

Digital laboratory for the chemistry classroom

LABOTRIX SENSE CHEM L3

PRODUCT PASSPORT

Kyiv

2026

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1. General Information about the Product

- 1.1. **Product name** — Digital laboratory for the chemistry classroom.
- 1.2. **Trademark** — Labotrix.
- 1.3. **Model** — Sense Chem L3; full trade designation — LABOTRIX SENSE CHEM L3.
- 1.4. **Manufacturer** — Labotrix Group Limited, China.
- 1.5. **Intended use:** system for conducting chemistry experiments in educational institutions, which includes a set of digital sensors, software, and accompanying materials. It enables experimental study of the thermodynamics of chemical reactions, electrochemistry, kinetics, concentration analysis, and other branches of chemistry in the general and specialized courses. Designed for classroom work under a teacher's guidance and in teaching laboratories. The laboratory combines hardware, multimedia content, and elements of generative artificial intelligence, which makes lessons inclusive and engaging for students of different preparation levels: working with the platform develops attention, logical and imaginative thinking, creative abilities, and collaboration skills, and students perform tasks individually or in groups, developing learning independence and interaction.
- 1.6. **Design features:** kit combines wireless sensors of temperature, pH, conductivity, pressure, and a colorimeter, which synchronize with a personal computer via software. All the equipment is designed for a wide range of temperatures and humidity, provides the measurement accuracy required for educational purposes, and is fitted with protective elements. The set additionally includes sensors for surface temperature, carbon dioxide, oxygen, dissolved oxygen, and a drop counter. Each sensor is equipped with a color LCD screen with a 1.8-inch diagonal, which immediately displays the measurement result, and operates completely autonomously — without a data logger or any other additional analog-to-digital converter for transmitting data to a computer or tablet.
- 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 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 and for project work, 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 experiments, 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 of the course and the answers of the assistant are provided in Ukrainian, while the interface of the learning platform is multilingual: the Ukrainian localization is enabled by default, an English-language interface is available as an option.

- 1.8. **Processing of the measured data on the platform:** the sensors of the set transmit measurement results to the electronic platform automatically — the student does not copy the reading off the screen and does not enter numbers by hand. The built-in artificial intelligence agent works with this data set right away: it builds graphs and tables from it, processes the results obtained, shows the patterns that appeared during the experiment, compares the measured values with the reference values for this work and leads the student towards independently formulating a hypothesis, a conclusion and an interpretation, keeping the student within the defined "knowledge corridor" — it does not prompt a ready answer but narrows the search down to the correct direction. Work with the platform is arranged so that it is suitable both for individual performance and for work in a group.

2. Technical Specifications

- Brand — Labotrix
- Model — Sense Chem L3
- SKU — LTX-SENSE-CHEM-L3
- Product type — digital laboratory for studying chemical processes
- Number of sensor types in the base set — 10 (11 devices in total; only the gas pressure sensor is doubled — 2 pcs, the rest of the types — 1 pcs each)
- Sensor display — color LCD, diagonal 1.8 inches, the readings are displayed on the screen immediately in real time
- Autonomy of the sensors — measurement and data transmission without a datalogger or any other additional analog-to-digital converter
- Number of temperature sensors (pcs) — 1
- Temperature measurement range (degrees Celsius) — from -50 to $+200$, resolution $0.01\text{ }^{\circ}\text{C}$, rated accuracy $\pm 0.5\text{ }^{\circ}\text{C}$
- Surface temperature sensor (pcs) — 1, range from -25 to $+125\text{ }^{\circ}\text{C}$, resolution $0.1\text{ }^{\circ}\text{C}$
- Carbon dioxide sensor — resolution 1 ppm within 0–50 000 ppm
- Oxygen sensor — resolution 0.1 % within 0–100 %
- Dissolved oxygen sensor — resolution 0.1 mg/l within 0–20 mg/l
- Drop counter sensor — resolution 1 drop/min within the range of 0–240 drops/min
- pH sensor (pcs) — 1
- pH measurement range (units) — from 0 to 14, resolution 0.01
- Conductivity sensor (pcs) — 1, range 0–20 000 $\mu\text{S/cm}$, resolution 1 $\mu\text{S/cm}$
- Pressure sensor (pcs) — 2
- Gas pressure measurement range (kPa) — from 0 to 700, resolution 0.1 kPa

- Colorimeter with filters (pcs) — 1, range 0–100%, resolution 0.01%
- Number of light filters (pcs) — 3
- Connection interface — wireless (Bluetooth), as well as wired connection (including USB) and/or transmission to a mobile device or cloud service, with support for simultaneous data reading from multiple sensors
- Sensor power type — built-in battery; charging — with the charger included in the set, allowing 4 sensors to be charged simultaneously
- Data analysis software — displays measured data as tables and graphs, exports to spreadsheet editors and other programs
- Compatibility with operating systems — Windows 7/10, Mac OS, Linux; interface in Ukrainian (English — as an option)
- Computer requirements — USB port, minimum 2 GB RAM
- Documentation set — operating manual, teaching guide for teacher and for student, 12 ready-made experiment protocols
- 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 and of the answers of the assistant — Ukrainian; interface of the platform — multilingual, the Ukrainian localization by default, an English-language interface available as an option
- Transfer of the results to the platform — automatic, without manual entry of numbers
- Processing of the measured data by the artificial intelligence agent — plotting of graphs and tables, analysis of the results, identification of the patterns of the experiment
- Comparison with reference values — provided for every laboratory work of the course
- Support in formulating the conclusions — within the defined "knowledge corridor", without a ready answer
- Operating conditions — premises of an educational institution, air temperature from +5 to +40 °C, relative humidity from 40 to 60 % without condensate
- Language of marking and operating documentation — Ukrainian
- Product marking — trademark, model and a space for applying the inventory number
- Packaging — individual box of corrugated cardboard with the contents secured
- Installation method — on the laboratory bench of the chemistry classroom, requires no additional fastening

- Ready-to-use condition — supplied charged and ready to connect with the software
- Care of the sensor surfaces — wiping with a dry or slightly damp cloth is permitted
- Service life (year) — 5
- Warranty period (month) — 12

3. Package Contents

- Wireless temperature sensor — 1 pcs
- Wireless surface temperature sensor — 1 pcs
- Wireless carbon dioxide sensor — 1 pcs
- Wireless oxygen sensor — 1 pcs
- Wireless dissolved oxygen sensor — 1 pcs
- Wireless drop counter sensor — 1 pcs
- Wireless pH sensor — 1 pcs
- Wireless conductivity sensor — 1 pcs
- Wireless gas pressure sensor — 2 pcs
- Wireless colorimeter with filters (red, green, blue) — 1 pcs
- Box (case) with foam insert liners for the sensors — 1 pcs
- Teaching guide (for teacher and student) together with the operating manual — 1 set
- Right of access to the online course with a language-model-based assistant (license) — 1 pcs
- Plastic cuvettes for the colorimeter — 10 pcs
- Buffer solutions for calibrating the pH sensor (pH 4, 7, and 10) — set
- Charger for the sensors (simultaneous charging of 4 sensors) — 1 pcs
- USB cable for connection to a computer — 1 pcs
- Software (CD or downloadable) — 1 set
- Product Passport and Warranty Card — 1 pcs
- Individual transport packaging — 1 pcs

The system is supplied with everything necessary to start work without additional equipment purchases. Reagents and materials for specific experiments (except for calibration buffer solutions) are not included in the set and are provided by the educational institution according to the selected protocol. It is separately recommended to have a personal computer, glassware, and measuring instruments, which are usually available in the chemistry classroom.

4. Safety Precautions

4.1. General requirements

- Before first use, read this passport and the user manual. Keep the documents together with the product.
- The system is operated by a teacher or a trained laboratory assistant familiar with the safety rules for working with chemical reagents and laboratory equipment.
- Students work with the system only under the supervision of a teacher, in accordance with sanitary and methodological requirements for conducting educational experiments.
- Check the unpacked set for mechanical damage; damaged sensors must not be used.

- Keep the work area clean and dry during and after experiments.

4.2. Electrical safety

- Use the sensors and the charger according to the instructions. Never immerse the sensors in water while charging.
- Do not leave the sensors under direct sunlight. Do not place them near heat sources.
- The personal computer used with the system must have properly functioning wiring and grounding.
- Check the integrity of the USB cable; replace damaged cables.

4.3. Work with chemical reagents

- All participants in the experiment must wear safety goggles and clothing that covers the skin.
- Seal liquid reagents tightly after use. Store them in a cool, well-ventilated place.
- If a reagent contacts the skin or eyes, immediately flush the affected area with water for several minutes and seek medical attention.
- Never smell or taste the reagents; follow the instructions for the safe handling of each substance.
- Install sensors and measurement liquids strictly according to the experiment protocol.

4.4. It is strictly prohibited

- Washing the sensors in a dishwasher or under a powerful stream of water; some sensor models may be damaged.
- Immerse the sensors in organic solvents, concentrated acids, or alkalis without appropriate protection.
- Disassemble or take apart the sensors; this will result in loss of sealing and warranty.
- Drop, strike, or subject the sensors to mechanical loads.
- Leave activated sensors unattended during chemical reactions.

5. Preparation for Use

- 5.1. Unpack the system and place all components on a flat, clean surface. Check the completeness of the contents against Section 3.
- 5.2. Check the sensors' charge level and, if necessary, charge them with the charger included in the set (at least 4 sensors can be charged simultaneously). The first startup of the system may take up to 5 minutes to pair the sensors with the program.
- 5.3. Install the software on the personal computer according to the instructions included in the set. Make sure the computer meets the minimum required technical specifications.
- 5.4. Review the 12 ready-made experiment protocols included in the software. Choose experiments that match the curriculum.
- 5.5. Prepare the work area using trays, special stands, and protective mats. Install the sensors on stable holders at a height convenient for observation.

- 5.6. Before the first experiment, perform a trial run of a simple setup with water to test the sensor connection and synchronization with the program.

6. Operating Procedure

6.1. General sequence of the experiment

- Obtain the experiment protocol from the Labotrix program, select the appropriate sensor for the experiment, and install it according to the diagram.
- Prepare the glassware and materials, measure out the required quantities of reagents according to the protocol.
- In the program, press the "Start" button before adding the first reagent, to begin data recording.

6.2. Temperature measurement

- Immerse the temperature sensor in the solution so that it is positioned close to the center of the vessel but does not touch the bottom.
- Observe the temperature curve in real time on the computer screen.
- If necessary, carefully stir the solution with a glass rod for even heat distribution.

6.3. Measurement of pH and conductivity

- Place the pH sensor into the chemical container before adding reagents; it is recommended to calibrate the sensor at least once a week.
- Install the conductivity sensor in the same way, immersing it in the solution.

6.4. Pressure measurement

- Attach the pressure sensor to the container through a special fitting or a three-way valve; some experiments require airtight sealing.
- Monitor pressure changes in the program's graph window.

6.5. Spectrophotometry and colorimetry

- Install the required light filter into the colorimeter (red, green, or blue).
- Completely dissolve the analyte in an appropriate solvent and pour it into a plastic cuvette.
- Perform calibration using a clean solvent before measuring samples.

6.6. Finishing the work

- Press the "Stop" button after completing the experiment.
- Export the data in a format suitable for further processing (CSV or graph).
- Carefully remove the sensors from the containers and wipe them with a soft cloth.

6.7. 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 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.
- Start recording the sensor readings: the data arrive at the platform automatically, there is no need to copy them out manually.
- Open the graph or the table of the measured values and ask the agent to process the result: it will show the patterns, compare the data with the reference values of the work and lead the student to formulating a hypothesis and a conclusion.

7. Care, Maintenance and Troubleshooting

7.1. Cleaning

- After each experiment, rinse the sensors with distilled water and wipe them with a soft, clean, lint-free cloth.
- Clean the colorimeter lens only with special optical wipes, to avoid scratching the coating.
- Rinse the cuvettes in soapy water and dry them completely before the next use.
- Never use abrasive materials, alcohol, or aggressive solvents to clean the sensors.

7.2. Periodic inspection

- Monthly, check the accuracy of the temperature sensor using a reference thermometer in ice water and boiling water.
- The pH sensor requires calibration at least once a week using standard buffer solutions (pH 4, 7, and 10).
- Check the charge level of the sensor batteries; shortly before discharge, the sensor will send a warning in the program.
- Repair and replacement of components that are not subject to simple maintenance are performed exclusively by an authorized service center.

7.3. Possible malfunctions and methods of their elimination

Symptom	Possible cause	User actions
The sensor does not connect to the computer	Battery discharged; Bluetooth disabled on the computer	Charge the sensor; enable Bluetooth; restart the program
Temperature sensor readings fluctuate	Sensor not sufficiently immersed in the solution; vibration on the table	Immerse the sensor deeper; stabilize the vessel with a stand

Symptom	Possible cause	User actions
pH sensor does not calibrate	The electrode's glass membrane is contaminated; the buffer solution has run out	Carefully rinse the membrane with distilled water; replace the buffer solution
Colorimeter shows zero readings	Filter installed incorrectly; cuvette contaminated	Reinstall the filter; replace the cuvette with a clean one
The data are not recorded in the software	Computer's free memory is low; USB contact is weak	Free up space on the hard drive; reconnect the USB cable

8. Storage and Transportation Conditions

- Store the system in a dry, enclosed room at a temperature of not less than +5 and not more than +40 °C and relative air humidity of not more than 80% without condensation.
- Protect the sensors from dust, direct sunlight, and vibration; do not leave them out of their packaging for extended periods.
- Store the sensors in their original protective boxes or dedicated cases if the system is not used for more than a month.
- It is recommended to discharge sensor batteries to 20–30% before long-term storage.
- Transport the system in rigid packaging that protects against impacts and vibration. Mark the packaging with the label "Caution: Fragile".
- 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:	Digital laboratory for the chemistry classroom
Product model:	LABOTRIX SENSE CHEM L3
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