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1. Overview

UNS-BX1-type marking retroreflectometer is a portable on-site measuring instrument, used for measuring the retroreflection characteristic of road marking. UNS-BX1-type instrument is to simulate the brightness of road marking that can be seen by the driver under the illumination of motor vehicles at night, and the measured parameter is the coefficient of retrorefection brightness at night, namely, R_L value.

UNS-BX1-type marking retroreflectometer is a kind of professional measuring instrument mainly developed by Anhui Union Safe Technology Co., Ltd. This product has completely independent intellectual property rights and has obtained relevant patents and software copyrights. It also has passed the testing and calibration certification of National Institute of Metrology and Transportation, China and China Academy of Transportation Science.

Designed with high precision and high stability structure, UNS-BX1-type marking retroreflectometer applies high-standard MCU master module, large-capacity storage unit, touch screen display with handwriting input function and embedded

program control software, supports for rapid inspection and prints out results on site through the built-in printer. It is featured by free preheating, small measurement error, out-of-the-box and so on. This is a necessary instrument for the production, quality supervision, engineering construction, supervision and other units to measure the retroreflection performance of road marking.



Fig.1

2. Main Functional Characteristics and Technical Parameters

2.1 Main Functional Characteristics

- I Support rapid measurement (Measure the value of the retroreflective coefficient within 3 seconds);

- | Support simple calibration procedure;
- | Large battery capacity, super long standby, quick charging;
- | Support high brightness LCD transparent touch screen and the operative interface can be seen clearly under illumination;
- | Support multiple measurements to calculate the average;
- | Support storing more than 99,999 test data information, including, measurement data, operator, road section information and testing time, etc.;
- | Support 8G SD card data storage and support data storage in Excel format, and the data can be exported to the computer through U disk;
- | Support real-time broadcast of measured data;
- | Support locking on-site detection data and directly print out testing results on site through the printer;
- | Enter Chinese character, English and characters with touch buttonboard;
- | Support real-time display of on-site temperature and humidity;
- | Open English menu operation mode to foreign customers;

- | Support smart standby management and the system automatically enters sleep state when there is no operation;
- | Portable instrument;
- | Small/light;
- | Under the same on-site measurement environment, support one-off calibration of all colors before testing without respectively calibrating different colors each time.

2.2 Main technical parameters

- | Measurement items: retroreflective coefficient $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$
- | Measurement range: 0---4000
- | Observation angle: 1.05°
- | Angle of incidence: 88.76° , Complementary angle is 1.24°
- | Light source color temperature: $2856\pm 50\text{K}$
- | Measuring aperture area: 340mm x 95mm
- | Error of repeatability measurement: $\leq 3\%$

- | Continuous working time of battery: >72h
- | Data storage space: 8GB
- | Built-in battery capacity: 13Ah
- | Charger: DC 8.4V
- | Ambient temperature: -15°C~+60°C
- | Ambient humidity: <98%, no frost
- | Instrument size: 700mm x 135mm x 115mm

3. Working Principle

The geometric condition of UNS-BX1-type marking retroreflectometer is to simulate the brightness that the driver observes in the cab reflected from the marking made of retroreflective material on the road by the headlamp when the vehicle is driven on the road at night. The schematic diagram of the optical path is shown in Fig. 2.

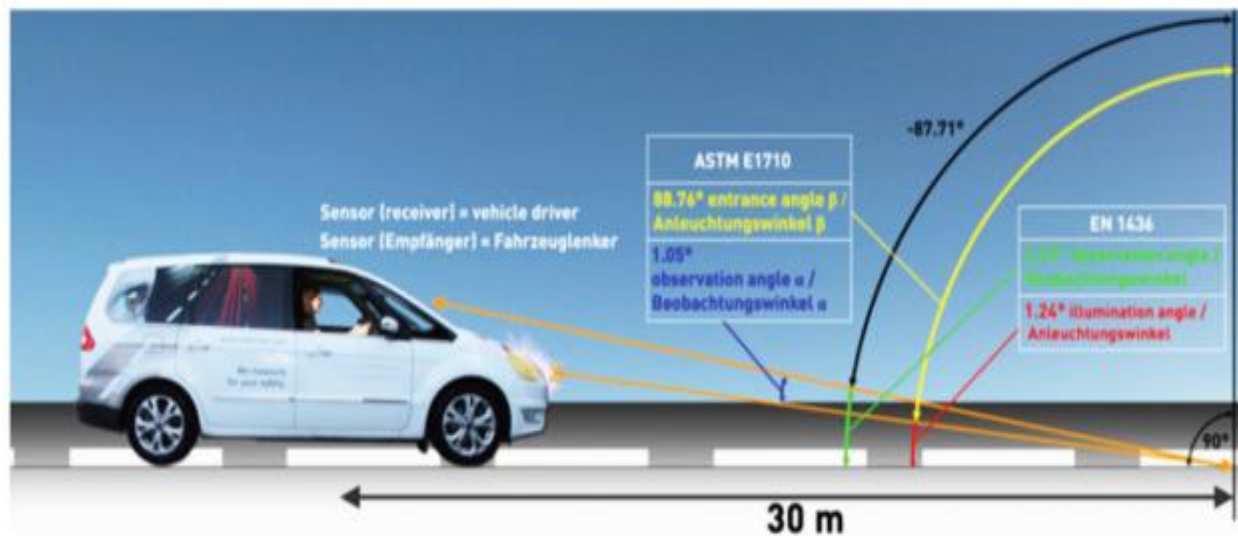


Fig. 2

The angle between the optical axis of the headlamp and the normal line (reference axis) of the road surface is called the

incidence angle, which is set at 88.76° and the angle between the optical axis of the headlamp and the reflected light is called the observation angle, which is set at 1.05° . The light source of the optical system is directed to the marking line according to the incident angle. The size of measurement window is 340 x 95mm. The reflected light from the marking line is received by the $V(\lambda)$ filter at the observation angle of 1.05° . After signal processing and calculation, the measured value is displayed. This value is the value of retroreflection coefficient RL.

【Attention】

(1) This instrument realizes $V\lambda$ spectrum correction through advanced optical filter.

(2) Stray light occasionally enters the instrument, which, however, will not affect the ongoing normal measurement.

Before each measurement and calibration, UNS-BX1 will automatically evaluate the stray light and automatically generate compensation. In case of significant leakage of the stray light, a detection error message will be provided by the instrument and some protective measures must be taken.

(3) Light leakage, light drift and offset error of the instrument will be compensated according to the data obtained from calibration procedure. Therefore, it is important to ensure that the calibration board is clean and calibration shall be made regularly.

4. Main Components of Products

The main components and structure appearance of the instrument is shown in Fig. 3, mainly including 3 parts: operation panel, instrument casing and handle, bottom optical detection system.

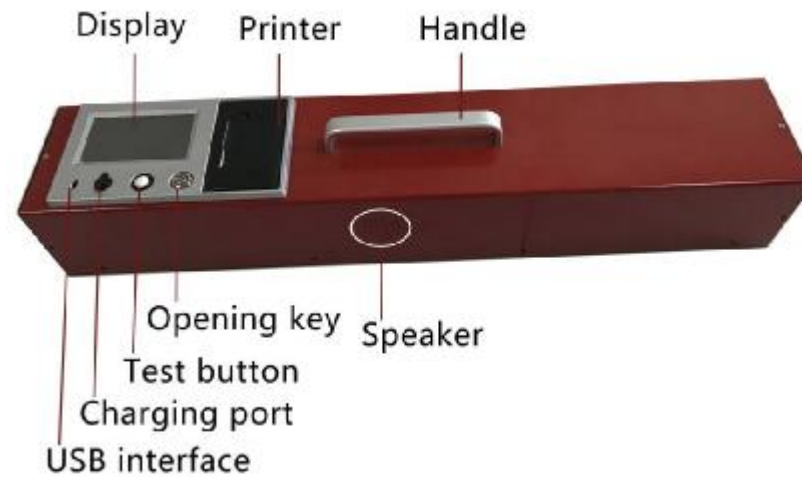


Fig. 3

5. Introduction to Use

5.1 Operation panels and basic operations

1. The operation panel of the instrument is shown in Fig.4. The panel includes display touch screen, printer, charging plughole, USB data interface, on/off button and testing button.



Fig. 4

I On/off button

Turn on/off the instrument.

When starting up, press the button for 10-12 seconds, and the display screen is light. Then there is a “drop” sound, and the instrument is turned on;

When shutting down, press the button and the instrument is turned off.

Note: When the instrument is turned off, it can be charged by a standard charger.

I Testing button

Trigger operation when measuring.

Press the button and the instrument begins to test.

I Display screen

Display various states and data information when the instrument is working, and can also perform system settings, measurement calibration, and record transmission for the instrument.

I Printer

Print out the current measurement results with the built-in printer.

I USB interface

Connect the instrument to the computer through USB interface to transmit data.

I Charging plughole

Charge the instrument.

2. When measuring, the detection window of the instrument is required to align to the measured object. An optical window at the bottom of the instrument is shown in Fig. 5. When using the instrument, place it flat on the measured object and put the optical window completely in the scope of the measured object.

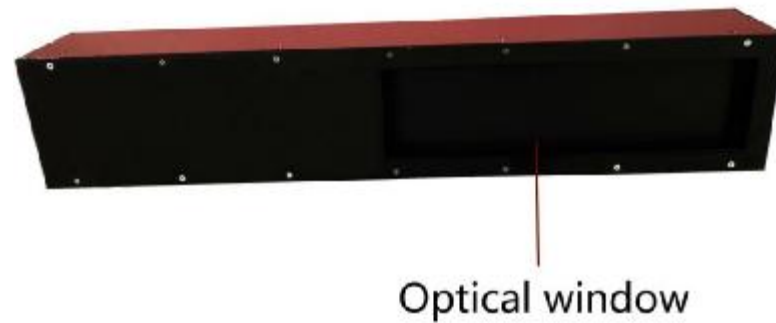


Fig. 5

5.2 Instructions for the Use of Interface

1. Boot

Press “On/Off” button, and the boot interface is displayed on the screen of the instrument, as shown in Fig. 6.



Fig. 6

During the boot process of the instrument, it will start a self-test for nearly 10 seconds and then automatically enter boot LOGO interface, as shown in Fig. 7.

Several seconds later, the instrument directly enters the on-site measurement interface, as shown in Fig. 8. If the instrument

has been calibrated, you can choose measured color on the interface to directly trigger the testing button for on-site measurement.



Fig.7

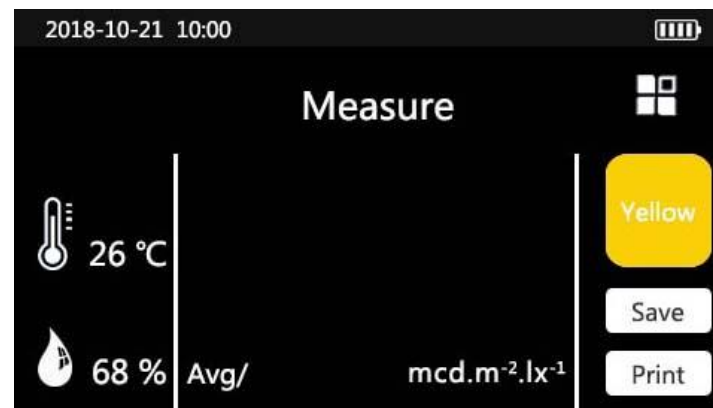



Fig.8

2. On-site measurement

After the instrument enters the on-site measurement interface, first choose the color of the measured marking through clicking on the color selection icon , and then press the testing button to start testing after ensuring that the instrument testing window is completely within the scope of the measured object. About 3 seconds later, the reverse reflection coefficient value of the marking is displayed and 2 seconds is required for measurement results in case of continuous

measurements. At the same time, average value of recent multiple measurements can be calculated for reference, as shown in Fig. 9.

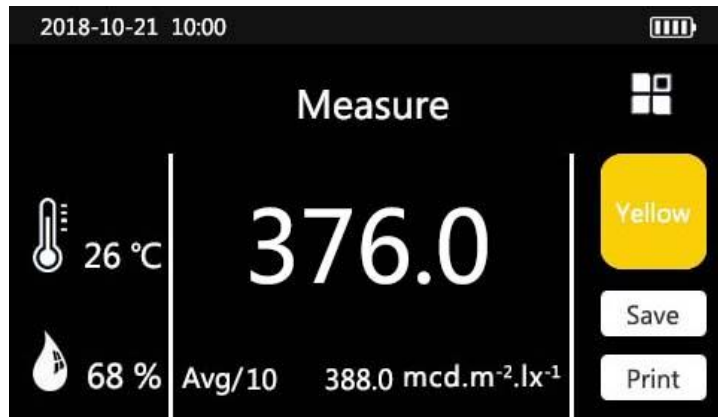




Fig.9

```
Field detection for Road marking  
s  
  
TestingDate:4/11/2019 4:46:50 PM  
Detection Site:No.191,Haitang,Ro  
ad  
TestingColor:White  
MeasuredValue: 1.0  
Inspector's Name:Jim,Smith  
Inspected Company:ANHUI,UNION,SA  
FE,TECHNOLOGY,CO.,LTD  
Temp: 21°C  
RH: 61%
```

Fig.10

After successful testing, the measured data will be displayed on the display screen and played through loudspeakers. To save the current testing data, click the "Save" button, and current measured data and relevant information can be saved. To print the current testing data, click the "Print" button and the printed content is shown in Fig. 10.

3. Functional menu interface

After the instrument enters the on-site measurement interface, click on function selection icon  to enter functional menu interface, as shown in Fig. 11. In this interface, there are four interfaces, such as, Settings, Calibrations, Recordings and About; to return to measurement interface, click on home page icon .

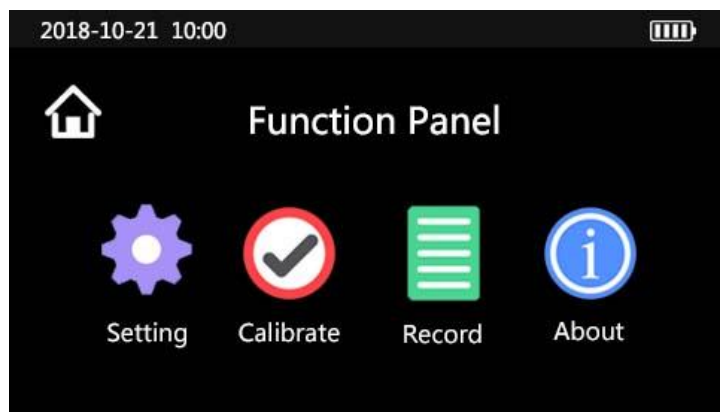


Fig. 11

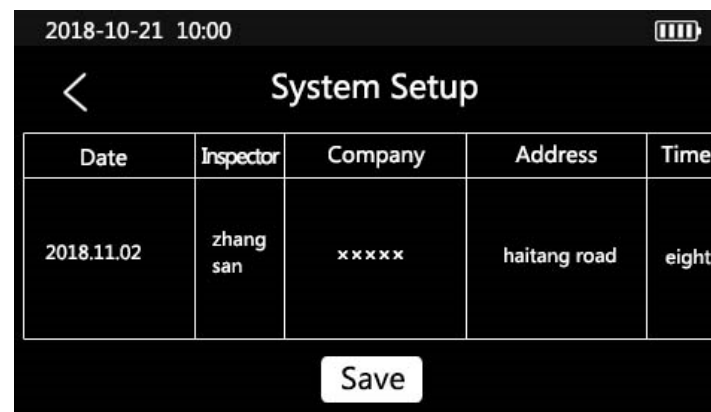



Fig. 12

4. Setting interface

On the functional menu interface, click on “Settings” icon and enter setting interface, as shown in Fig. 12. On the setting interface, system date, inspector, inspecting unit, inspecting place and unit inspecting times of average value can be set up.

Click on “Save” after setting, and continue to click on return icon  to return to functional menu interface.

5. Calibration interface

On functional menu interface, click on “Calibration” icon to enter calibration interface, as shown in Fig. 13. The interface is used to calibrate parameters for the instrument, including, black, white and yellow. The parameters shall be corrected before formal measurement. The calibration will be made with the calibration board of three colors provided by the factory and then calibration value on the back of the calibration board is input.



Fig.13



Fig. 14

Calibration process: Place the instrument on the calibration board of current color calibration, as shown in Fig.14.

Then choose current color icon on the calibration interface, and ✓ icon will appear after successful selection.

Secondly, to modify calibration values for successfully selected color, click on the number box below the color icon and digital input dialog box is displayed as shown in Fig. 15. Modify corresponding value based on calibrated value on the calibration board. After modification is finished, click on Enter to confirm.

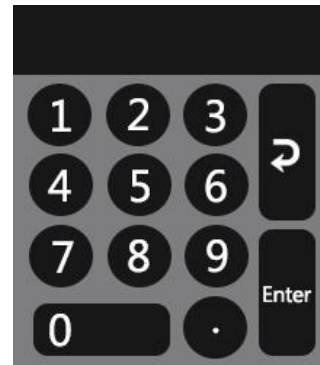


Fig. 15

Last, stably press testing button. The instrument will collect data that appears in AD digital box. Through multiple collection and observation of AD values until the first four digits are stabilized, click on “Save” button, and then color calibration is finished. The other colors are calibrated in turn.

Note: Pay attention to protect calibration board and keep the surface of the calibration board clear and complete.

6. Record and query interface

On the functional menu interface, click on “Recording” icon to enter record and query interface as shown in Fig. 16. Select the time period to query, input location/road name and click on “Query” button to query out the required information. It can also query the recent ten recordings through “recent testing”. The query results can be sorted according to project category to make query function more convenient and faster.

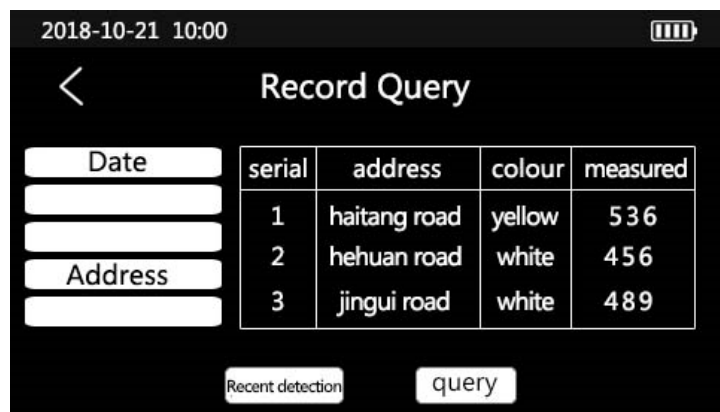


Fig. 16

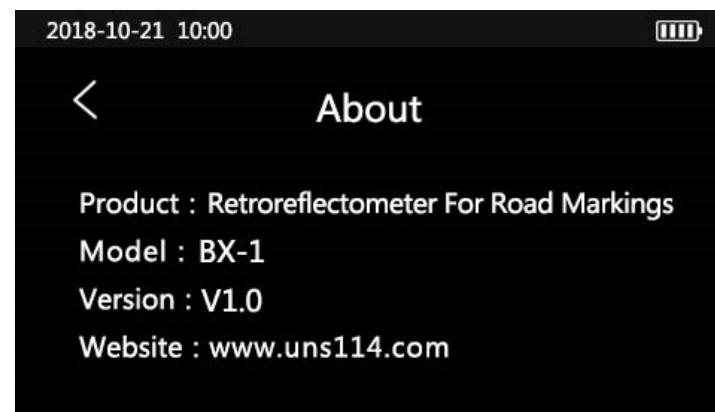


Fig. 17

7. About interface

On the functional menu interface, click on “About” icon to enter “About” interface as shown in Fig. 17. From the interface, you can view the product model, software version information and company website information, to facilitate users to

understand the product information more deeply.

5.3 Data Storage and Export

1. When saving measured data, click on “Save” button on the on-site measurement interface, as shown in Fig. 9.

2. If there is any doubt about the measured data, it shall be abandoned and measured again until it is confirmed. The measured data can not be deleted and modified once the data are saved by the system.

3. When exporting recordings to external PC, the power button is required to turned on, and the instrument and PC will be connected through USB connecting line.

Note; (1) Data is exported though U disk.

(2) The document exported from PC should be in EXCEL format.

4. The recording data can be saved in the system. When recordings are reproduced or exported, all records are deleted or emptied to save room for storage.

5.4 Power charging

1. A lithium battery is built in the instrument. The nominal voltage is 7.4V and the external charging power supply voltage is 8.4V. When the battery is low, charge the instrument while ensuring that the instrument is turned off. Please use dedicated charger of the instrument to charge, as shown in Fig. 18.



Fig.18

During charging, the indicator of the charger is red and becomes green after charging is completed as shown in Fig. 19. The instrument battery is fully charged in approximately 4 hours.



Fig. 19

2. When the instrument is not used for a long time, turn it on periodically to fully charge the built-in battery.

6. Matters needing attention:

1. Read the user manual before using the instrument and please follow the instructions.
2. The instrument should be protected from moisture, water and shock. It is forbidden to use the instrument in any harsh environment, such as heavy rain or freezing.
3. This product is an optical instrument. When using the instrument, please pay attention to the protection window at the bottom of the instrument, which should not be damaged. If damaged, it will directly affect the measurement

results.

4. When measuring the data, keep the optical testing window of the instrument close to the surface of the object to be tested, and click the testing button to complete the data collection.
5. Turn off the power if it's not in use.
6. Please only use approved special accessories. Do not connect it to incompatible products.
7. When the instrument is not in use, it should be placed in a cool and dry place where there is no corrosive gas in the surrounding area.
8. If there are quality problems, the instrument can be returned to the factory for repair and calibration. Our factory is not responsible for the instrument which is disassembled by users without our consent.
9. This instrument applies to product compliance test and inspection. The inspection results of testing institutions authorized by the state shall prevail.