

Digital CNC laser machine

LABOTRIX LASER X2

PRODUCT PASSPORT

Kyiv

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1. General Information about the Product

- 1.1. **Product name** — Digital CNC Laser Machine.
- 1.2. **Trademark** — Labotrix.
- 1.3. **Model** — Laser X2; full trade designation — LABOTRIX LASER X2.
- 1.4. **Manufacturer** — Labotrix Group Limited, China.
- 1.5. **Intended use:** a professional machine for laser processing of non-metallic materials — image engraving and workpiece cutting — using programs prepared on a personal computer. The machine is equipped with a gas CO₂ laser tube, a coordinate table with electric drives along the X and Y axes, and a table with adjustable height along the Z axis. The machine is used in training workshops, creative classrooms and art centers for making engraved and cut products from wood, acrylic, leather, fabric, paper, cardboard and other combustible materials. The delivery set includes personal protective equipment, special tools for servicing the machine and final finishing of products, consumables for one academic year, software and teaching materials for conducting classes in the educational process.
- 1.6. **Design features:** the machine is equipped with a water cooling system to prevent the laser tube from overheating, air assist to improve the cutting process, and a fume extraction system to remove caustic fumes. The control system allows the user to set the processing power and speed, which makes it possible to achieve optimal results on different materials. The control panel offers an intuitive interface for starting jobs and monitoring work progress.

2. Technical Specifications

- Brand — Labotrix
- Model — Laser X2
- SKU — LTX-LASER-X2
- Machine type — a machine for laser engraving and cutting with computer numerical control (CNC)
- Active lasing medium — gas laser using carbon dioxide (CO₂), emits in the invisible infrared range
- Protective enclosure class — class 1 provided the enclosure is closed during operation
- Laser tube power — 50 watts
- Laser tube power supply — a power supply unit with an output voltage of over 20 000 volts DC
- Machine power supply — single-phase AC mains at 220 V or 110 V (with a permissible deviation of 10 %), frequency 50/60 Hz, grounding required
- Working area size (engraving and cutting) — 400 × 400 millimeters
- Maximum travel speed — 500 millimeters per second
- Positioning speed — 400 millimeters per second
- Laser power control — from 0 to 99.9 % of energy in increments of 0.1 %
- Processing resolution — 1000 dots per inch (DPI)
- Positioning accuracy (repeatability) — ±0.05 millimeters
- Cutting speed (feed rate) — 0-50 millimeters per second

- Pilot laser — visible red diode laser for alignment
- Control system — RD controller or M2/M3 board
- Software — RDWorksV8 or LaserDRW 2013.02
- Input data formats — WMF for engraving, PLT for cutting, RD for standalone jobs
- Interfaces — USB for connection to a computer, USB flash drive for standalone operation, Ethernet for connection to a local network
- Cooling — water-based with a submersible pump and tank, or an industrial chiller
- Air assist — air compressor, mandatory for vector cutting
- Fume extraction — exhaust fan with corrugated hose
- Overall dimensions of the machine — 900 × 750 × 420 millimeters
- Machine weight — depends on the specific configuration
- Consumables — a set of sheet and roll materials for engraving and cutting (plywood, acrylic, cardboard, faux leather, paper and others), designed for one academic year
- Teaching support — teaching materials for conducting classes on laser engraving and cutting (lesson instructions, project examples, safety rules), in printed and/or electronic form
- Language of marking and operating documentation — Ukrainian
- Product marking — trademark, model and a space for the inventory number
- Supply packaging — individual container packaging with the contents secured inside
- Operating conditions — premises of an educational institution, air temperature from +5 to +40 °C, relative humidity from 40 to 60 % without condensate
- Installation method — on a level, stable floor or a special support table near a ventilation opening
- Operating mode indication — the status of the laser and cooling is shown by light indicators on the control panel
- User requirements — the work is organized by a teacher or laboratory assistant who has completed training; students work under direct supervision
- Service life (year) — 5
- Warranty period (month) — 12

3. Package Contents

- Digital CNC Laser Machine — 1 pcs
- Special protective table with a frame and support beams — 1 pcs
- Set of laser safety glasses — 1 pcs
- Set of special tools for servicing the machine during operation and for finishing the finished products — 1 pcs
- Submersible water pump for cooling — 1 pcs
- Air compressor for air assist during cutting — 1 pcs
- Exhaust fan with corrugated hose for fume removal — 1 pcs
- USB data cable for connecting to a computer — 1 pcs
- Honeycomb table or table with blade strips — 1 pcs
- Focus ruler for setting the focal distance — 1 pcs
- Media with software and drivers — 1 pcs

- Consumables for making products (plywood, acrylic, cardboard, faux leather, paper and others per the order specification) — a set for one academic year
- Teaching materials for use in the educational process (lesson instructions, project examples, safety rules) — 1 set
- Operating instructions and machine passport — 1 pcs
- Product Passport and Warranty Card — 1 pcs
- Individual transport packaging — 1 pcs

Industrial cooler (chiller) — optional accessory, supplied separately. The exact package contents are determined by the order configuration.

4. Safety Precautions

4.1. General requirements

- Before first use, carefully read the "Safety Precautions" section and the entire passport. Keep the passport together with the machine and the proof of purchase.
- Only persons who have completed occupational safety training are allowed to work on the machine. Students and minors work exclusively under the direct supervision of a responsible adult educator.
- Never leave a running machine unattended. Incorrectly set parameters create a very high risk of fire and explosion.
- Never operate the machine if you are tired, agitated, or disoriented.

4.2. Laser and optical safety

- The CO₂ laser produces invisible infrared beams that can cause severe burns and fatal injuries. Never operate the machine with the protective panels removed.
- Do not look directly at the red pilot laser. Although it is less powerful than the main laser, it can still damage your eyesight through direct eye contact.
- Use the safety glasses provided in the kit if there is a possibility of exposure to light.
- Regularly check the enclosure for tightness; any gaps or openings may allow beams to escape from the machine.

4.3. Electrical safety

- The laser power supply outputs a voltage of over 20 000 volts DC. Before accessing electronic components, always allow the capacitors sufficient time to discharge.
- Never open any of the machine's service panels while it is connected to the mains.
- Never connect or disconnect electrical connections while the machine is turned on.
- Do not touch bare conductors and do not attempt to turn on the device without grounding. The machine housing must always be grounded.
- If moisture has gotten inside the machine, immediately unplug it from the outlet and let it dry before turning it back on.

4.4. Fire safety

- Laser cutting systems generate extremely high temperatures, which pose a very high fire hazard. Be prepared for sudden ignition.

- Never leave the machine unattended during operation. Flames can flare up suddenly, especially when working with acrylic.
- Always keep a working carbon dioxide fire extinguisher (class E, suitable for extinguishing electrical equipment) or a class ABC dry powder fire extinguisher at hand, or qualified personnel able to extinguish laser fires. Minimum capacity — 2.3 kilograms.
- Never operate the machine without a functioning exhaust and ventilation system. Most materials release caustic fumes when engraved and cut, which are hazardous to breathe.
- Regularly remove material residue, dust and debris from inside the machine. Accumulated residue poses a fire hazard.
- Always turn on the air assist during vector cutting, since the slow movement of the laser causes heat to build up in the material.

4.5. It is strictly prohibited

- Disassemble the machine or modify its construction without the manufacturer's written permission.
- Remove protective covers and panels while the machine is connected to the mains power.
- Operate without a functioning cooling system. Check the water circulation before every job.
- Point the main or pilot laser at people, animals, or eyes.
- Leave the machine unattended during operation.
- Use the machine in explosive atmospheres or near flammable materials.
- Immerse the machine in water or use water to extinguish a laser fire (use a carbon dioxide or dry powder fire extinguisher).

5. Preparation for Use

- 5.1. Install the machine on a level, solid surface in a well-ventilated room, away from flammable materials. Make sure the location has enough space to open the lid and to place a roll of material.
- 5.2. Check that the machine housing is reliably grounded using a grounding wire to the main grounding busbar.
- 5.3. Install the submersible water pump in a tank filled with clean distilled or deionized water. Make sure the pump is fully submerged in the water.
- 5.4. Connect the machine's coolant outlet to the tank, and the coolant inlet — to the pump's pressure port, using hoses.
- 5.5. Connect the corrugated fume extraction hose to the connection port on the back panel of the machine and route it outside the room or to an extraction system.
- 5.6. Connect the air compressor hose to the compressed air inlet on the back panel of the machine.
- 5.7. Connect the machine's power cord to a grounded outlet. Make sure all connections are secure and reliable.
- 5.8. Install the software on the computer according to the instructions on the software media, and install the necessary USB drivers.

6. Operating Procedure

6.1. Powering on and system check

- Press the power button (main switch) on the machine's control panel to supply power to the control system. The pump and compressor will turn on automatically.
- Wait until water starts flowing from the drain (return) hose, which indicates that the coolant is circulating. If there is no circulation within 30 seconds, immediately turn off the machine and eliminate the cause.
- Press the green button (laser switch) to turn on the high voltage of the laser tube.
- Wait until the control system completes its self-check and returns to the home position.

6.2. Focusing and positioning the material

- Place the workpiece on the honeycomb table or the table with blade strips.
- Place the focus ruler for setting the focal distance between the nozzle of the laser head and the surface of the material.
- Change the table height using the Z↑ and Z↓ buttons on the control panel so that the gap matches the focus ruler.
- Remove the focus ruler. The machine is ready for operation.

6.3. File preparation and starting processing

- Launch the RDWorksV8 program on the computer and draw the required outline or import a ready-made image.
- Place the graphics within the machine's working area (up to 400×400 millimeters).
- Set the processing mode for each object: engraving (Engraving) or cutting (Cut).
- Set the parameters for each layer: power (5-99.9 %), speed (depends on the material), number of passes and other options.
- Click "Start" in the program to send the job to the machine. The machine will start processing automatically.
- Never leave the machine unattended during operation.

6.4. Finishing the work

- Wait for the processing to finish and for the laser head to stop at its home position.
- Let the exhaust run for another 2-3 minutes to remove any remaining fumes, then turn off the fan.
- Press the green button to turn off the laser.
- Remove the finished product from the table and place it in a safe location to cool down.
- Press the red mushroom-shaped emergency stop button (E-STOP) to immediately cut off power to the machine.
- Let the pump run for another 5-10 minutes to cool the laser tube before fully stopping it.

7. Care, Maintenance and Troubleshooting

7.1. Cleaning

- Daily, after work, remove material residue and dust from the honeycomb table using a brush or vacuum cleaner.
- Weekly, wipe the lenses and mirrors with a soft cotton swab moistened with a 75 percent alcohol solution, using gentle circular motions from the center to the edges.
- Monthly, disassemble and clean the laser head: unscrew the lens mount, carefully remove the lens, wipe it with alcohol and let it dry.
- Quarterly, replace the water in the tank with clean distilled water.
- Do not use abrasive materials, metal brushes, solvents or chlorinated substances.

7.2. Periodic inspection

- Weekly, check the coolant circulation and make sure the water is not hot to the touch.
- Monthly, check the reliability of all connections, screws and fasteners; tighten any loose parts.
- Quarterly, check the processing quality on a test material; if the engraving depth has decreased, alignment of the optical path is needed.
- Regularly check that the panels and the lid close tightly without gaps.
- Repairs to the machine are performed only by an authorized service center. The user is prohibited from disassembling the machine without the manufacturer's permission.

7.3. Possible malfunctions and methods of their elimination

Symptom	Possible cause	User actions
No power	The cable is not plugged into the outlet or the outlet is faulty	Check the cable; try a different outlet; replace the fuse
Uneven engraving depth	The laser tube is not cooling properly; the material surface is not level	Let the machine cool down for 1 hour; replace the water in the tank; check that the table is level
No laser beam	The laser is not turned on; the power control is set to 0 %; the coolant is not circulating	Press the green button to turn on the laser; set the power to 50 % or higher; check the circulation
Blurry contours	The lens is dirty; the focal distance is incorrect; the data resolution is inaccurate	Clean the lens with alcohol; readjust the focus using the focus ruler; check the file
Slow machine operation	The task is too complex; the computer is slow; problems with the USB connection	Simplify the graphics; close unnecessary programs on the computer; replace the USB cable
Material ignition	Power is set too high; air assist is not turned on; excessive material buildup	Reduce the power by 10–20 %; turn on the air assist; space the material out more

Symptom	Possible cause	User actions
Extra lines appear on the product	The data cable is damaged; the grounding is loose; electromagnetic interference	Replace the USB cable; check the grounding wire; remove mobile phones from near the machine
The machine does not respond to commands	The control system has frozen; the computer is not connected to the machine	Press the emergency stop switch; wait 30 seconds; turn it back on; check the USB connection

8. Storage and Transportation Conditions

- Store the machine in a dry, enclosed room, maintaining a temperature of not less than +5 °C and not more than +40 °C, at a relative air humidity of up to 80 %, without condensation forming.
- Drain the water from the cooling system if the machine will be stored at a temperature below +5 °C, and replace it with a non-freezing liquid (antifreeze).
- Place the machine in its original packaging or a rigid box, protected from mechanical shocks, vibration and falls.
- Protect the machine from dust, direct sunlight, vibration, and exposure to aggressive gases and chemicals.
- Transport the machine by any type of enclosed transport with appropriate securing provided inside the container.
- Do not place heavy objects on the machine's packaging and do not stack other items on top.
- The storage period before commissioning is unlimited, provided the stated requirements are met.

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:	Digital CNC laser machine
Product model:	LABOTRIX LASER X2
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