

Universal mobile omnidirectional platform for studying autonomous systems and AI

LABOTRIX OMNI R4

PRODUCT PASSPORT

Kyiv

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1. General Information about the Product

- 1.1. **Product name** — Omnidirectional Mobile Platform for Autonomous Systems and AI.
- 1.2. **Trademark** — Labotrix.
- 1.3. **Model** — Omni R4; full trade designation — LABOTRIX OMNI R4.
- 1.4. **Manufacturer** — Labotrix Group Limited, China.
- 1.5. **Intended use:** the Labotrix Omni R4 mobile platform — is a training omnidirectional chassis on Mecanum wheels, intended for studying autonomous transportation systems, computer vision, and artificial intelligence algorithms. The platform is designed to work together with a training robotic arm, purchased separately: it is installed into a dedicated mounting slot on the platform and moves together with it, forming a mobile manipulation complex. Thanks to built-in ultrasonic sensors and a camera, the platform recognizes obstacles, the travel line, and road signs, which makes it possible to practice scenarios of autonomous movement, cargo sorting, and logistics. The product is used in educational institutions in computer science, technology, and robotics lessons, and in club and project-based activities.
- 1.6. **Design features:** the platform is driven by four Mecanum wheels — two left-rotation and two right-rotation, — which, thanks to the rollers on the rim, provide movement forward, backward, sideways, diagonally, and rotation in place without turning the body. Power to the platform itself, the controller installed on it, and the connected robotic arm is supplied by two built-in battery packs. Control is carried out in several modes — by joystick, wireless channel, wired connection, or an autonomous script loaded into the controller, — the current mode and status are shown by LED indicators. The body has a cargo platform for placing items, an emergency stop button, and threaded holes for mounting additional equipment.
- 1.7. **Digital learning support:** together with the product, the right of access to an online teaching support course is transferred; the course is hosted in a learning management system (LMS) and is designed for 70 academic hours of lessons. The course is compiled to match the current curricula of general secondary education institutions of Ukraine. The materials are grouped into research modules in the subjects of physics, biology, chemistry, STEM and robotics, and every topic contains a lesson plan, a list of the required equipment, an experiment scenario, a step-by-step laboratory work instruction with an explanation of the expected result, a video demonstration of working techniques, interactive exercises and tasks for independent study, suitable both for individual and for group work. All modules are compiled for this very equipment and have been tested on it, therefore the course works along the direct chain "equipment → methodology → learning outcomes". A language-model-based assistant with retrieval over the course knowledge base (Retrieval-Augmented Generation) is built into the course: for the topic of the lesson it selects appropriate tasks, sets out the sequence of conducting the study in methodological terms, examines typical student errors and gives personal advice on how to get rid of them, changes the level of difficulty to match the preparation of a particular class and helps to draw up a report on the study and to organize the conclusions. The knowledge base of the

assistant is localized and aligned with the Ukrainian curriculum. The license for the course and the accompanying software is valid for 12 months from the date on which access is transferred; the content, the interface and the answers of the assistant are provided exclusively in Ukrainian.

2. Technical Specifications

- Brand — Labotrix
- Model — Omni R4
- SKU — LTX-OMNI-R4
- Product type — educational mobile omnidirectional platform for mounting a robotic arm
- Drive type — four Mecanum wheels, two left-rotation and two right-rotation
- Product weight (kilogram) — 5
- Maximum load of the platform together with the robotic arm and cargo (kilogram) — 5
- Body dimensions, length × width × height (millimeter) — 463 × 289 × 124
- Manipulator mounting slot — with ready power (4-pin, 12 V) and communication (10-pin) cables, designed for a robotic arm weighing 2 kg
- Number of ultrasonic obstacle detection sensors (piece) — 4
- Obstacle detection range (centimeter) — up to 30, scanning sector (degree) — 60
- Orientation sensor — gyroscope, for maintaining heading, turning to a set angle, and calculating position coordinates
- Built-in chassis camera — recognition of the travel line and road signs on the training mat
- Route planning — automatic, by means of the software environment: based on the recognized travel line, road signs, and positioning markers, the environment forms and executes a sequence of movements to the set point, while directions in which the ultrasonic sensors have detected an obstacle are excluded from the route
- Training mat size (centimeter) — 328 × 235
- Camera for mounting on the robotic arm (included) — recognition of objects and positioning markers; mount tilt angle (degree) — from 0 to 90
- Memory card slot — storage of snapshots and trained object recognition models
- Control modes — remote (joystick), wireless (Bluetooth), wired (cable), script-based (autonomous, without a computer)
- Programming environments — block-based (graphical) for beginners, text-based in Python for complex scenarios
- Wireless adapter range (meter) — up to 15, in open space
- Built-in battery packs (piece) — 2
- Capacity of each battery pack (milliamp-hour) — 2500, energy (watt-hour) — 27
- Autonomous operation time (minute) — up to 150, line following with simultaneous operation of the robotic arm
- Full charging time of the battery packs (minute) — approximately 110

- Mains supply voltage — from 100 to 240 V AC, 50/60 Hz
- Power input of the platform and switching unit — 12 V DC / 5 A
- Maximum power consumption of the switching unit (watt) — 60
- Microcontroller of the switching unit — 32-bit, ARM Cortex-M4 architecture
- Controlled 12 V power interfaces on the switching unit (piece) — 2
- Universal ports for expansion sensors on the switching unit (piece) — 6
- Computer communication interface — USB
- Additional communication channel of the switching unit — Bluetooth
- Operating temperature (degree Celsius) — from 0 to +35
- Maximum platform movement speed (meter per second) — 1
- Product marking — trademark, model and a space for the inventory number
- Packaging — individual box of corrugated cardboard with the contents secured
- Documentation supplied — product passport with warranty card and operating manual
- Ready-to-use condition — supplied fully assembled, requires no preliminary setup
- Installation method — on the floor, a training mat, or a demonstration table with raised edges
- Care of the surfaces — wiping with a dry or slightly damp cloth is permitted
- Language of marking and operating documentation — Ukrainian
- Digital learning support — online course in a learning management system (LMS)
- Course volume (academic hour) — 70
- Course subjects — physics, biology, chemistry, STEM, robotics
- 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

3. Package Contents

- Mobile omnidirectional platform with four Mecanum wheels, with two built-in battery packs and a chassis camera — 1 pcs
- Switching unit installed on the platform — 1 pcs
- Camera for mounting on the robotic arm, with mount and communication cable — 1 set
- Calibration board with nine markers for camera calibration — 1 pcs
- Joystick — 1 pcs
- Joystick wireless signal receiver — 1 pcs

- Wireless communication adapter (Bluetooth) — 1 pcs
- USB cable for connection to a computer — 1 pcs
- Power supply unit 12 V / 5 A with mains cable — 1 pcs
- 10-pin communication cable — 2 pcs
- 4-pin power cable — 1 pcs
- 4-pin camera communication cable — 2 pcs
- Mounting accessory kit (hex keys, screws) — 1 set
- Training mat with printed markings, designed for practicing training navigation algorithms, — 1 pcs
- Training mat accessory set (direction signs, boxes, sorting objects) — 1 set
- User instructions and teaching guide — 1 set
- 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 robotic arm and other expansion modules are not included in the minimum platform set and are supplied separately. The product does not require assembly, except for installing selected external accessories — the robotic arm and its camera — if needed.

4. Safety Precautions

4.1. General requirements

- Before first using the platform, read this passport, especially this section, and keep the document together with the product afterward.
- Only persons who have completed occupational safety training are allowed to work with the platform; students work with the product only under the supervision of a teacher.
- After unpacking, inspect the platform, controller, cables, and accessories for absence of mechanical damage; using a damaged product is prohibited.
- The package contains small parts — keep them in a place out of the reach of children.
- Do not allow children to play with the platform unsupervised; turn off the power immediately after the lesson ends.
- It is prohibited to independently modify the product's wiring or remove factory nameplates and markings.

4.2. Safety during movement and placement

- Start the platform only on a flat horizontal surface — a floor, a training mat, or a wide table with raised edges; falling from table height damages the product and is dangerous for people.
- Before starting, make sure there are no people, animals, cables, or foreign objects on the movement path; students must stay outside the platform's movement zone.
- Do not keep hands or fingers under the platform or between the wheels and the body while it is moving — the rollers of the Mecanum wheels can pinch them.
- In case of a dangerous situation, press the emergency stop button: the platform will stop and the movement of the motors will be locked; to release the lock, press the button again.

- During indoor lessons with students, turn on the ultrasonic obstacle detection sensors — when they are triggered, the platform stops moving in the direction of the obstacle.
- Do not exceed the maximum load on the cargo platform; secure items or position them so that they do not fall during acceleration, braking, or turning.
- Do not leave the moving platform unattended; turn off the power of the switching unit immediately after the program ends.

4.3. Electrical safety and battery

- Connect the platform only to the standard power supply (mains from 100 to 240 V AC, 50/60 Hz, output 12 V DC); using other power sources is prohibited.
- Do not connect or disconnect power and communication cables while the product is switched on; perform all connections with the product fully de-energized.
- Do not immerse the platform, switching unit, or power supply in water, and do not allow liquid to get inside the housings.
- Do not use or store the built-in battery pack at high temperature, do not allow it to short-circuit, do not disassemble it, and do not immerse it in liquid.
- Charge the product only with the standard power supply, do not leave the platform charging unattended, and do not charge it on a flammable surface or outside the operating temperature range.
- If the battery pack has become deformed, or if any deviation from normal behavior is detected during operation, storage, or charging, stop using it immediately and contact specialists.

4.4. It is strictly prohibited

- Independently disassemble, repair, or modify the platform, controller, and battery pack — in case of malfunction, contact the supplier or service center.
- Exceed the maximum load of the platform together with the robotic arm and cargo.
- Leave children unattended with the platform switched on or moving.
- Expose the battery pack to fire or temperatures above 100 °C, or use a damaged or modified battery pack.
- Operate the product outside the stated operating temperature range, or in places with strong static electricity or magnetic fields.
- Carry the platform by the wheels, cables, or switching unit.

5. Preparation for Use

- 5.1. Unpack the platform, take out the accessories, and check the completeness against Section 3 of this passport; we recommend keeping the packaging for future storage and transportation.
- 5.2. Inspect the platform, controller, cables, and Mecanum wheels for absence of mechanical damage; make sure the wheels are arranged according to the pattern — two left-rotation wheels on one diagonal, two right-rotation wheels on the other.
- 5.3. Charge the built-in battery, or connect the standard power supply to the switching unit and then to the mains.

- 5.4. Place the platform on a flat horizontal surface and clear the space around it by at least 0.5 m.
- 5.5. Make sure the emergency stop button is not pressed; if necessary, press it again to release the lock.
- 5.6. If a robotic arm is involved in the work, install it in the platform's mounting slot, connect the power and communication cables, and route them so that they do not get under the wheels and do not interfere with the movement of the links.
- 5.7. If necessary, mount the camera on the robotic arm, connect the camera's data cable to the platform, and adjust the tilt angle of the mount.
- 5.8. Turn on the switching unit with the power button and select the required control mode.

6. Operating Procedure

6.1. Connection and switching on

- Make sure all cables are connected and the Mecanum wheels are installed correctly, then press the power button on the switching unit.
- The platform's LED status indicators show the current operating mode by the color of the light and the blinking pattern.
- Select the control mode — remote joystick, wireless, wired, or script-based — depending on the task.

6.2. Coordinate reset and manipulator camera calibration

- Before precise positioning on the training mat, place the platform at the marked starting point so that its front faces the required direction, and execute the coordinate reset command — the current position becomes the reference origin.
- Before using the manipulator camera for object recognition, calibrate it: place the calibration board with nine markers on the cargo platform, sequentially point the manipulator's end effector at each marker, and confirm its coordinates in the software environment.

6.3. Manual and remote control

- In joystick control mode, the sticks and buttons set the direction and speed of the platform's movement, while switching individual buttons — controls the links of the connected robotic arm.
- In wireless or wired mode, the platform or the robotic arm is controlled in real time from the software environment on a computer — using blocks, a text script in Python, or a control panel; the same environment also allows observing the current movement parameters.

6.4. Automatic movement according to a program

- Automatic line following is turned on with a button on the control panel or programmatically: the chassis camera recognizes the travel line on the training mat and keeps the platform on it, while road signs are used to stop or change the route according to the lesson scenario.
- The ultrasonic sensors are turned on separately for obstacle avoidance: if an obstacle is detected, the software environment excludes its direction from the route and rebuilds the sequence of movements so

that the platform continues moving to the set point around the obstacle.

- A composed program can be run from a computer in wired or wireless mode, or loaded into the switching unit and run autonomously, without a computer.

6.5. Finishing the work

- Wait for the program to finish, turn off any active actuators of the robotic arm, if one is connected.
- Turn off the platform using the power button on the switching unit, and only then disconnect the power supply from the mains.

6.6. Work with the 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 tasks, 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 Troubleshooting

7.1. Cleaning

- Before cleaning, turn off the platform and disconnect the power supply from the mains.
- Wipe the body with a soft dry or slightly damp cloth; using strong aggressive agents, solvents, and abrasives is prohibited.
- Do not immerse the platform, switching unit, or power supply in water.
- Clean the rollers of the Mecanum wheels from dust and lint with a soft brush, carefully removing wound threads or hair.
- Wipe camera lenses only with an optical cleaning cloth, without pressing on the glass.

7.2. Periodic inspection

- Before each lesson, check the integrity of the body, wheels, cables, and connectors, as well as the battery charge level.
- Periodically check the tightness of the mounting screws of the motor shafts and the manipulator camera, as well as the reliability of the manipulator's fixation in its mounting slot.
- Repair and replacement of platform components and the battery pack are performed only by an authorized service center.

7.3. Possible malfunctions and methods of their elimination

Symptom	Possible cause	User actions
Indicators are lit yellow, the platform is locked	The emergency stop button has been pressed	Press the button again to release the lock
Indicators blink yellow, the platform has stopped while moving	An obstacle is detected or the motor is jammed	Remove the obstacle near the platform; if a jam is suspected, check the motor shaft mount
The platform does not turn on	The built-in battery is discharged, or the power cable is damaged	Connect the standard power supply, check the cable and the presence of mains voltage
The platform moves in the wrong direction	Mecanum wheels are not installed according to the rotation pattern	Check the arrangement of the left-rotation and right-rotation wheels along the diagonals
The platform does not respond to the joystick	The signal receiver is not connected, or the joystick is in a non-operational mode	Check the receiver and switch the joystick to the required mode
The platform does not stay on the line, wobbles, or cuts corners	Excessive following speed, a dirty mat, or uneven lighting	Reduce the speed, clean the mat, and even out the lighting of the work area
Platform coordinates do not match the mat markings	Coordinate reset at the starting point has not been performed	Place the platform at the starting point of the mat and repeat the coordinate reset

8. Storage and Transportation Conditions

- Store the platform in a dry, heated room at a temperature from +5 to +40 °C, away from direct sunlight and heating appliances.
- Before long-term storage, fully charge the built-in battery; if the product is not in use, recharge it at least once every three months to avoid deep discharge.
- Before storage, remove the robotic arm and camera, disconnect the cables, and pack the accessories separately.
- Transport the product in its original packaging, positioning it gently and according to the arrow direction on the box, by any type of enclosed transport.
- Carry the platform by holding the body with both hands; do not carry it by the wheels, cables, or switching unit.
- Do not place heavy objects on the packaging with the product; the storage period before commissioning is unlimited provided that the stated requirements are observed.

9. Warranty Obligations

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

- 9.2. The manufacturer guarantees that the product conforms to the declared technical specifications provided that the transportation, storage and operating rules set out in this passport are observed.
- 9.3. During the warranty period, defects of the product that have arisen through the fault of the manufacturer are remedied free of charge. The method of remedy (repair, replacement of a component or replacement of the product) is determined by the service center.
- 9.4. Warranty service is provided on presentation of a correctly and completely filled-in warranty card and of a document confirming the fact and the date of purchase.
- 9.5. The warranty does not cover 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 cover the natural wear of the coating and of the appearance of the product, nor 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

Name:	Universal mobile omnidirectional platform for studying autonomous systems and AI
Product model:	LABOTRIX OMNI R4
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 _____

Telephone of the buyer _____ Signature of the buyer _____

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 of the product is valid for 12 months from the date of sale specified in the warranty card. Within this period, components that have failed because of a manufacturing defect are repaired or replaced at no cost to the buyer.
2. Before applying, 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 subsection 7.3.
3. After the end of the 12-month warranty period, repairs are performed on a paid basis; the cost of the work and of the 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