RK500-55 Non-contact Road Condition Sensor User Manual

Revision Time	Reviser	Current Version	Remarks
20250626	SUN	V5.0	

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1. Product Description

RK500-55 Non-Contact Road Surface Condition Detector employs advanced remote sensing technology to perform inspections without physical contact with the road surface. This preserves the structural integrity of the pavement and eliminates traffic disruptions caused by sensor installation. Its core multispectral measurement technology accurately identifies road surface ice, snow accumulation, and water film thickness with millimeter-level precision.

As an ideal alternative to traditional embedded sensors, this device is particularly suitable for scenarios where road excavation is impractical. Installation requires no road closures or pavement cutting—it can be directly mounted on existing weather stations or nearby structures, ensuring both operational efficiency and safety. Additionally, its low-maintenance design makes it a preferred component for road weather monitoring systems. RK500-55 casing is sturdy and durable to ensure stable operation in harsh weather conditions and provide accurate data. By providing accurate road condition information, road management departments can be alerted to take appropriate remedial measures before dangerous driving surfaces are caused by weather factors.

2. Feature

- Remote monitoring water,ice and snow
- Remote surface state sensing
- Measure amount of water, ice, and level of grip
- No embedded installation
- Anti-corrosion
- Infrared detection, distance up to 15.5 meters
- Easy for installation with shutting down the road
- Robust structure, 7*24 hours monitoring

3. Specification

Item	Technical Specification
Measuring Distance	2-15m
Measuring Diameter	25cm
Angle	30-85°
Power Supply	12-24VDC
Power Consumption	5W(Including lens heating)
Operating Temperature	-38ºC to +70 ºC
Operating Humidity	0 to 100%
Measuring Range	Water:0.00—10mm
	Ice:0.00—10mm
	Snow:0.00—10mm
	Level of Grip:0.00—0.82
	Road surface temperature:-40 ºC to +80 ºC (optional)
Accuracy	0.1mm
Resolution	0.01mm
Lens Contamination Detection	Automatic lens contamination level detection and compensation
Road Surface	Concrete, asphalt pavement
Communication Interface	RS485,RS232
MTTF	10 years
Safety	Infrared measuring technology, no radiation

4. Electrical Connections

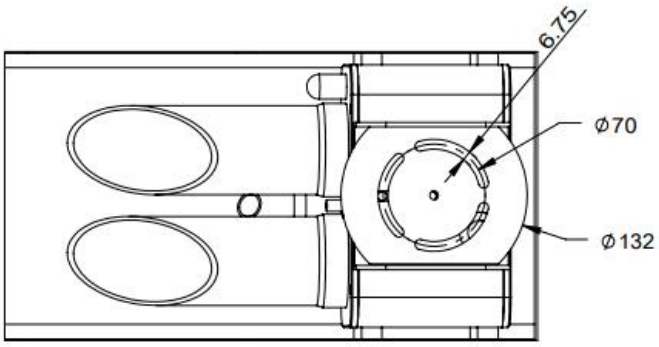
Connector（Cable）	RS485
Red	V+
Black	V-
Yellow	RS485A
Green	RS485B

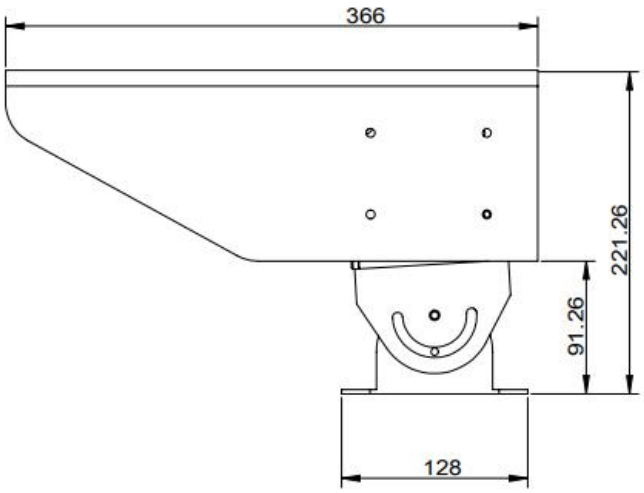
Note: This product has been tested and complies with European CE requirements for EMC directive.

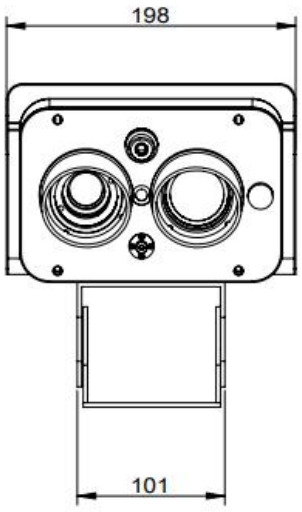
5.Dimensions

Diagram with dimensions

Unit:mm







6.Installation Notes

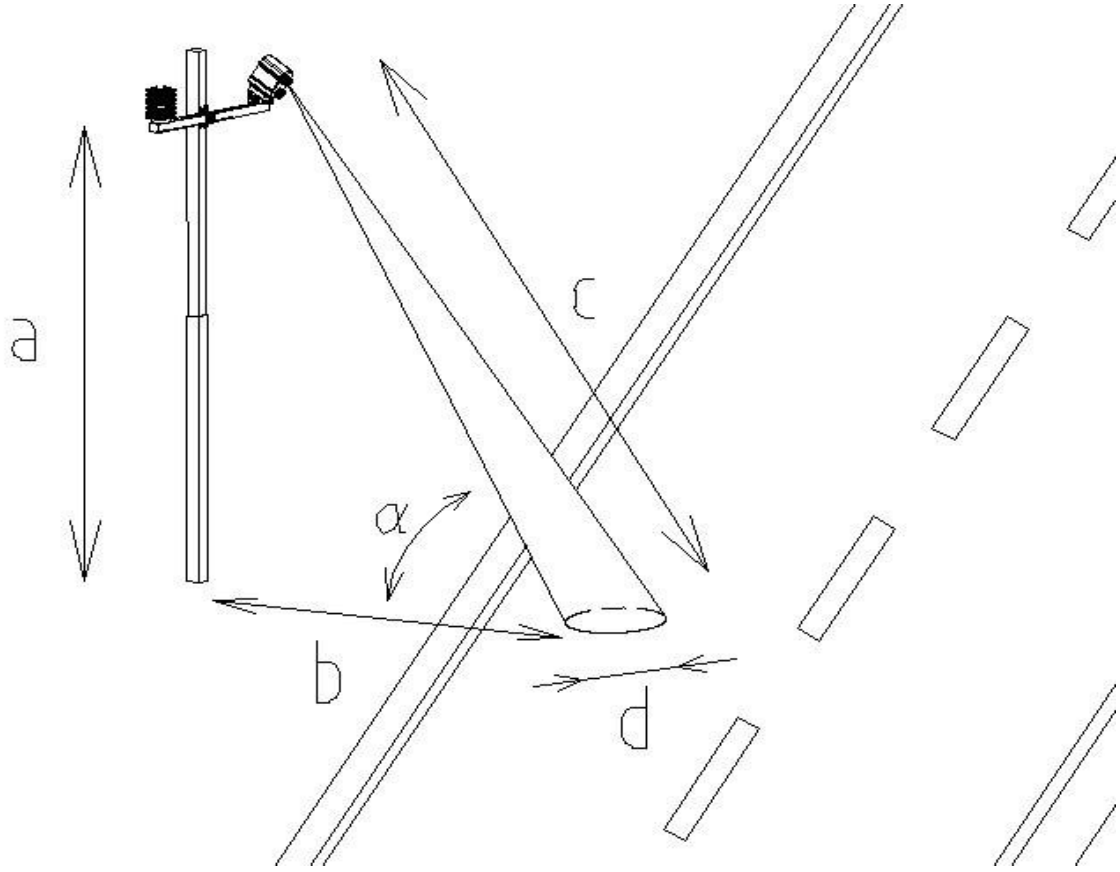
6.1 It is forbidden to measure the following types of road surfaces.

6.2 Choose a flat and dry road for the irradiation position

6.3 Installation distance: If different installation angles can be selected, the shorter measurement distance is preferred.

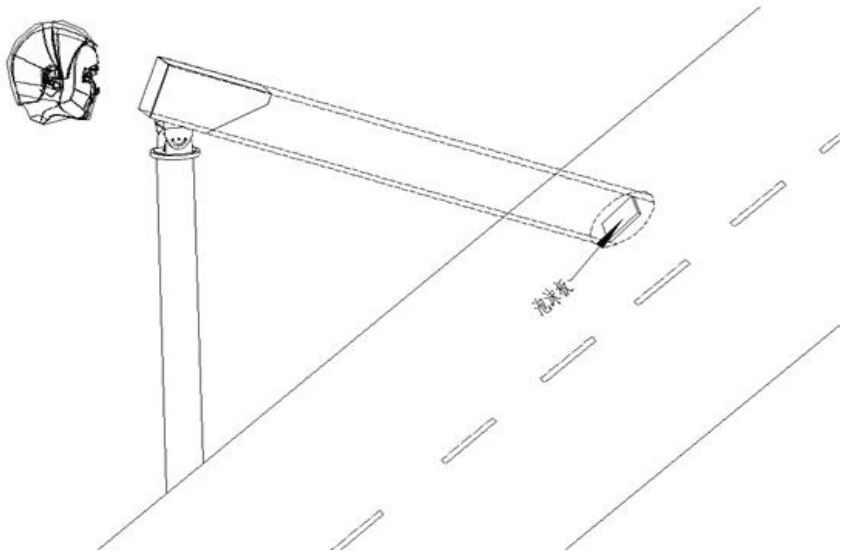
Measurement distance: the distance range of **C** in the following figure is determined by the incident angle (2–15 m);the installation angle **α** of horizontal line is 30° – 85° ;

Installation height: 3-8 m. The diameter (d) of the measuring range is proportional to the measuring distance (c). When the measurement distance is 10m, the diameter of the measurement range is 20cm. When the measurement distance is 5m, the diameter of the measurement range is 10cm.



6.4 Equipment Debugging

6.4.1 After the instrument is installed, due to the different heights and distances of the installation site, it is necessary to adjust the incident angle of the instrument, and place the A4 paper at the position to be measured,(Don 't be too close to the side of the road, the invisible beam emitted on the road to form a ring, too close to the side of the road is easy to cause the ring part to shoot out of the road, affecting the accuracy of the measurement) The eye looks down on the upper, lower, left and right sides of the instrument shell (as shown below), and adjusts the position of the instrument to aim at A4 paper, so that the four edges of the instrument cover are just aligned with A4 paper, and then the fixed screws on the bracket are slightly tightened (do not tighten to the end, the subsequent steps need to be adjusted). This method can roughly align with the measured points of the instrument.



6.4.2 Debug Command

Initial adjustment, alignment test position, connection power and signal line, according to the following steps :

A. Road condition inquiry 01:

Open serial software, send **‘: 014700B8’**, the instrument will return a string of characters indicating that the instrument has been connected, without any feedback please check the data line connection and power supply.

Send :0104700B8<CR><LF>

Return :014814A2000000000000000000000003F51EB8500010001<CR><LF>

B. Enter Setup Mode:

Send >*<CR><LF>

Return CONFIGURE MODE<CR><LF>

C. Turn On Debug Mode:

Send >DEBUG MODE<CR><LF>

Return DEBUG MODE READY<CR><LF>

D. Open Settings:

Send >OPEN DSC * <CR><LF>

Return RSS OPENED FOR OPERATOR COMMANDS<CR><LF>

NOTE:

The three commands B-C-D need to be completed in sequence within 15s. If no command is received within 15s, it will automatically exit the setting mode. If you receive '>NORMAL MODE<CR><LF>', please re-send the three commands B-C-D in sequence.

E. Adjust Focus

Send >MAX 1 <CR><LF>

Return 424 0.01 32<CR>

427 0.01 32<CR>

425 0.01 32<CR>

426 0.01 32<CR>

425 0.01 32<CR>

426 0.01 32<CR>

…

F. Dry Calibration

Send >DRY ON <CR><LF>

Return DRY PARAMETERS: 254.2 115.5 196.4<CR><LF>

DRY SIGNALS: 254.2 115.5 196.4<CR><LF>

G. Road Condition Inquiry 02

Send **:014800B7<CR><LF>**

Return ROAD STATE SYSTEM V4<LF>

VERSION 4.0.0.33 2021/3/23<LF>

ADDR : 01#<LF>

ROAD TEMP : -20.00<LF>

ROAD STATE : DRY<LF>

GRIP : 0.82<LF>

WATER : 0.00<LF>

ICE : 0.00<LF>

SNOW : 0.00<LF>

BOX TEMP: 18.9,30.2<LF>

HARDWARE : OK<LF>

INPUT VOLTAGE : 11.0<LF>

AMBIENT : 18.0<LF>

H. Reset

Send >#RC <CR><LF>

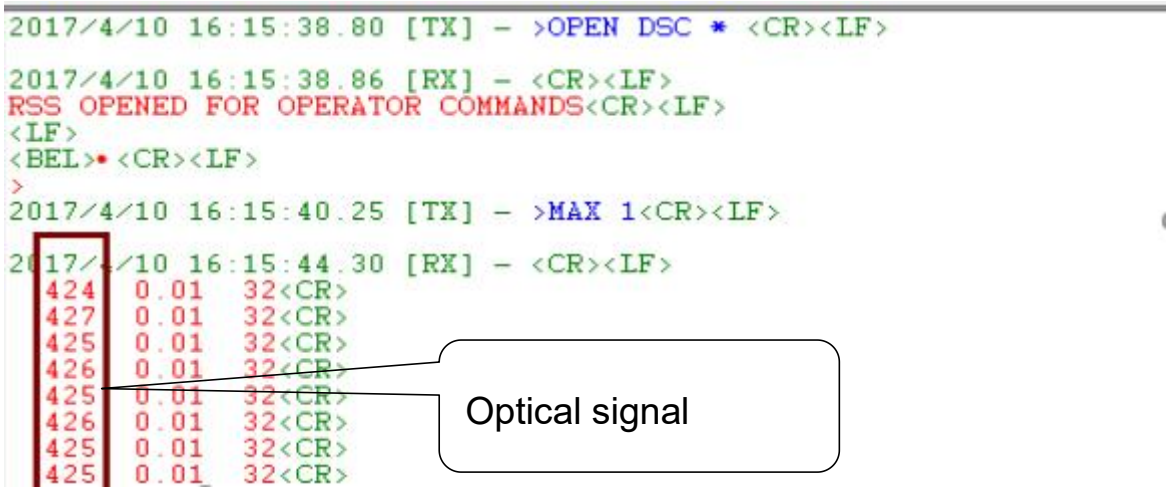
Return C51 RESET OK<CR><LF>

6.4.3 Debug Steps

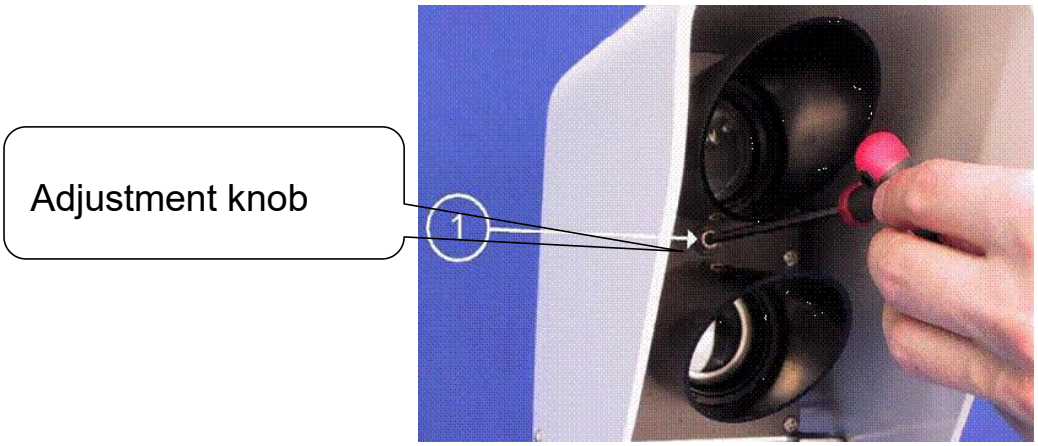
A. Adjust Focus

Send the instructions **'B-C-D-E-H'** in 5.4.2 in sequence.

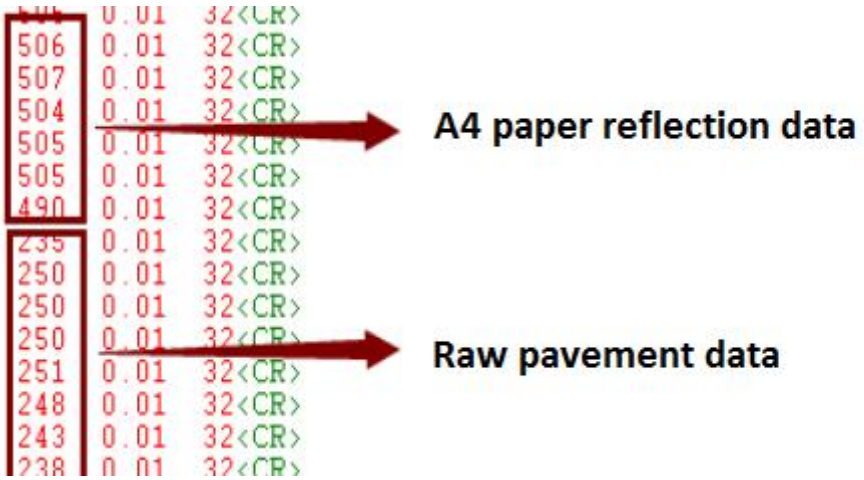
Send command **'E'**, all the light signal values will be received within 5 seconds (as shown in the figure below), if not, please try to send **'B-C-D-E'** commands in sequence,



When the optical signal is continuously refreshed, the focal length of the instrument can be adjusted. According to the change of the optical signal data, finding the maximum value is the best focal length point. As shown in the figure, use the prepared 4mm Allen wrench to align the adjustment knob of the focal length, and turn left and right to observe the change of the light signal. When the value change is larger than the current value, it is the best focus point. If the value becomes smaller, it can be reversed. Rotate or adjust the knob back to the original position



Lock the fixing screw on the adjusting bracket after finding the best focal point. After locking, the A4 paper can be moved slowly up and down, left and right in the test range, and the edge of the light spot can be found according to the change of the value (the value of the light spot on the A4 paper will increase, and the original value of the road surface will be restored after it is removed). By marking the road surface between the reflection value and the original value, the central measurement range can be accurately found, which is convenient for drying test after debugging.



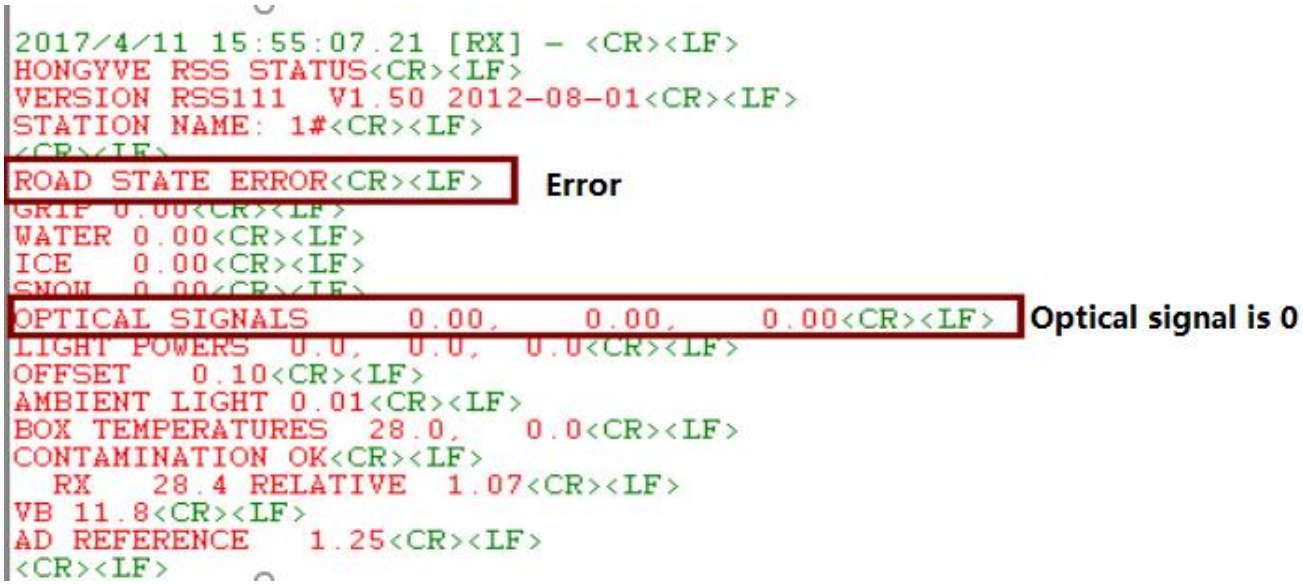
After the focusing is completed, send the command '**H**' to exit the debugging mode and restart, that is, the adjustment of the focus is completed.

B. Dry Calibration

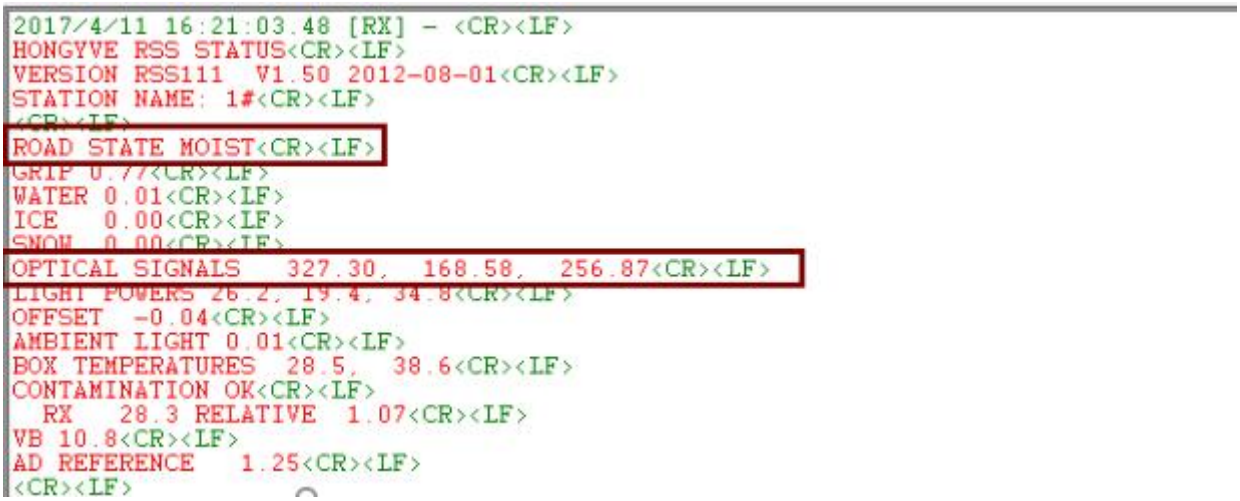
Dry calibration is to calibrate the optical characteristics of the road surface, which can only be carried out when the road surface is completely dry.

Before calibration, remove the A4 paper, and then send the instructions **'B-C-D-G'** in 5.4.2 in sequence

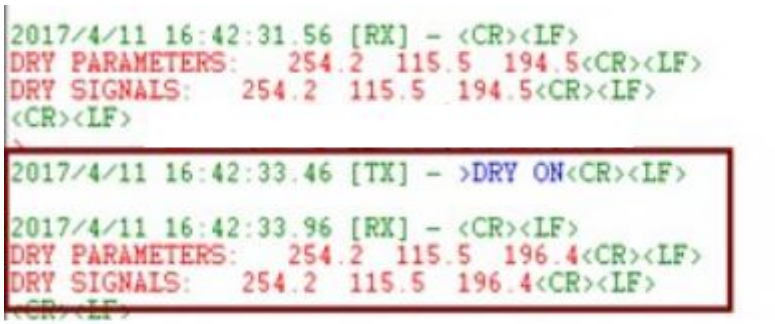
Parameters such as road condition and light signal will be refreshed continuously, but because the instrument will self-check after reset, the road condition will display an error before the self-check is completed, and dry calibration cannot be performed in this case.



Wait for about 60 seconds, and the dry calibration can be carried out after the road display status and optical signal have values.



Send the command **'D'**, and the calibration is successful when the sensor returns the road signal value.



After the dry calibration is completed, send the command **'G'**, and the road state will be displayed as dry. In case of error or abnormal status, please recalibrate or restart the instrument and wait for the status to refresh.

Pavement status code

W(Warning)	R	S(Surface Condition)
0 NO WARNING	Reserved, always displayed as 0	0 ERROR
1 WARNING		1 DRY
2 ALARM		2 MOIST
3 FROST WARNING		3 WET
4 Reserved		4 Reserved
		5 Reserved
		6 SNOW
		7 ICE
		8 Reserved
		9 SLUSHY

7. Simulated Ponding Test

After the equipment completes the dry calibration, it is necessary to test the water state of the road area in a simulated rainy day, send the road state query command, and the road state will be refreshed continuously. When adjusting the focal length, make a mark and sprinkle water evenly on the detection position.

Observe the change of pavement state. According to the amount of water, it takes a certain time (about 3 minutes) for the state to change from dry to wet and then to ponding.

NOTE:

Because the simulated test is artificial watering to form a slippery road, it does not belong to the accumulation of the natural environment. During the test, there is a chance that snow or ice will appear for a short time, which is a normal situation. You only need to wait for a certain time (within 10 minutes). After repeated verification, the correct result can be obtained.

The road status sensor needs to be tested under the environment of standard pavement (cement, asphalt pavement); it is not recommended to conduct any test on non-standard pavement (wood floor, marble, etc.), which may cause abnormal device data or long-term status error.

CE Complies with applicable CE directives.

Manual subject to change without notice.