



Digital Refractometer

LB-10DGR

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1. Safety Measures



Instrument Usage Warning:

Ensure the instrument is used correctly and for its intended purpose. Improper operation may weaken or disable its built-in safety features.



Chemical Handling Warning:

Handle all analytical solutions with care, following laboratory safety protocols. Check the relevant Material Safety Data Sheets (MSDS) before use. Always wear appropriate personal protective equipment:

- Lab coat
- Safety goggles
- Rubber gloves
- Exercise caution when handling hot reagents to avoid burns.



Electrical Hazard Warning:

Risk of electric shock exists. Only qualified personnel should open the instrument's cover or internal panels.

Precautions

Due to the sensitivity of fully automated refractometers—particularly regarding the cleanliness of the prism/sample groove and the temperature-dependent nature of liquid refractive indices—the following best practices are recommended to ensure accurate results:

Cleanliness: Before each test, thoroughly clean the sample test tank to ensure no residual liquid is present, which could affect the measurement.

Temperature Setting: Minimize the difference between the ambient temperature and the set temperature. This helps the system reach thermal equilibrium faster and improves temperature control stability.

Temperature Equilibration: Allow the sample liquid to sit in the test tank for a sufficient period before starting the measurement. This ensures the liquid reaches the set temperature for accurate readings.

2. Description

Digital Refractometer LB-10DGR is a specialized unit designed to measure refractive indexes within the range of 1.3000 to 1.7000 ND across different substances. Equipped with a high-performance sensor and advanced temperature control, it precisely measures refractive index (Nd) and sugar content (Brix) in diverse liquids, ensuring accuracy in transparent, translucent, dark, and viscous substances

3. Features

- Ensures high-level file protection with MD5 verification and supports Wi-Fi printing
- Following the rules for 21CFR Part 1 audit trails, pharmacopoeia, and electronic signature standards
- Features multi-level authority management with configurable permissions
- It offers the most extensive range of refractive index measurements and the finest resolution
- Utilizes a high-quality sapphire prism to ensure precise and consistent measurements
- Temperature control utilizes built-in Peltier technology, varying in control range and stability
- Equipped with an LED light source with a 589 nm wavelength

4. Specifications

Model No.	LB-10DGR
Measuring range	1.30000 to 1.70000 (ND)
Resolution	0.0001 (ND)
Precision	±0.0002
Operating mode	Refractive index /sugar content
Brix range	0 to100 %
Accuracy	±0.1 % (Brix)
Temperature control method	Built-in Peltier
Temperature range	5 to 65°C
Temperature control stability	±0.03°C
Display	LED
Wavelength range	589 nm
Detection method	High-resolution linear CCD
Prism	Sapphire
Sample cell	Stainless steel
Display method	7-inch FTF color touchscreen
Data storage capacity	32 GB
Output method	USB, RS232, RJ45, SD card, U disk
User management	Yes/four-level authority management
Power supply	220 V / 50 Hz
Packing dimension (W× D × H)	440× 400× 340 mm
Gross weight	7.15 kg

5. Applications

Digital Refractometer LB-10DGR finds broad applications in industries such as petroleum, pharmaceuticals, food, cosmetics, and chemical/petrochemical sectors, aiding in quality control, purity assessment, and concentration determination for various substances like raw materials, products, and ingredients

6. Working Principle

Principle of Digital Refractometer LB-10DGR

- 1) The refractometer measures the refractive index of transparent or translucent materials using the zero-boundary angle method.
- 2) A linear CCD sensor captures the optical image generated during measurement.
- 3) The captured image is sent to a microcomputer system for analysis.
- 4) The system identifies the boundary between light and dark, which corresponds to the critical angle.
- 5) Based on the critical angle, the refractive index or Brix value of the sample is calculated.
- 6) The final result is then displayed digitally on the instrument's interface.

7. Operations

7.1 Introduction of the instrument interface

Ensure to keep the prism surface clean before starting the machine. If there is residual in the last test, be sure to clean it; otherwise, the accuracy of the instrument will be affected. After finishing the previous step, cover the cover, turn on the power, and turn on the machine. The instrument boot surface appears.

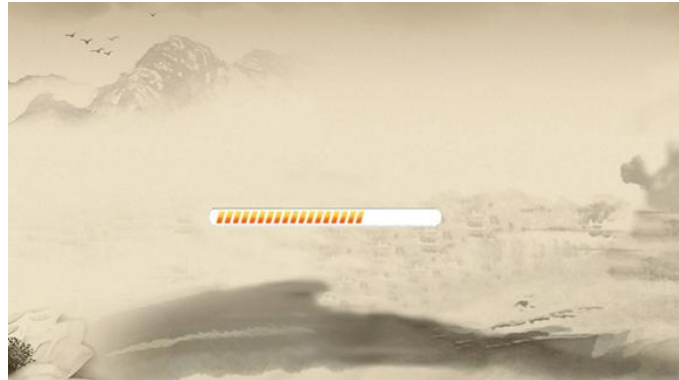


Figure-1

Click anywhere on the screen or wait for a few seconds to enter the user management interface.

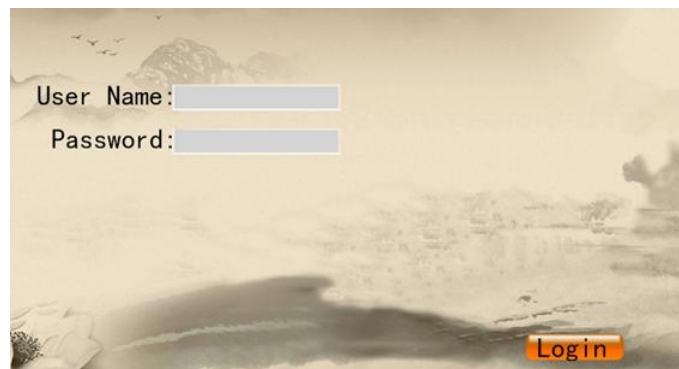


Figure-2

Enter the user's name and password and click the login key to enter the main interface.

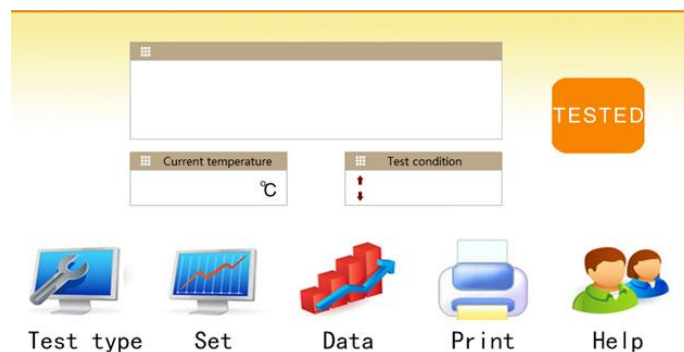


Figure-3

7.2 Interface Description

- 1) **Digital refractometer display area:** Displays refractive index and sugar content.
- 2) **Current temperature display area:** Displays the current temperature.
- 3) **Test condition display area:** Displays whether the current test status has exceeded the limit.
- 4) **Tested:** Save the test data.
- 5) **Test type:** Enter the instrument setting interface.
- 6) **Set:** Enter the test parameter setting interface.
- 7) **Data:** Enter the test data interface.
- 8) **Print:** Print the current test data.
- 9) **Help:** If there is a problem with the instrument, ask for help.

7.3 Instrument Test Parameter Setting Interface

Click the test button in the main interface and the screen interface.

Test Type : ☐ refraction ☐ sugar content Sample number : 1 2 3

Sample name : Set temperature :

Detection Upper : 1 2 3 nD Detection lower : 1 2 3 nD

1 2 3 4 5 6 Esc

7 8 9 0 ■ ← Enter ↵

Confirm Return

Figure-4

The function description in the test parameter setting interface:

- 1) **Test type:** Select the test type (refraction / Brix sugar content) required by the user.
- 2) **Sample number:** The user can input the sample number according to the demand.
- 3) **Sample name:** The user can input the sample name according to the demand.
- 4) **Set temperature:** According to the set temperature value, the instrument controls the sample temperature (default 20°C).
- 5) **Detection upper:** Set the test upper limit for the instrument. If the upper limit is exceeded, the instrument will alarm automatically.
- 6) **Detection lower:** Set the lower limit of the test for the instrument. If the lower limit is exceeded, the instrument will alarm automatically.
- 7) **Confirm:** Confirm to set test parameters for the temperature control test.
- 8) **Return:** Return to the main interface.

7.4 Instrument Data Interface

Click the data button in the main interface to enter the operation interface.

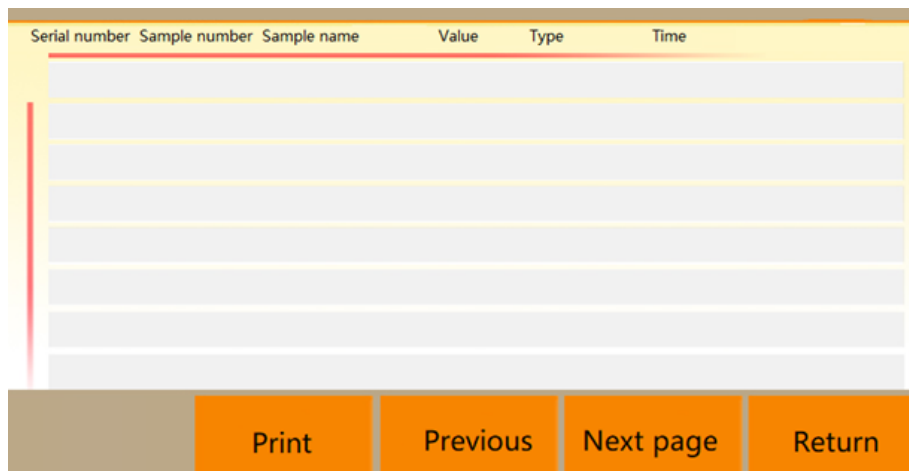


Figure-5

Function description in test data interface:

- 1) **Display area:** Display test data list.
- 2) **Previous:** To the previous page of data.
- 3) **Next page:** To the next page of data.
- 4) **Return:** Return to the upper interface.

7.5 Instrument Setting Interface

Click the main interface setting button to enter the operation interface.

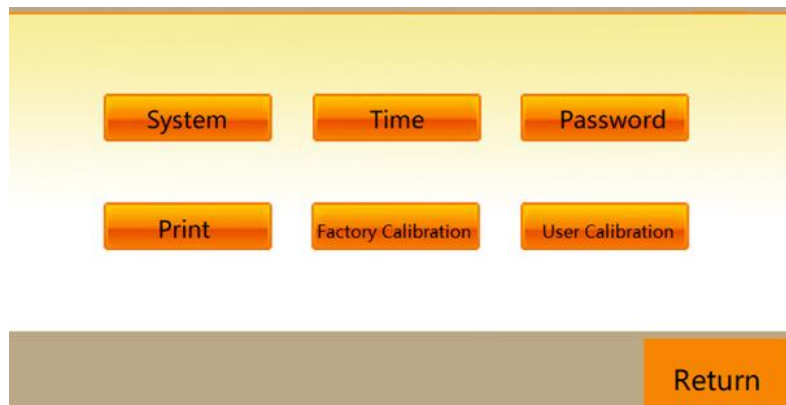


Figure-6

Introduction of the setting interface:

- 1) **System:** Enter the system setting interface.
- 2) **Time:** Enter the time setting interface.
- 3) **Password:** Enter the password setting interface.
- 4) **Print:** Enter the print setting interface.
- 5) **Factory calibration:** Enter the factory calibration interface.
- 6) **User calibration:** Enter the user calibration interface.
- 7) **Return:** Return to the upper interface.

7.5.1 Introduction of the system setting interface

Click the system settings button, and the interface.

Figure-7

Power on temperature control option: If "yes" is checked, the temperature will be controlled by pressing the last set temperature immediately after starting; if "no" is checked, the temperature will be controlled by pressing the last set temperature immediately. By default, the system will not control the temperature. The user needs to log in and enter the "test" interface. Click "OK" to start the temperature control.

Overrun reminder: If "yes" is checked, it will be on the right side of "test state" in the main interface, according to whether the test value of refractive index exceeds the set upper and lower limit of detection. It is shown in green  or red  Prompt, check "no". The default display is green .

Confirm: Confirm to change the options in this interface.

Return: Return to the upper interface.

7.5.2 Introduction to the time setting interface

Click the time setting button, and the interface. According to the cursor position, input the year, month, day, hour, minute, and second in turn.

Figure-8

Return: Return to the upper-level interface

7.5.3 Introduction to password setting interface

Click the password setting button to enter the interface.

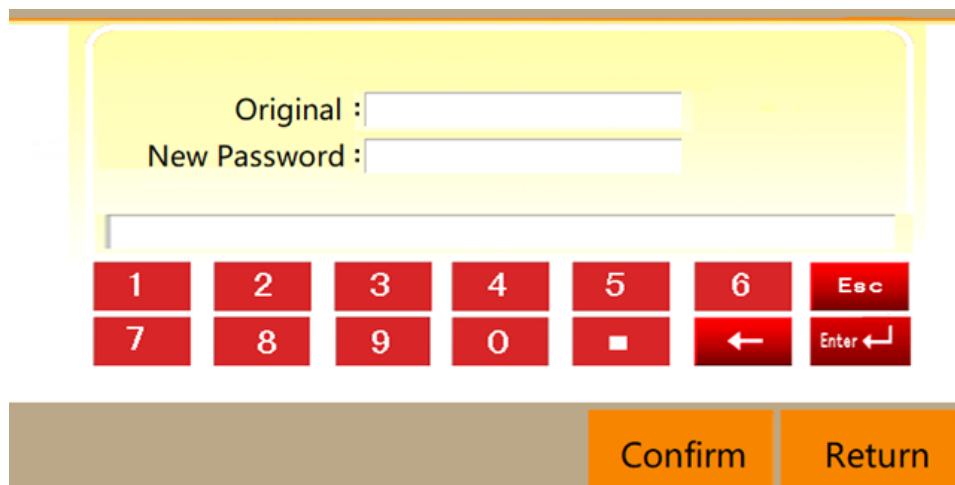
The interface for setting a password. It features a yellow background with two input fields: 'Original : ' and 'New Password : '. Below these fields is a numeric keypad with buttons for digits 1-9, 0, a decimal point, and arrows. To the right of the keypad are 'Esc' and 'Enter' buttons. At the bottom right, there are two orange buttons labeled 'Confirm' and 'Return'.

Figure-9

Original boot password: Display the login password when starting this time. The default password of the instrument is 888888; input the password: click the input box to input the new password. The password is a combination of 6 English letters or numbers.

Confirm: Confirm to save the new password.

Return: Return to the previous interface.

7.5.4 Introduction to printing settings interface

Click Print Settings to enter the print settings interface.

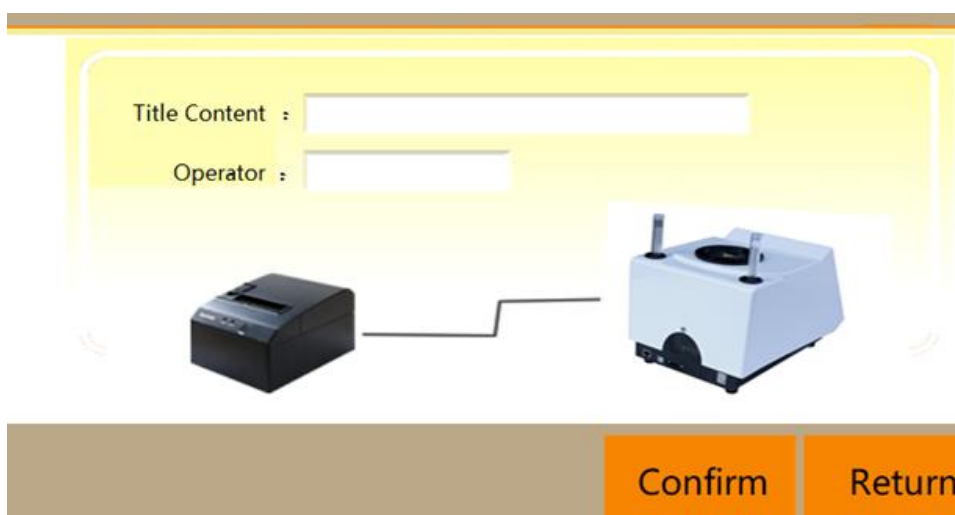
The interface for printing settings. It features a yellow background with two input fields: 'Title Content : ' and 'Operator : '. Below these fields is an illustration of a printer connected to a refractometer by a cable. At the bottom right, there are two orange buttons labeled 'Confirm' and 'Return'.

Figure-10

Title Content: Add a title above the printed content, which can be combined with letters and numbers.

Operator: Add the operator's name at the end of the print, which can be combined with letters and numbers.

7.5.5 Introduction to factory calibration settings

The factory settings are used for data calibration, maintenance, and debugging of the instrument before delivery, and the user does not need to operate during normal use and the test process. If you need to enter this interface for related operations.

7.5.6 Introduction of user calibration interface

Click the user calibration button, and the interface.

Figure-11

Correction: According to the prompt, enter the refractive index value of the standard sample used to calibrate the instrument.

Current: Automatically displays the refractive index when the instrument is not calibrated.

Confirm: Confirm correction.

Return: Return to the upper-level interface.

Note: After the instrument is turned on, control the temperature at 20°C and preheat for half an hour (about one hour is recommended), enter this interface for user calibration. This correction must be performed every time you restart.

During calibration, add 1.0 ml distilled water into the sample tank of the instrument, wait for the temperature to stabilize at 20 °C (the fluctuation of up and down is not more than 0.05 °C), wait for about 2 minutes, and then click the icon after "corrected refractive index", input the refractive index of 1.3330, and press "enter".

Note: The standard refractive index of water is 1.3330 at 20°C.

Finally, click "OK" to save the current correction value. Return to the main interface, wait for a few seconds, and the instrument displays the corrected refractive index of 1.3330.

If the refractive index of water at the main interface has a small deviation in a short time after correction, it may be that the preheating time is not enough. Please re-enter this interface for correction.

7.5.7 Introduction to help interface

Click the help button to enter the operation interface.

-
1. Be Sure to clean the test tank before testing the sample.
 2. When testing, please preheat for 30 minutes, wait until the distilled water test value is stable before testing to ensure that the test is accurate.



Figure-12

This interface shows simple precautions.

Return: Return to the upper interface.

7.5.8 Routine operation process of the instrument

Follow the steps below for standard operation of the instrument:

1) Power On:

- Connect the 220V power cord.
- Turn on the rear power switch.
- The instrument will automatically enter the login interface.

2) Login:

- Enter your account credentials (username and password).
- Click "Login" to access the main interface.

3) Set Test Conditions:

- Click "Test" on the main interface.
- Configure the required test parameters.
- Return to the main interface after setting.

4) Instrument Warm-Up:

- The system begins warming up to the preset temperature (default: 20°C).
- Allow at least 30 minutes for warm-up; optimal stability is usually achieved after about 1 hour (depending on ambient conditions).

5) User Calibration:

- After sufficient warm-up, add 0.5 ml of distilled water to the sample tank.
- Open the user calibration interface.
- Once the temperature and refractive index readings are stable, click “OK” to calibrate.
- Return to the main interface and observe.
- If the reading is still unstable, allow more time to warm up and repeat the calibration.

6) Sample Testing:

- After successful calibration, proceed with sample testing.
- Use 0.5 ml of liquid sample (not less than 0.3 ml, not more than 1 ml).
- The instrument will automatically control the sample temperature.
- Wait 1–2 minutes for stabilization.
- Once the refractive index reading is stable, click “Start” to save the data.

7) Sample Tank Cleaning:

- After testing, clean the sample tank to avoid cross-contamination.
- For organic samples, clean 2–3 times with absolute ethanol ($\geq 95\%$) or a suitable solvent.
- Rinse 3 times with distilled water to finish.

8) Data Printing:

- To print results, connect the dedicated printer.
- Go to the data interface and select the desired item(s) for printing.
- The “Print” button on the main interface will print the most recently saved data by default.

8. Maintenance

The instrument is a precision measuring instrument. To ensure the accuracy of the instrument and prevent damage during use, it is hoped that the user will maintain the instrument as follows:

- 1) When not in use, the instrument should be placed in a dry and ventilated room as much as possible.
- 2) The temperature difference in the room is not easy to change too much, to prevent the optical parts from becoming mouldy after being damp.
- 3) Before and after the instrument is used and when changing samples, the working surface of the sample vessel of the refractometer must be cleaned.
- 4) After testing the corrosive liquid, clean it up in time.
- 5) This instrument is strictly prohibited from measuring highly corrosive liquids.
- 6) Keep the instrument clean. It is strictly forbidden to touch the surface of the prism with bare hands.
- 7) If there is a gray tip on the surface of the prism, wipe it off with high-grade suede or long-fiber absorbent cotton. If the surface is stained with grease, it should be wiped clean with an alcohol and ether mixture in time.
- 8) Prevent corrosive liquids from dripping onto the plastic shell of the instrument to prevent damage to the appearance of the instrument.
- 9) It is strictly forbidden to disassemble and install the instrument without authorization. If the instrument fails, it should be repaired in time.