



DE-45xx series

Laser scanning sensor

Manual



Thank you for using our company's products. This manual explains the usage and safety matters of the products.

- ◆ Please read this manual carefully and pay attention to safety during use.
- ◆ Please keep this manual and put it in a suitable place for reference at any time.

Guangdong Hinson Technology Co., Ltd.

Version declaration

Document Version	Soild Version	Add/remove information
V1.0		Publish
V1.2		Add access to regional data
V1.3		Corrected thread color definition to be the same as actual thread definition
V1.3.1		Add the acquisition of version information

Contents

1 Safety Precautions	1
1.1 Attention to applicable environment	1
1.2 Pay attention to the wiring environment	1
1.3 Note on debugging environment	1
2 Function introduction	2
2.1 Model rules	3
2.2 Function	3
3 Install	9
3.1 Size parameters	9
3.2 Installation requirements	10
3.3 Indicator light	11
4 Wiring	12
4.1 Line definition	12
4.2 Power connection	13
4.3 Switch output	13
5 Configuration	15
5.1 Connection	15
5.2 Configure software operations	15
5.3 Run the configuration software	16
5.4 Introduction to the configuration software interface	19
5.5 Icon function	26
5.6 Sensor firmware version	29
5.7 Sensor Status Bar	29
5.8 Quick setup steps	29
5.9 Configuration export and import	33
6 Data protocol	35
6.1 Parameter setting	35
6.2 Measurement data acquisition	35
6.3 Region state fetch data	39
6.4 Firmware information Acquisition Data	41
6.5 CRC check	42
7 Troubleshooting	43
7.1 Fault status	43
7.2 Troubleshooting	43
8 After-sale information	44
8.1 Warranty period	44
8.2 Warranty coverage	44
8.3 Scope of disclaimer	44
8.4 Technical support	44

1 Safety Precautions

1.1 Attention to applicable environment



Visible particles in steam, smoke, dust and air may cause the sensor to misjudge or even become unusable;

Qualified technicians need to be regularly arranged to check whether the sensor is connected and installed correctly;

The maximum service life of the sensor is 10 years, after which it must be replaced, otherwise it may not meet the required performance requirements;

Sensors should be inspected and cleaned regularly;

This product is only allowed to be used within specified limits and specified technical parameters and operating conditions at any time.

1.2 Pay attention to the wiring environment



Do not connect the power supply reversely or connect it to a voltage higher than the specified maximum working voltage, otherwise the sensor will be damaged;

If the power supply is lower than the minimum working voltage, the sensor will not work or work abnormally;

Please follow the instructions in the manual for wiring, otherwise the sensor may not be able to detect the input signal correctly;

Do not connect the device to the output signal terminal to exceed the load capacity of the sensor, otherwise it will cause sensor failure.

1.3 Note on debugging environment



Only qualified and authorized personnel are allowed to connect, install, commission and set up laser distance sensors;

Confirm that the peripheral equipment associated with the sensor is in a reliable stop operation state;

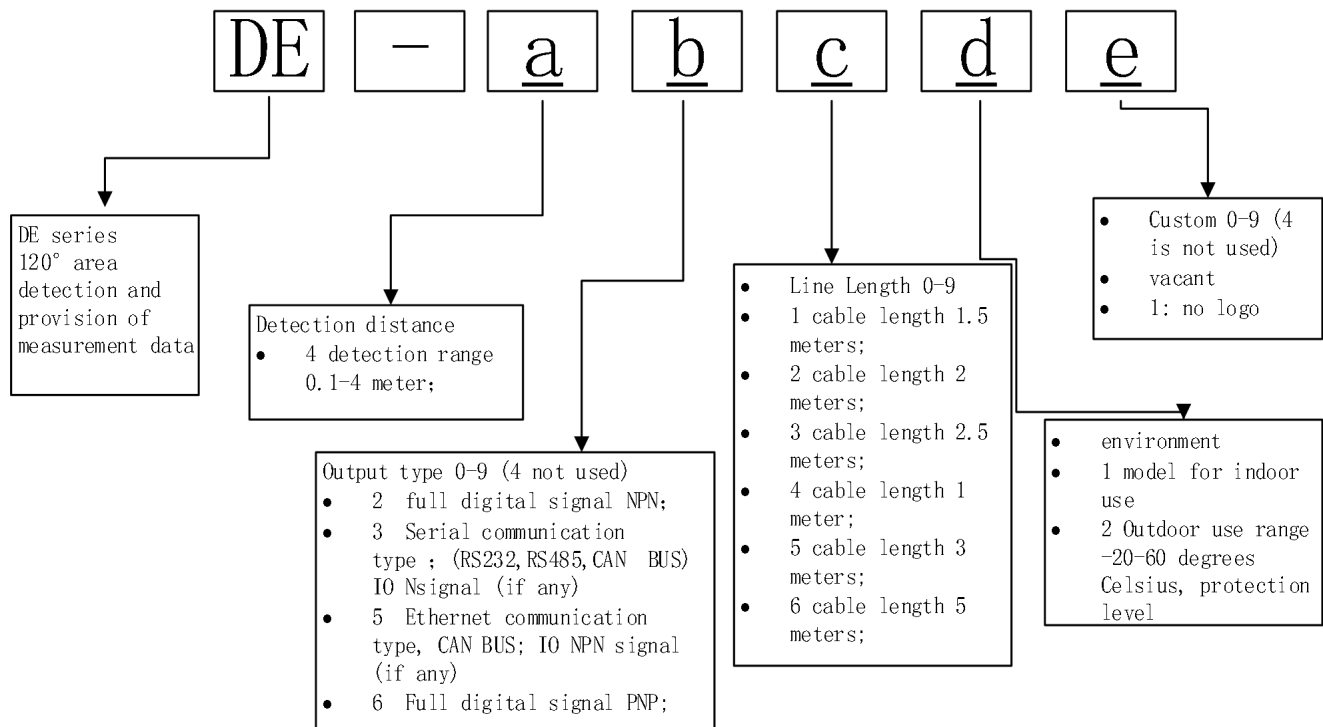
Confirm that the debugger is in a safe position;

Confirm that other people or objects are outside the range of the device.

2 Function introduction

Product Parameter	DE-45XX
Operating Voltage	DC10-30V
Power consumption	1.2W
Light Source	Laser (pulsed light)
Laser Class	1 (IEC 60825-1:2014, EN 60825-1:2014)
WaveLength	905nm
Pulse Width	5ns
Measurement methods	Pulse Ranging Technology (PRT)
Light resistance	sun resistant (≤80000 Lux)
Detection range	0.1-1.5m (10%Reflectivity)
	0.1-4 m (90%Reflectivity)
Angular resolution	0.1°、0.2° Software Configurable
Recognizable object shape	Arbitrary shape, the resolution is calculated according to the sensing distance
Whether to output raw measurement data	Support
Switch input	None
Switch output	4 *NPN
Channels	0-63 total 64
Configure ports	Ethernet
Ethernet	TCP/UDP
Scanning speed	The motor scanning speed is 10HZ, and after 4 times the frequency processing, it is 40HZ.
Scanning Angle	120°
Laser scan frequency	72KHZ、144KHZ Software Configurable
Measurement accuracy	±4cm
Detection output delay	0-500ms Software Configurable
Detection hold delay	0-500ms Software Configurable
Use environment	Indoor use, working temperature (-10℃-50℃), working humidity (≤85%RH, no condensation)
Protection class	IP65
Vibration resistance	10-50Hz, 0.7mm double amplitude each X, Y, Z for 2 hours
Impact resistance	196mJ/m², 10 times each in X, Y, Z
Indicator light/action description	Green (power indicator), the indicator is on when the sensor is powered normally
	Yellow (output signal 1 light), the light is on when there is an obstacle intruding in zone 2
	Orange (output signal 2 light), the light is on when there is an obstacle intruding in zone 1
	Red (output signal 3 light), the indicator light is on when there are obstacles in the protected area
Built-in cable length	Optional
DE-45xxx: 4 NPN outputs, support Ethernet TCP/UDP output switch value, Ethernet TCP/UDP output raw data	

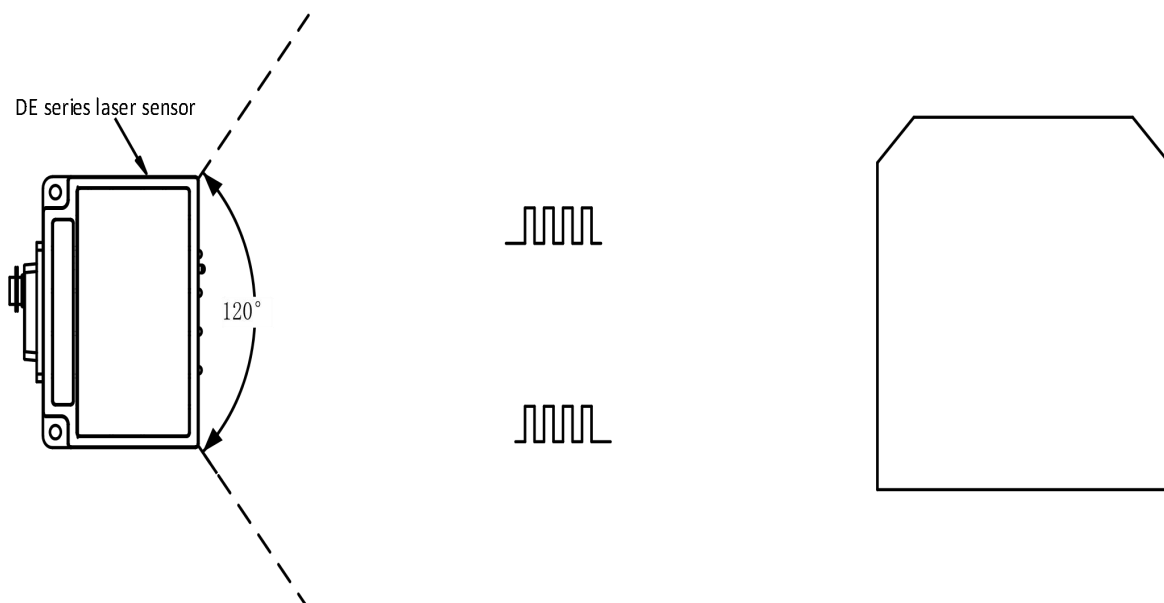
2.1 Model rules

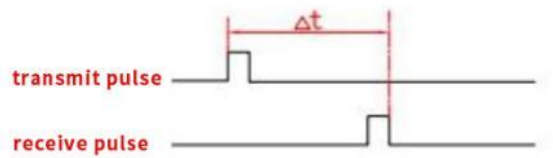


2.2 Function

2.2.1 Detection principle

The laser scanning sensor operates according to the laser time-of-flight (TOF) measurement principle. Under the extremely high synchronization clock, the laser is emitted at uniform time intervals. The laser beam is reflected back when it encounters an object, and the laser scanning sensor receives the reflected beam. Then, the distance from the laser scanning sensor to the obstacle is calculated by the time difference Δt between transmission and reception.

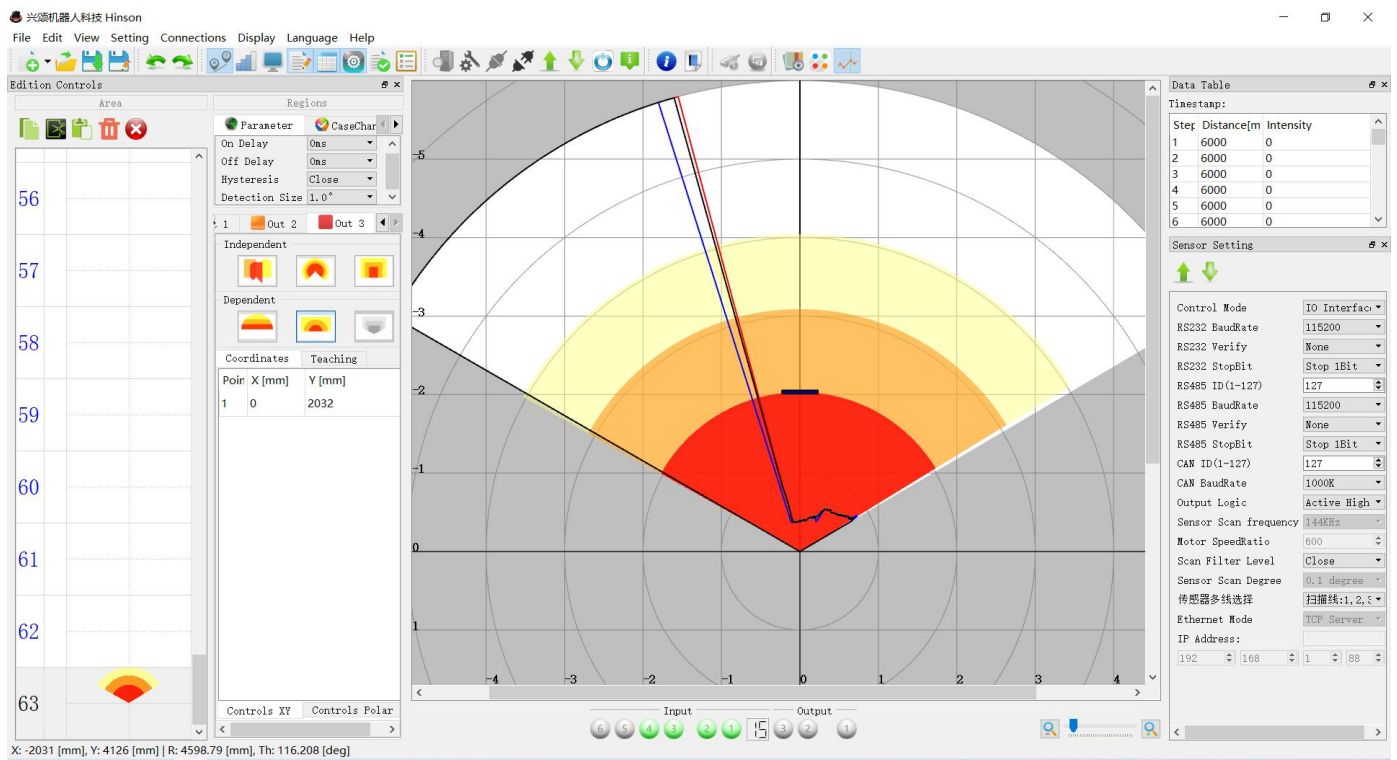




$$S = v * \frac{\Delta t}{2}$$

S: measured distance
v: the speed of the laser
Δt: Time difference

The surrounding area is scanned by a laser beam to obtain the environmental profile pattern, and the protection area range is established through software configuration. Once an object is in the set area, the output port corresponding to the sensor outputs the signal. The upper computer obtains the signal and makes further judgments and processing.



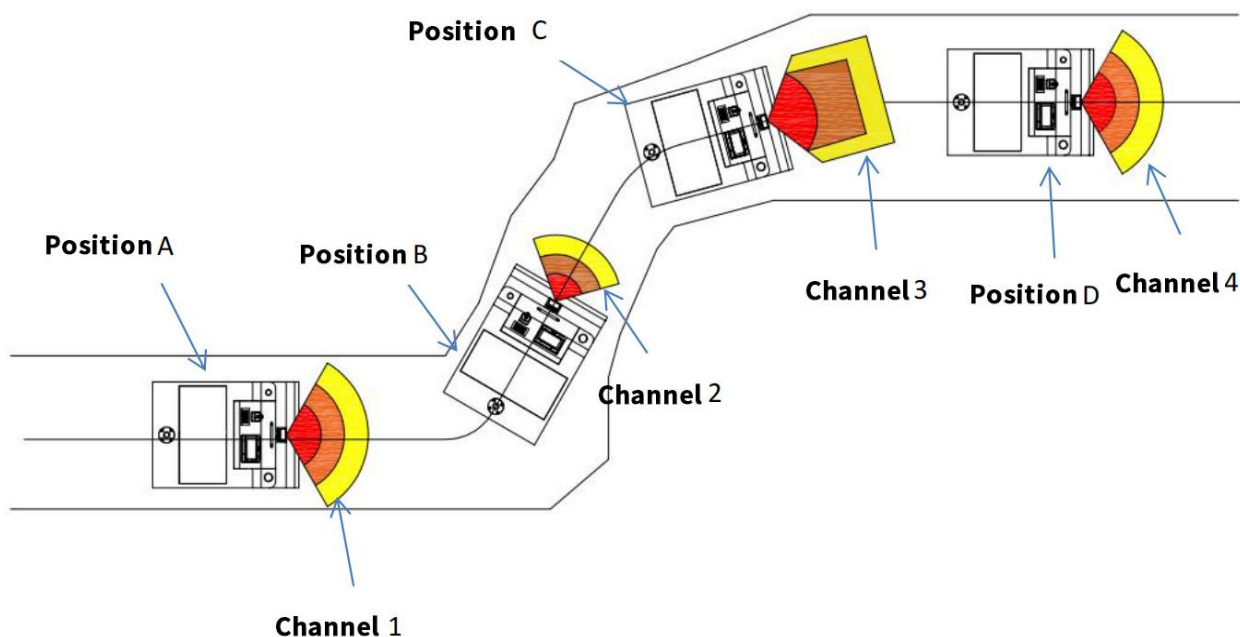
2.2.2 Channel switching

DE-45xx can set a maximum of 64 detection channels, and switch channels through Ethernet to meet the detection needs of different occasions.

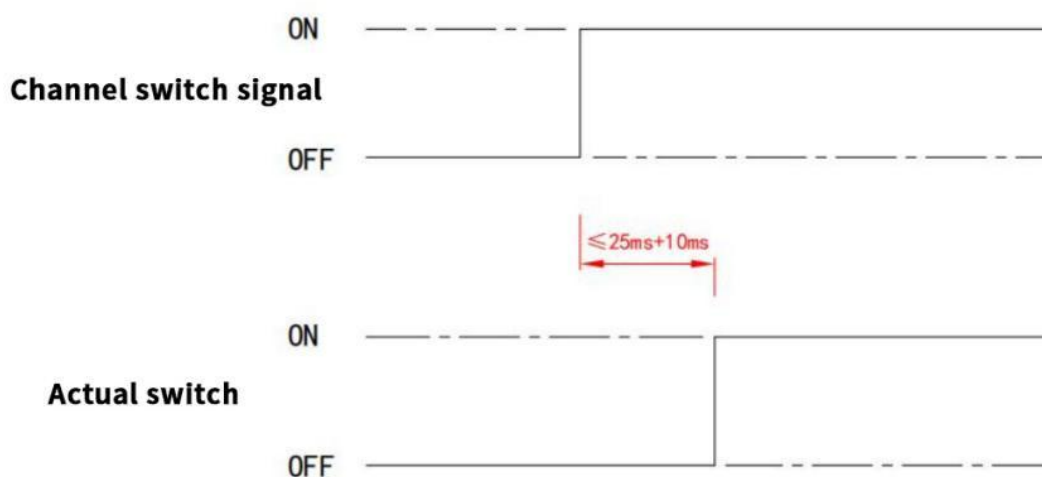
When the AGV runs to the position of line A, use the detection range set by channel 1;

When the AGV runs to the line B position, the AGV cannot pass through the original channel 1 sensing range due to the external space transformation, then switch to channel 2 with a smaller sensing range setting to pass smoothly.

The application process of AGV is shown in the figure below:



After DE-45xx receives the channel switching signal, there is a switching delay due to the influence of the scan cycle, and the channel switching will not take effect immediately. The switching delay is shown in the figure below:

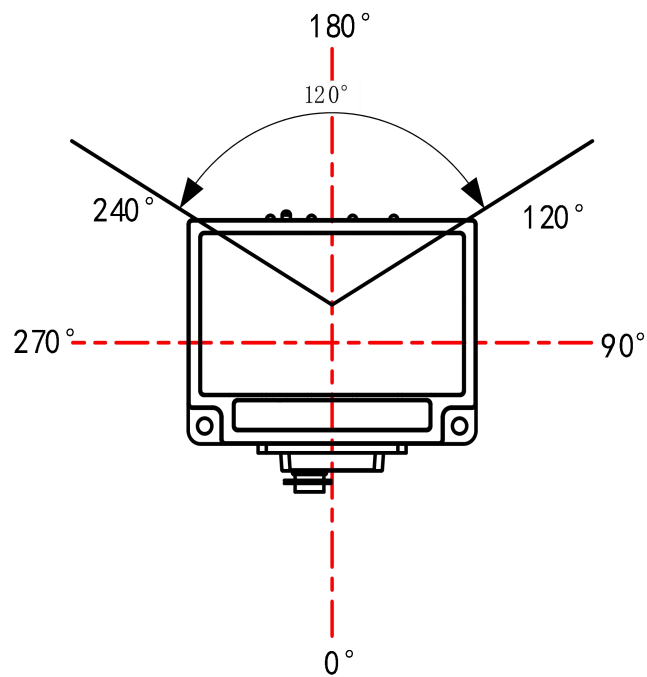


The time for DE-45xx to collect complete $120^\circ - 240^\circ$ data is 25ms. After DE-45xx receives the channel switching signal, it takes less than 10ms to obtain the detection pattern of the channel from the memory and analyze it. The whole process from the channel switching signal to the successful channel switching takes $\leq 35\text{ms}$.

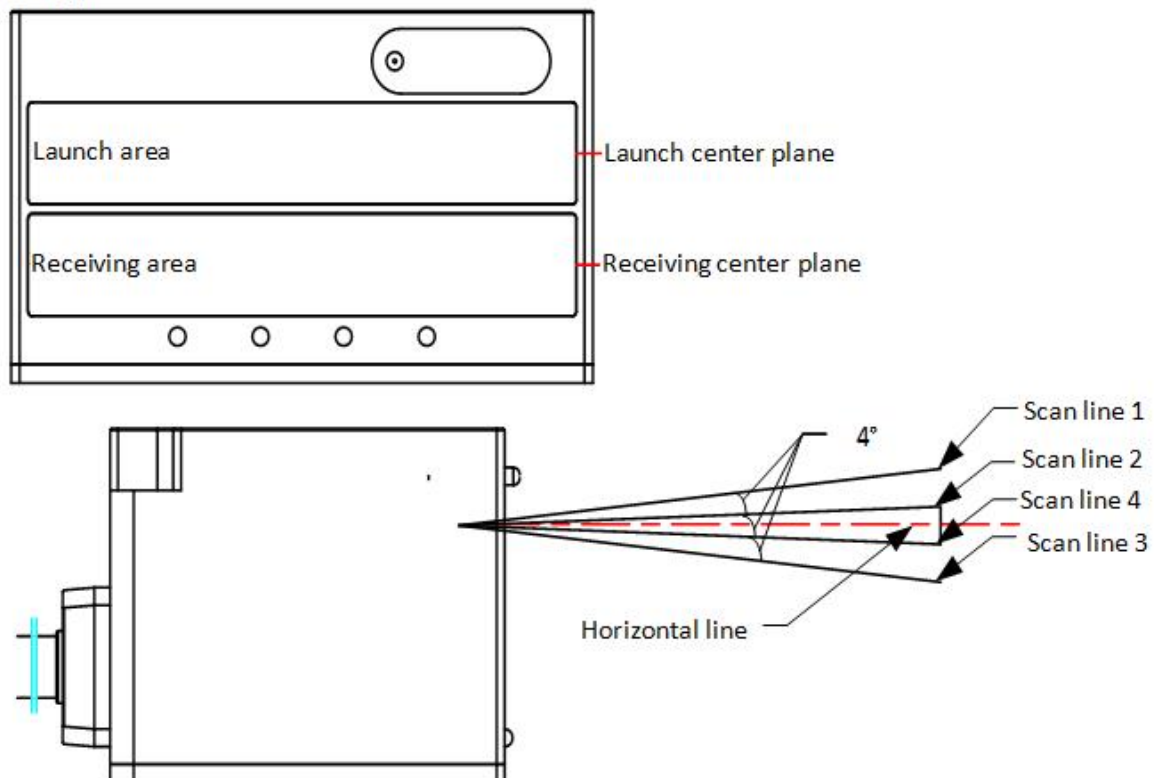
Notice:	1. When switching to no graphics channel, the sensor will keep the previous graphics channel status output 2. Switch the channel within this scan period (scanning period is 25ms), and the output port will keep the state before switching the channel
---------	---

2.2.3 Detection range

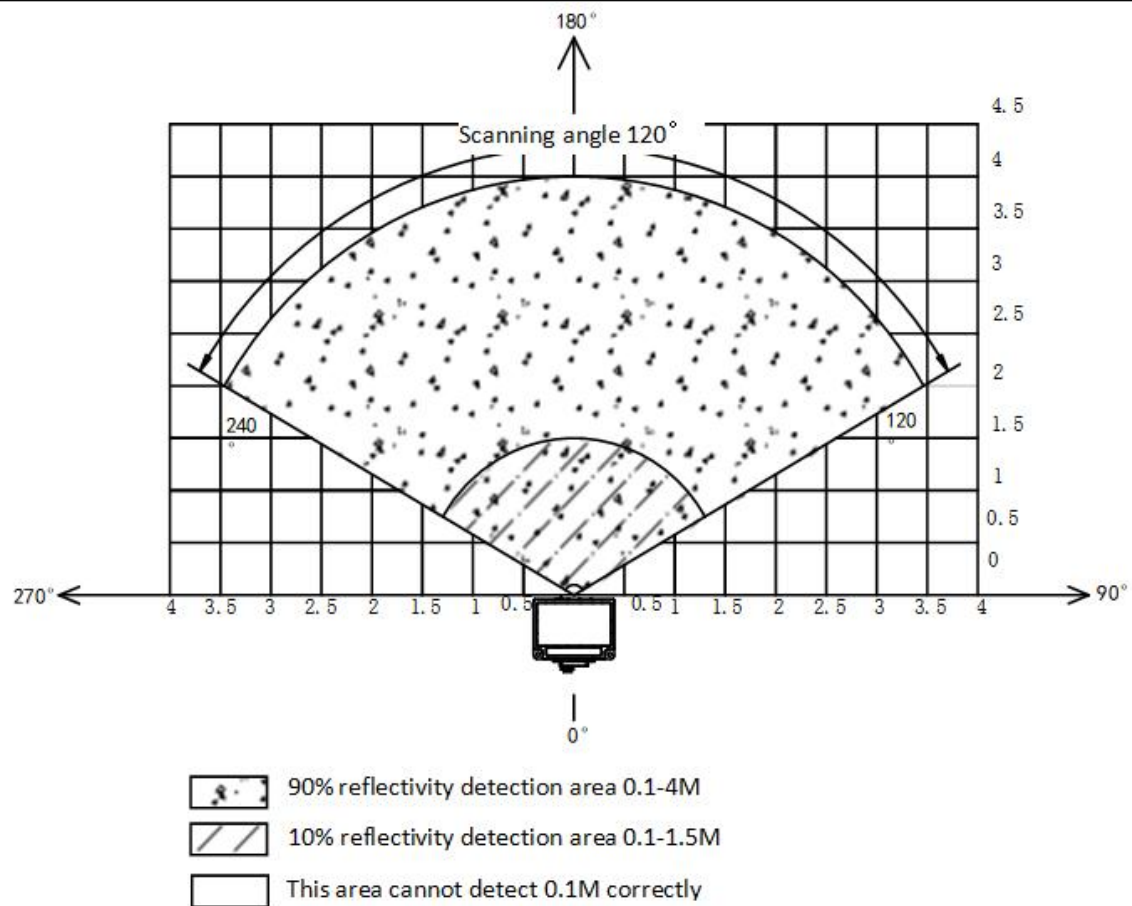
Detection angle horizontal angle



Detect vertical angle

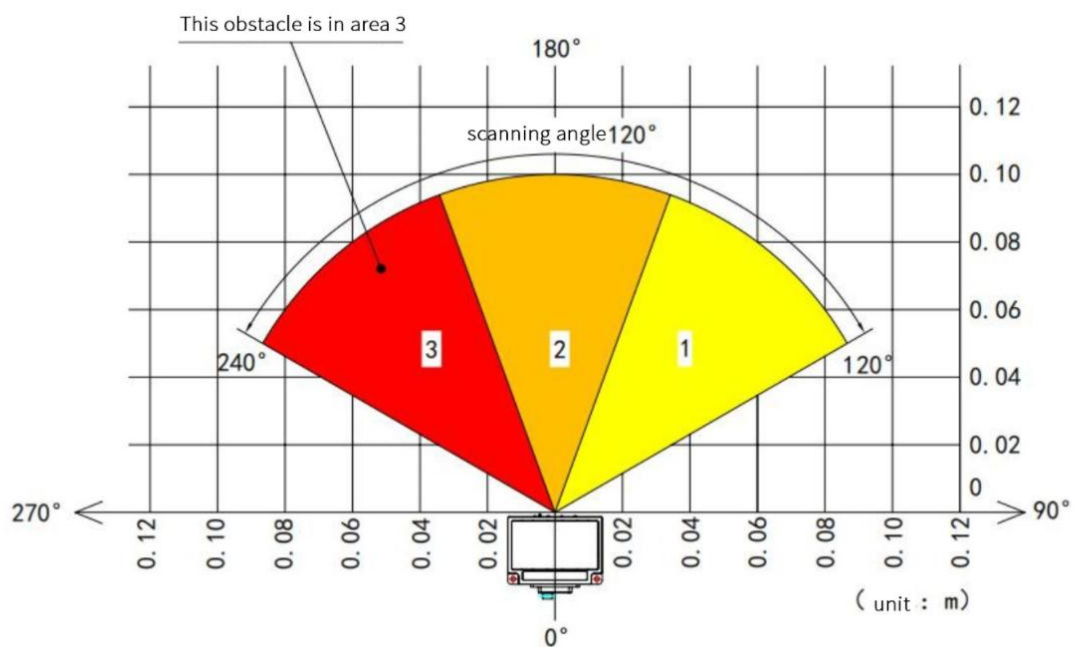


10% and 90% reflectance object detection range is as follows:



It cannot be correctly identified within the range of 0-10cm;

Detection area setting

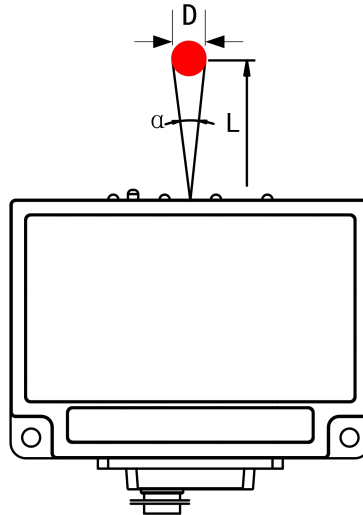


Special note: Set output 1 (warning 2 area), output 2 (warning 1 area), and output 3 (protection area) within the range of an angle of 120° and a radius of 10 cm, then no matter which area the obstacle is in, output 1, output 2. Output 3 has signal output.

2.2.4 The smallest detectable object diameter

There is a rotating mirror in the sensor, and the laser beam will continuously emit laser light with the rotating mirror, so that it can scan a fan-shaped area with a maximum angle of 120°, and the emitted laser beam will cover a fan-shaped surface, thus Objects can be detected in an area of up to 120°.

The angular resolution of sensor is 0.5°



$$d = 2\pi L \frac{a}{360}$$

L: The distance from the measured object to the sensor

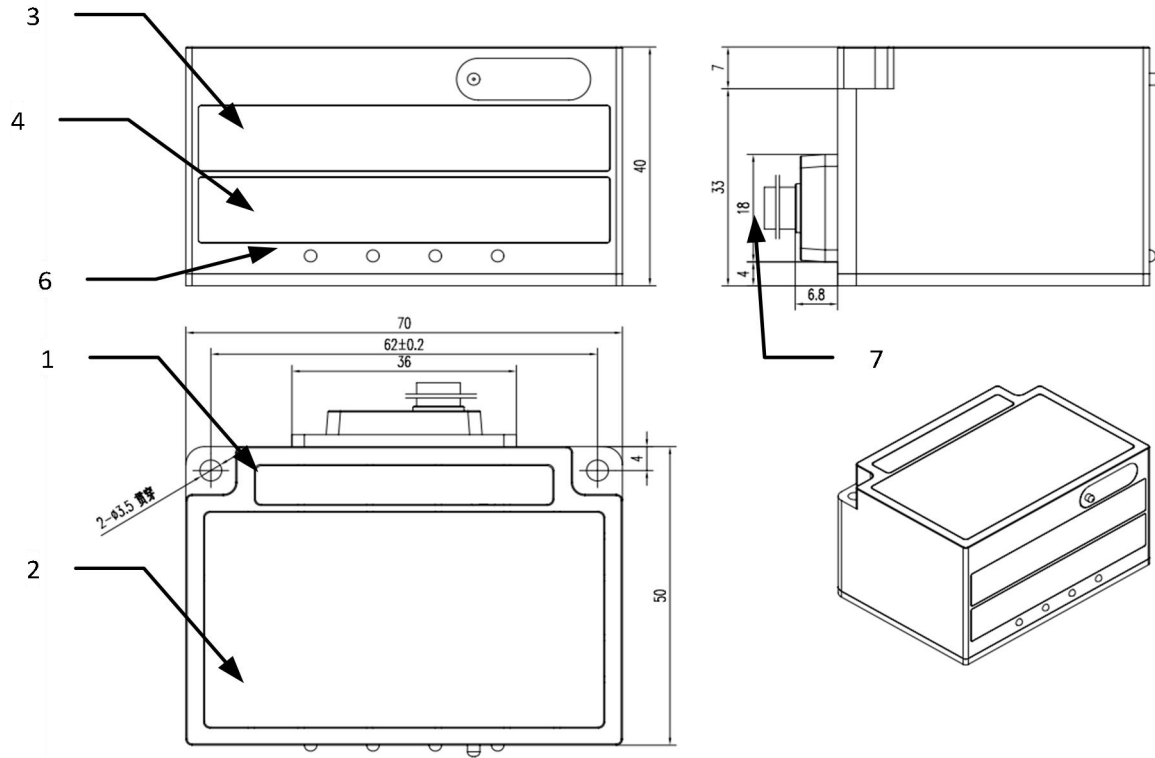
d: The diameter of the object to be measured

a: Laser scanning angle resolution

For example: when L is 1000mm and the laser angle resolution is set to 0.5°, the minimum resolution of objects that can be detected is 8.72mm.(4 round 5 to get 2 decimal places).

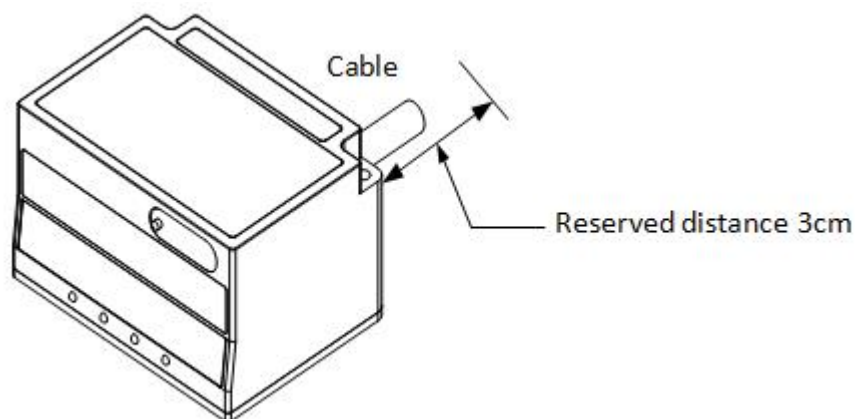
3 Install

3.1 Size parameters

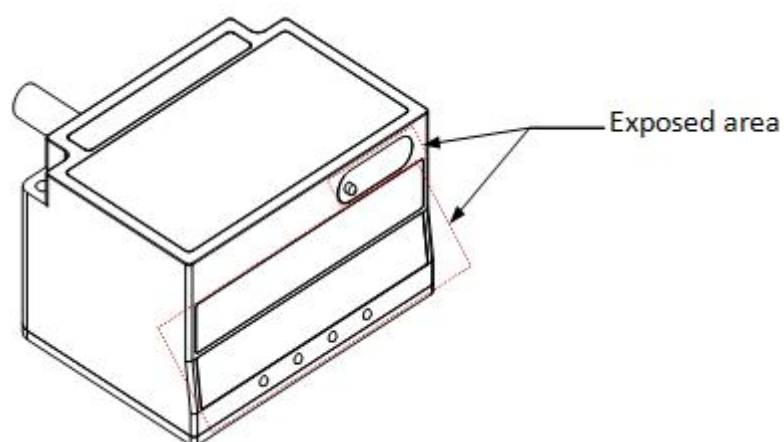


NO.	Sign	Illustrate	Remark
1	-	company label	-
2	-	Line order definition label	See 4.1 Line Definition for details
3	-	Laser emission area	Make sure to keep it clean
4	-	Laser receiving area	Make sure to keep it clean
6	-	Indicator area	Display current sensor status and area detection status
7	-	Power and IO cables	Sensor output cable

3.2 Installation requirements



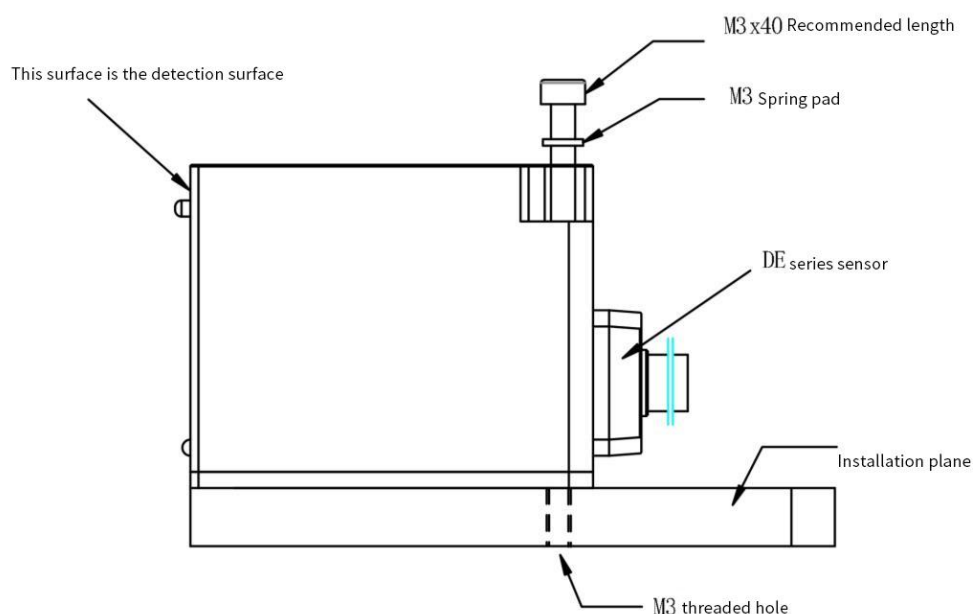
The laser obstacle sensor comes with a cable, and the position of the cable needs to be reserved to avoid excessive bending of the cable.



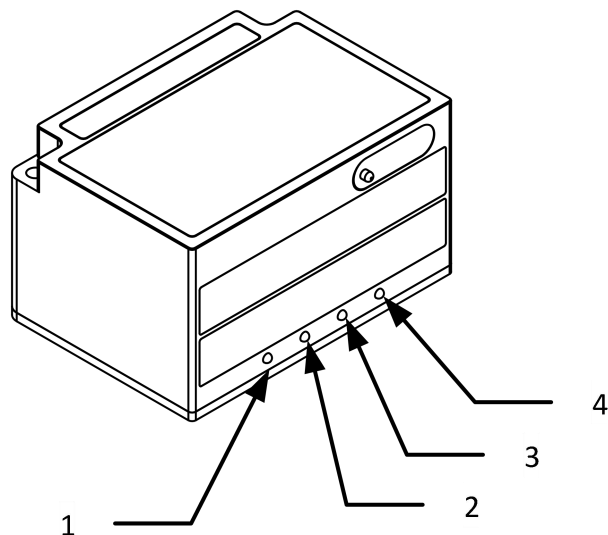
1) When installing horizontally, it should be noted that there are no obstacles on the upper and lower sides of the sensor.

2) There should be an indicator light observation window and a configuration port in front of the laser obstacle sensor base to facilitate observation of sensor status and configuration.

Fixed position



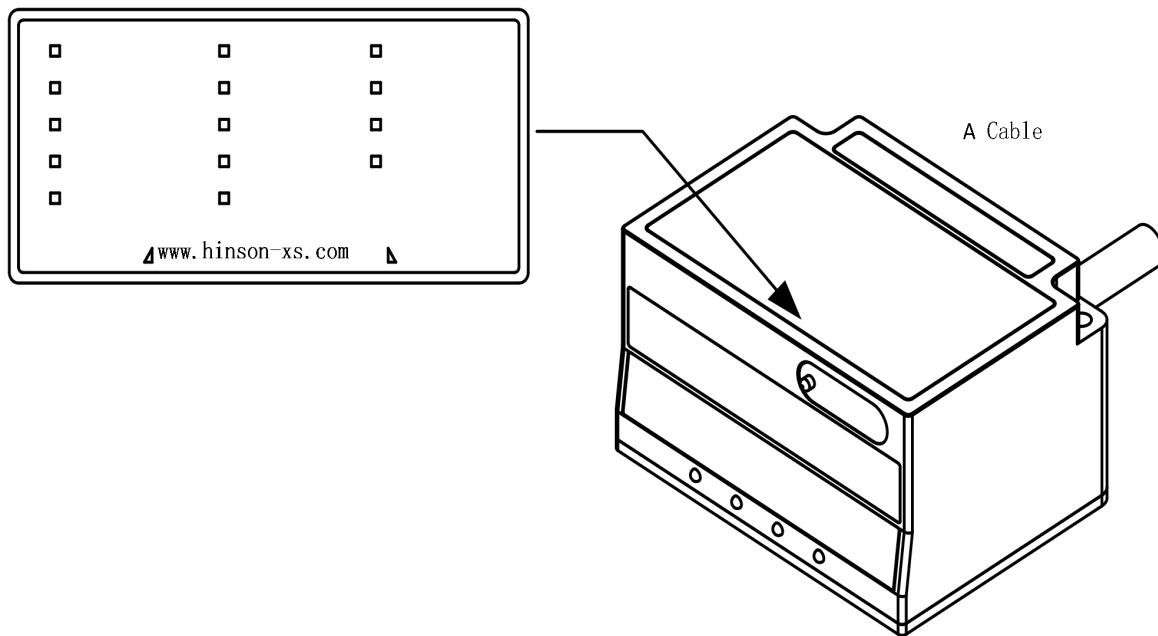
3.3 Indicator light



NO	Symbol	Illustrate	Remark
1	PW	Power/Fault Indicator	When the sensor is powered normally, the power indicator is on
			When the sensor fails, the indicator light flashes the corresponding number of times, see 6.1 Fault Status for details
2	Q1	OUT1 output indicator	Obstacle intrusion warning zone 2 indicator light is on (corresponding to output 1 of the configuration software)
3	Q2	OUT2 output indicator	Obstacle intrusion warning zone 1 indicator light is on (corresponding to output 2 of the configuration software)
4	Q3	OUT3 output indicator	When there is an obstacle intruding into the protection area, the indicator light is on (corresponding to the output 3 of the configuration software)

4 Wiring

4.1 Line definition

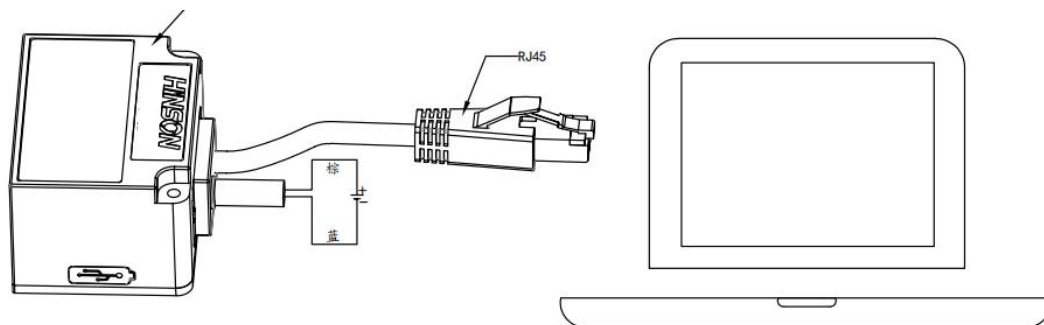


DE-45xx leads to A/B cable, and the definition of A/B cable corresponds to the following table:

A cable (power supply and IO cable)				B cable (Ethernet cable)			
Colour	Signal type	Signal	Function Description	Colour	Signal type	Signal	Function Description
Brown	Power	VCC	12V-32V	White Green	Enthnet	TX+	Ethernet communication TX+
Blue		GND	Negative power supply	Green		TX-	Ethernet communication TX-
Black	Switch Input	OUTCOM	Output common terminal, connected to the negative pole of the power supply	White Red		RX+	Ethernet communication RX+
Orange		OUT1	Warning zone 2 output	Red		RX-	Ethernet communication RX-
Yellow		OUT2	Warning zone 1 output				
White Blue		OUT3	protected area output				
Purple		ERR OUT	Fault output, when DE-45xx is faulty, this port has output				

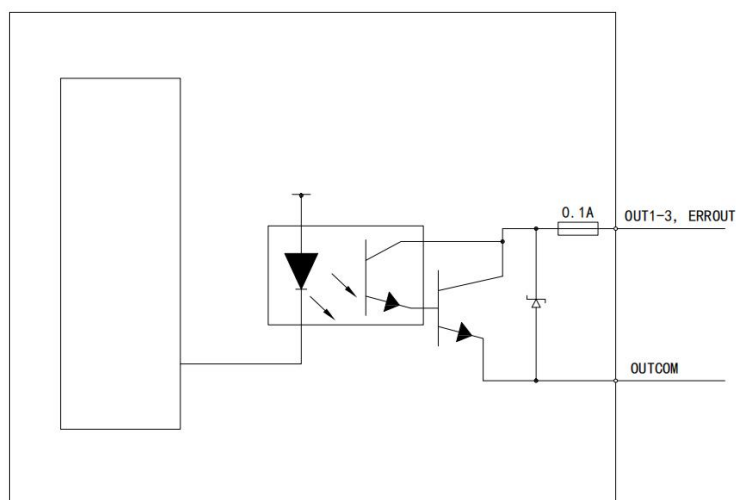
4.2 Power connection

Access power supply: $DC24V \pm 10\%$. In the AGV system or other power equipment network, a DC24V voltage stabilizing device needs to be added to ensure that the interference of the power supply part will not affect the normal operation of the sensor.

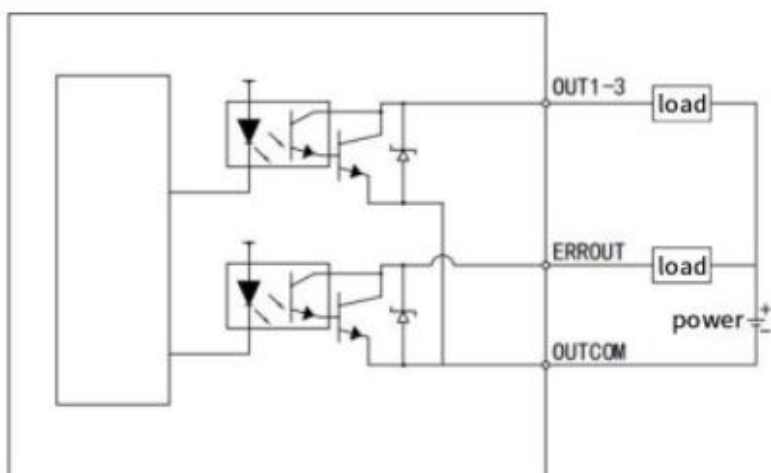


4.3 Switch output

The output port of DE-45xx is an open-collector (NPN) signal, which is output by optocoupler isolation. When the output has a signal, the voltage is 0V, and the maximum load capacity of the output port is 100mA. The internal circuit diagram is as follows:



The following is an example of output wiring:



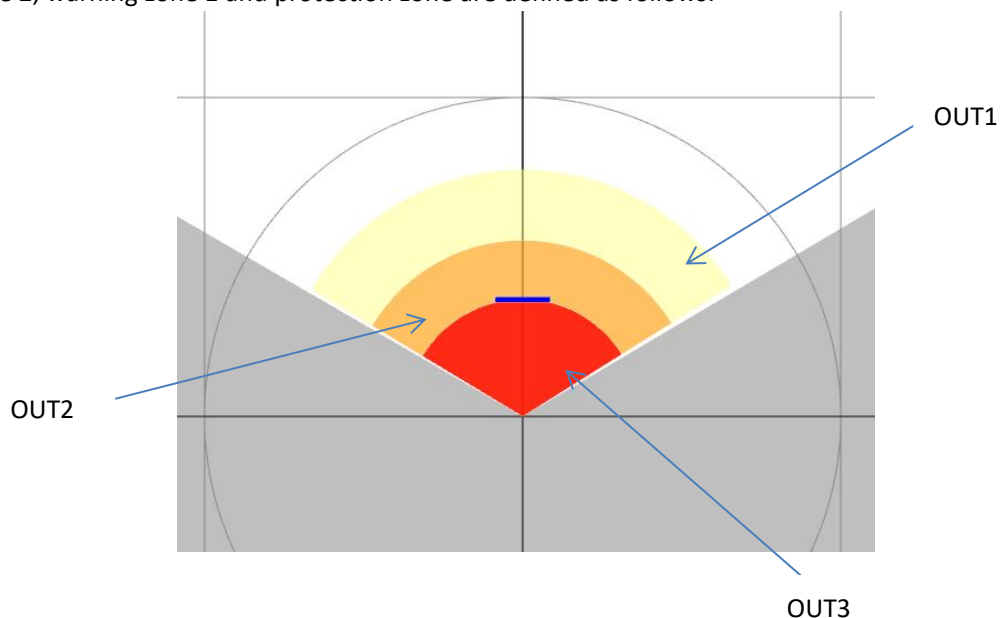
OUT1: Used for remote obstacle detection, corresponding to OUT 1 of the configuration software, when an obstacle invades the area, the port outputs a low level;

OUT2: Used for middle-end obstacle detection, corresponding to OUT2 of the configuration software, when an obstacle invades the area, the port outputs a low level;

OUT3: Used for near-end obstacle detection, corresponding to OUT3 of the configuration software, when an obstacle invades the area, the port outputs a low level;

ERROUT: When a fault occurs, the port outputs low level;

Warning zone 2, warning zone 1 and protection zone are defined as follows:



Notice	Only when the corresponding output has drawn graphics, will there be detection output; The input and output ports cannot be short-circuited or connected to a load exceeding the specified current, otherwise the sensor will be damaged.
--------	--

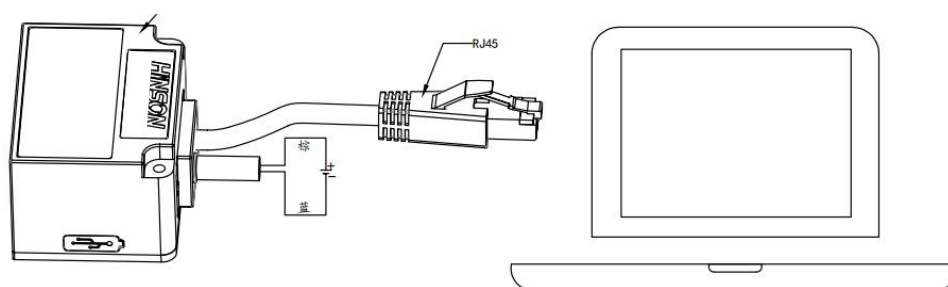
5 Configuration

5.1 Connection

5.1.1 Prepare

laser scanning sensor	Brand	Hinson
	Model	DE-45xx
DC power supply	Voltage	DC10-30V
	Electric current	1A and above
computer	System	Windows 7 and above
	Port	Equipped with RJ45 interface or equipped with USB to RJ45 network
	Resolution	1280*720 and above

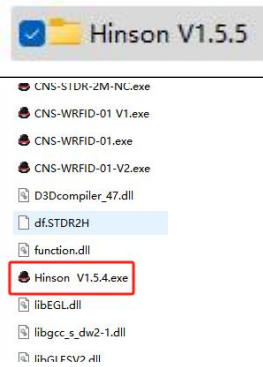
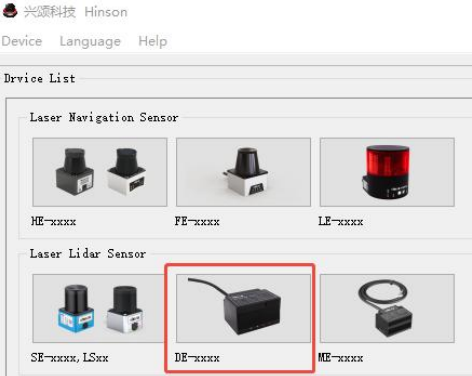
5.1.2 Connect the sensor to the computer



5.2 Configure software operations

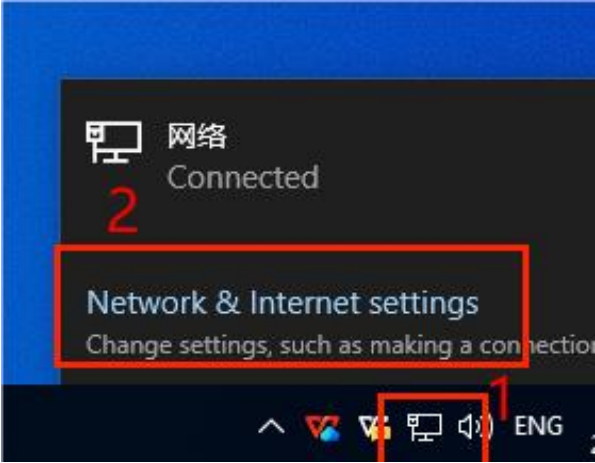
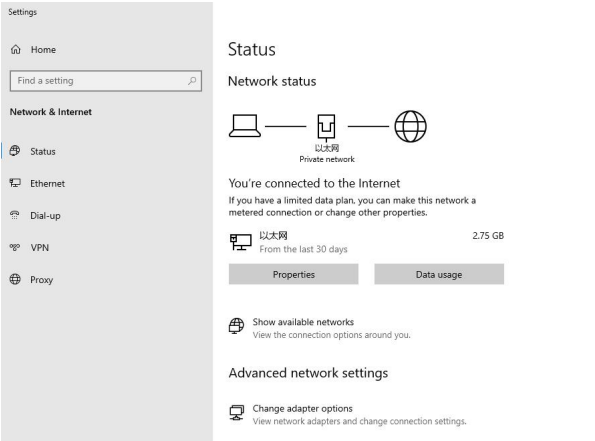
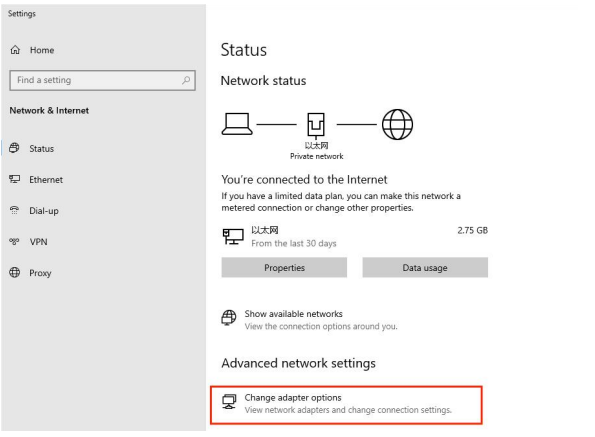
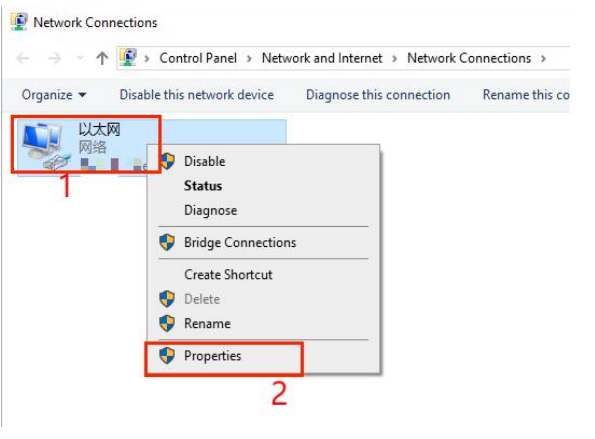
Get software	
1) Visit the company website to obtain www.hinson-xs.com	
2) Consult sales and technical support personnel to obtain	
Software running environment	
System requirements	Windows 7 or above
Display resolution	1280*720 or above
Software decompression	
 Hinson V1.3.6.exe 1) Double-click to open; 2) After the file is unzipped, it will be produced in the current directory;  Hinson V1.3.6	

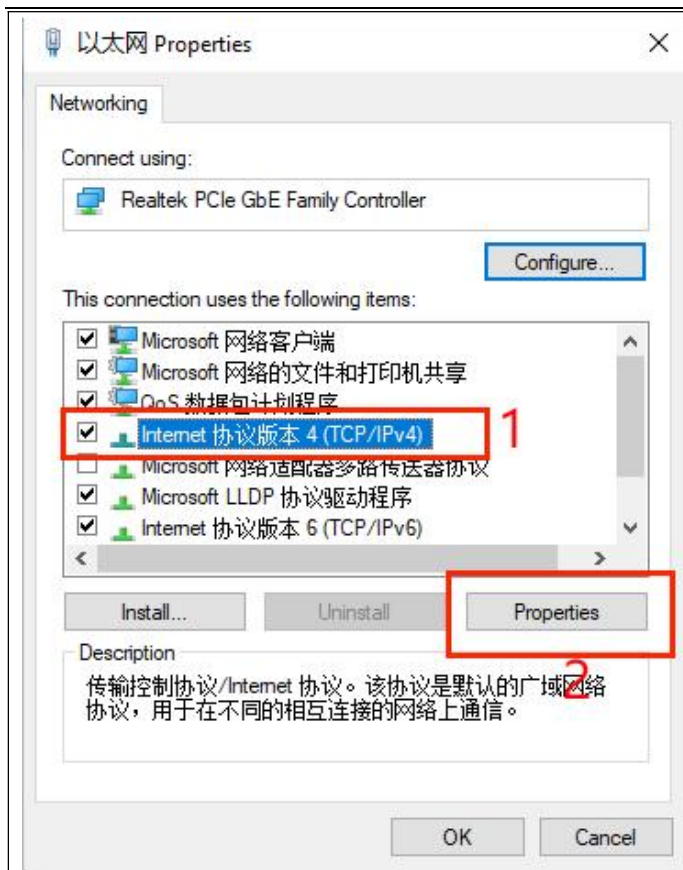
5.3 Run the configuration software

	Unzip the configuration software file
	Open the folder, find the opening configuration software, and open it with the left mouse button; Select to DE-XXXX, click to open;
	When opened for the first time, a prompt will appear. Click "Allow".
	Select the corresponding series of sensors; Connection: Select Ethernet, the software will automatically search for the current sensor IP address in the network and modify the local network connection IP segment according to the radar IP address; Note: If searchable occurs, 1) Please disable other local network connections and try; 2) Turn off the local network proxy software or VPN software;

Set the local IP address;

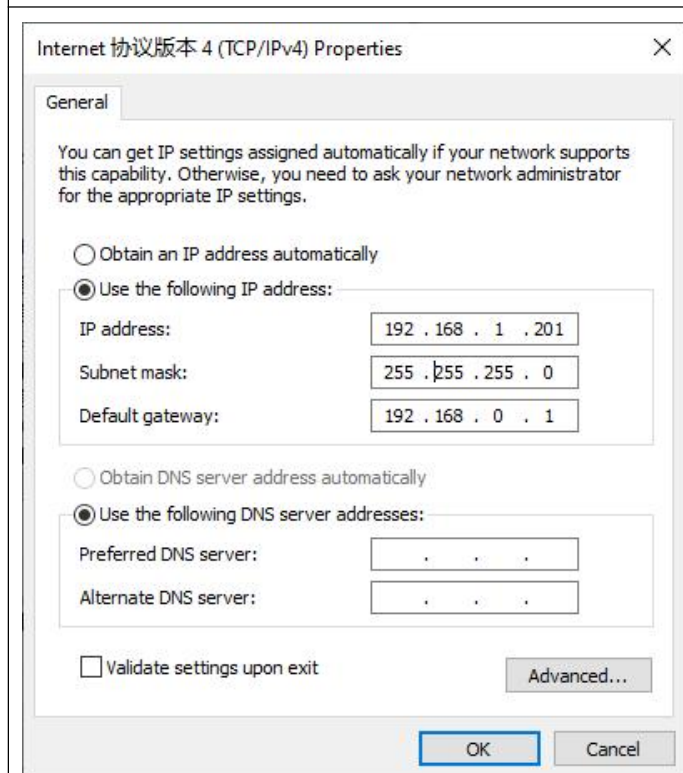
Taking Windows 10 as an example, different system versions may have differences; specific setup methods can be searched online;

 	On the computer desktop, find the network icon in the lower right corner, and then right-click; open "Network & Internet Settings";
	Click to Change adapter options.
	1: Find the local connection of the link sensor; 2: Right-click, select Properties in the pop-up dialog box;



In the local network card attribute interface "This link uses the following items"

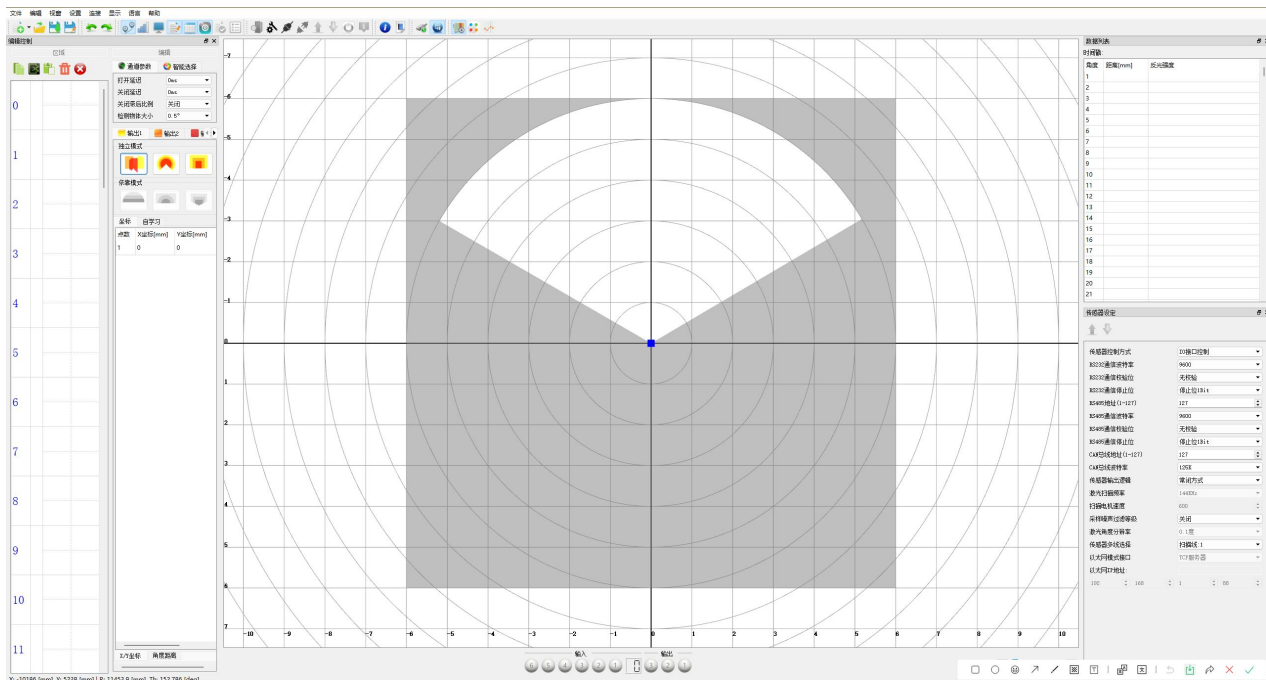
- 1: Select "Internet Protocol Version 4 (TCP/IPv4)";
- 2: Click the "Properties" button below;



"Internet Protocol Version 4 (TCP/IPv4) Properties"
 "Tick the interface "Use the following IP address";
 Fill in the relevant "IP address, Subnet mask, Default gateway;
 After filling in, press the "OK" button to exit.

5.4 Introduction to the configuration software interface

After connecting to the configuration software, the following interface is displayed:



5.4.1 Menu Bar

Level 1 Menu	Level 2 Menu	Level 3 Menu	Correspond icon	Remark
File	Create file	-		Create a new file
	Open file	-		Open edited file
	Save file	-		Save edited file
	Save as	-		Save edited file as
	Exit	-		Exit current configuration software page
Edit	undo	-		Undo previous operate
	Restore	-		Restore previous operate
	Copy	-		Copy detection channel's detection graphic
	Cut	-		Cut detection channel's detection graphic
	Paste	-		Paste detection channel's detection graphic into another channel
	Delete	-		Delete current choose detection channel graphic

	Delete all	-		Delete all detection channel graphic
	App settings	-		-
Windows	Windows	Edit		Click the icon to configure the software to display the edit function box
		Monitor		Click the icon to configure the software to display the monitoring status
		Sensor set		Click the icon to configure the software to display the sensor parameter setting function box
		I/O simulation		Click the icon to display the sensor input and output simulation function box
		Self-check status		Click the icon to display the sensor self-test status
	Distance	-		Click to close or display the scan profile within the current 320° range of the sensor
	Strength	-		Click to turn off or show the reflective intensity of obstacles
	Data list	-		The configuration software does not support the output of distance data for all current detection points, this item is unavailable
Set	Serial port	-		The sensor does not support serial connection configuration software, this item is unavailable
	Ethernet	-		Click to select the Ethernet connection configuration software
	Serial port set	-		The sensor does not support serial connection configuration software, this item is unavailable
	Ethernet set	-		Click to see current status sensor Ethernet address
Connection	Interface	Serial port		The sensor does not support serial connection configuration software, this item is unavailable
		Ethernet		
	Connect device	-		Click to connect sensor and configuration software
	Disconnect device	-		Click to disconnect sensor and configuration software
	Upload data	-		Click to upload the detection channel graph and various parameters that have been set by the sensor
	Download data	-		Click to download the detection channel graph and various parameters
	Restart device	-		After setting the detection channel graph and its parameters, click this icon to restart the sensor, and the parameters will take effect
	Sensor information	-		-

Display	Display graphic	-		Click this icon and the sensor 320° scan profile is displayed in a flat graphic
	Point cloud display	-		Click this icon and the sensor 320° scan profile is displayed as a point cloud
	Line display	-		Click this icon and the sensor 320° scan profile is displayed as a line
Language	Chinese	-		Click this icon, the configuration software is displayed in Chinese
	English	-		Click this icon, the configuration software is displayed in English
Help	About	-		Click this icon to configure the software to display version information
	Guise	-		-

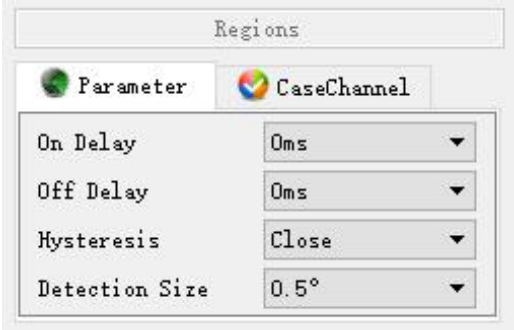
5.4.2 Quick icons

All the shortcut ICONS are explained in the menu bar of Part 1.

5.4.3 Detection channel graphics editing

The DE series supports detection channels from 0 to 63. Each detection channel supports the output of detection graphics for three detection areas. The DE-42XX/DE-46XX can select channels through the signal combination of IN1, IN2, IN3, and IN4 and output whether there are obstacles invading the detection areas of OUT1, OUT2, and OUT3 of the channels.

5.4.4 Channel parameters and intelligent selection

	Open delay: 0-500ms The output signal is output after the object intrusion time is set for the time, which is used to filter objects or interference when flashing; Close delay: 0-500ms, The object invades and outputs the signal, and then the output signal is maintained for the set time after the object leaves, and then the output is restored; It sometimes does not cause frequent jumps in the sensor output port when used in obstacles; Close lag ratio: 0-10%, After the object intrusion is triggered, the object needs to be away from the set proportional distance and restored; Detected object size: 0.5°-5° Adjusting the size of the detected object can reduce the sensor error trigger caused by the unclean mirror of the sensor.
---	---

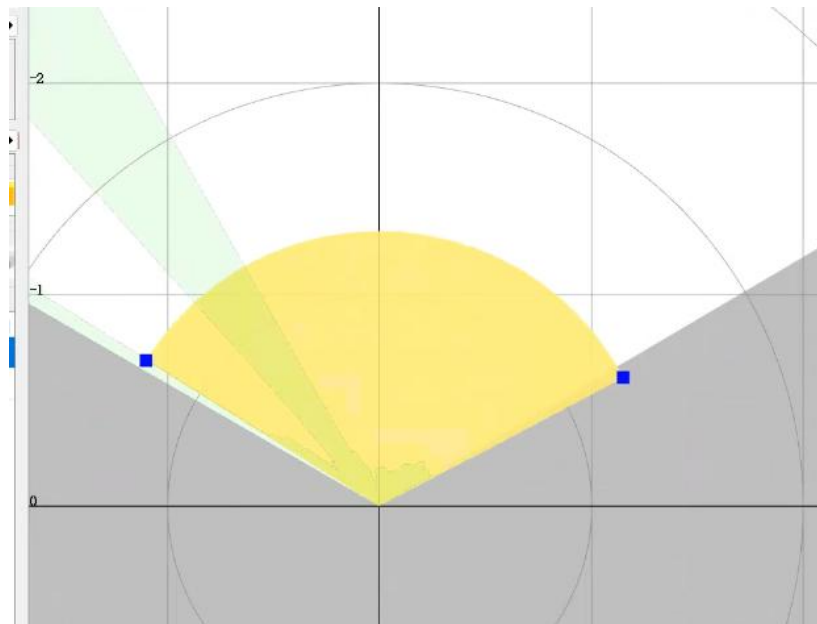
Regions	
Parameter	CaseChannel
Degree Range	0 0
Speed Range	0 0
Operation	Type 0

Only applicable to the DE-43xx/DE-45xx series sensors

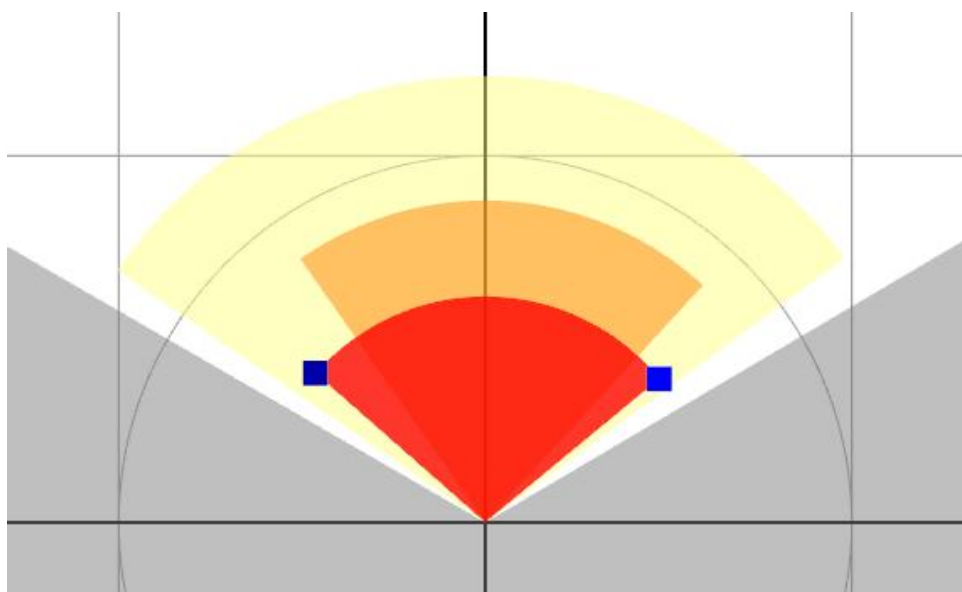
Not applicable to the DE-42xx/DE-46xx series sensors

Output 1, Output 2, Output 3 Edit mode.

Independent mode: Sectors and rectangles can be set separately. The drawing of the figure must not exceed the range of 30 to 150° (the horizontal line to the right of the coordinate origin on the figure is the 0° line, and the range is marked as 30 to 150°).

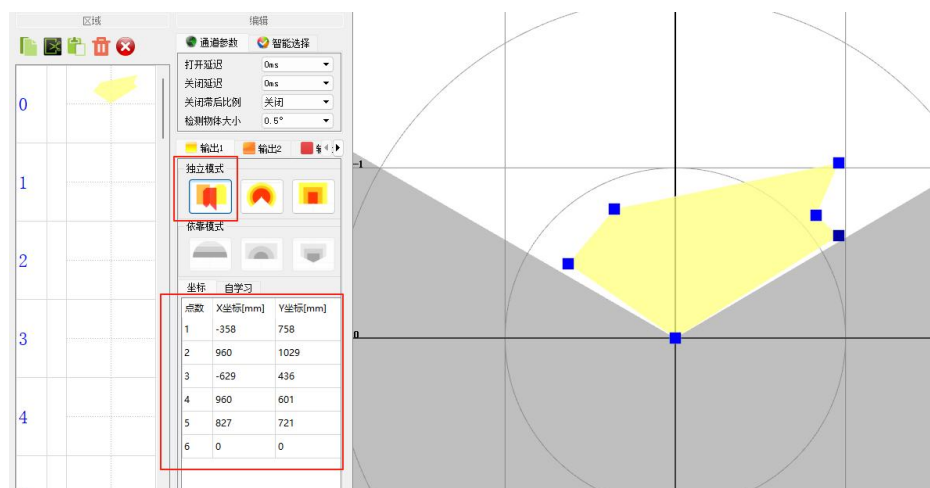


Relying mode: After setting the graphics of output 1, you can choose to copy the graphics of output 1 in different proportions by relying on the mode.



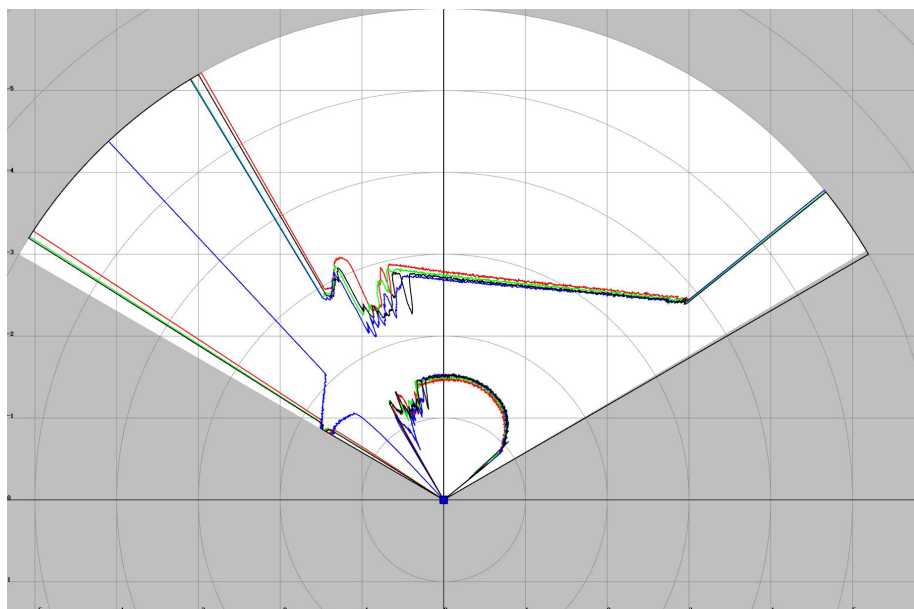
5.4.5 Polygon drawing mode

The distances and angles between each point of the irregular shape and the coordinate origin in the independent mode:

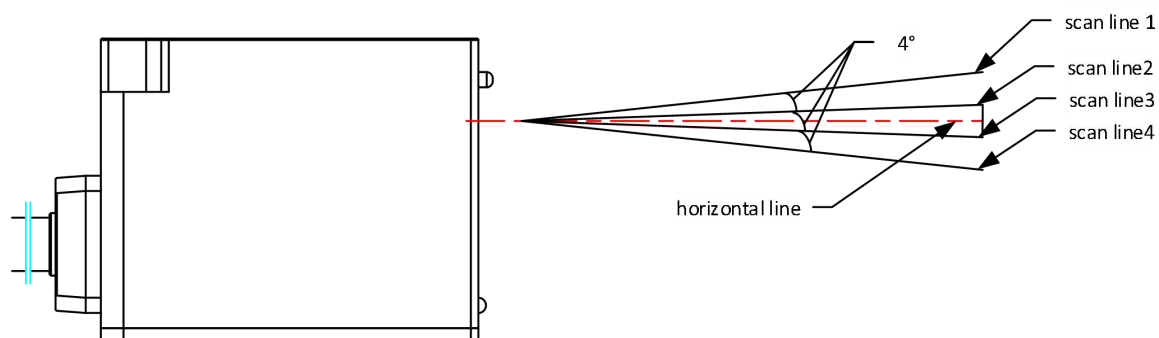


Note: Point 9 is the origin of the coordinate system

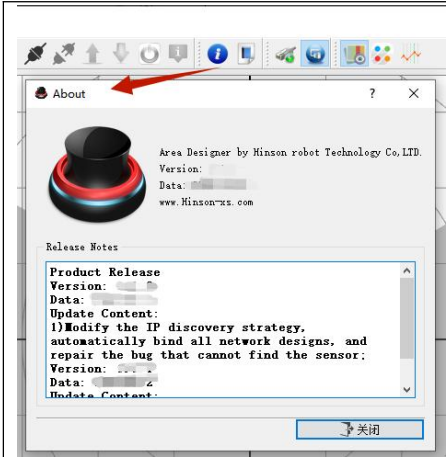
Scanning contour, reflection intensity, detection channel graphic display area:



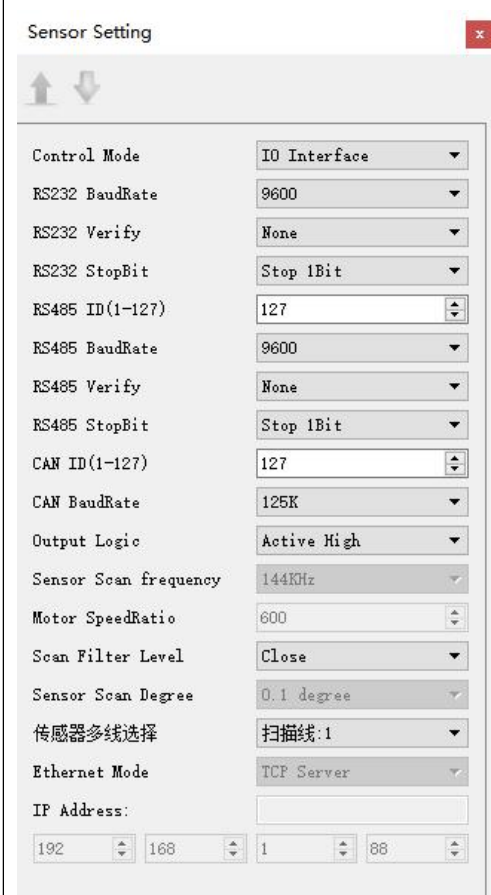
Scanning line 1: red;
 Scanning line 2: green;
 Scanning line 3: blue;
 Scanning line 4: black;



5.4.6 Sensor parameter settings



Confirm the configuration software version;



Parameter configuration list

Parameter name	Parameter	Parameter description	
Sensor control method	IO interface control RS232 communication control RS485 communication control (default) CAN bus control Modbus protocol control CANOPEN protocol control	Series	Support
		DE-43xx Series	RS232 communication control RS485 communication control CAN bus control Modbus protocol control
			CANOPEN protocol control
		DE-42xx/DE-46xxSeries	IO interface control
		The parameters of the D45xx series cannot be set	

RS232 communication baud rate	1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps (default) 6: 460800bps (Only DE-0533F10 support)	RS232 communication baud rate
RS232 communication check bit	1: No parity check (default) 2: Odd check 3: Even check	RS232 communication check bit
RS232 communication stop bit	1: Stop bit 1Bit (default) 2: Stop bit 1.5Bit 3: Stop bit 2Bit	RS232 communication stop bit
RS485 address	1-127 (default 127)	RS485 address
RS485 communication baud rate	1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps (default) 6: 460800bps (Supported by firmware versions larger than 2.5.3)	RS485 communication baud rate
RS485 communication check bit	1: No parity check (default) 2: Odd check 3: Even check	RS485 communication check bit
RS485 communication stop bit	1: Stop bit 1Bit (default) 2: Stop bit 1.5Bit 3: Stop bit 2Bit	RS485 communication stop bit
CAN bus addresss	1-127 (default)	CAN bus addresss
CAN bus baud rate	1: 125K 2: 250K 3: 500K 4: 1000K	CAN bus baud rate
Sensor output logic	Normally closed mode (default) Normally open mode	The output logic of ports OUT1 to OUT3 Normally closed mode An object was detected; (OUT1-OUT3 are in the disconnected state) No object was detected. (OUT1-OUT3 are in the conducting state) Normally open mode An object was detected; (OUT1-OUT3- in the conducting state) No object was detected. (OUT1-OUT3 are in an open state.)

Laser scanning frequency	144K	Set the measurement frequency of the sensor and it cannot be changed. <u>Only applicable to the DE-46xx series</u>
Motor scanning speed	600	Unalterable
Laser angle resolution	0.1° 0.2°	Set the scanning Angle resolution of the sensor; <u>Only applicable to the DE-46xx series</u>
Multi-line selection of sensors	Scan lines 1-4	Set the effective scan line;
Noise filter level	Close Simple Medium Strict	Set the noise filtering level of the sensor. The higher the level, the smaller the jitter of the sensor measurement, but the greater the distortion degree of the graphic edge.
Ethernet mode interface	TCP Server Mode (default) UDP Mode	Sets the communication mode <u>Only applicable to the DE-46xx series</u>
Ethernet IP address	10.10.0.1--223.255.255.255 (default 192.168.1.88)	Set the IP address of the sensor; <u>Only applicable to the DE-46xx series</u>

5.5 Icon function

5.5.1 Input output emulation

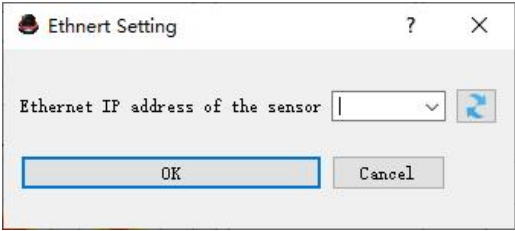
The input and output simulation function is to emulation the operation of the IO port of the laser sensor in the configuration software, or to set the emulation conditions to select the automatic switching port.



Input Port Emulation	Enable input port emulation function. When the emulation function is enabled, the input port action is invalid. This function can simulate input port switching area channels.
Output Port Emulation	Enable the output port emulation function. When the emulation function is enabled, the output port action does not follow the actual sensing object action. This function can simulate output port action.
Exception state simulation	Enable the exception state port output emulation function. When the simulation function is enabled, the sensor fault output port action does not follow the actual sensor abnormal state. This function can simulate the action of the sensor fault output port.
Intelligent Select Simulation	Check "Intelligent Select Simulation" and enable the intelligent selection emulation function. When the intelligent selection simulation function is enabled, the sensor automatic switching area function is invalid. This feature can simulate intelligently selected conditions to allow the sensor to automatically switch areas.

Tips	When an abnormality in the input and output of the sensor is detected, use the input and output port emulation function to test the sensor.
------	---

5.5.2 Network port settings

		It is applicable when connected to the sensor model DE-46xx series and automatically locates the IP address of the sensor
---	--	---

5.5.3 Serial port settings

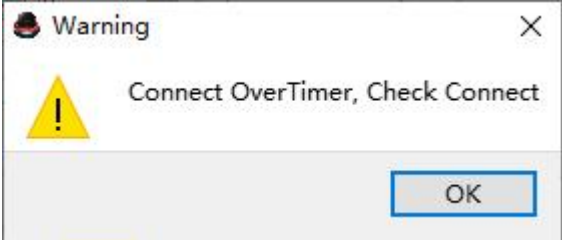
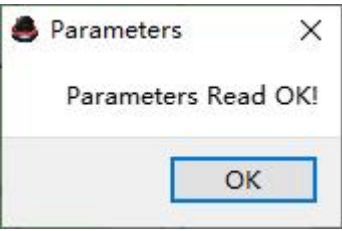
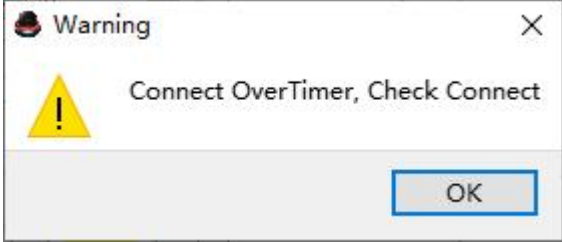
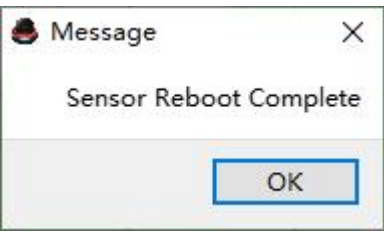
Set the parameters of the parameter configuration port Micro USB. After the sensor is connected via USB, it is connected to the computer system through the COM port.

DE-42xx/DE-43xx/DE-46xx series

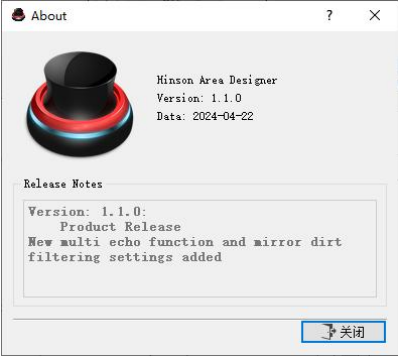
Parameter	Parameter information
Serial port number	COM-*
Communication rate	576000bps
Data bit	8bit
Check bit	None
Stop position	1
Flow control	None

Tips	The connection must be successful using the default parameters.
------	---

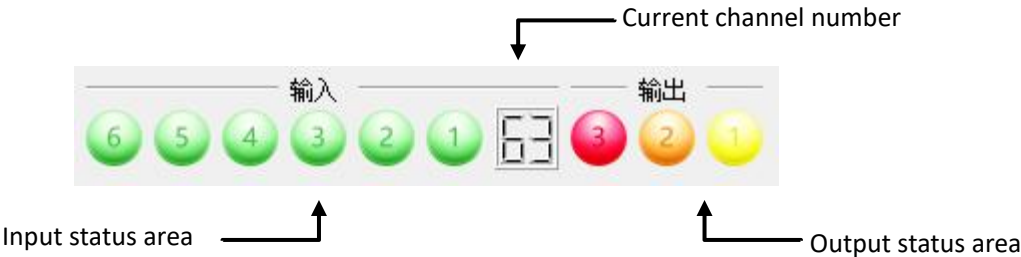
5.5.4 Connection and disconnection

		Connect the device, read the sensor data, and disconnect it from the device. After the connection is successful, start uploading data from the sensor.
		If the device is not connected, a read and write timeout warning will be displayed. After prompting a warning, troubleshoot according to the fault status.
		Upload success prompt; Upload parameters from the sensor and read the current parameters set inside the sensor and the drawn graphic data.
		Download the parameters set by the configuration software and the drawn graphic data into the sensor.
		After the device is not connected to or the connection is disconnected, a read and write timeout warning will be displayed. After prompting a warning, troubleshoot according to the fault status.
		Control sensor restart for sensor initialization and parameter setting to take effect. The restart process is about 5 seconds.

5.6 Sensor firmware version

		After connecting to the sensor, click the version get button to get the current sensor version number; Get the firmware version information of the current sensor.
---	---	--

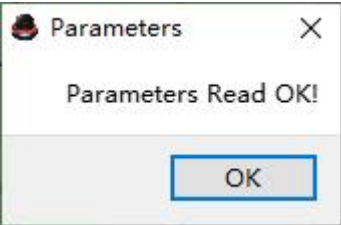
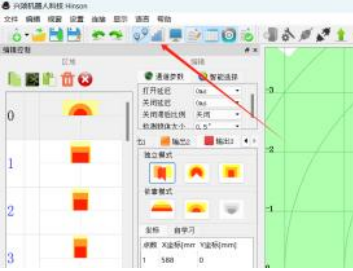
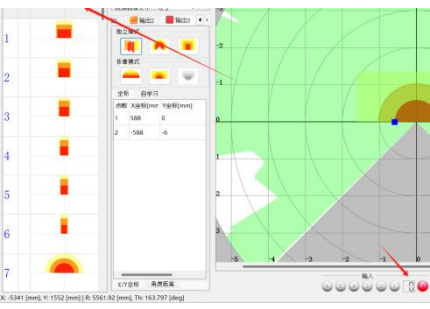
5.7 Sensor Status Bar

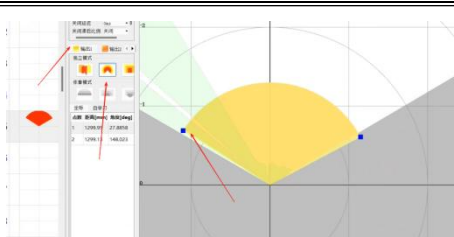


Input status area	Display the current input port status. The numbers 1 to 4 respectively represent the input states IN1 to IN4. Green: No signal input; Gray: Signal input
Current channel number	The displayed value is the channel number of the current sensor that is in effect
Output status area	Display the current output port status. Numbers 1 to 3 respectively represent the output status of OUT1 to OUT3. Related to the sensor output logic of the parameter setting item: Normally closed mode (default) Color: No object was detected; (OUT1-OUT3 are in the disconnected state) Grey: An object has been detected; (OUT1-OUT3 are in the conducting state) Normally open mode Color: Object detected; (OUT1-OUT3 are in the conducting state) Grey: No object was detected; (OUT1-OUT3 are in an disconnected state.)

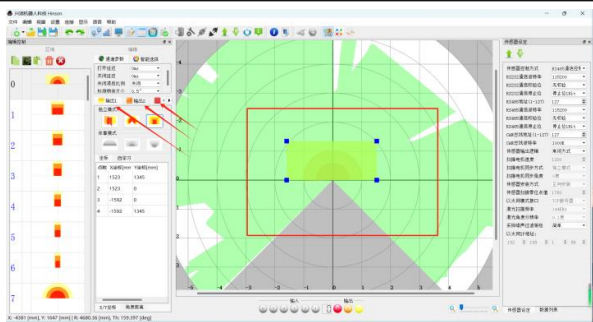
5.8 Quick setup steps

	Open the configuration software
---	---------------------------------

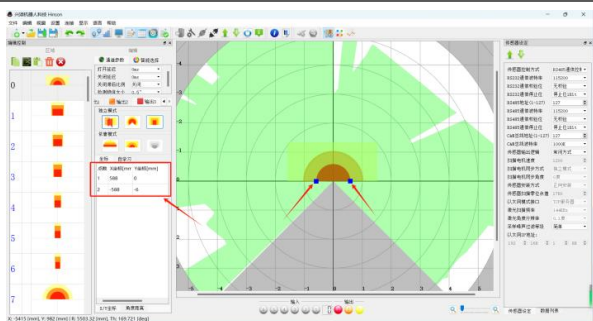
	Select to the DE-XXXX series icon
	Set the connection series model, Refresh the IP address;
	Wait for uploading data;
	The sensor connection was successful;
	Turn off the signal strength
	Select the default channel; In the selected channel number, perform editing;



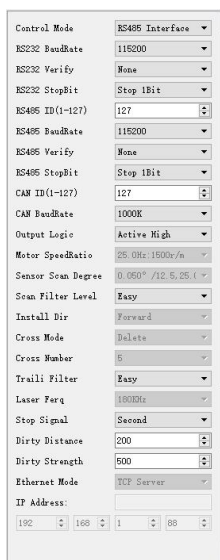
Select to output 1
Select editing mode;



According to the electrical wiring and the defined area number, click the left mouse button to select the area channel you want to edit, and then drag the middle blue dot in the editing area to draw the desired graphic.



The position of the blue dot can also be customized by directly modifying the coordinates.



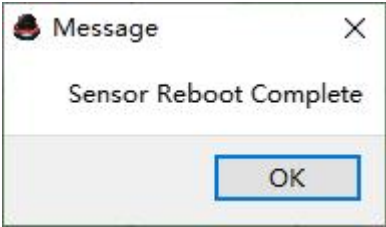
Set parameters;



Download parameters into the sensor.



The parameters are written successfully;



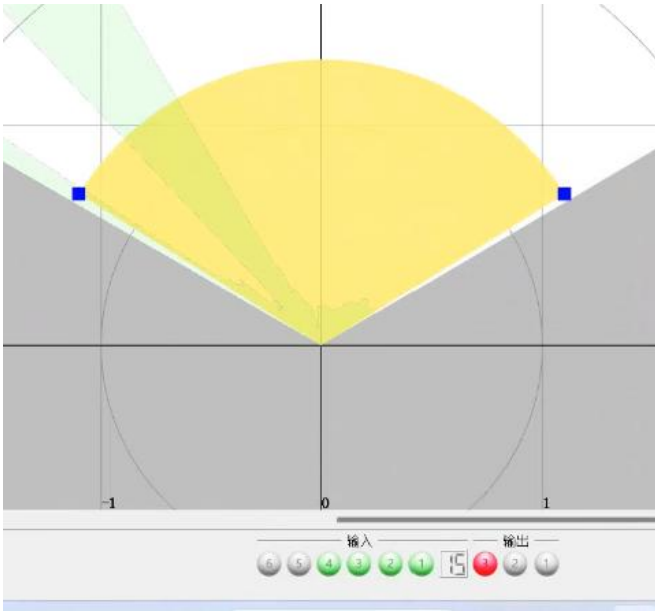
Click Restart to take effect;



After editing is completed, click the "Download Data" button to download the data to the sensor, and then click the "Restart Device" button to restart the laser scanning sensor online.



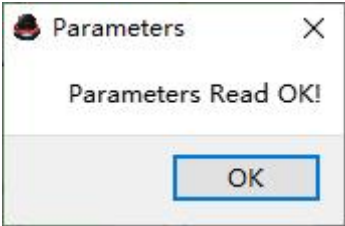
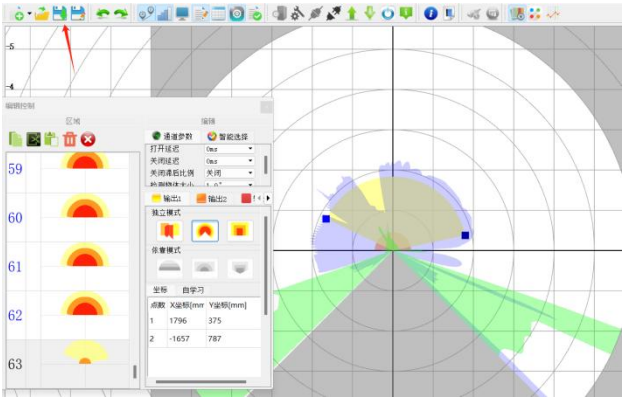
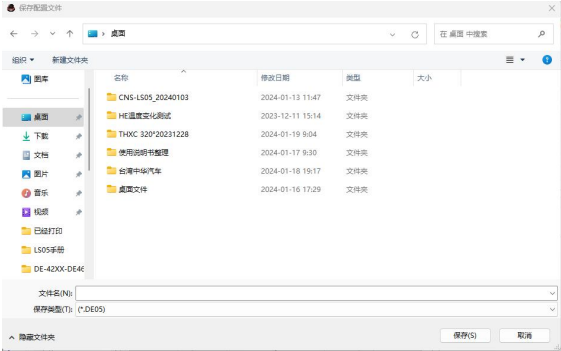
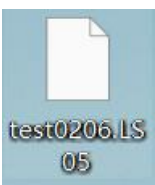
Note: Restart after downloading to take effect!



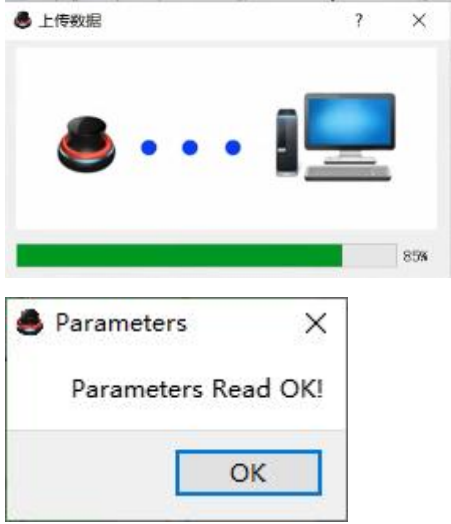
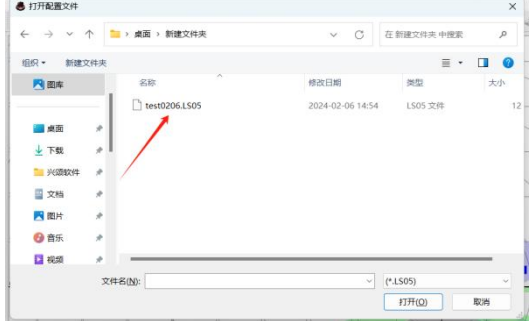
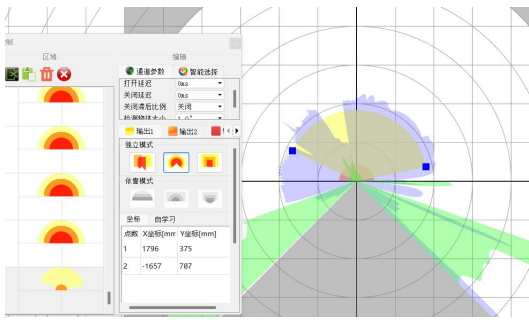
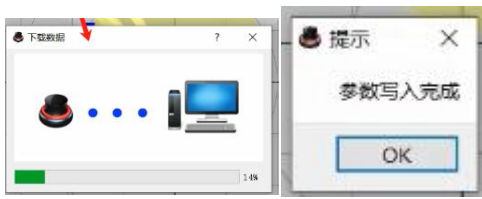
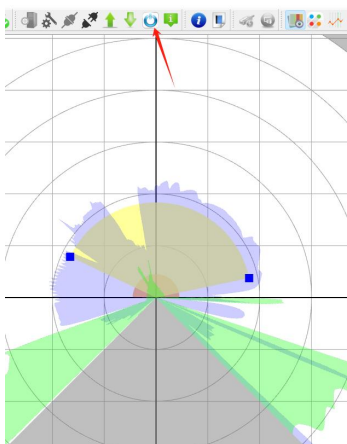
Scanning effect display:
 Figure 1: No obstructions were found within the set range, and all three output lights were on.
 Figure 2: When the obstruction enters the range of output 1, the light of Output 1 goes out and the lights of Output 2 and 3 come on.
 Figure 3: When the obstruction enters the range of output 2, the lights of Output 1 and 2 go out and the light of output 3 comes on.
 Figure 4: When the obstruction enters the output 3 range, all three output lights go out

5.9 Configuration export and import

5.9.1 Configuration import

 	Connect the sensor; and prompt that the parameter reading is completed.
	Click on the upper left corner and click Save Configuration as a file;
	Select the path you need to save; Enter the folder name; Click Save;
	Save the file; The file cannot be opened directly and needs to be imported before it can be used.

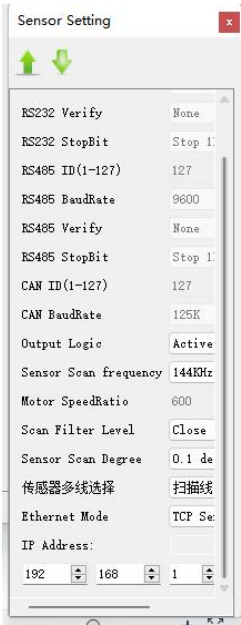
5.9.2 Configuration export

	Connect the sensor; and prompt that the parameter reading is completed.
	Select the path to the configuration file; Select the corresponding configuration file Click to open;
	Display the current configuration after opening the configuration;
	Click to download parameters; Wait for the download progress to complete; After prompting the parameter writing is completed; Download Successful;
	Click the restart button and the parameters take effect;

6 Data protocol

6.1 Parameter setting

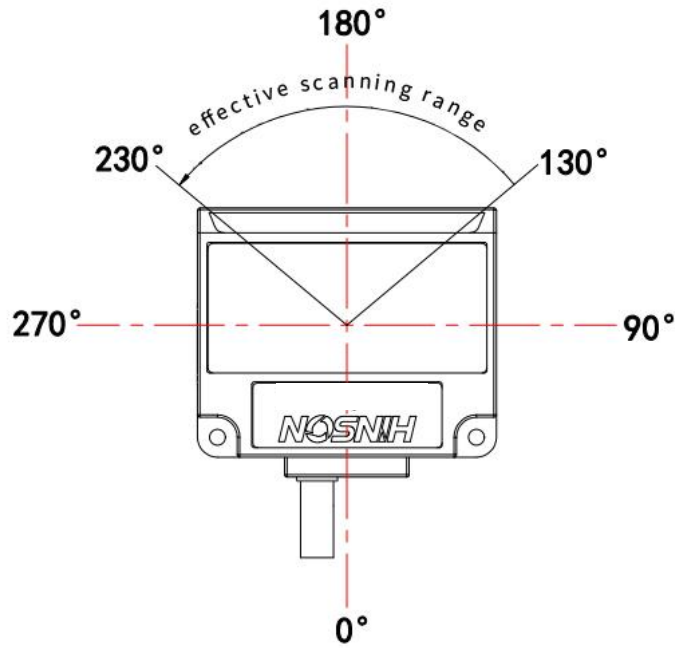
Open the configuration software, enter the sensor (server side) setting interface, and set 3 parameters related to the Ethernet mode.



Parameter name	parameter value	Defaults
Ethernet mode interface	TCP server	TCP server
	UDP mode	
Ethernet IP address	10.0.0.1 start The sensor (server) port is fixed at 8080	192.168.1.88
Laser angular resolution	0.1°	0.1°
	0.2°	

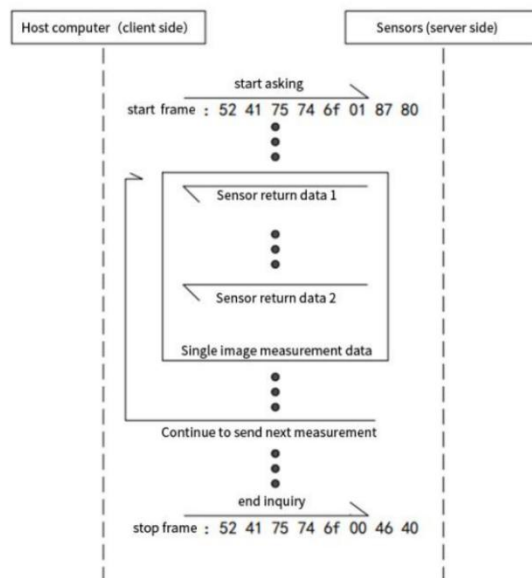
6.2 Measurement data acquisition

DE-45xx measures the distance and reflective intensity of obstacles within a range of 100° according to a fixed cycle. The measurement start angle is 120° and the end angle is 240°. Angle resolution can be set to 0.1° and 0.2°. Total measurement points = 100/angle resolution, the sensor coordinate system is as follows:



The sensor scans the distance of 120° - 240° and the reflection intensity data is transmitted in 2 frames. Each frame of transmission data includes "start code", "start angle", "end angle", "measurement points of the current data frame", "distance of each detection point and its reflection intensity", the client passes the start and the end angle value to reconstruct the distance of each point, and the measurement result is the current environment result scanned by the sensor.

After the client initiates a request and establishes a connection, data transmission starts, and the transmission method is as follows.



The host computer (client) sends a start data frame to the sensor (server), and the sensor returns the measurement data of 120° - 240° in 2 frames. After returning the complete measurement data of 120° - 240° , the sensor continues the next measurement. The data is sent until the sensor receives the stop data frame sent by the host computer.

6.2.1 Send to obtain the measurement data

◆ Start data frame (Hex)

0x52 0x41 0x75 0x74 0x6F 0x01 0x87 0x80

After the host computer sends the start frame to the sensor, the sensor returns the measurement data.

6.2.2 Sensor returns the measurement data

◆ Measurement data frame (Hex)

1	2	3	4	5	6
Start code	Scan line number	Starting angle	End angle	Measurement points	Measurement data
5Byte	1Byte	H L	H L	H L	(measurement points*4) Byte
		2Byte	2Byte	2Byte	

The measurement data frame of each circle is 2 frames, and the data length of each frame is fixed, and an example will be given below.

1. Start code (Hex):

0x43 0x6C 0x6F 0x75 0x64

2. Scanning line number (Hex):

01-04 represents the scan line number represented by the frame data;

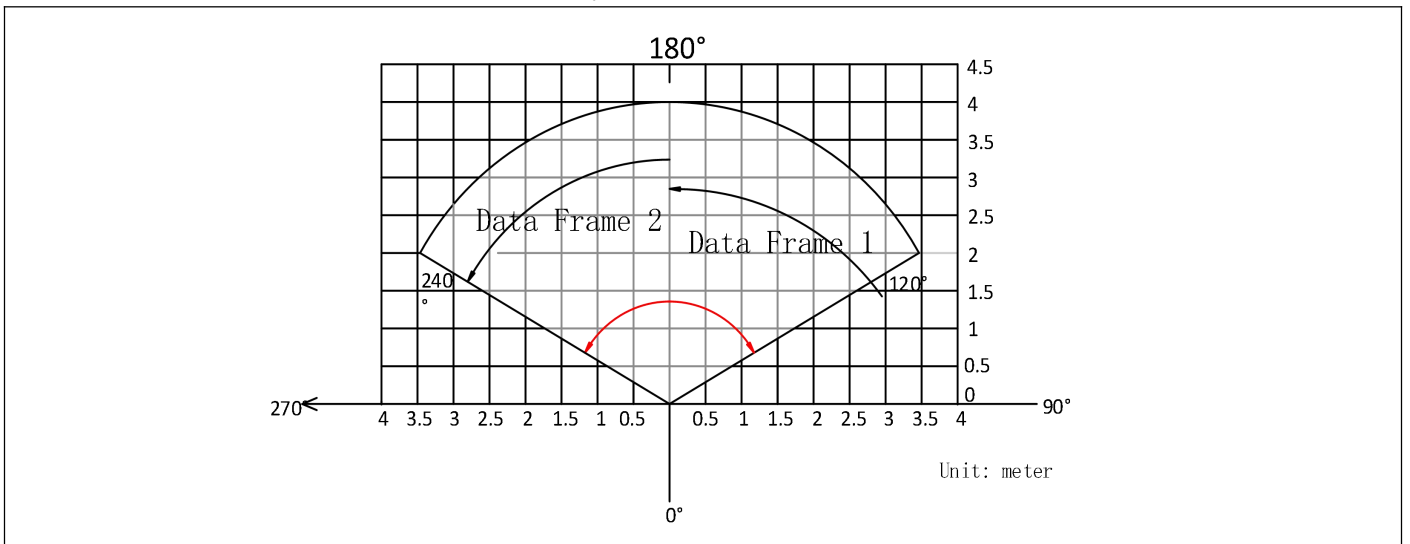
3. Starting angle (Hex):

The current starting angle of measurement, the minimum is 120° , the high position is in front and the low position is behind;

4. End angle (Hex):

The angle of the current end measurement, the maximum is 240° , the high position is in front, and the low position is behind;

120° - 240° data is returned in 2 frames, and the positions of 120° and 240° are defined as follows:



5.Measurement points (Hex):

The number of measurement points is related to the start angle, end angle, and laser angle resolution.

Number of measurement points = (end angle - start angle) / laser angle resolution, the following table is an example.

Starting angle	120°	180°	120°	180°
End angle	180°	240°	180°	240°
Laser angular resolution	0.1°	0.1°	0.2°	0.2°
Measurement points	500	500	250	250

6.Measurement data (Hex):

The first point measurement data (4Byte)				The second point measurement data (4Byte)				 (4Byte)				Last point measurement data (4Byte)			
Measuring distance (2Byte)		Measure strength (2Byte)		Measuring distance (2Byte)		Measure strength (2Byte)		Measuring distance (2Byte)		Measure strength (2Byte)		Measuring distance (2Byte)		Measure strength (2Byte)	
L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H

The unit of measuring distance is mm, and the output is the distance data between the reflection point and the sensor;

The measurement intensity is reflected by the reflective intensity of the reflection point. The higher the value, the stronger the reflective ability of the object;

The measurement distance and intensity are both low in front and high in back;

◆ Stop data frame (Hex)

0x52 0x41 0x75 0x74 0x6F 0x00 0x46 0x40

After the host computer sends a stop data frame to the sensor, the sensor stops returning measurement data.

6.2.3 Examples

1. The sensor parameters are set as follows;

Ethernet mode interface: TCP server

Ethernet IP address: 192.168.1.88

Laser angular resolution: 0.1°

It is important to note that the sensor (server) port is fixed at 8080, and the connection between the host computer and the sensor is established successfully.



2、The host computer sends a start data frame (Hex) to the sensor

The start data frame is 0x52 0x41 0x75 0x74 0x6F 0x01 0x87 0x80



3、The sensor returns the measurement data frame (Hex) to the host computer

Measurement data frame 1: scan line 2 measurement data

The start angle is 120° , the end angle is 180° , the number of measurement points=(180-120)/0.1=500, and the measurement data returns 2000Byte.

1	2	3		4		5		6
Start code	Scan line number	Starting angle		End angle		Measurement points		Measurement data
0x43 0x6C 0x6F 0x75 0x64	02	H	L	H	L	H	L	xx xx xx xx ... xx xx xx xx
		00 82		00 B4		01 F4		Measurement data return 500*4Byte=2000Byte

Measurement data frame 2:

The start angle is 180° , the end angle is 240° , the number of measurement points=(240-180)/0.1=500, and the measurement data returns 2000Byte.

1	2	3		4		5		6
Start code	Scan line number	Starting angle		End angle		Measurement points		Measurement data
0x43 0x6C 0x6F 0x75 0x64	02	H	L	H	L	H	L	xx xx xx xx ... xx xx xx xx
		00 B4		00 E6		01 F4		Measurement data return 500*4Byte=2000Byte



4、The sensor continues to return the measurement data frame (Hex) to the host computer



•
•
•



5、The upper computer sends a stop data frame (Hex) to the sensor

52 41 75 74 6F 00 46 40



6、The sensor stops returning measurement data.

6.3 Region state fetch data

The following protocol acquires the current status information of the sensor

6.3.1 Send to obtain the status data

Data identifier	5Byte
Sensor working mode	1Byte
Sensor channel value	1Byte
Switching angle value in smart channel selection mode	2Byte
Switching speed value in smart channel selection mode	2Byte
Channel group number	2Byte
Invalid data bit	3Byte
Check Digit	2Byte

- Data identifier (5byte)
The identifier is fixed data: 0x57 0x53 0x69 0x6d 0x75 This data function;
- Sensor working mode (1byte)
00: Invalid command
01: channel designation mode
02: Intelligent channel selection mode
- Sensor channel value (1byte)
The current sensing channel of the control sensor, the data range is 00-63;
- Sensor communication angle (2byte)
Angle value in channel group mode, the data is signed data range -180-180;

- Sensor channel speed value (2byte)
Speed value in channel group mode, the data is signed data range -300-300;
- Sensor channel group number (2byte)
The channel group number used by the control sensor for current sensing, the data range is 00-04;
- Invalid data (3byte)
Invalid data, the default data must send 0x00;
- Check digit (2byte)
The data check digit adopts the CRC16 check method with modbus low order first. The verification value is calculated by the verification formula, and the specific calculation method is detailed in the appendix.

6.3.2 Sensor returns data

Data identifier	5Byte
Sensor channel value	1Byte
Invalid data	1Byte
IO port output status	1Byte
Invalid data	1Byte
Fault state	2Byte
Invalid data	10Byte
Check Digit	2Byte

- Data identifier (5byte)
The identifier is fixed data: 0x57 0x53 0x69 0x6d 0x75 This data function;
- Current channel value (1byte)
The current channel value of the sensor is 0-15;
- Invalid data (1byte)
Invalid data;
- Output status (1byte)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Invalid					OUT3	OUT2	OUT1

Rsetting item sensor output logic:

Normally closed mode (default)

00: object detected;

01: No object detected

Normally open mode

01: Object detected;

00: no object detected;

- Invalid data (1byte)
invalid data;
- Sensor fault status (2byte)
Display the current status of the sensor, the value range is 00-07;
00: The sensor is in normal state;
01-07: sensor fault status;
- Invalid data (10 byte)
invalid data;
- Check digit (2byte)

The data check digit adopts the CRC16 check method with modbus low order first. The verification value is calculated by the verification formula, and the specific calculation method is detailed in the appendix.

6.4 Firmware information Acquisition Data

Obtain the information of the current sensor version

6.4.1 Send to obtain data

Data identifier	5Byte
Check Digit	2Byte

- Data identifier (5byte)
The identifier is fixed data: 0x52 0x50 0x72 0x64 0x61 This data function;
- Check digit (2byte)
The data check digit, 0xC7 0xFF

6.4.2 Sensor returns Data

Data identifier	5Byte
Sensor type	2Byte
Firmware version number	2Byte
Sensor serial number	2Byte
Production year	2Byte
Production month	2Byte
Production Day	2Byte
Invalid data	494Byte

- Data identifier (5byte)
The identifier is fixed data: 0x52 0x50 0x72 0x64 0x61 This data function;
- Sensor type (2byte)
Fixed data;
- Firmware version number (2byte)
The data is read as 16, and the version number is parsed as decimal data. For example, when reading data, 0x00 0x64, decimal 100, version number V.1.0.0;
- Sensor serial number (2byte)
The current sensor serial number reads the data as 16, and the version number parses it as decimal data;
- Production year (2byte)
The current production year of the sensor reads data as 16, and the version number is parsed as decimal data;
- Production month (2byte)
The current sensor production month has data ranging from 1 to 12. The data is read as 16, and the version number is parsed as decimal data;
- Production Dayr (2byte)
On the current production date of the sensor, the data range is 1 to 31. The data is read as 16, and the version number is parsed as decimal data;
- Invalid data (2byte)
Invalid data, meaningless;

6.5 CRC check

C language CRC check function

cBuffer: Calculate the array of CRC checksums.

iBufLen: The length of this array.

unsigned int CRC_Verify(unsigned char *cBuffer, unsigned int iBufLen)

```
{
    unsigned int i, j; //define wPolynom 0xA001
    unsigned int wCrc = 0xffff;
    unsigned int wPolynom = 0xA001;
    /*-----*/
    for (i = 0; i < iBufLen; i++)
    {
        wCrc ^= cBuffer[i];
        for (j = 0; j < 8; j++)
        {
            if (wCrc & 0x0001)
            { wCrc = (wCrc >> 1) ^ wPolynom; }
            else
            { wCrc = wCrc >> 1; }
        }
    }
    return wCrc;
}
```

7 Troubleshooting

7.1 Fault status

DE-45xx prompts the failure through the power indicator light, and the sensor will stop outputting signals when the green LED is flashing;

LED number of flashes	Troubleshooting	Deal with
Always on	Normal status	
Flashing	Sensor fault status	1) Restart the sensor; 2) If the error is still reported after restarting, replace the sensor; 3) Contact after-sales staff

7.2 Troubleshooting

When the DE-45xx cannot work normally or the status cannot be determined, troubleshoot and confirm according to the following procedures.

Fault	Solve
Object not detected	Use the configuration software to view and monitor the current channel status and drawn detection area;
Channel cannot be switched	Check whether the sensor correctly receives the channel switching instruction;
Output signal flashes	(1) When the sensing range is at the critical point, the output port may be unstable, and the protection area should be expanded if necessary. (2) There is dust in the sensor detection window;
The power light is blinking	Contact us

8 After-sale information

8.1 Warranty period

Hinson provides a limited-time warranty. During the warranty period, if the product cannot be used normally due to quality problems or design defects, we will provide free after-sales maintenance.

- Warranty period: 2 years from sale.

8.2 Warranty coverage

If the product is within the warranty period and falls within the scope of the warranty conditions, we will repair or replace it free of charge

- The warranty and after-sales service of this product are limited to mainland China;
- Due to the unpacking of the product caused by transportation, it cannot be used normally;
- Failure to work due to damage to the components of the product itself;
- Defects in product design make it impossible to use normally;

8.3 Scope of disclaimer

Please pay attention to the following conditions during the use of the product, we will not provide free after-sales and warranty.

- Failure to install the product correctly according to the instructions, resulting in damage to the product;
- Using this product in an unsuitable environment and condition, resulting in damage to the product;
- Damage to the product due to failure to operate in accordance with the specifications of the product manual;
- Disassemble or repair the product without the permission of the company;
- Product damage caused by irresistible external forces such as natural disasters and fires.

8.4 Technical support

Guangdong Hinson Technology Co., Ltd.

Tel: 0757-22218956 (8:30-17:30 on weekdays)

Website: www.hinson-xs.com

Email: hinson@hinson-xs.com

Technical support QQ: 2636178756