construction of 40 models with accompanying theoretical and experimental activities covering engineering design, coding, mechanics, and science. Two generations of robotic models can be built: simpler Qboidz models for younger students to introduce coding, and complex models using classic Engino parts for advanced users.



This image illustrates five different robotic models that can be constructed with the Engino STEM & Robotics Mini Set, demonstrating the versatility and range of projects possible. The models include a crane, a vehicle, and various robotic designs.

SAFETY INFORMATION

Choking Hazard: This product contains small parts. It is not suitable for children under 3 years of age. Adult supervision is recommended during assembly and play, especially for younger users.

WHAT'S IN THE BOX

The Engino Education STEM & Robotics Mini Set includes the following components:

- Plastic storage tub (43 x 31 x 15 cm)
- 312 Plastic parts (Engino - Qboidz)
- 1596 Connecting points
- ERP MINI Controller with 4 input-output ports

- Battery compartment (requires 3xAAA batteries, not included)
- 2 IR sensors
- 1 Touch sensor
- 2 DC motors
- 1 Red LED
- Instruction Manual (digital and physical resources)

SETUP

1. Powering the ERP MINI Controller

Locate the battery compartment on the ERP MINI Controller. Insert 3xAAA batteries (not included) according to the polarity indicators. Ensure the compartment cover is securely closed.

2. Connecting Components

The ERP MINI Controller features 4 input-output ports. Connect the DC motors, IR sensors, and touch sensor to these ports as required for your model. The LED can also be connected to an available port.



This image shows the ERP MINI Controller connected to various electronic components, including two DC motors, two IR sensors, and one touch sensor. The controller features Bluetooth and USB connectivity options.

3. Connectivity Options

The ERP MINI Controller supports connectivity via USB cable for direct connection to a computer and Bluetooth for wireless communication with compatible devices.

4. Accessing Building Instructions

Detailed, interactive 3D building instructions are available through the Engino KidCAD application. Download the app on your smart device (compatible with Android and iOS) for step-by-step guidance on constructing various models.

Engino kidCAD (3D Viewer)



**3D interactive
instructions
to download on
your smart device**



- ROTATE IN 3D!
- ZOOM IN AND OUT!
- EXPLODE AND IMplode!
- FIND AND EXPLORE
MORE MODELS!



STEP BY STEP INSTRUCTIONS

in digital format

This image displays a tablet screen showing the Engino KidCAD 3D Viewer application, which provides interactive, step-by-step building instructions. The app allows users to rotate, zoom, explode, and implode models for detailed viewing.

OPERATING

1. Building Models with the Multi-Level System

The Engino set utilizes a multi-level building system. Younger students can begin with simpler constructions using Qboidz parts, while more advanced users can engage with complex robotic challenges using classic Engino parts. The kit supports the creation of 40 experimental models.

Students of younger age start from the 1st level with simple constructions. As they grow up they reach the 5th level by engaging with more complex robotic challenges!



1st Level: Stacking blocks vertically

One-dimensional Thinking™

Stack the patented cubic blocks (named Qboidz) vertically as with traditional brick systems



2nd Level: Connecting blocks to the side

Two-dimensional Thinking™

Connect the Qboidz blocks sideways to explore the 3D space, increasing building complexity while further developing hand-eye coordination, dexterity skills and spatial perception



3rd Level: Combining blocks with beams

Three-dimensional Thinking™

The next step is to fine tune the skills acquired in the previous level. Qboidz blocks can connect to a range of beams designed with a plethora of male and female connecting nodes in order to allow for more detailed constructions. These beams require a higher force of assembly, challenging older preschool children



4th Level: Compatible with Engino Toy system

Forth-dimensional Thinking™

The Qboidz parts, both blocks and beams, have embedded in their design the same geometries as the standard ENGINO® system that is suitable for older children, aged 6+. This ensures a smooth transition from one level to the next and enables full compatibility between a wide library of parts. By allowing growing children to combine these parts they can create more complex technical models



5th Level: Compatible with robotic parts

Fifth-dimensional Thinking™

There are three generations of construction toys. The 1st was that of building simple models. It followed with the inclusion of mechanical elements that added motion, manual or motorized. New technologies shifted our world into the 3rd generation of robotized constructions. The compatibility of the Qboidz system with ENGINO® extends to programmable controllers and sensors! This step into technology helps students acquire 21st century skills and learning coding and STEM through interdisciplinary engineering challenges



MULTI-LEVEL BUILDING SYSTEM

The STEM system that grows with the student!

This image explains the Engino multi-level building system, showing how constructions progress from simple block stacking (1st level) to complex robotic challenges (5th level) using Qboidz and classic Engino parts.

2. Understanding the ERP MINI Controller

The ERP MINI Controller features onboard membrane buttons for manual programming. These buttons allow for direct interaction and control of the connected motors and sensors. Refer to the KEIRO™ Software Manual for detailed button functions and programming instructions.

STEM & ROBOTICS HANDBOOK

Definition of Robot

The term "robot" was first introduced in 1920 by the Czech writer Karel Čapek in his novel "R.U.R., meaning "roboter" in Slavic language. This shows how people first conceived the notion of robots: "devices performing tasks that are too dangerous, complicated or just boring for humans to do". However, a more scientific definition is that a robot is a mechanical device that receives feedback from its surroundings and is able to respond to it accordingly. Therefore, robots have, to a certain degree, real autonomous behaviour and in a way they think and act for themselves. However, this depends on their program language and their pre-determined commands.



Robotic arms used in a car assembly line

For example, an automatic sliding door (found in shops, hotels etc.) is robotic. It has a motion sensor which sends a continuous infrared signal. If this signal is interrupted, because someone gets in front of the invisible beam, the central processor gives a command for the door to open. After some seconds the door closes and the procedure is repeated. Examples of robots include domestic heating and motion-activated lights. However, controlled cars or toys are not robots. They are direct commands through a controller. As this is not feedback, they do not make decisions concerning the open e.g. stop button.



Person with touch sensor

Lesson 7: Grabber in a loop

Repeat seconds statement and IR sensor
Until now you have used the touch sensor. Another sensor used to interact with the environment is the infrared sensor. The infrared sensor is used in the case that we need a program a robot to select objects or follow a path. Follow the experiment below to find out how it works for object detection.

Discover:

- How to use an infrared sensor for object detection.

Materials Needed:

Engine™ STEM and Robotic MINI, PC or Smart device with KEIRO™ software downloaded and installed.

Procedure:

1. Find the instructions in pages 17-23 and build the Octopus grabber model.
2. The octopus mouth should be closed at the beginning. Record the manual program of exercise 1.
3. In exercise 2 use the "repeat seconds" statement to set the program to run in a loop for a specific period of time.
4. Find the appropriate button on the controller. In order to open the octopus grabber.
5. The infrared sensor is mounted on the octopus grabber. It can detect whether an object is in front of it. Find the program of exercise 3 and find out how the sensor operates. Program the octopus grabber so that it can find food.
6. The task of exercise 4 is to program the octopus grabber to stop as soon as it detects food, in order to continue looking for food. Create the program and send it to the controller to test it.

Exercise 1. Create a manual program so that:

- the octopus mouth opens and closes.

Press the "Play" button to test the program and once finished, upload the program to the C or Smart device.

Exercise 2. Make the appropriate modifications in the flow diagram to create the following program:

- the octopus grabber rotates clockwise for 1 second; the octopus mouth opens and closes; the octopus repeats 10 seconds; statement to set the motor in a loop for 10 seconds. Also, remove the "repeat seconds" statement from the program.

Tip: Use the "repeat seconds" statement to set the motor in a loop for 10 seconds. Also, remove the "repeat seconds" statement from the program.

Exercise 3. In the flow diagram:

- the octopus grabber rotates clockwise for 1 second; the octopus mouth opens and closes; the octopus repeats 10 seconds; statement to set the motor in a loop for 10 seconds. Also, remove the "repeat seconds" statement from the program.

Tip: Use the "repeat seconds" statement to set the motor in a loop for 10 seconds. Also, remove the "repeat seconds" statement from the program.

Exercise 4. Create the following program that:

- the octopus grabber rotates forever with a stop spinning; if the IR sensor is triggered by an object, the octopus stops; the mouth opens for 1 second and then opens again.

Tip: Set the idle time block to keep the mouth shut for 2 seconds. You may use a crumpled paper as food. Place the paper in front of the sensor and keep the octopus eat.



Engine™ Octopus grabber model

MINI 2.0 controller

The Engine™ MINI 2.0 controller is a robotic device consisting of a main controller, a variety of buttons and LEDs. It can be connected with peripherals such as motors, LED, infrared and touch sensor. The MINI 2.0 controller provides information about the main features of the controller. How to install the KEIRO™ software and how to program your robot through code examples.



- 1 A RJ 45 and 2 RJ ports (connect peripherals to the controller)
- 2 MOTOR A BUTTONS (connects to the controller)
- 3 PROGRAM BUTTON (connects to the controller)
- 4 PROGRAM LED (connects to the controller)
- 5 MINI LAB PORT (connects to a PC)
- 6 POWER BUTTON
- 7 ON/OFF LED (turns on when controller is ON)
- 8 PLAY LED (turns on when giving a program)
- 9 PLAY BUTTON (run the latest program)
- 10 MOTOR B BUTTONS (connects to the controller)

LESSON PLANS

KEIRO™ SOFTWARE MANUAL

CURRICULUM in digital format

This image shows the STEM & Robotics Handbook, lesson plans, and the KEIRO Software Manual, along with a detailed diagram of the ERP MINI Controller's buttons and ports. These resources provide theoretical background, experimental activities, and programming guidance.

3. Programming with KEIRO™ Software

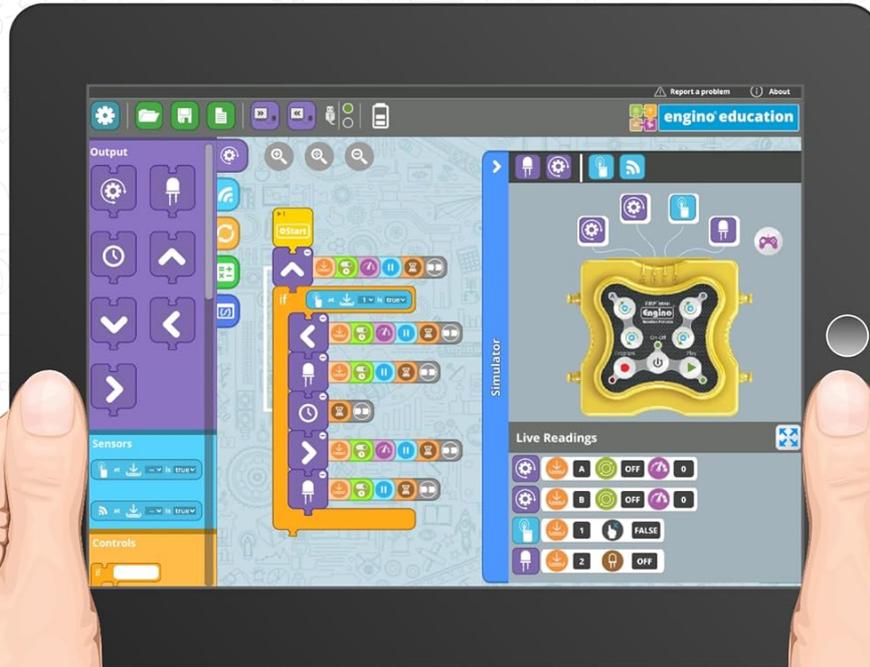
For advanced programming and complex functionalities, utilize the KEIRO™ Software. This software is compatible with Windows, Android, Apple, and Linux operating systems. It supports various programming methods including manual programming, flow diagrams, and a KEIRO Code Viewer.

The Engino Programming Ladder

MANUAL
PROGRAMMING

FLOW
DIAGRAM

KEIRO™ CODE
VIEWER



Compatible with:



KEIRO™ SOFTWARE INCLUDED
programming complex loops and functions made easy!

This image depicts a tablet displaying the KEIRO™ Software interface, which allows users to program the robotic models using a visual block-based coding environment. The interface supports manual programming, flow diagrams, and code viewing.

4. Advanced Building Features

The set includes an advanced snap-fit system, extendable rods, and an extraction tool. These features facilitate quick assembly, disassembly, and the creation of various models with adjustable lengths, enhancing the building experience.

EXTENDABLE ROD:

By combining these two simple parts any length is possible!



Turn to lock and adjust length!

PATENTED CONNECTING SYSTEM:

With only a few snap-fit parts you can build fast and easy many different models!



EXTRACTION TOOL:

For easy disassembly!



ADVANCED SNAP-FIT SYSTEM

for more complex robotized models...

This image details the advanced snap-fit system, extendable rods, and an extraction tool. These features facilitate quick assembly, disassembly, and the creation of various models with adjustable lengths.

MAINTENANCE

To ensure the longevity and proper functioning of your Engino STEM & Robotics Mini Set, follow these maintenance guidelines:

- **Cleaning:** Keep all plastic parts and electronic components clean and dry. Use a soft, dry cloth to wipe surfaces. Avoid using harsh chemicals or abrasive materials.
- **Storage:** Store all components in the provided plastic tub when not in use. This prevents loss of small parts and protects them from dust and damage.
- **Electronics Care:** Avoid exposing the ERP MINI Controller, sensors, and motors to moisture, direct sunlight, or extreme temperatures. Remove batteries from the controller if the set will not be used for an extended period to prevent leakage and corrosion.
- **Battery Check:** Periodically inspect the battery contacts in the controller for any signs of corrosion. Clean contacts with a cotton swab if necessary.

TROUBLESHOOTING

If you encounter issues with your Engino STEM & Robotics Mini Set, refer to the following troubleshooting tips:

- **Model not moving or responding:**
 - Ensure batteries are correctly inserted and fully charged.
 - Check all cable connections between the ERP MINI Controller, motors, and sensors for secure fit.
 - Verify that the program is correctly uploaded and running on the ERP MINI Controller.
- **Connectivity issues (Bluetooth/USB):**
 - Ensure the ERP MINI Controller is powered on.
 - For Bluetooth, confirm that the controller is discoverable and correctly paired with your device.
 - For USB, ensure the cable is securely connected to both the controller and your computer. If necessary, check for required drivers on the Engino website.
- **Parts not fitting or assembly difficulties:**
 - Refer to the digital instructions in the Engino KidCAD app for detailed 3D views and step-by-step assembly guidance.
 - Ensure correct orientation of parts as shown in the instructions.
 - Use the provided extraction tool for easy disassembly if parts are stuck.
- **Sensors not detecting:**
 - Check sensor connections to the controller.
 - Ensure sensors are clean and unobstructed.
 - Verify that the programming code correctly utilizes the sensor inputs.

SPECIFICATIONS

Feature	Detail
Product Dimensions	16.93 x 12.21 x 5.91 inches
Item Weight	6.4 pounds
Model Number	E20.1
Manufacturer Recommended Age	6 - 18 years
Controller	ERP MINI Controller (4 input-output ports)
Connectivity	USB, Bluetooth
Sensors	2 IR sensors, 1 Touch sensor
Actuators	2 DC motors, 1 Red LED
Power Source	3xAAA batteries (not included)

Feature	Detail
Plastic Parts	312 Engino - Qboidz parts
Connecting Points	1596

WARRANTY

For information regarding product warranty, please contact Engino customer support directly or refer to the official Engino website. It is recommended to retain your proof of purchase for any warranty claims.

SUPPORT

For further assistance, technical support, or to explore additional Engino products and educational resources, please visit the official Engino Store online:

[Engino Store on Amazon](#)