LS117
Optical Density Meter

User Manual V2.23

Please read this manual carefully before using it and reserve it for reference.

I. Product Introduction

The Optical Density Meter is used to measure the transmittance and optical density of the materials, which mainly include the following three kinds of materials:

- The light transmittance of various diffuse transmission materials such as milky, fogged, abrasive, and matte materials.
- Absolute optical density of materials like X-ray film, and aluminum film.
- The absolute optical density measurement of all films.

Standards for the product

JJG 920-2017 Diffuse Transmission Visual Densitometers

JJF 1225-2009 Calibration Specification for Transmittance Meter of Automobile

GB/T 11500-2008 Photography - Density Measurement - Part 2：Geometric conditions for transmission density

GB/T 11501-2008 Photography - Density Measurement - Part 3：Spectral Conditions

II. Parameters

Light transmittance measurement accuracy	±1%（0% ~ 50%） ±2%（50% ~ 100%）
Light transmittance resolution	0.0005%（0% ~ 10%） 0.005%（10% ~ 100%）
Optical density measurement range	0.000 OD ~ 6.000 OD
Optical density measurement accuracy	±0.02（0 ~ 2.00 OD） ±1%（2.00 ~ 4.00 OD） ±2%（4.00 ~ 6.00 OD）
Optical density resolution	0.001 OD（0 ~ 2.00 OD） 0.01 OD（2.00 ~ 4.00 OD） 0.1 OD（4.00 ~ 6.00 OD）
Aperture	2mm
Light Source	380nm - 760nm, conforming to the CIE photopic luminosity function
Weight	About 576g (without battery)

Power supply	4*AAA alkaline dry battery
Display	240*160 dot-matrixes LCD
Dimension	148mm×76mm×26mm (L*W*H)
Supply Voltage	DC5V
Operating Current	10mA
Operating Power Consumption	50mW

III. Operation

1. Power on / off

- **Power on:** Short press "HOLD" to power on the meter. Before that, place the receiving probe and light source probe into the holder or align them tightly without test sample between the two probes. After powering on, the meter displays the version number, serial number and other information, and then enters the WARM-UP interface. After the warm-up is completed, the measurement interface appears. The OD (optical density) is displayed as "0.000"and the light transmittance is displayed as 100.00%.
- **Power off:** Long press "HOLD" for 3s to power off the meter. The meter will be automatically off without any operation after 3 minutes if the auto off is enabled (Auto off=ON).

2. Parameter setting

When the meter is off, long press "HOLD" for 3s to enter into the setting mode:

In the setting mode, the "▲" button and the "▼" button are the select function and the "100%" is confirmation function.

A. (Auto Off: ON/OFF)

Short press "▲" or "▼" to select ON/OFF.

ON: The meter will be automatically off without any operation after 3 minutes (default option).
OFF: The meter shall be powered off manually-instead of automatically.

Short press"100%"to complete the setting and enter into the "Test Mode" (FAST/SLOW measurement) interface.

B. Test Mode, FAST/ SLOW measurement setting

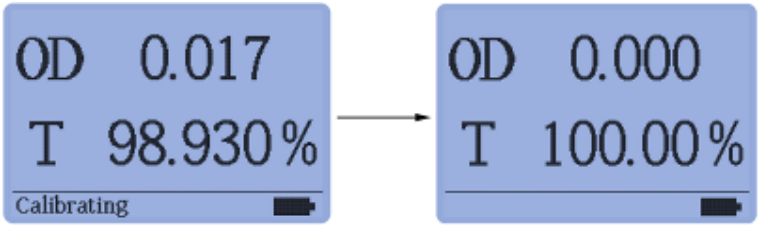
Short press "▲" or "▼" to select FAST/ SLOW.

Select FAST, the measurement time is 1.1s each time. If the optical density is less than OD5, the FAST mode is recommended.
Select SLOW, the measurement time is 2.8s each time. If the optical density is larger than OD5, the SLOW mode is recommended.

Short press "100%" to complete the setting and enter the "WARM-UP" interface. After the "WARM-UP" is completed, the Measurement interface appears.

3. Measurement

- After "WARM-UP" is completed and enters into the measurement interface without test sample, OD (optical density) is displayed as "0.000"and T (light transmittance) is displayed as "100.00%".
- In the measurement mode, if the backlight is off, short press "HOLD" to light up the backlight. If the backlight is on, short press "HOLD", the "HOLD" symbol will be displayed in the left bottom of the interface. The test data will be kept on the LCD, and the current data will be saved to the history record.
- In the HOLD state, if the backlight is off, short press "HOLD" to light up the backlight. If the backlight is on, short press "HOLD" to cancel the HOLD function and start a new measurement.
- In the measurement mode, if the backlight is off, short press "100%" to light up the backlight. If the backlight is on, short press "100%" and calibrate the light transmittance to 100% manually. The "Calibrating" symbol will be displayed in the left bottom of the interface as shown in the figure below:



During manual calibration, the symbol "Calibration failed" appears in the lower-left corner of the interface means the calibration failure, which may be caused by the following two reasons:

1) The receiving probe is not tightly aligned with the light source probe.

2) During calibration, a test sample is placed between the receiving probe and the light source probe.

4. History query

- In the measurement mode, short press "▲" or "▼" to enter the history query mode. The No.1 record will be displayed on the interface, which is the last record to be stored. A maximum of 9 records (No.1 – No.9) can be stored and the earliest one will be deleted automatically when the records exceed 9.
- Short press "▲" or "▼" to scroll up or down the record group.
- Long press and hold "100%" for 3s to clear all history records.
- Short press "HOLD" to enter the measurement mode.
- History record will not be lost after shutdown.

5. Backlight auto lit

In the measurement mode, if the backlight is off, the backlight will be automatically on when the test sample is placed in the slot, and be off again without any operation after 30 seconds.

6. Low Power Alarm

When the battery power is low, the empty battery symbol "▭" on the right bottom of the screen will flash, indicating that the battery needs to be replaced.

7. Measurement process

1) Light transmittance test for diffuse transmission material:

As for light transmittance of various milky, fogged, abrasive and matte materials, such as milky and abrasive glasses, ceiling lamps, diffuser, and zirconium oxide, etc. The two testing methods are adopted subject to size of the test sample.

Testing of small samples

Tight the light source probe with the receiving probe on the holder, the light transmittance is displayed as 100.00% in the interface. Lift up the receiving probe and put the test sample into the holder, and then tightly attach the receiving probe to the light source probe again. The current "T" value is the transmittance value of the test sample.

Testing of large samples

In the case that it's impossible for the test sample (like large lamp chimney) to be put into the holder and it's necessary to remove the light source probe and the receiving probe from the holder, the Probe-in-hands method is used to measure the sample, with the testing process as shown in the followings:

- Align and keep those two probes in tight before powering the meter on. After “Warm-up”, the meter enters into measurement interface, with T displayed as 100.00%.
- Separate two probes and clamp the test sample. The current T value is the light transmittance value of the test sample (it's necessary to match two test probes together and make convex surface of the object face to the receiving probe).

2) Optical density measurement of films

In the case that there is no sample and the light source probe is tightly attached to the receiving probe, when OD in the interface is displayed as 0.000, the measurement begins.

Lift up the receiving probe and put into the test sample, and then tightly attach the receiving probe to the light source probe again. The current OD value is the optical density value of the tested film.

IV. Features

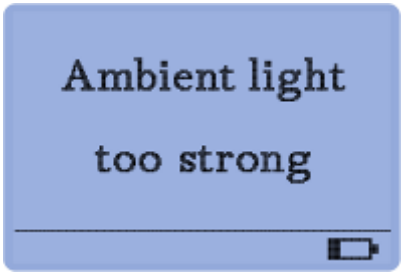
1. Light transmittance measurement for diffuse transmission material.
2. Equipped with holder, two ways of measurement available.
3. Light transmittance and the optical density can be measured simultaneously.
4. Suitable for production, quality inspection and other occasions.

5. High precision and wide measuring range, optical density up to OD 6.

V. Precautions

1. When there is no test sample and the displayed data cannot be recovered as 100%, short press "  " for calibration.

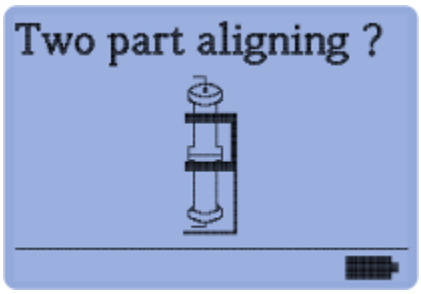
2. When the meter pops up a prompt of "Ambient light too strong", please use the meter in a weak light environment.



3. If the prompt as shown below appears when powering on, please check:

   1) Whether the receiving probe is aligned tightly with the light source probes.

   2) Whether a test sample is placed between the receiving probe and the light source probe.



4. The light transmittance may be displayed as 100% with high light transmittance sample. The front of the receiving probe should paste the black flannelette before testing. (For details, please consult Linshang Company).

5. Avoid contact with corrosive materials and keep away from high temperature and humidity environment.

6. When not use for a long time (e.g. several months), please take the battery out.

7. When the battery symbol is displayed as empty and flashes, please replace the battery.

VI. Description of metrological verification

1. Optical density test

Verification based on: "JJG920-1996" diffuse transmission densitometer visual verification regulation"

Verification instructions: **when the meter verifies the optical density, the receiving probe does not need to paste black flannelette** (flannelette is not pasted acquiescently before delivering, if the receiving probe has been pasted with black flannelette, please tear it off and then calibrate).

2. Light transmittance test

Verification based on: “JJG178-2007” ultraviolet, visible and near infrared spectrophotometer verification regulations".

Verification instructions: **when the light transmittance is verified by the meter**, since there is mutual reflection between the opalescent glass at the front end of the receiving probe and the sample (see the geometric conditions of “GB/T 11500-2008/ISO 5-2” transmission density for details), **the receiving probe must be re-calibrated by sticking black flannelette**, as shown in the figure below.

Receiving Probe+Back Flannelette=Small Receiving Probe

VII. Standard packing list

No.	Description	Quantity	Unit
1	Optical Density Meter	1	set
2	User Manual	1	pcs
3	Black Flannelette	1	pcs
4	Calibration Report	1	pcs
5	Certificate/Warranty Card	1	pcs
6	Aluminum Case	1	pcs

VIII. Service

1. The meter has one-year warranty. If the meter works abnormally, please send the whole meter to our company for maintenance.
2. Provide users with spare parts and lifelong maintenance services.

3. Provide the users with the meter calibration service.
4. Free technical support for long term.

Manufacturer: Shenzhen Linshang Technology Co., Ltd.
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