

DOBOT Palletizing Workstation Safety Function Manual

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The user has the responsibility to make sure following the relevant practical laws and regulations of the country, in order that there is no significant danger in the use of the robot arm.

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Preface

Purpose

This document explains how to install and configure LiDAR to ensure safety protection for the DOBOT Palletizing Workstation during operation.

Intended audience

This document is intended for:

- Customer
- Sales Engineer
- Installation and Commissioning Engineer
- Technical Support Engineer

Compatible versions

Product		Version	How to obtain
Palletizing Process Package		Palletizing_v2-4-2-stable	Contact technical support for access
CR20A	DobotStudio Pro (PC / Android / Teach Pendant)	4.6.4.0-stable or above	DOBOT Download Center
	Controller	4.6.6.0-pal-stable	Upgrade via Robot Maintenance Tool (Get the Robot Maintenance Tool from DOBOT Download Center)
CR30H	DobotStudio Pro (PC / Android / Teach Pendant)	4.7.0.0-stable	DOBOT Download Center
	Controller	4.7.3.1-stable	Upgrade via Robot Maintenance Tool (Get the Robot Maintenance Tool from DOBOT Download Center)

NOTE: The current version of DobotStudio Pro does not support import or export functions when running on the Teach Pendant.

Related documents

Document	Description	Download link
DOBOT CRA/CRH Series Palletizing Workstation User Guide	Introduces the hardware installation, software configuration, and palletizing project operation for DOBOT CRA/CRH Series Palletizing Workstation.	Contact technical support for access.
DOBOT CRA Series Hardware User Guide	Introduces the functions, technical specifications, and installation guidance for DOBOT CRA series collaborative robots.	
DOBOT CR30H Series User Guide	Introduces the functions, technical specifications, and installation guidance for DOBOT CR30H series collaborative robots.	

Revision history

Date	Version	Revised content
2026-04-29	V2.4.2	Added an introduction for the safety solution and how to enable the LiDAR signal .
2024-06-14	V1.0	The first release

Symbol conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates a high potential hazard that, if not avoided, could result in death or serious injury.
 WARNING	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robot arm damage.
 NOTICE	Indicates a potential risk that, if ignored, could result in robot arm damage, data loss, or unpredictable result.
 NOTE	Provides additional information to emphasize or supplement important points in the main text.

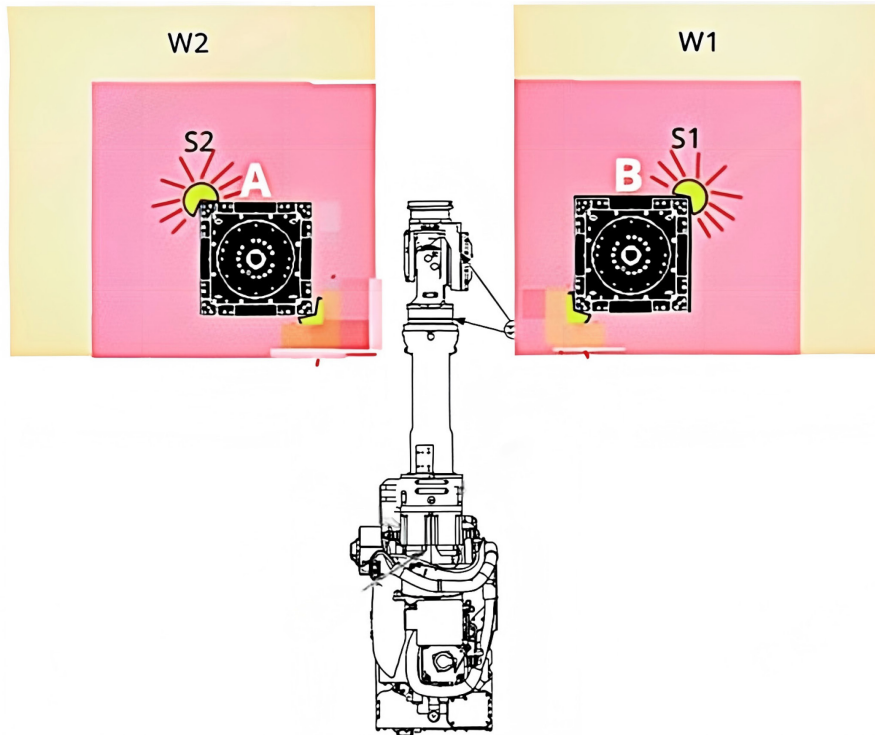
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1. Solution Introduction

The safety solution for the palletizing workstation uses a safety laser scanner, which emits infrared laser beams to scan the surrounding environment and establish protected zones to guard hazardous areas.

Once an object enters the protected zone, the signal at the safety output changes. The robot then analyzes the signal and responds by stopping the hazardous operation. The diagram of this laser safety solution is shown below:



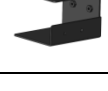
1. Install the safety laser scanners  on the left and right pallet sides and at the rear of the workstation by referring to the [Installation Instructions](#) and [Wiring Instructions](#).
2. Perform [Software Configuration](#), such as setting safety I/O, enabling the left/right pallet LiDAR signals, and debugging the LiDAR and safety module.
3. Once the LiDAR detects a trigger signal, safety protection is provided according to the following working logic.

Working logic:

- **LiDAR signal triggered during palletizing:** If someone enters the W1/W2 warning zone, the robot slows down. If someone enters the S1/S2 protection zone, a protective stop is triggered on the controller, and palletizing is paused. After the LiDAR trigger signal is reset, the palletizing process resumes.
- **LiDAR signal triggered before palletizing starts:** When you click to run the palletizing project, a protective stop is triggered immediately, and the robot will not start moving.
- **In "1 Conveyor 2 Pallets" or "2 Conveyors 2 Pallets" palletizing mode:** When the robot is palletizing on the left pallet, a trigger on the right LiDAR has no effect. Similarly, when the robot is palletizing on the right pallet, a trigger on the left LiDAR has no effect.

2. Installation Instructions

2.1 Material list

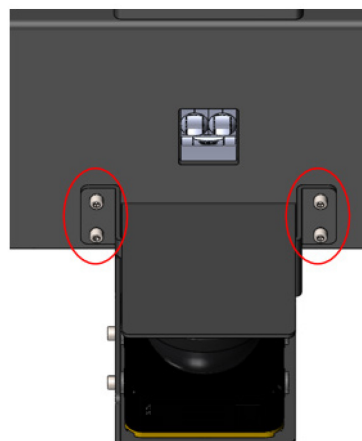
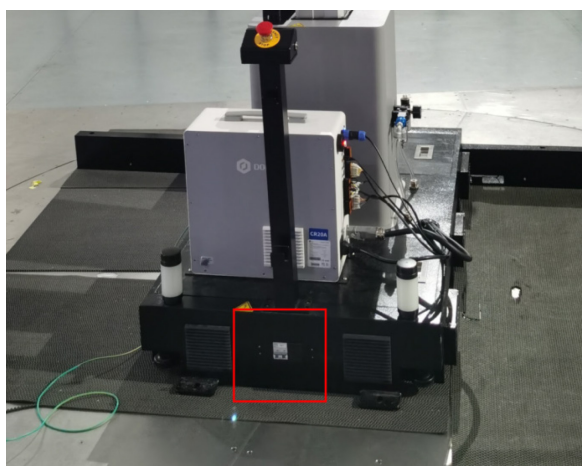
No.	Name	Specification/Model	Brand	Qty.	Unit	Remark
1	Safety laser scanner	NANS3-AAAZ30AN1	SICK	3	pcs	
2	System plugin	NANSX-AAABAEZZ1	SICK	3	pcs	
3	Cable	DOL-1208G02MD25KM1	SICK	3	pcs	
4	Debugging cable	SSL-2J04-G02ME60	SICK	1	pcs	
5	Screws	Cylindrical head, M5×10	/	8	pcs	
6	Screws	Cylindrical head, M6×10	/	8	pcs	
7	Safety laser mounting plate A	DTIGST35C-01-03-001V01	/	1	pcs	
8	Safety laser mounting plate B	DTIGST35C-01-03-002V01	/	1	pcs	
9	Safety laser mounting plate C	DTIGST35C-01-03-004V01	/	1	pcs	
10	Base connecting plate A	DTIGST35C-01-03-003V01	/	1	pcs	
11	Base connecting plate B	DTIGST35C-01-03-005V01	/	1	pcs	

2.2 Tool list

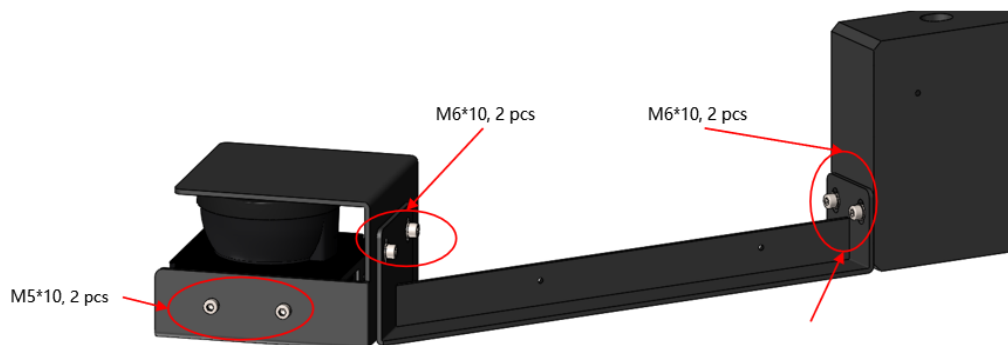
No.	Name	Specification/Model	Qty.	Unit	Remark
1	Torx wrench	TX10	1	pcs	For installing the System Plugin
2	Slotted screwdriver	3mm tip diameter	1	pcs	For wiring
3	Hex wrench	S4	1	pcs	For securing the Screws M5×10
4	Hex wrench	S5	1	pcs	For securing the Screws M6×10

2.3 Hardware installation

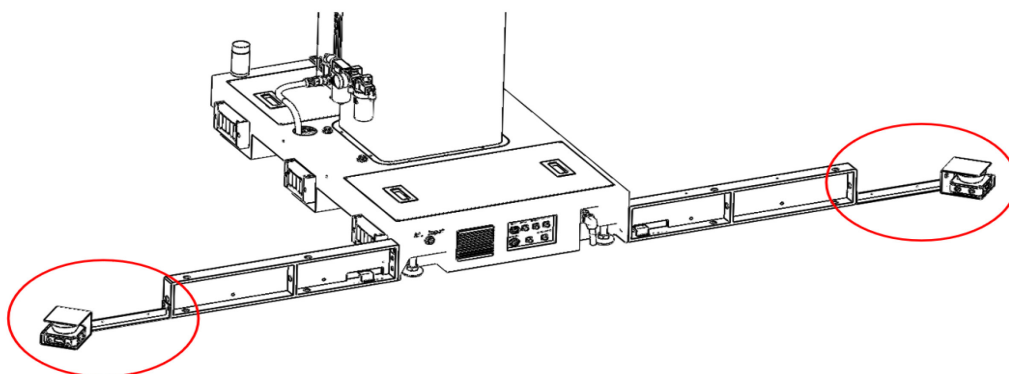
- On the front of the palletizing workstation, use the S4 hex wrench to tighten the mounting bracket with four M5×10 screws, as shown in the figure below:



- On the side of the palletizing workstation, use the S5 hex wrench to secure four M6×10 screws to the left and right pallet edge guards, as shown in the figure below:



3. The left and right sides are symmetrical, as shown in the figure below:



4. Diagram of the installed LiDAR:



Right



Left

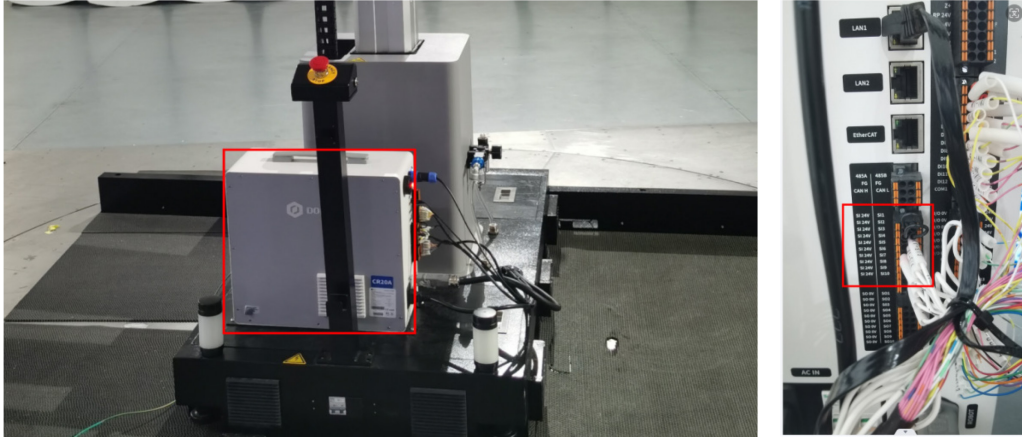


Front

3. Wiring Instructions

3.1 Robot controller wiring

1. Location of the robot controller.



2. Use the slotted screwdriver to press down the orange spring buttons and remove the four terminals (SI3, SI4, and SI 24V) on the safety I/O. This involves a total of two wires.



3. Remove SI3 and SI4 that temporarily placed in terminals SI7 and SI8, and connect them into the right-side SI3 and SI4 terminals respectively.



-
- A technical line drawing showing a cable connection. On the right is a control unit with a circular top and a rectangular base. A cable with two conductors runs from the control unit to a small rectangular terminal block. The cable is secured by two clamps. The terminal block has two screws and is connected to the control unit's base.

- | Color | Definition | Description |
|-------|------------|---|
| Brown | N2401-1 | Supply voltage (+24 V DC) |
| Blue | P2401-1 | Supply voltage (0 V DC) |
| White | S1-OSSD1A | OSSD pair 1, OSSD.A |
| Green | S1-OSSD1B | OSSD pair 1, OSSD.B |
| Pink | S1-OSSD2A | Universal I/O 1, configurable: <ul style="list-style-type: none"> • Static control input B1 • Universal input: Sleep mode, restarting the device • Universal output: Contamination, error, reset required (OSSD pair 1), monitoring result |

Color	Definition	Description
Yellow	S1-OSSD2B	Universal I/O 2, configurable: - OSSD pair 2, OSSD A (OSSD 2.A) - Static control input A1 - Universal input: Sleep mode, restarting the device - Universal output: Contamination, error, monitoring result

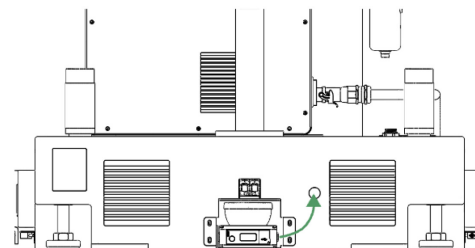
Wiring diagram: SICK NanoScan3 Core safety laser.



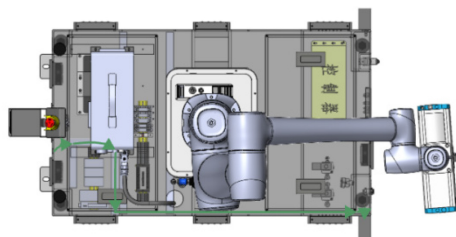
- Route the I/O cables to the terminal block. The three different wiring colors correspond to the LiDAR at different positions.



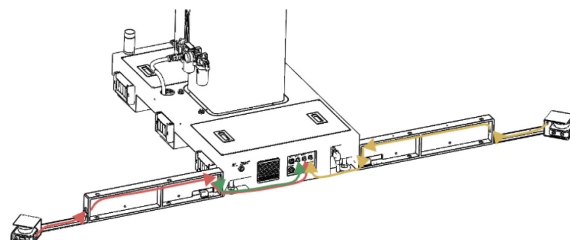
I/O cable male/female connector assembly



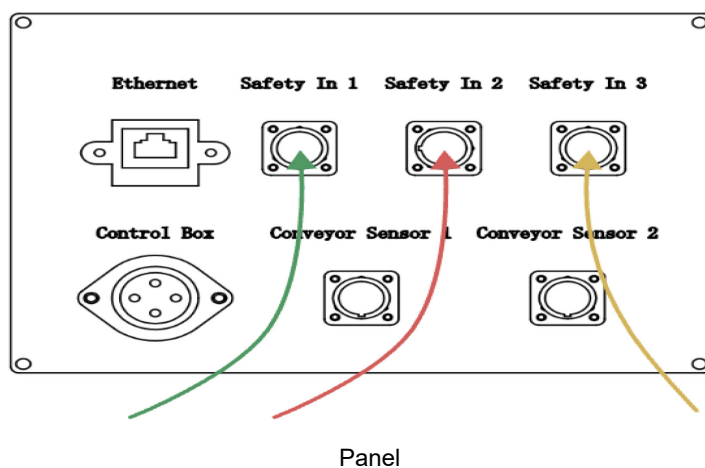
LiDAR I/O routing at button area



LiDAR I/O routing at button area



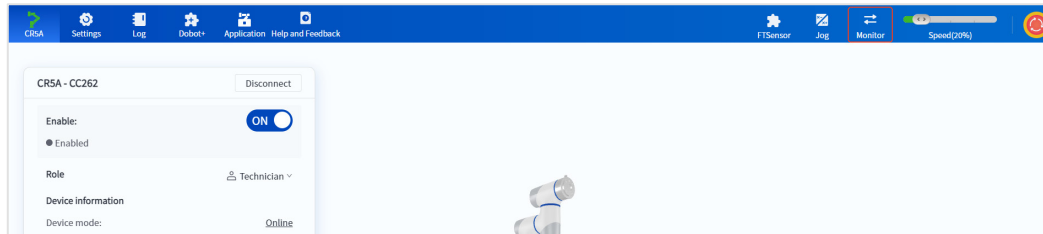
LiDAR I/O routing at left/right sides and button area



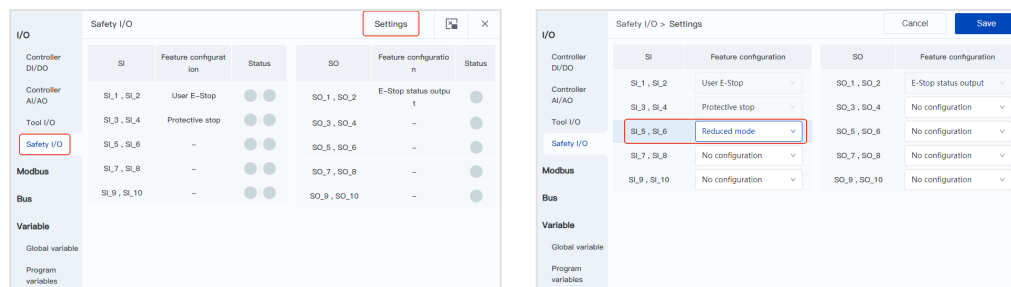
4. Software Operation

4.1 Configure safety I/O

1. Install DobotStudio Pro and the palletizing process package plugin.
2. Open DobotStudio Pro, connect it to the robot, and go to the "Monitor" page.

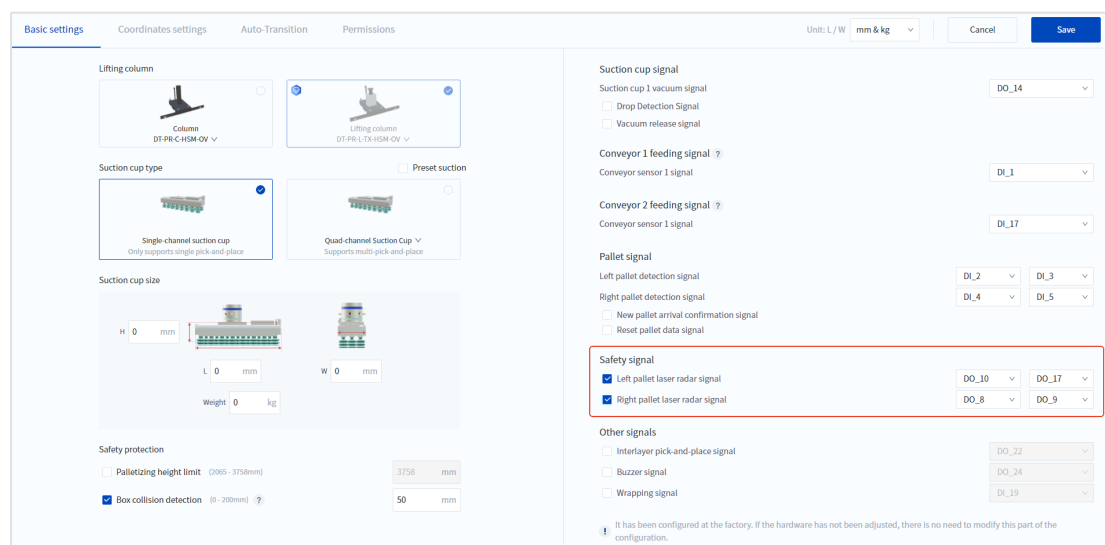


3. Go to the "Safety I/O" page and click "Settings". Set SI5/SI6 to "Reduced mode" (skip this configuration if this mode is not required). After configuration, save the settings, then power off and restart the controller.



4.2 Enable LiDAR signals

Open the palletizing process package plugin and go to the "Workstation settings" page. Under "Safety signals", check "Left/Right pallet LiDAR signal". The LiDARs on the left and right sides will only take effect after this option is checked.



NOTICE

- The palletizing process package plugin can only control whether the left and right LiDARs are enabled; it cannot control the rear LiDAR.
- The "Left/Right pallet LiDAR signal" being checked must match the palletizing project being used. For example, if you are using the left pallet, check "Left pallet LiDAR signal". This enables the left LiDAR and disables the right one. In actual operation, the robot will only perform palletizing on the left pallet and will not operate on the right pallet. The same logic applies to the right pallet.

4.3 Configure LiDAR

4.3.1 Install the debugging software

1. Check your computer configuration and download the software.

Minimum computer requirements:

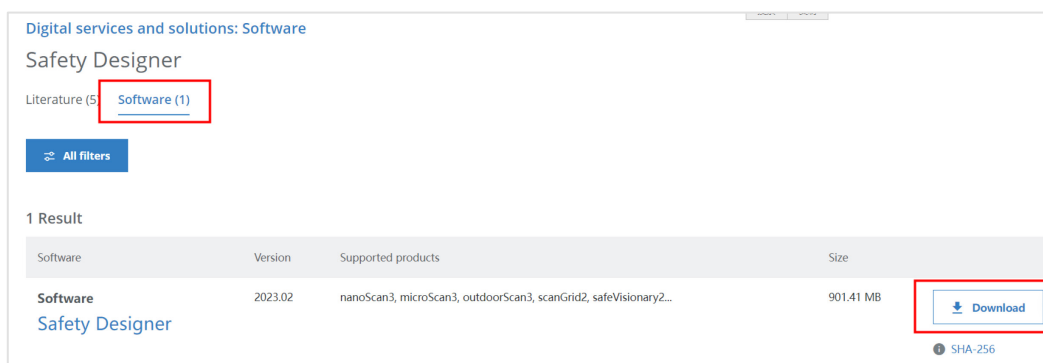
- Operating System: Microsoft Windows 7 or higher;
- Processor: 2 GHz or higher;
- RAM: 2 GB;
- Screen Resolution: 1024 × 768 pixels;
- Free Hard Disk Space: 2 GB

Debugging software for nanoScan3:

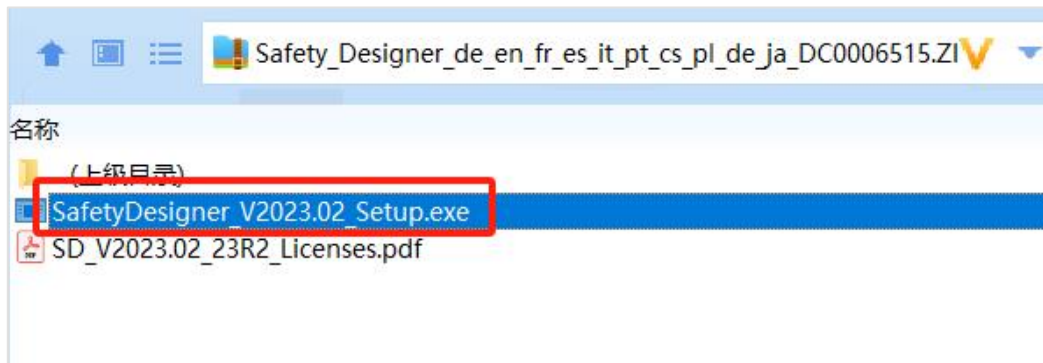
SafetyDesigner; Latest version: 1.16.1080 (2023.02)

Download link:

<https://www.sick.com/cn/en/catalog/digital-services-and-solutions/software/safety-designer/p/p444968?category=g569793&tab=downloads>

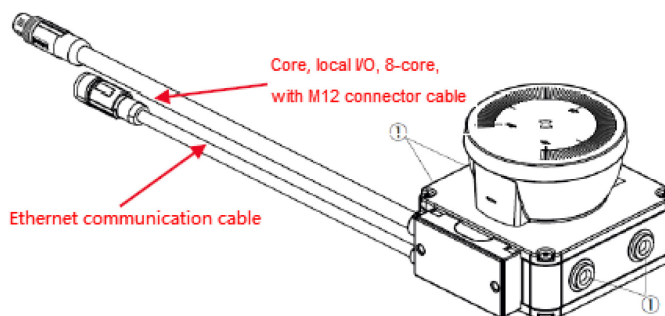


- After the software is downloaded, double-click "SafetyDesigner_V2023.02_Setup.exe" and on-screen instructions to proceed.

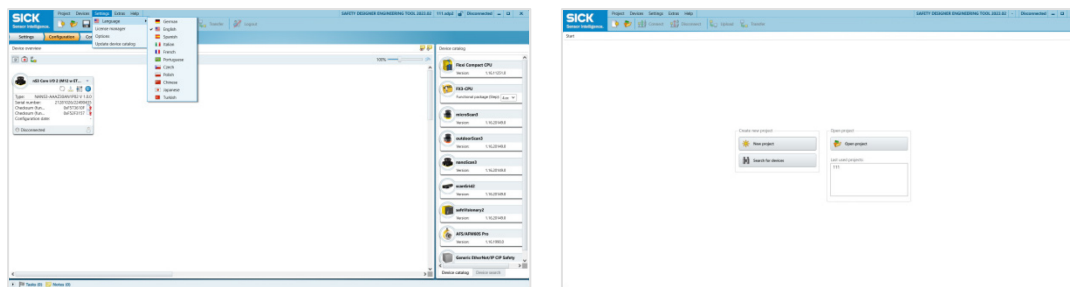


4.3.2 Add LiDAR

- Prepare the following debugging cable. Connect the M12 connector (Head A) of the debugging cable to the LiDAR's Ethernet communication cable (green).



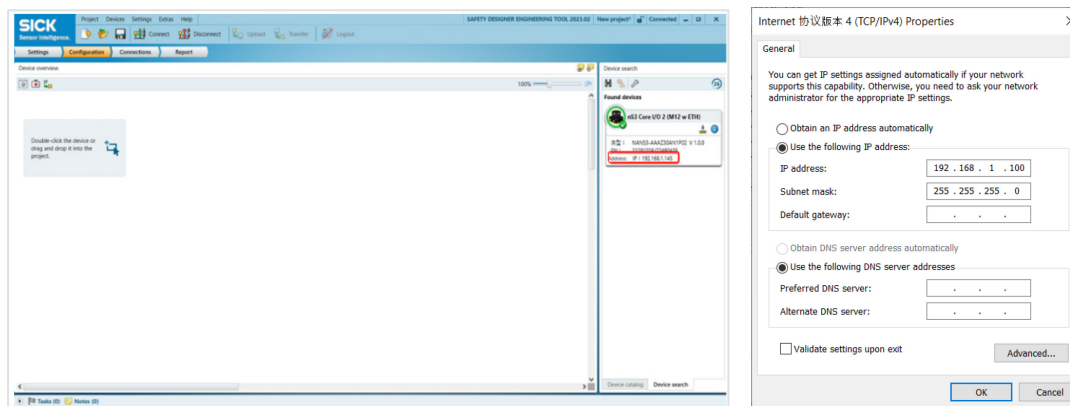
- Open the debugging software (SafetyDesigner) and click "Search for device".



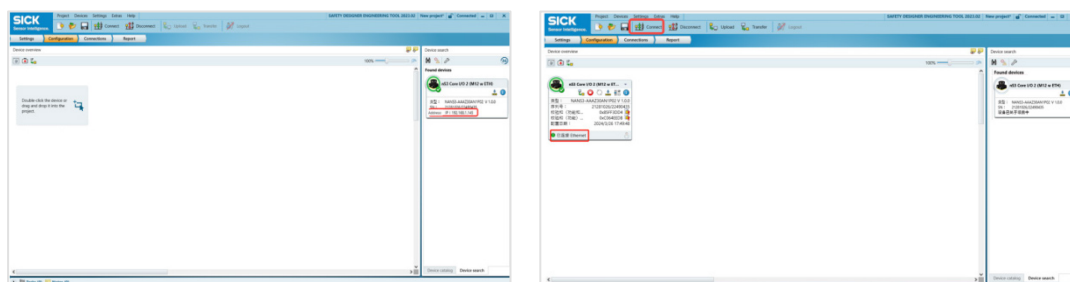
NOTE

To change the display language of the debugging software interface, modify it via "Settings" in the menu bar.

- Once the device is found, check its IP address. Set your computer's IP address to be on the same network segment as the device, keeping the subnet mask as the default. After completing the settings, close the SafetyDesigner software and restart it.

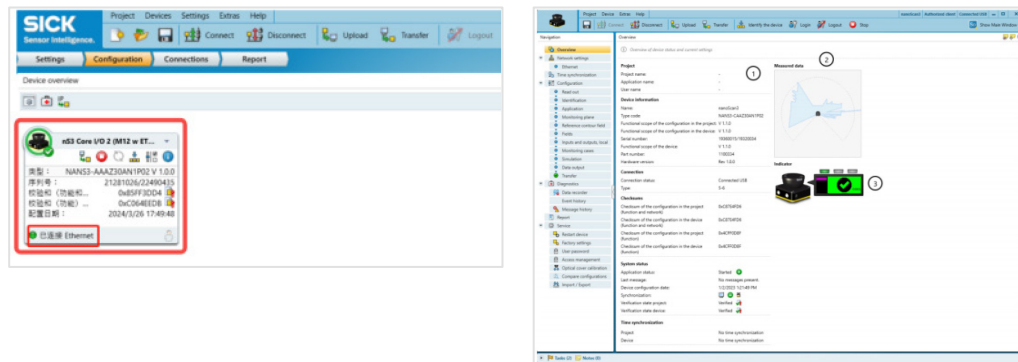


- Drag or double-click the device into the center area to add it. Click "Connect" in the menu bar and wait until "Ethernet Connected" is displayed.

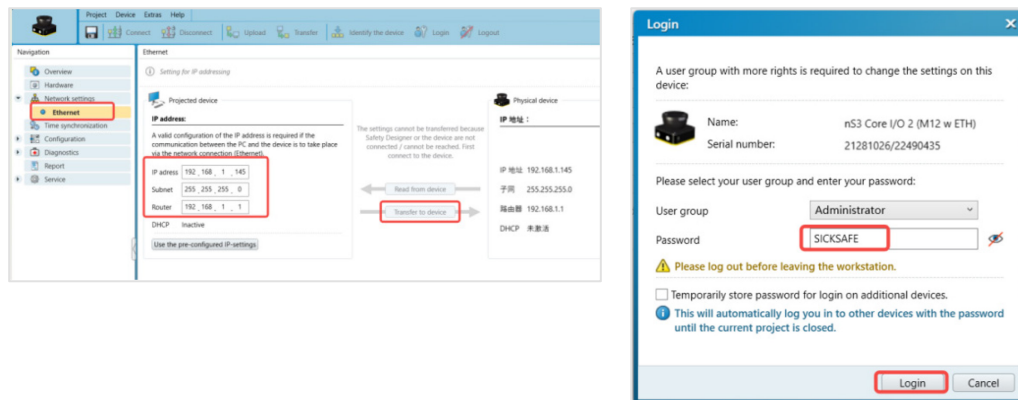


4.3.3 Configure LiDAR

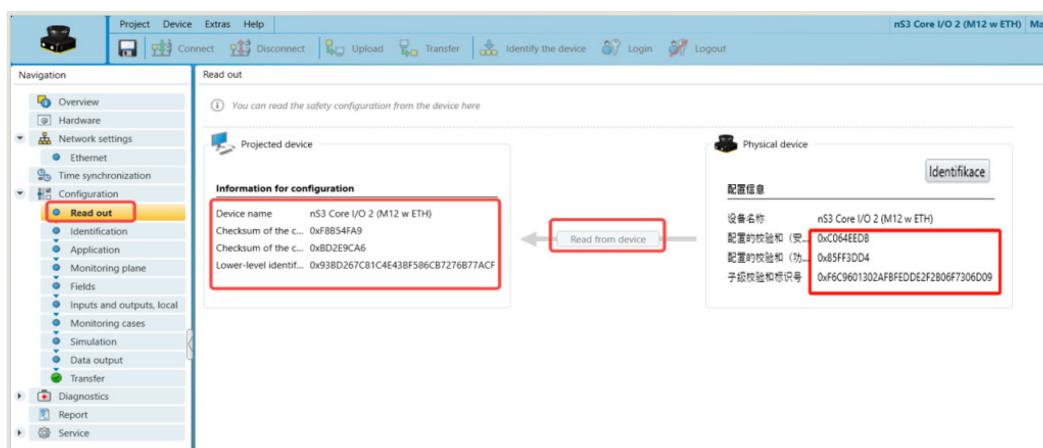
1. Double-click the device to enter the configuration page.



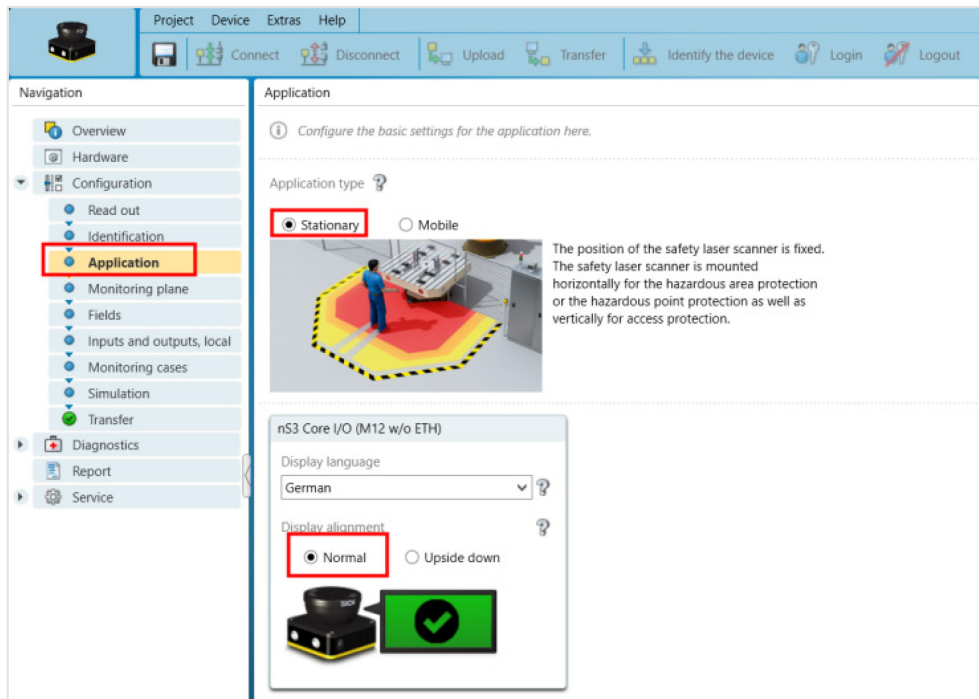
2. Modify the network configuration of the LiDAR as needed. Administrator privileges are required. Default password: SICKSAFE. If the password has been modified, enter the new password.



3. Go to "Configuration > Read out" from the left navigation bar. Compare whether the sensor in the current project match that displayed online. If not, click "Read from device".

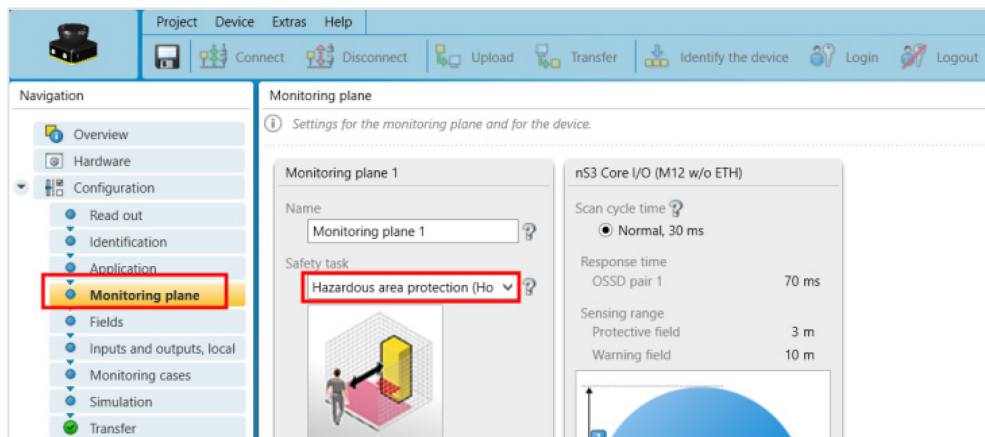


4. Go to "Configuration > Application" from the left navigation bar. Set "Application type" to "Stationary" and "Display alignment" to "Normal".



5. Go to "Configuration > Monitoring plane" from the left navigation bar to set up the monitoring plane. The following uses horizontal plane protection as an example:

- ① Safety task: Select "Hazardous area protection (Horizontal)".

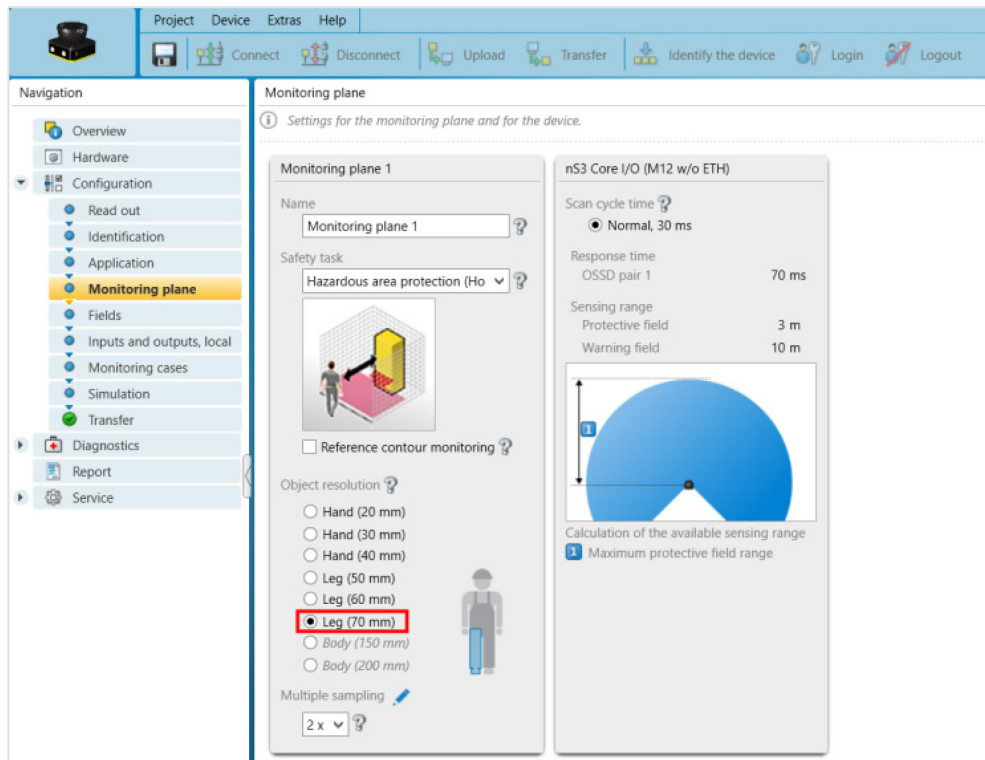


- ② Object resolution: Select "Leg (70 mm)".

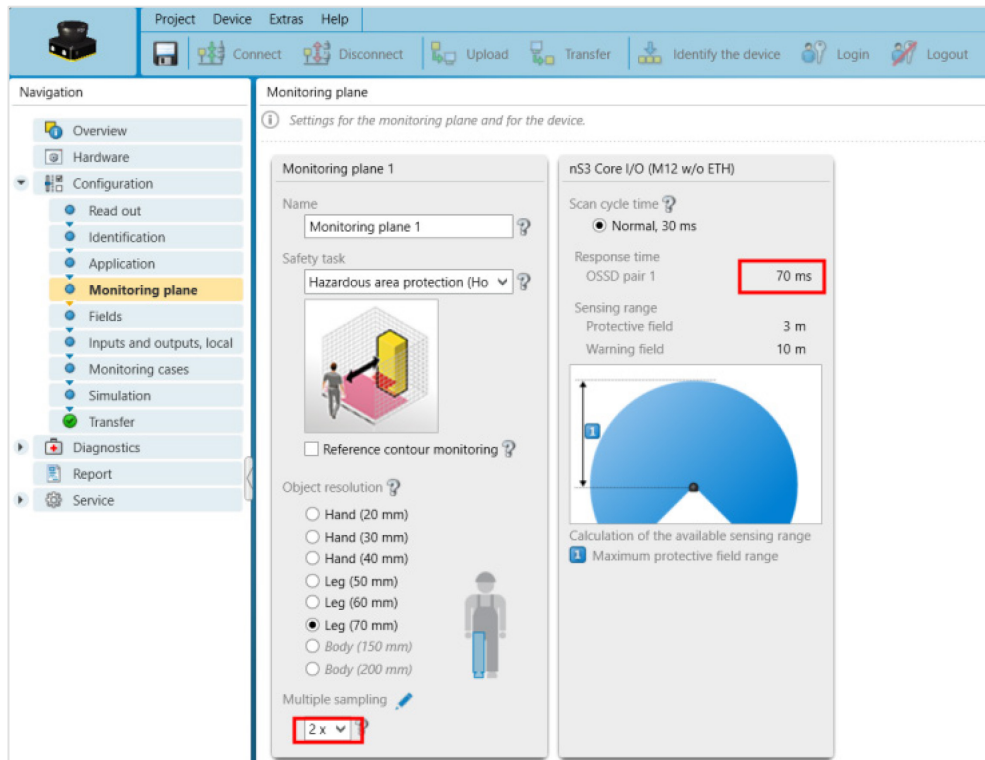


NOTICE

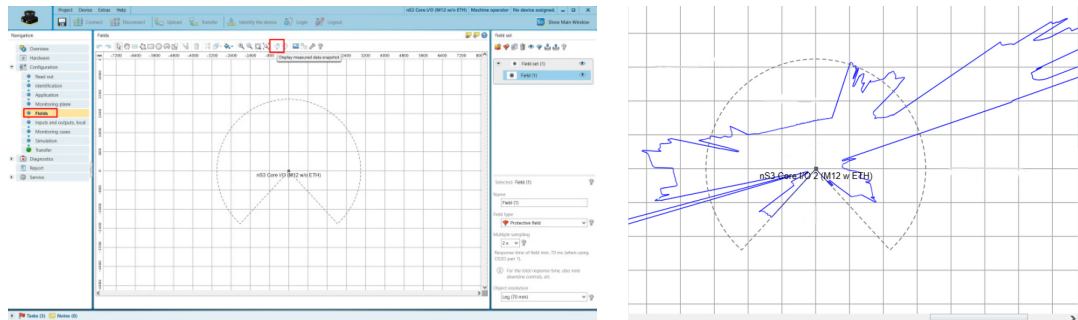
Different resolutions correspond to different protection area ranges. Select the appropriate resolution based on the actual protection distance required.



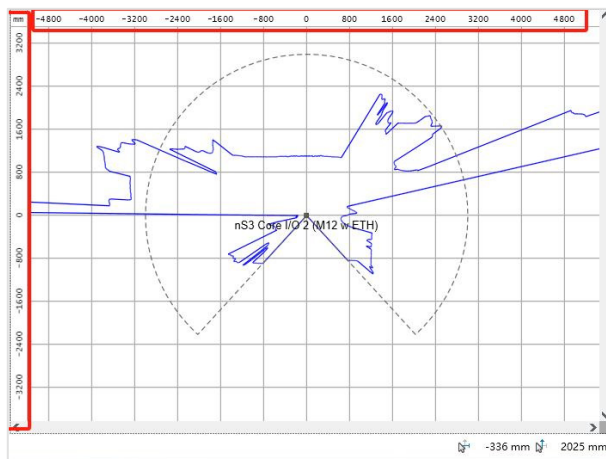
- ③ Multiple sampling: Select "2x". This can be adjusted based on the actual detection sensitivity. The minimum value is 2x. For each additional multiple, the OSSD response time increases by 30 ms. The higher the sampling multiple, the lower the probability of false detection, but the longer the response time.



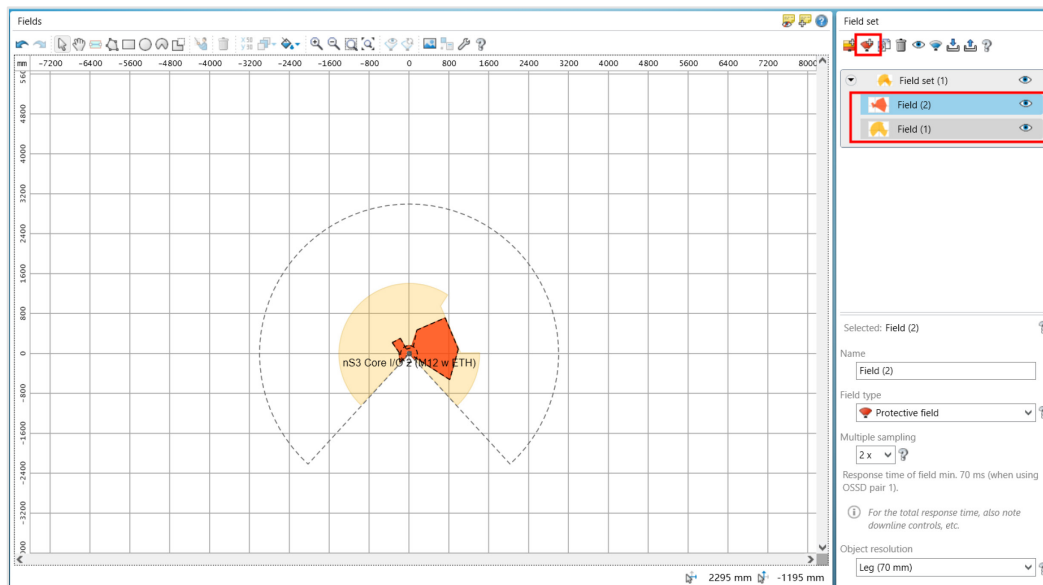
6. Go to "Configuration > Fields" from the left navigation bar. Click "Display measured data snapshot" to display the scan contour at the time of clicking, which helps identify obstacle positions.



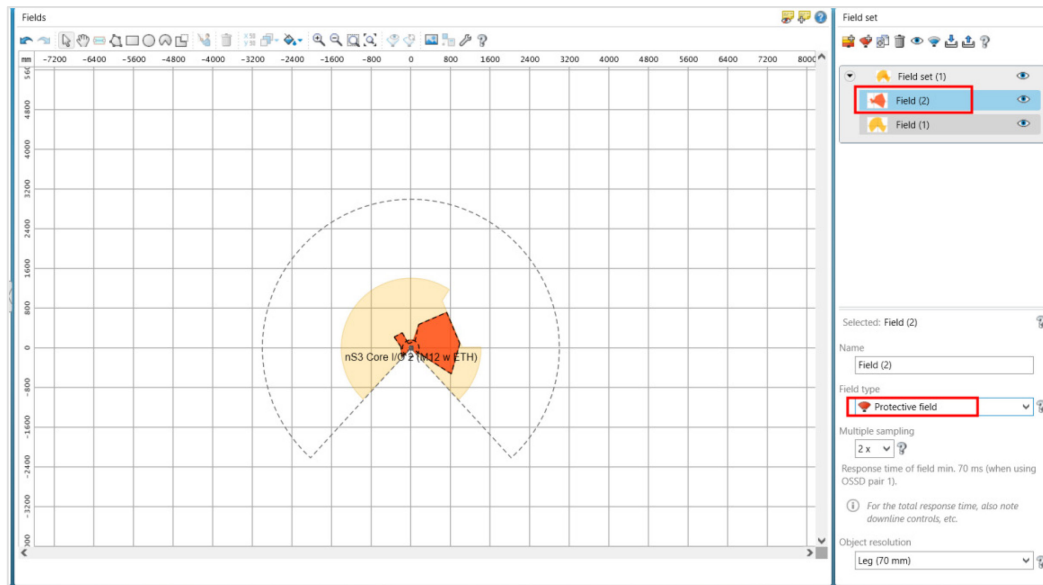
7. Use the scales on the left and top to determine obstacle distances. Hold Ctrl and scroll the mouse wheel to adjust the view size and scale resolution. Unit: mm.



8. In the field group on the right, click "Add Field to Field set" twice to add two fields, as shown in the figure below.



9. Follow the instructions below to draw the protective field. Select "Field (2)", and select "Protective field" for "Field type".

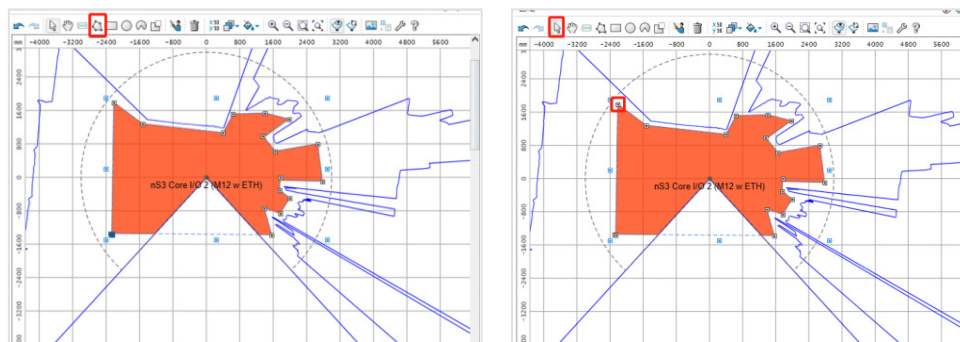


- Polygon drawing:**

Select the polygon drawing icon. Left-click sequentially on the areas to be protected. As shown in the figure below, when clicking the last point, double-click to stop adding polygon points and form a closed protective field. The orange shape represents the drawn protective field.

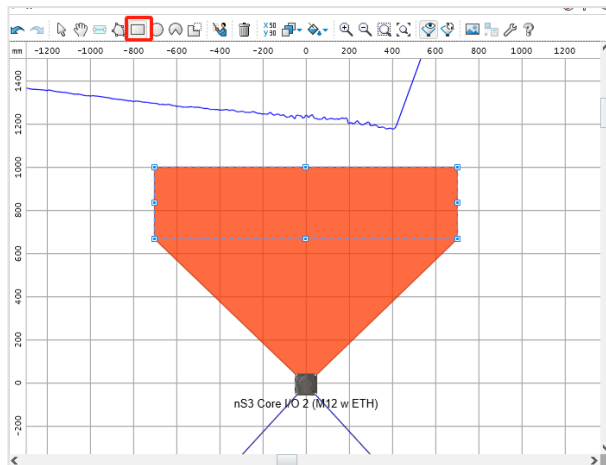
To fine-tune the shape, deselect the polygon drawing icon and click the small arrow icon (select object). Move the mouse to the point to be adjusted, then hold the left button and drag.

The outermost points of the shape can be used to stretch the shape in the corresponding direction.



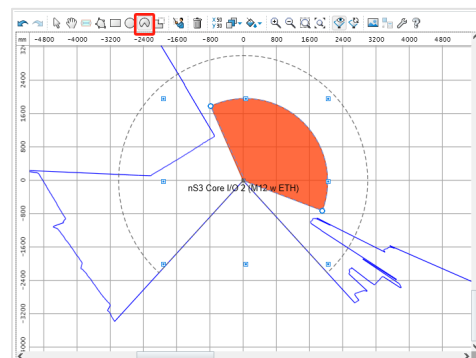
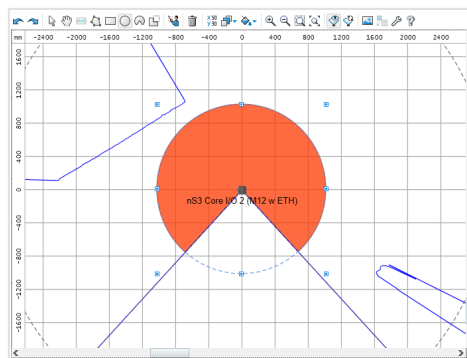
- Rectangle drawing:**

Click the rectangle drawing icon, hold the left mouse button on the field, and drag the mouse to the desired protection area.

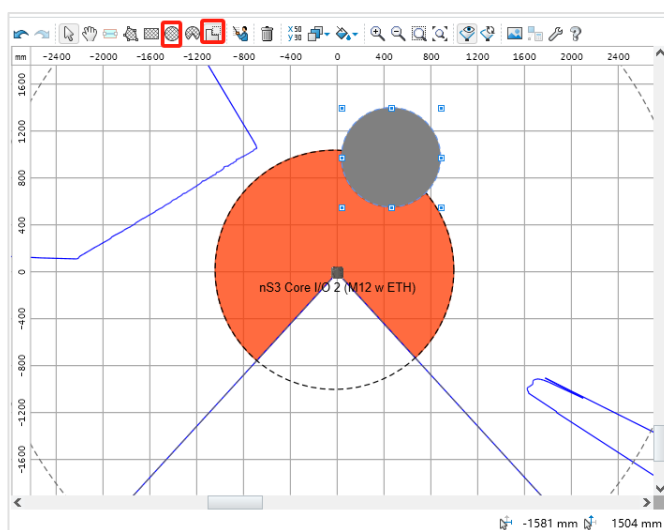


- **Circle/Sector drawing:**

Click the circle or sector icon, hold the left mouse button on the field, and drag the mouse to the desired protection area.



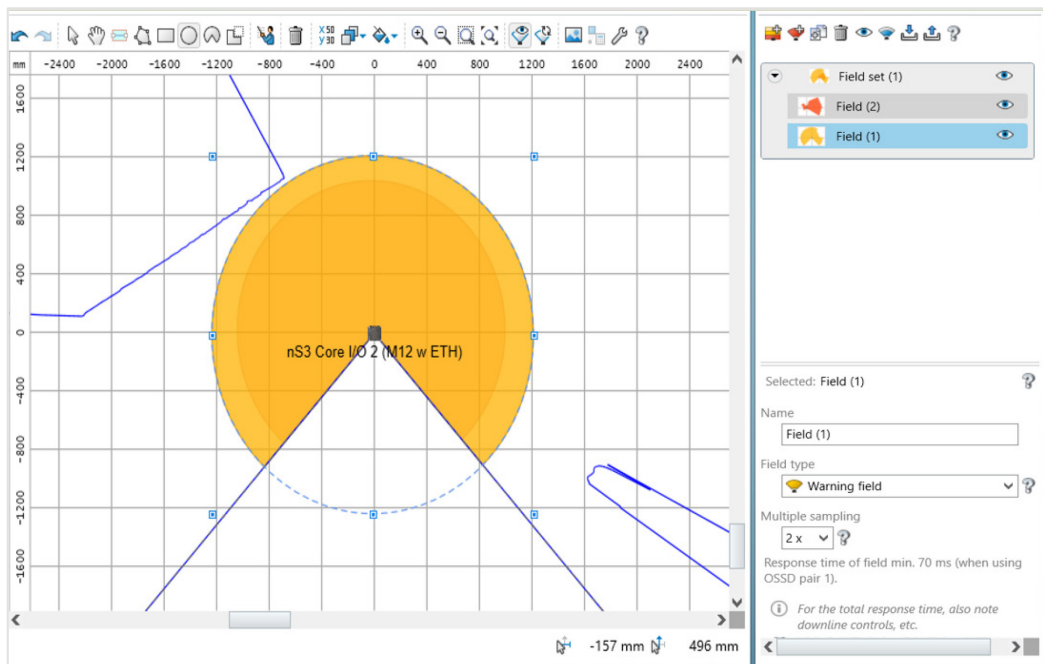
- **Add a masked area:** If there are obstacles such as columns within the drawn field, you can add a masked area based on their actual positions to facilitate quick drawing. As shown in the figure below, select the masked area icon and draw the area to be masked according to the desired shape. After finishing, deselect the masked area option.



10. Draw the warning field: Select "Field (1)", and select "Warning field" for "Field type".

Using the same method as for drawing the protective field, choose the appropriate

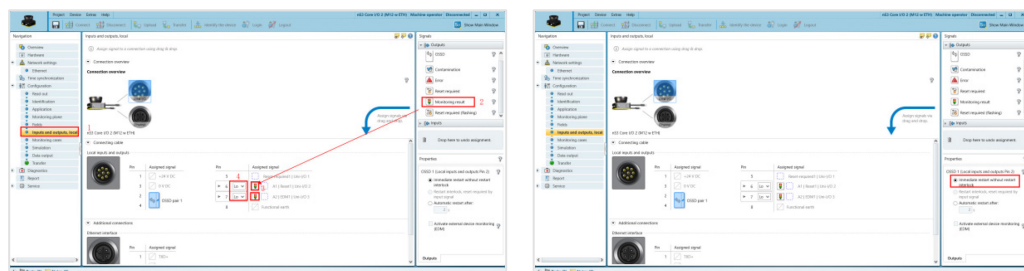
drawing icon. The warning field will appear in yellow, as shown in the figure below.



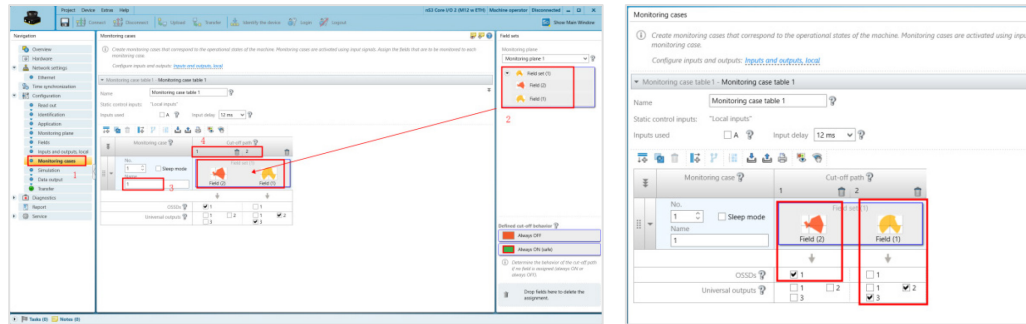
11. Go to "Configuration > Inputs and outputs, local" from the left navigation bar. In the output section, find "Monitoring result", drag the "Monitoring result" onto A1 and A2 (pins 6 and 7), and change the default output level from "Hi" to "Lo". Under "Properties", select "Immediate restart without restart interlock".

NOTE

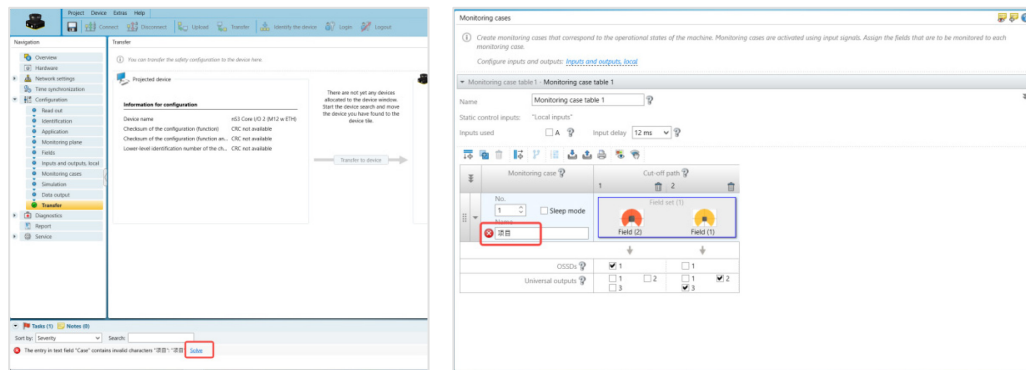
If the application scenario requires a delayed recovery of the protective field, select "Automatic restart after" and set the delay time (2s – 60s).



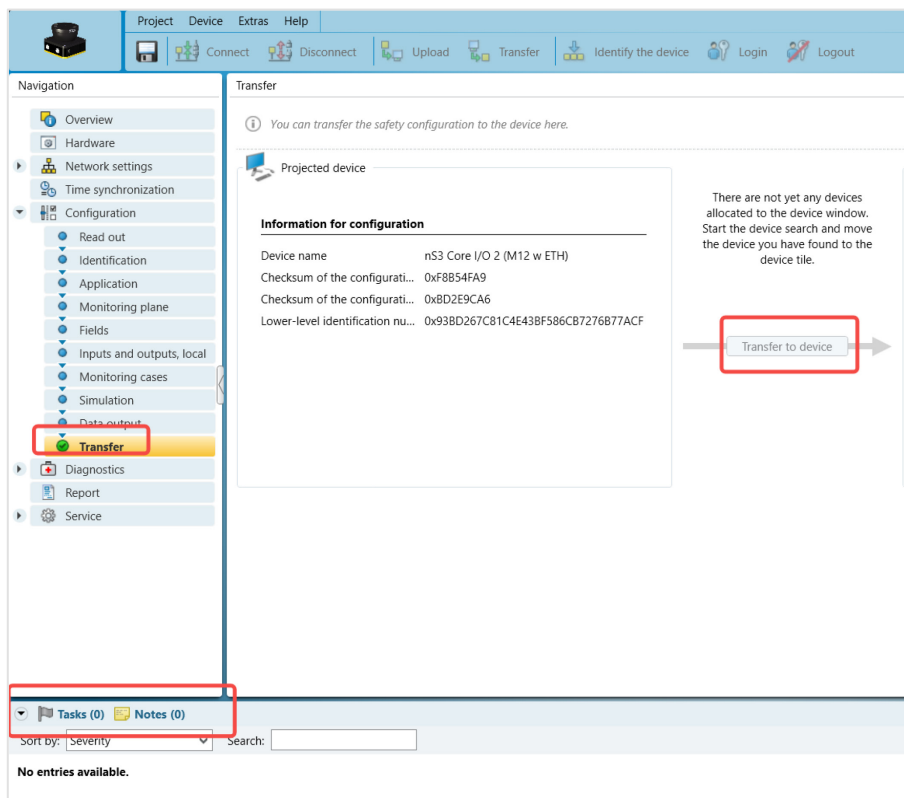
12. Go to "Configuration > Monitoring cases" from the left navigation bar. Move the mouse to the "Field set", hold the left mouse button, and drag the "Field set" onto the "Cut-off path". Rename the "Cut-off path" (Note: The path name cannot contain Chinese characters or symbols, otherwise an error will occur).
13. For "Cut-off Field 2", select "OSSDs 1". For "Cut-off Field 1", select "Univesal outputs 2 and 3". This binds field monitoring to the outputs.



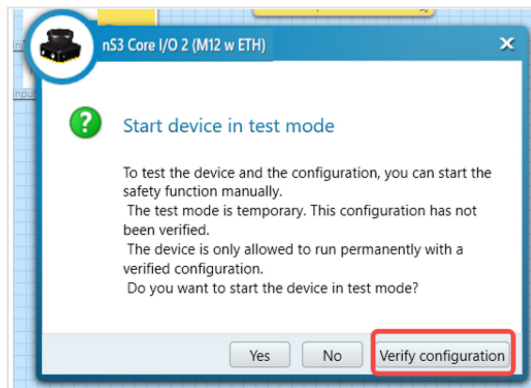
- After configuration, check the "Tasks" bar at the bottom for any errors. If an error appears, click "Solve" to jump to the error page and modify the parameters as prompted. Incorrect parameters will be indicated by a red "x".



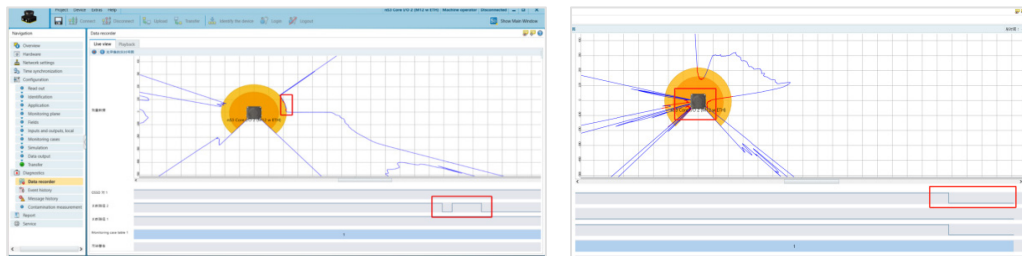
- After correcting all errors, navigate to "Configuration > Transfer" from the left navigation bar. Click "Transfer to device" to transfer the configuration parameters to the LIDAR.



16. Click "Verify configuration", and a verification report will pop up. Click "Verify" to complete the program download and confirmation.



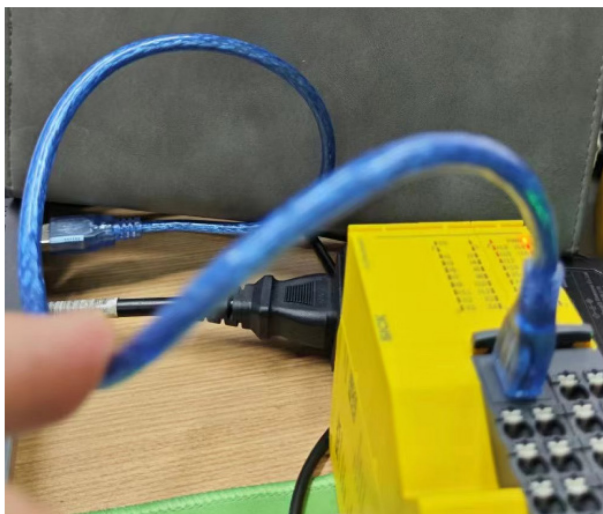
17. Go to "Diagnostics > Data logger" from the left navigation bar to view real-time trigger status. As shown in the figure below, when the warning field is triggered, "Cut-off path 2" switches from high to low mode. When the protective field is triggered, "OSSD 1" and "Cut-off path 1" also switch from high to low mode.



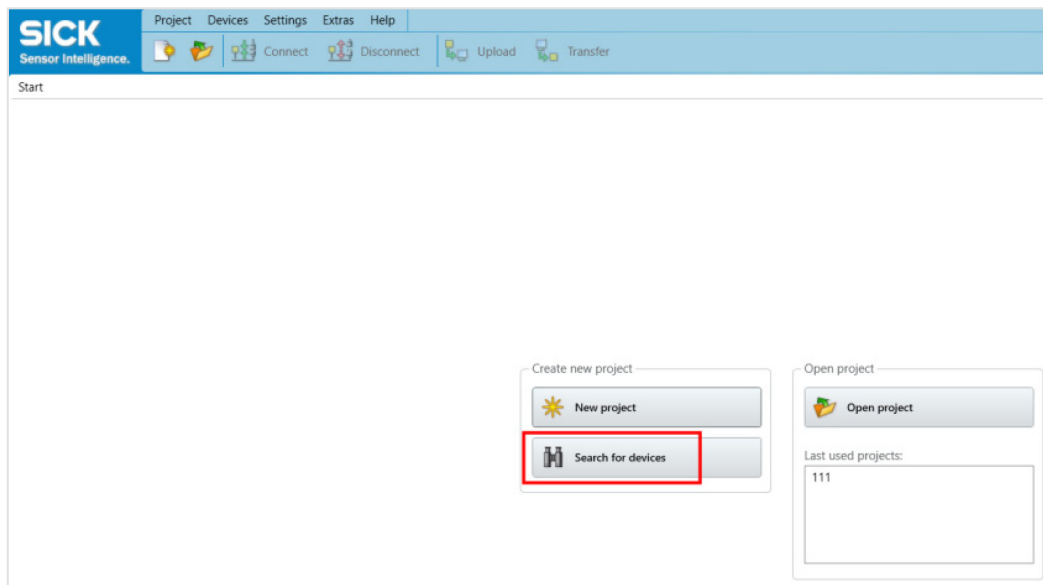
18. Click "Save" to save the project for future use.

4.4 Configure safety module

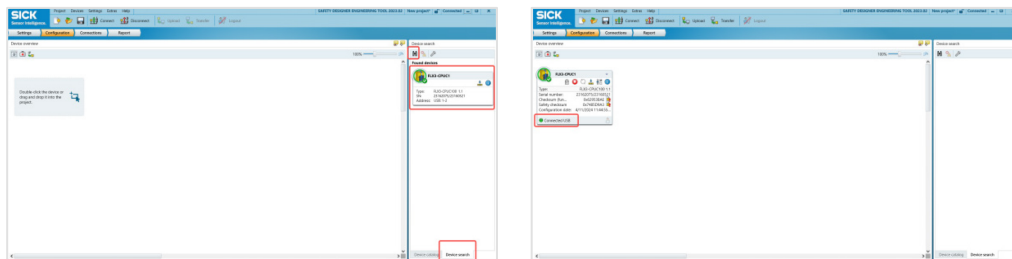
1. The debugging software for the safety module is the same as that for the LiDAR. Refer to ["Install the debugging software"](#) for instructions.
2. Connect the computer to the safety module: Connect one end of a USB Micro debugging cable to the Micro USB socket of the CPU module and the other end to the computer.



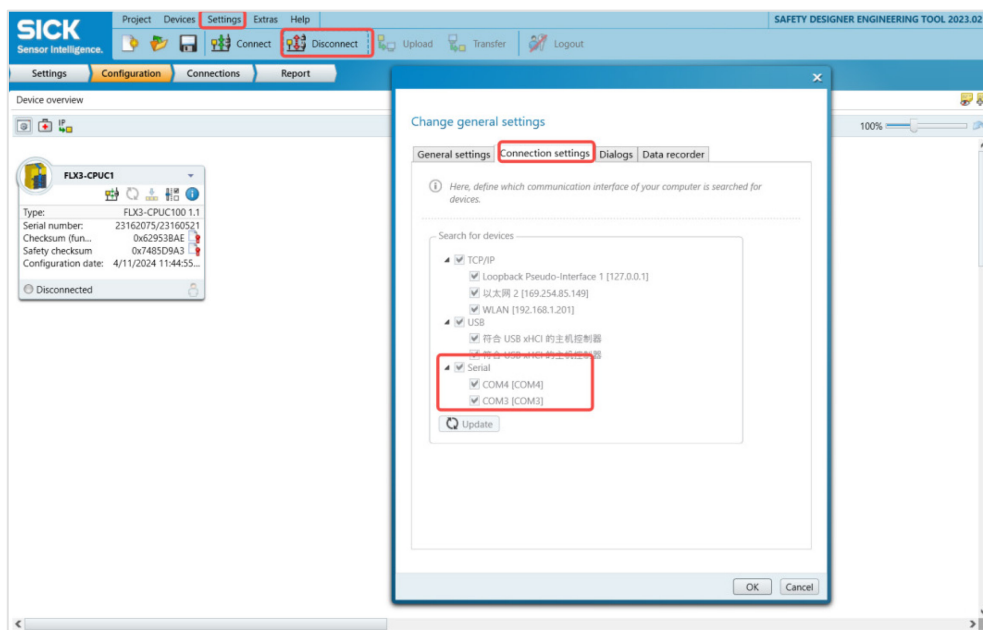
- Open the **Safety Designer** software and click "Search for devices".



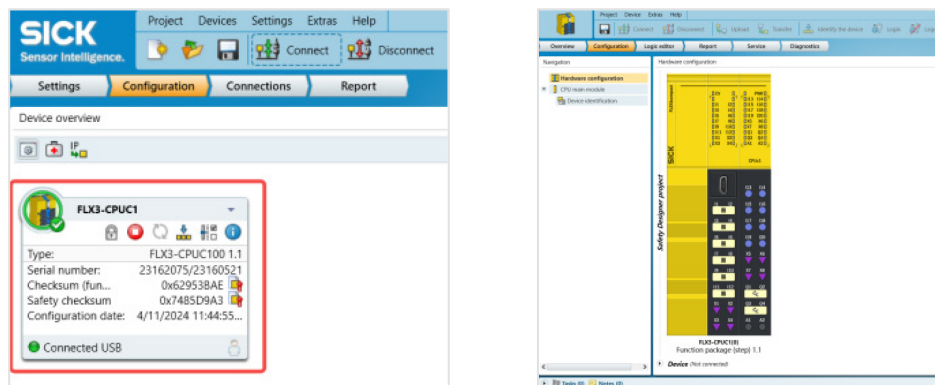
- Among the searched devices, drag or double-click the device to the center of the screen.



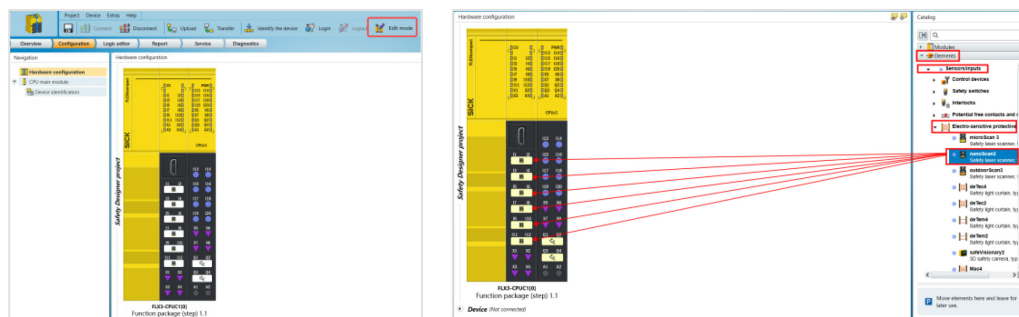
- If the device cannot be found, click "Disconnect", check whether "USB" is selected under "Devices > Options > Connection settings", and then search for the device again in Safety Designer.



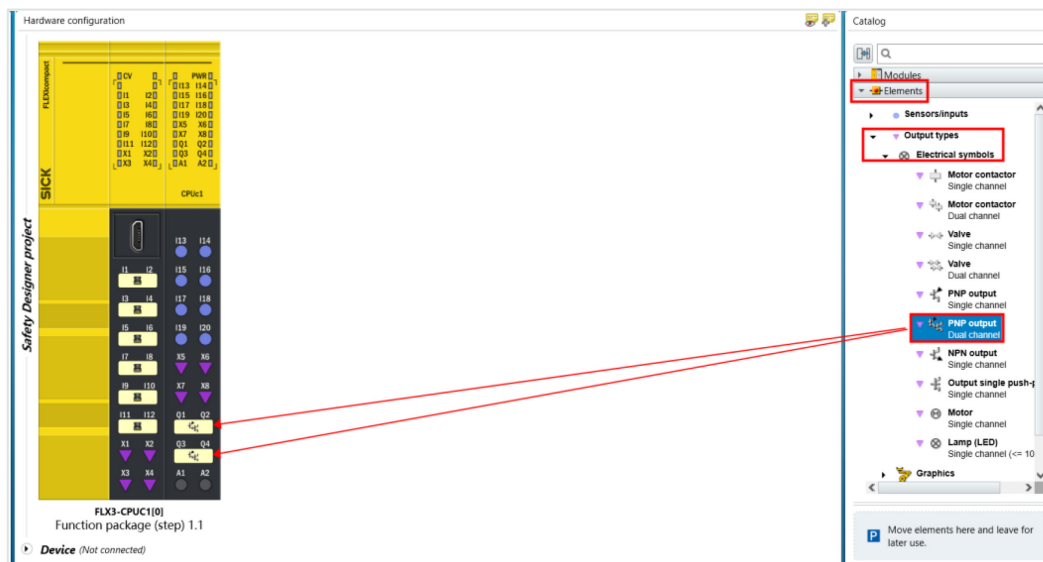
6. Double-click the device in the center to enter the configuration interface.



7. Enable "Edit mode". In the right catalog, navigate to "Elements > Sensor/Inputs > Electro-sensitive protective device > nanoScan3", then drag the devices sequentially to Inputs I1–I12.

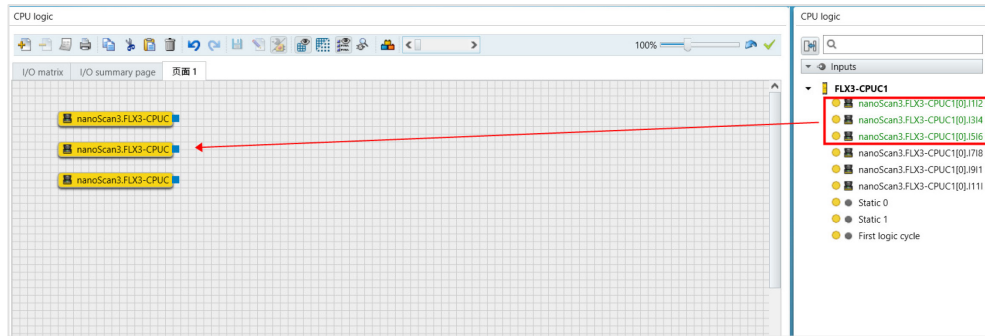


8. In the right catalog, navigate to "Elements > Output types > Electrical symbols > PNP output", then drag the devices sequentially to Outputs Q1–Q4.

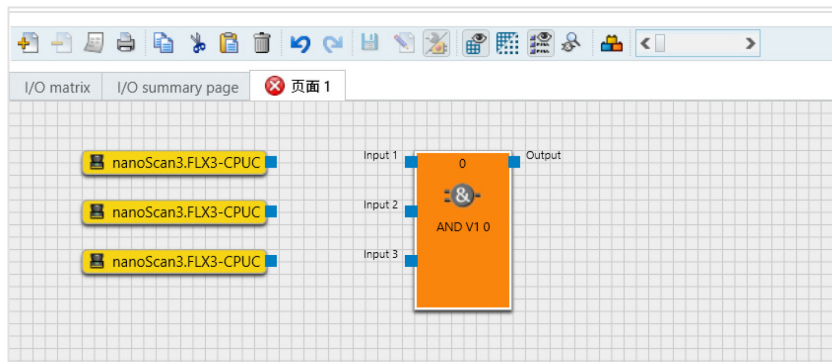
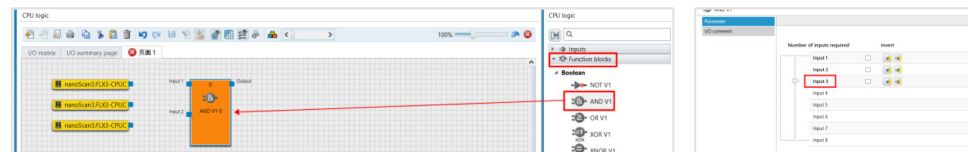


9. Protective field configuration

- ① Go to the "Logic editor" interface. In the right catalog, navigate to "Inputs > FLX3-CPUC1", drag I1I2, I3I4, and I5I6 from the CPU to the center of the page (Note: If you cannot edit, check whether you are in Edit mode).



- ② In the "Function blocks" catalog on the right, drag the "AND V1" module onto the page. Double-click the "AND V1" module and adjust the "Number of inputs required" to 3.

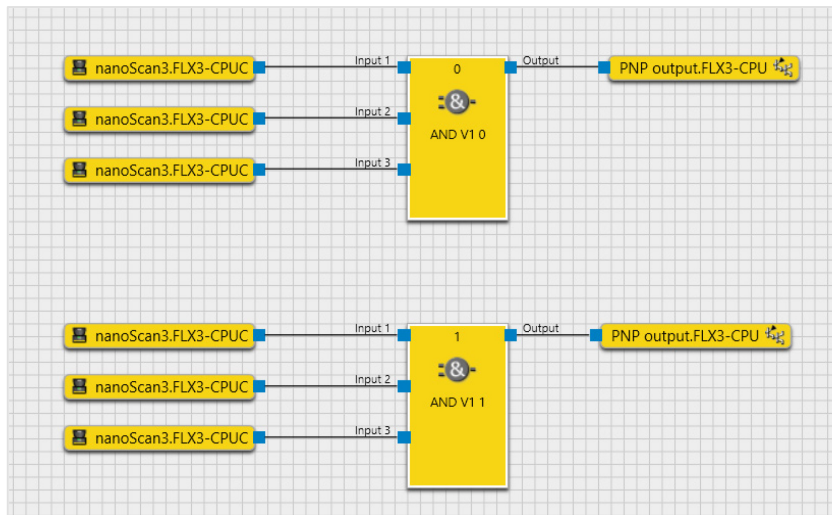


- ③ In the "Outputs" catalog on the right, drag Outputs Q1Q2 from FLX3-CPUC1 onto the page. Drag the blue dots with the mouse to connect all the modules as shown in the following-right figure.

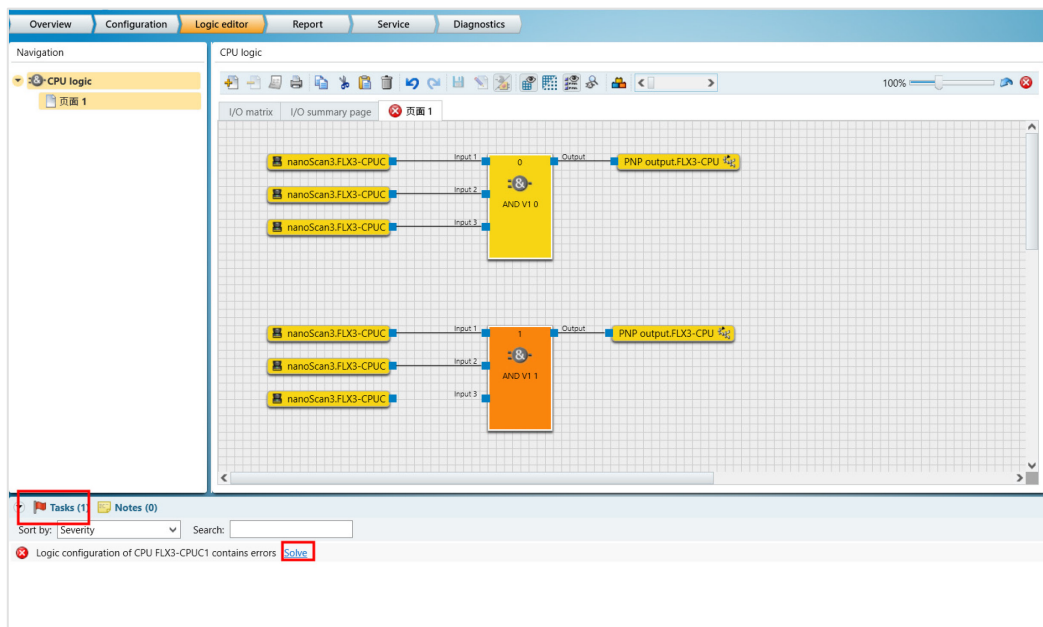


10. Safety field configuration

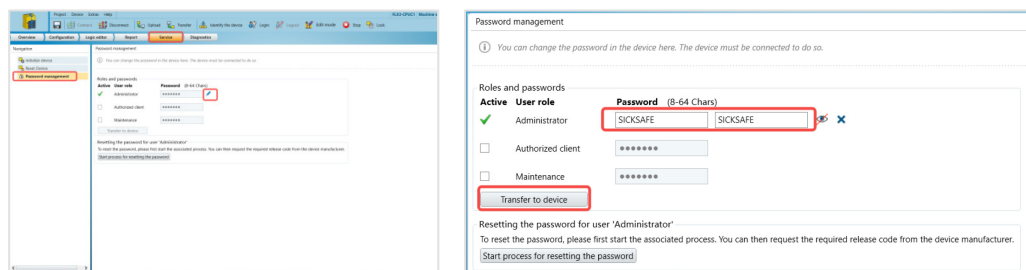
Similarly, navigate to "Inputs > FLX3-CPUC1" in the right catalog, drag I718, I9110, I11112 from the CPU and Outputs Q3Q4 onto the page. Connect them using an AND module.

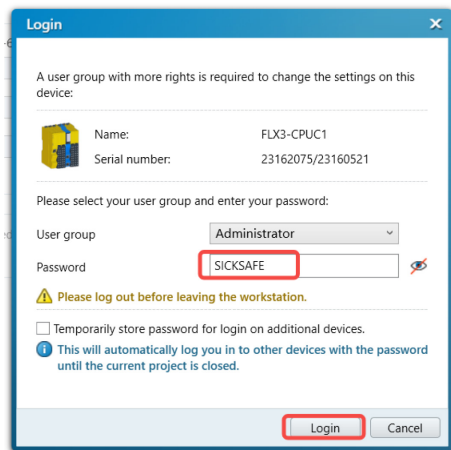


11. Check the "Tasks" bar at the bottom for any errors. Click "Solve" to jump to the corresponding settings interface.

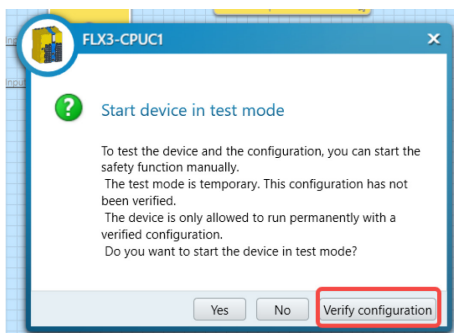
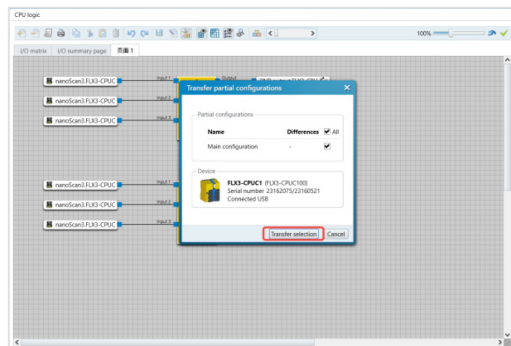
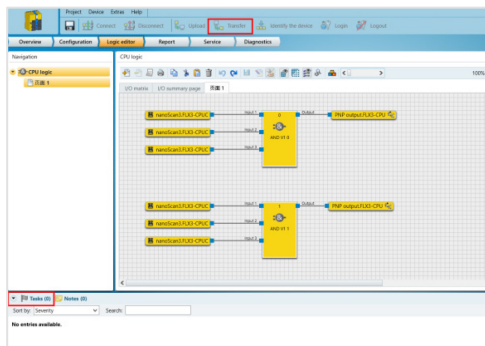


12. When using the system for the first time, you need to set an administrator password. It is recommended to use the default password "SICKSAFE" to avoid forgetting it. If the password is changed, be sure to remember it.

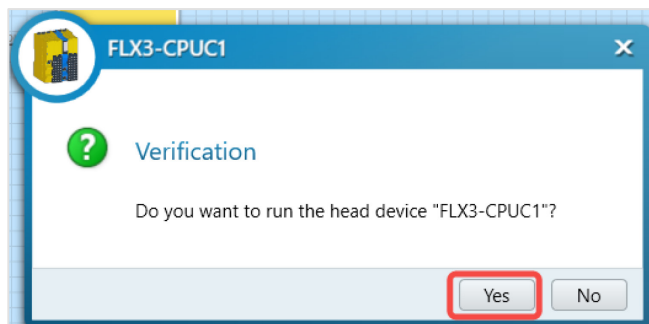
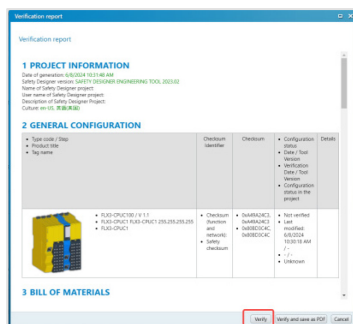




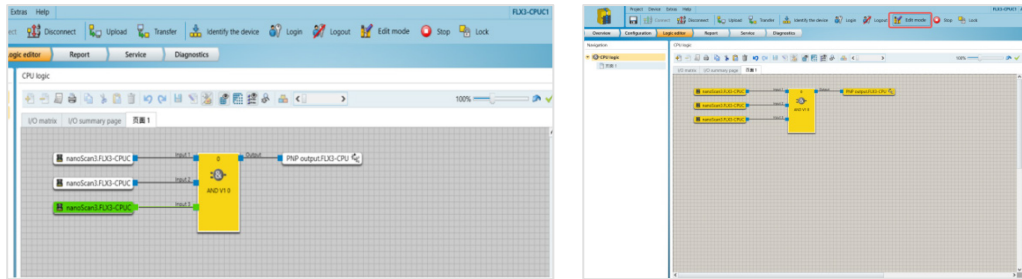
13. Go back to the "Logic editor" page, ensure there are no errors in the "Tasks" bar, and click "Transfer to device > Transfer selection > Verify configuration".



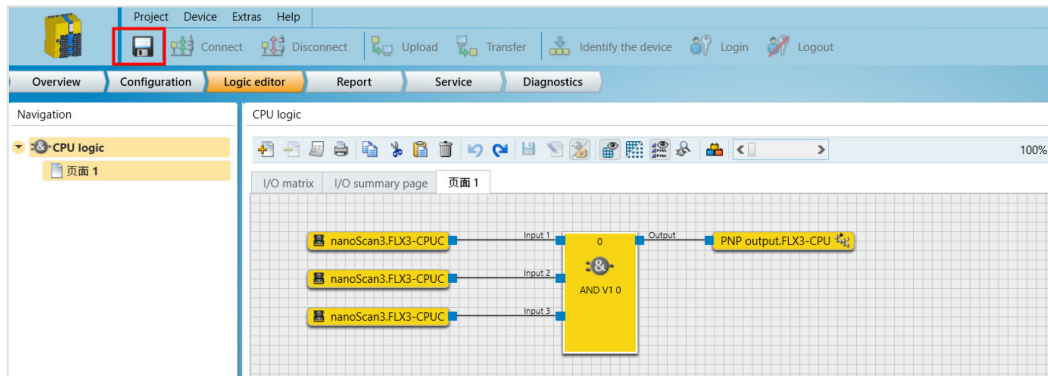
14. A verification report pop-up will appear. Click "Verify". The parameters will be saved to the module. Click "Yes" to run the module program.



15. Then, you can monitor the input status of the module. If monitoring is not possible, check whether "Edit mode" is turned off.



16. Click "Save" to save the configuration file for future use.



17. Normally, the module's input indicator lights should be ON or OFF in pairs at the same time (e.g., I1, I2). If the indicator light flashes, it means that the input signal is not connected or disconnected synchronously. Check if the signal is normal, or restart the module power and trigger the action again to see if the module returns to normal.

