Laboratory set for studying electricity

LABOTRIX ELECTRO E4

PRODUCT PASSPORT

Kyiv

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Contents

1. Basic product information

1.1. Product name — Laboratory set for studying electricity.

1.2. Trademark — Labotrix.

1.3. Model — Electro E4; full trade name — LABOTRIX ELECTRO E4.

1.4. Manufacturer — Labotrix Group Limited, China.

1.5. Intended use: a set of equipment for students, designed for laboratory and practical work on electricity and magnetism. The set allows students to independently build electrical circuits, measure circuit characteristics, and investigate the properties of electromagnetic phenomena. Designed for teaching according to the secondary school curriculum in specialized science classes and laboratories of educational institutions.

1.6. Design features: The kit consists of modular elements specially designed for easy circuit design and modification. All components are equipped with convenient clamps and connectors for quick installation. The kit includes a wide range of resistors, capacitors, current sources, measuring instruments and magnetic elements for a comprehensive study of electrical and magnetic phenomena. The kit includes a methodological guide for conducting laboratory experiments.

1.7. Digital learning support: The product includes access to an online teaching support course hosted in a learning management system (LMS) and designed for 70 academic hours of classes. The course is designed to meet the current curricula of secondary education institutions in Ukraine. The materials are grouped into research modules in the disciplines of physics, biology, chemistry, STEM, and each topic contains a lesson plan, a list of necessary supplies, an experiment scenario, step-by-step instructions for laboratory work with an explanation of the expected result, a video demonstration of work methods, interactive exercises and tasks for independent study, suitable for both individual and group work. All modules are designed for this equipment and tested on it, so the course works in a direct chain of "equipment → methodology → learning results". The course has a built-in assistant based on a language model with a search through the course knowledge base (Retrieval-Augmented Generation): based on the topic of the lesson, it selects relevant experiments, methodically describes the sequence of conducting the research, analyzes typical student errors and gives personal advice on how to get rid of them, changes the level of complexity to prepare for a specific class, and helps to write a research report and organize the conclusions. The assistant's knowledge base is localized and aligned with the Ukrainian curriculum. The license for the course and accompanying software is valid for 12 months from the date of transfer of access; the content, interface, and answers of the assistant are provided exclusively in Ukrainian.

2. Technical specifications

- Brand — Labotrix
- Model — Electro E4
- The article number is LTX-ELECTRO-E4
- Product type — laboratory kit for studying electricity and magnetism
- Number of components in the set (pieces) — 38
- Panel for assembling circles — 1 pc.
- Main current source 12 V 2 A — 1 pcs
- Current source modules 1.2 V — 2 pcs
- Light bulbs: 2.5 V 0.3 A — 2 pcs.; 6.2 V 0.5 A — 2 pcs.; 12 V 0.1 A — 2 pcs.
- 12 V light bulb modules — 4 pcs.
- Resistors: 100 Ohm, 220 Ohm, 470 Ohm, 1 kOhm, 4.7 kOhm, 10 kOhm — 2 pcs. of each value
- Modular capacitors: 1000 μF, 100 μF, 470 μF — 1 pc.
- Diode module — 1 pcs
- Switch modules: push-button switch — 1 pc., toggle switch — 1 pc.
- Voltmeter: scale 0-15 V and 0-1.5 V — 1 pc.
- Galvanometer — 1 pcs
- Module for connecting an ammeter/voltmeter — 1 pcs
- NTC thermistor — 1 pcs
- Rheostat — 1 pcs
- Connecting wires: red 25 cm - 2 pcs., red 50 cm - 1 pc.; black 25 cm - 2 pcs., black 50 cm - 1 pc.
- Clamps — 10 pcs.
- Straight conductors — 6 pcs.
- Corner guides — 4 pcs.
- Corner conductors with terminal — 2 pcs.
- T-shaped conductors — 2 pcs.
- Bar magnet — 1 pcs
- Electromagnet — 1 pcs
- Collapsible electromagnet — 1 pc.
- Coil — 1 pcs
- Disassemblable laboratory model of an electric motor — 1 pcs
- Power supply — from an external 12 V source or battery depending on configuration
- Operating conditions — premises of an educational institution, air temperature from +5 to +40 °C, relative humidity from 40 to 60 % without condensate
- Digital learning support — online course in a learning management system (LMS)
- Course volume (academic hour) — 70
- Course subjects — physics, biology, chemistry, STEM

- Composition of the materials — research modules, experiment scenarios, step-by-step laboratory work instructions, video demonstrations, interactive exercises and tasks
- Compatibility of the materials with the equipment — full, along the chain "equipment → methodology → learning outcomes"
- Language-model-based assistant — built into the course, with retrieval over a localized knowledge base (Retrieval-Augmented Generation)
- Validity period of the license for the course and the software (month) — 12
- Language of the course, of the interface and of the answers of the assistant — Ukrainian
- Service life (year) — 5
- Warranty period (month) — 12
- Language of marking and operating documentation — Ukrainian
- Product marking — trademark, model and a space for the inventory number
- Packaging - individual corrugated cardboard box with fixed compartments for modules
- Ready to use - supplied assembled in modules, no additional configuration required
- Care of the surfaces — wiping with a dry or slightly damp cloth is permitted
- User requirements - students work with the set under the supervision of a physics teacher or laboratory assistant

3. Equipment

- Panel for drawing up electrical diagrams — 1 pc.
- Main current source 12 V 2 A — 1 pcs
- Current source modules 1.2 V — 2 pcs
- Light bulb 2.5 V 0.3 A — 2 pcs.
- Light bulb 6.2 V 0.5 A — 2 pcs.
- Light bulb 12 V 0.1 A — 2 pcs.
- 12 V light bulb modules — 4 pcs.
- Resistor 100 Ω — 2 pcs
- Resistor 220 Ohm — 2 pcs.
- Resistor 470 Ohm — 2 pcs.
- Resistor 1 kΩ — 2 pcs
- Resistor 4.7 kΩ — 2 pcs.
- Resistor 10 kΩ — 2 pcs.
- 1000 μF modular capacitor — 1 pc.
- 100 μF modular capacitor — 1 pc.
- Capacitor 470 μF modular — 1 pc.
- Diode module — 1 pcs
- Pushbutton switch module — 1 pc.
- Toggle switch module — 1 pc.
- Module for connecting an ammeter/voltmeter — 1 pcs

- Voltmeter 0-15 V / 0-1.5 V — 1 pc.
- Galvanometer — 1 pcs
- NTC thermistor — 1 pcs
- Rheostat — 1 pcs
- Red connecting wire 25 cm — 2 pcs.
- Red connecting wire 50 cm — 1 pc.
- Black connecting wire 25 cm — 2 pcs.
- Black connecting wire 50 cm — 1 pc.
- Clamp — 10 pcs.
- Straight conductor — 6 pcs.
- Angled conductor — 4 pcs
- Corner conductor with terminal — 2 pcs.
- T-shaped conductor — 2 pcs.
- Bar magnet — 1 pcs
- Electromagnet — 1 pcs
- Collapsible electromagnet — 1 pc.
- Coil — 1 pcs
- Disassemblable laboratory model of an electric motor — 1 pcs
- Storage box — 1 pcs
- Methodological guide for performing laboratory work — 1 pc.
- Right of access to the online course with a language-model-based assistant (license) — 1 pcs
- Product Passport and Warranty Card — 1 pcs
- Individual transport packaging — 1 pcs

The kit is designed to work in a typical school laboratory. All modular elements are ready to use and do not require additional assembly. An external 12 V power source is required for operation.

4. Safety measures

4.1. General requirements

- Before first use, read this passport carefully and follow all recommendations given in it. Keep the document together with the kit and the purchase document.
- Work with the set in an educational institution is carried out by a physics teacher or a specially trained employee. Students work with the equipment only under the constant supervision and guidance of an adult.
- Before first use, check all components for mechanical damage, chips and defects in electrical insulation. Damaged elements must not be used.
- Make sure the lap panel is placed on a flat, stable surface and secured to prevent it from falling.

4.2. Electrical safety

- The maximum voltage in the kit is 12 V, which is considered low-voltage equipment. However, caution must be exercised when working with current sources.
- Do not touch bare conductors when the circuit is closed and the power is on. Turn off the power source first, then make changes to the circuit.
- Before turning on the power supply, check that all components are connected correctly and that there is no short circuit in the circuit.
- Do not leave the circuit unattended when it is on. If you smell burning or smoke, turn off the power immediately.

4.3. Handling components

- Light bulbs have thin filaments that can burn out if over-voltage is applied. Do not operate the bulb with a voltage that exceeds its rating.
- Capacitors can accumulate charge. When dismantling the circuit, discharge the capacitors using a resistor.
- Magnets and electromagnets can attract metal objects and each other with great force. Do not allow magnets to accumulate unchecked.
- Rheostats and resistors can overheat when subjected to excessive current. Do not hold the rheostat in the lowest resistance position with the current turned on; check the component for heat by touch only after the power is turned off.

4.4. It is strictly forbidden

- Connect the circuit to a power source with a voltage greater than 12 V — the nominal value of the set's current source.
- Connecting the power supply terminals directly, without a resistor in the circuit, will cause a short circuit.
- Make changes to the circuit when the power is on. Always turn off the power source first.
- Immerse components in water or expose them to moisture and solvents.
- Independently disassemble or change the design of modular elements.
- Leave equipment turned on without an adult present.

5. Preparation for work

5.1. Unpack the kit and check the completeness of all components according to section 3 of the passport. We recommend that you keep the packaging for storage and transportation.

5.2. Place the lap assembly panel on a horizontal, stable surface and secure it to prevent accidental movement or falling.

5.3. Check the power supply: make sure that the voltage at its outputs corresponds to the nominal value (12 V) and that the polarity is correct (positive output - red, negative - black).

5.4. Inspect each modular element and familiarize yourself with its designation and purpose. Each module should be clearly marked with the rating (for resistors) or function (for switches).

5.5. Start with a simple circuit: connect a light bulb directly to a power source through a switch to make sure all components are functioning.

5.6. If the kit has been stored at low temperatures, bring it indoors at room temperature for at least one hour before use to prevent condensation.

6. Procedure

6.1. Drawing up the base circle

- Place the power supply to the left of the panel and the resistor or light bulb to the right.
- Connect the positive output of the source to one end of the component with a red wire through a clamp.
- Connect the other end of the component to the negative output of the source with the black wire.
- Turn on the power gradually, observing the operation of the component.

6.2. Voltage and current measurement

- Place the voltmeter in parallel with the component whose voltage you want to measure.
- To measure current, install an ammeter in series with the circuit using a connection module.
- Read the readings on the instrument scales; for the voltmeter, select the appropriate range (0-1.5 V or 0-15 V).

6.3. Investigation of series connection

- Connect several resistors in series one after the other, measure the voltage across each and the sum of the voltages.
- Measure the current at different points in the circuit; make sure it is the same in the series circuit.

6.4. Research into magnetic phenomena

- Connect the finished electromagnet to a power source via a switch and watch it attract metal objects.
- Insert a bar magnet into a coil connected to a galvanometer and pull it back, observing the deflection of the needle - this is how the phenomenon of electromagnetic induction is demonstrated.
- Using a collapsible electromagnet, investigate the structure of the magnetic circuit and the magnetic field inside the coil.

6.5. Completion of work

- Turn off the power source and wait for the components to cool down.

- Carefully disassemble the circuit, placing each component in its place in the storage box.
- Pack all wires and clamps in a separate bag inside the box.

6.6. Working with an online course

- Obtain an account at the educational institution and activate the right of access to the course; the validity period of the license is counted from the date on which access is transferred.
- Select the topic of the lesson in the course list: every topic is accompanied by a plan, a list of equipment, an experiment scenario, a step-by-step instruction, a video demonstration and interactive tasks.
- Formulate a query to the assistant on the topic of the lesson — it will suggest appropriate experiments, set out the sequence of actions, examine typical errors and advise how to correct them.
- Set the level of difficulty of the tasks to match the preparation of the class; on the basis of the results of the work the assistant will help to draw up the report and to organize the conclusions.

7. Care, maintenance and possible malfunctions

7.1. Cleaning

- Wipe the panel and module housings with a dry, soft cloth.
- In case of contamination, wipe with a cloth dampened with distilled water and wipe dry.
- Clean the wires and terminals from oxidation with a dry brush.
- It is strictly prohibited to use abrasive materials and solvents that may damage the insulation.

7.2. Periodic control

- During regular use, check the condition of the wire insulation; if there are cracks, replace the wire.
- Check the voltmeter and galvanometer readings for deviations from the reference values.
- Check the contacts in the terminals; if they are loose, tighten them with screws.
- Repair and service maintenance are performed only by an authorized service center.

7.3. Possible malfunctions and ways to eliminate them

Symptom	Possible cause	User actions
The light bulb does not light up.	Open circuit or connection; bulb burned out; incorrect polarity	Check all connections; replace bulb; ensure correct source polarity

Symptom	Possible cause	User actions
The voltmeter does not show any readings.	Voltmeter connection module installed incorrectly; open circuit in voltmeter wires	Reinstall the module; check the integrity of the voltmeter wires
Galvanometer does not respond	Circuit not closed; current too low; device faulty	Check for circuit failure; increase source voltage; replace galvanometer
An electromagnet does not attract	Circuit not closed; coil connection incorrect; weak power supply	Close the circuit; make sure the connection is correct; check the 12V power supply
The rheostat does not regulate voltage.	Contacts are oxidized; slider does not move	Clean the contacts; ensure the slider moves freely.
Visible flashes when the circuit is closed	Short circuit in the circuit; poor contact connection	Turn off the power; check the circuit for errors; clean the contacts

8. Storage and transportation conditions

- Store the kit in a dry, closed room at a temperature not lower than +5 and not higher than +40 °C and a relative humidity of up to 80% without condensation.
- Place all components in a storage box, separating them by type.
- Wind the wires in loops and secure them to avoid tangling.
- Protect the kit from direct sunlight, vibrations, mechanical shocks and aggressive substances.
- Transport in the original or a similar rigid packaging by any type of closed transport.
- Mark the packaging as “Fragile”; do not allow heavy objects to be stored on top.
- The shelf life of the set is unlimited when the storage conditions are observed.

9. Warranty obligations

9.1. The warranty period of the product is 12 months from the date of sale specified in the warranty card.

9.2. The manufacturer guarantees that the product complies with the declared technical characteristics, provided that the rules for transportation, storage and operation set out in this passport are followed.

9.3. During the warranty period, product defects that have arisen due to the manufacturer's fault will be eliminated free of charge. The method of elimination (repair, component replacement or product replacement) is determined by the service center.

9.4. Warranty service is provided upon receipt of a correctly and completely filled out warranty card and a document confirming the fact and date of purchase.

9.5. The warranty does not apply to cases where the malfunction is caused by:

- mechanical damage, in particular cracks, chips and deformation of the housing and of the components of the product;
- violation of the operating, storage or transportation rules set out in this passport;
- ingress of liquid or foreign objects into the product, and also the action of insects and animals;
- independent disassembly, repair or modification of the product, in particular repair at unauthorized workshops;
- use of the product other than for its intended purpose;
- force majeure circumstances (fire, flood, earthquake, etc.).

9.6. The warranty does not apply to natural wear and tear of the coating and appearance of the product, as well as to consumables.

10. Product disposal

- The product must not be disposed of together with unsorted municipal waste. This is indicated by the marking in the form of a crossed-out container on the product or its packaging.
- After the end of the service life, hand the product over to a collection point for the corresponding waste or to an organization holding the appropriate permit.
- Hand over the packaging elements (cardboard, polymer materials) to the corresponding streams of recyclable materials.

Contacts

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Conditions of use and storage of the product

The product is intended for educational work in general secondary education institutions and is used only under the control and supervision of a teaching staff member; the recommended age of students — from 10 years, that is, students of grade 5 and of higher grades. Keep the product in a dry, clean and ventilated room at a temperature from +5 to +40 °C and relative air humidity up to 80 % without condensation, separately from heat sources and out of direct sunlight, moisture and dust. Use the product exclusively for its intended purpose and do not allow drops, impacts or other mechanical damage. If you notice damage, a crack or any malfunction, stop working with the product immediately and inform the teacher or the responsible person of the educational institution; repairing the product on your own is prohibited.

WARRANTY CARD

Product name:	Laboratory set for studying electricity
Product model:	LABOTRIX ELECTRO E4
Serial number:	
Date of sale:	
Warranty period:	12 months from the date of sale
Trading organization:	
Signature of the seller:	

The goods have been received in working order, without visible damage, complete, and have been checked in my presence. I have no claims regarding the quality of the goods; I have read and agree to the operating and warranty service conditions.

Full name of the buyer

Buyer's phone number Buyer's signature

Dear Customer!

Thank you for choosing Labotrix products. After-sales service of this product is provided in accordance with the regulations of the company and the legislation of the country of sale. So that we can serve you quickly and without unnecessary formalities, check that this warranty card is filled in correctly at the moment of purchase and keep it together with the payment document throughout the entire warranty period. When applying for repair, hand the product over to the seller or to the service center together with the filled-in card.

Procedure for applying

1. The right to free warranty service for the product is valid for 12 months from the date of sale specified in the warranty card. Within this period, components that have failed due to a manufacturing defect are repaired or replaced without payment from the buyer.
2. Before contacting, make sure that the malfunction is not caused by the reasons listed in section 9 of this passport, and if possible, use the table of possible malfunctions in section 7.3.
3. After the 12-month warranty period, repairs are carried out for a fee; the cost of work and spare parts is determined depending on the nature of the malfunction.

Grounds for refusal of warranty service

The company reserves the right to refuse free service or to perform the work on a paid basis if at least one of the following circumstances is established:

- absence of the warranty card, its incomplete or corrected completion, and also the absence of a document confirming the purchase;
- non-conformity of the serial number of the product with the number specified in the card, or damage to the factory marking;
- traces of independent disassembly, repair or modification of the product;
- damage caused by violation of the operating rules, connection to an unsuitable power source or external mechanical impact;
- damage as a result of force majeure circumstances.

Service Records

Date of entry	Description of the malfunction	Work performed	Position, signature, full name of the responsible person