



200AI

Smart Camera

Operation Manual

感谢您使用仪器

Thanks for selecting our product

请在使用仪器前仔细阅读用户手册

Please read the User's Manual carefully before operating the instrument.

-
- 请将用户手册作为仪器的一部分妥善保管，便于操作人员随时参阅。

Please keep this User's Manual as an integral part of the instrument for operators' ready reference.

- 本用户手册虽经认真审阅，但纰漏在所难免，如有不明之处，请联系公司客服中心或代理商。

Although this User's Manual has been carefully reviewed, omissions or errors may still exist. For any inquiries, please contact our Customer Service Center or authorized agents.

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Preface

The purpose of this section is to ensure that users can use the product correctly through this manual to avoid danger or property damage during operation; Before using this product, please read the product manual carefully and keep it properly for future reference.

Precautions for safe use

- When performing wiring, disassembly, and other operations, please be sure to cut off the power supply of the product and do not operate it with electricity.
- When multiple products are connected to the same switch power supply, it is necessary to confirm whether the power is sufficient and reserve enough margin to prevent the switch power supply from generating excessive heat or causing a fire.
- To reduce the risk of fire or electric shock, do not expose the product to rain or moisture.
- If the product produces smoke, odor, or noise, please immediately turn off the power, unplug the power cord, and contact the manufacturer in a timely manner.
- During the installation and use of the product, it is necessary to strictly comply with the electrical safety regulations of the country and the region of use.
- Please use a 24V switch power supply provided by a reputable manufacturer to provide separate power supply for the product, ensuring a power of at least 20W.
- When installing in the usage environment, please ensure that the product is firmly fixed and maintain smooth ventilation around the product.
- Avoid installing the product in a vibrating or impact environment, and keep the product away from electromagnetic interference. (Ignoring this may damage the product)
- Avoid placing the product in areas with direct sunlight or poor ventilation, or near heat sources such as heaters and radiators. (Ignoring this may lead to fire hazards)
- When used indoors, do not install the product in environments that may be exposed to water or other liquids, as well as in very humid conditions.
- Do not use the product in extremely hot, cold, dusty, corrosive, or high humidity environments.
- Please keep all the original packaging materials of the equipment properly, so that in case of any problems, the equipment can be packaged with packaging materials and sent back to the manufacturer for processing. (We do not assume any responsibility for accidental damage during transportation caused by non original packaging materials.)
- Installation and commissioning personnel requirements: Technical personnel with experience in weak current system installation, maintenance, or related work.

Precautions for preventing electromagnetic interference

- During the installation and use of the product, it is necessary to take measures to prevent electromagnetic interference, otherwise abnormal phenomena such as image abnormalities and camera false triggering may occur.
- To avoid the accumulation of static electricity, relevant equipment and products on site must be located on the same ground.
- Do not wire the product together with other equipment (especially servo motors/high-power devices, etc.), and control the wire spacing to be more than 10cm; If unavoidable, please make sure to take shielding measures on the cable.
- If the product is frequently powered on and off, it is necessary to strengthen voltage stabilization isolation. Consider adding a DC/DC isolation power module between the equipment and the power supply.
- When the product cable is too long, please be sure to use an 8-shaped tie, and unused cables must be insulated properly.
- During the installation and use of the product, it is necessary to avoid phenomena such as high voltage leakage.
- The product can be powered by 220V AC with low-power devices, but it is important to avoid using the same power supply as servo motors/high-power devices; If unavoidable, it is necessary to use red and black isolation plugs that meet the national standard GB2099.3.

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Chapter 1 Introduction to Smart Camera 200AI

1.1 Main purpose

- 1. Product Assembly Orientation Inspection:** Identify and confirm the front and reverse sides of materials during product assembly to prevent reversed or incorrect installation and avoid defective assembly products.
- 2. Carrier Tape Material Verification:** Applied to carrier tape packaging processes, it accurately detects the presence or absence of materials inside carrier tapes and inspects abnormal packaging conditions such as missing, omitted or excess materials
- 3. Pre-assembly Comparison & Confirmation:** Before formal product assembly, compare and verify the appearance and shape of incoming materials against standard samples to check material consistency and ensure compliance with assembly production requirements.
- 4. Rapid Dimension Inspection:** Complete measurement and judgment of product contours and critical dimensions rapidly. It replaces simple manual visual measurement to improve inspection efficiency and accuracy.
- 5. Wire Sequence & Color Recognition Verification:** For wire harness and flat cable products, quickly identify wire colors and arrangement order to detect abnormalities such as disordered wire sequences and mismatched wire colors.

1.2 Product Features

- 1. Intelligent Visual Inspection:** Equipped with self-developed AI vision software, the device integrates multiple inspection functions including presence/absence judgment, front-rear orientation recognition, dimension measurement and contour matching. With comprehensive inspection capabilities, it is compatible with various working conditions.
- 2. User-Friendly Operation Interface:** Equipped with a 7-inch touch display, it features intuitive and simple operation with friendly human-machine interaction, facilitating operators to debug programs and view inspection data in real time.
- 3. High-Grade Protective Structure:** The device housing is integrally formed by die-cast aluminum alloy with fully sealed structural design, reaching IP65 protection grade. It is dustproof, waterproof and anti-interference, suitable for complex workshop production environments.
- 4. Controllable Auxiliary Light Source:** Built-in dedicated digital light source control module allows operators to adjust light brightness directly on the touch screen. It adapts to inspection requirements of different material textures and lighting environments to guarantee clear imaging quality.
- 5. Stable Signal Interfaces:** Equipped with industrial electrical signal interfaces including 4-channel digital inputs and 8-channel digital outputs. Adopting optocoupler isolation circuit design, it can effectively isolate external signal interference to ensure stable, reliable and safe signal transmission of the device.

Chapter 2 Software Operation Main Interface

The detection and judgment results show that the result meets the requirements and is displayed as OK, while the result does not meet the requirements and is displayed as NG

Display window or processed pixels

Current usage scheme name

Software Run/Stop Menu

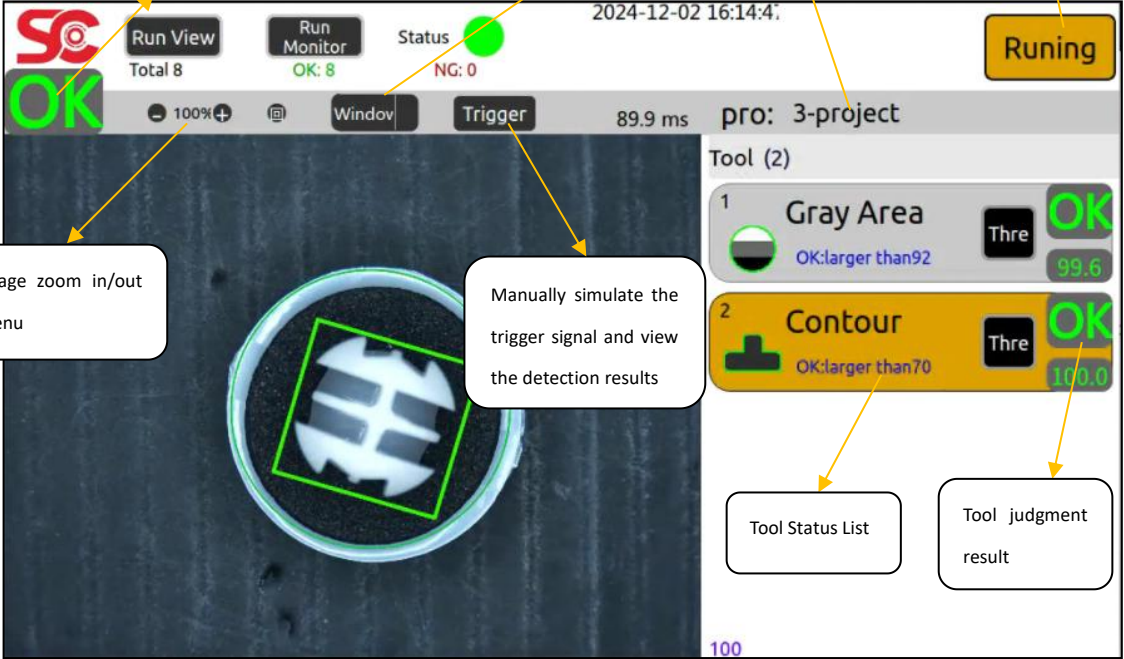


Image zoom in/out menu

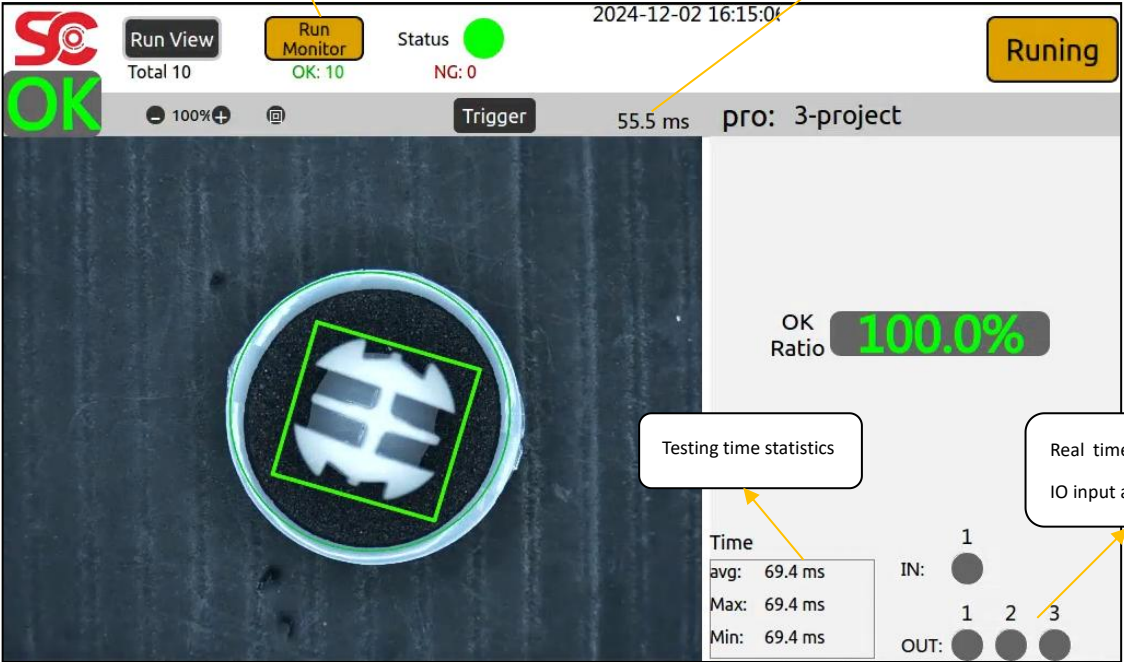
Manually simulate the trigger signal and view the detection results

Tool Status List

Tool judgment result

Switch to running monitoring mode

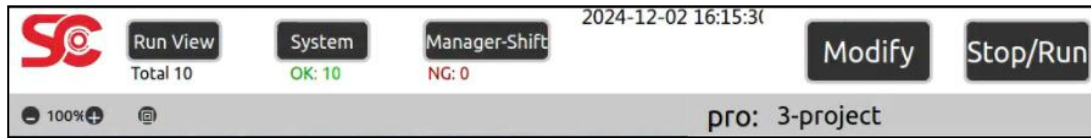
Algorithm computation



Testing time statistics

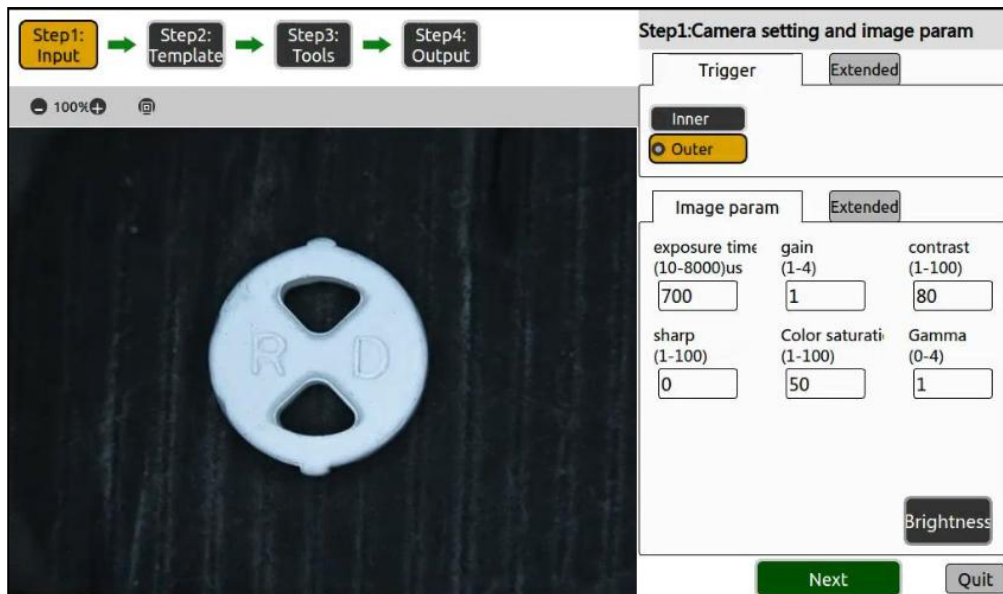
Real time status of IO input and output

Chapter 3 Algorithm Function Configuration



To set or modify algorithm functions, the software needs to be stopped first, and then click on the main interface menu scheme management to enter the scheme menu and create a new scheme. If there is already a scheme, you can also directly click on modify scheme to enter the scheme settings interface.

- **Step 1- Camera Settings:** Set the camera trigger mode, image parameters, and light source brightness.



Trigger method: Select the trigger type according to the detection requirements.

Internal trigger: The software triggers photography through a set fixed interval time.

External trigger: Trigger photography through external signals. (Extended parameters can be selected for delayed triggering or real-time triggering)

Image parameters: Adjust camera parameters.

Exposure time (1-10000us): The larger the value, the higher the brightness of the image, the longer the dynamic response time, and the corresponding effect of detecting images during motion will deteriorate.

Gain (1-4): Adjust brightness, the larger the value, the higher the brightness and the more noise.

Contrast (1-100): The difference between the brightest and darkest parts of an image. The higher the value, the greater the difference, and the clearer and more prominent the imaging display will be.

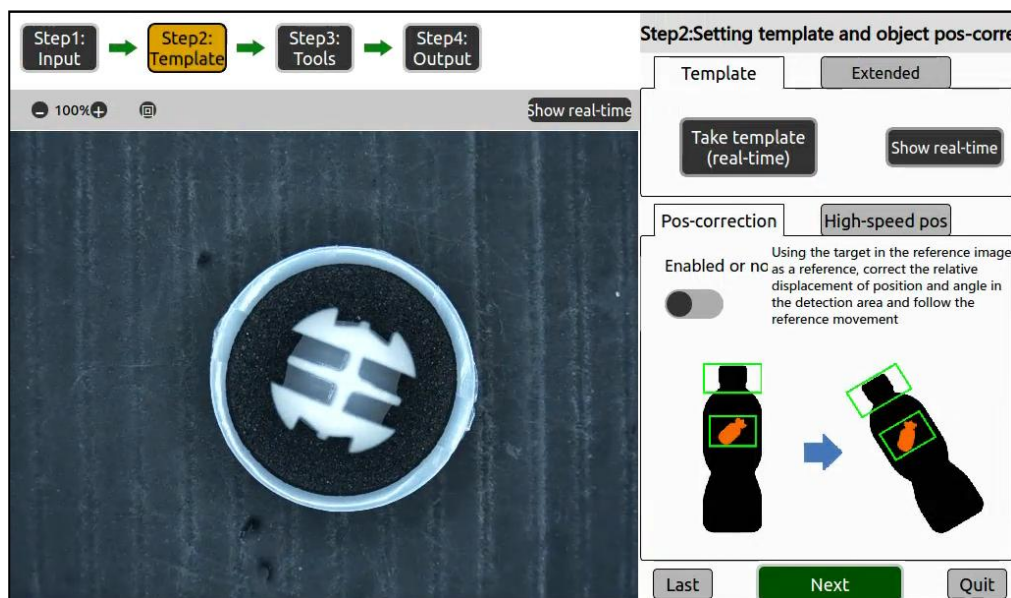
Sharpness (1-100): The higher the value, the higher the contrast of details, and the clearer the image, but the corresponding imaging may be distorted.

Color saturation (1-100): The purity of a color, the higher the value, the more vivid it is, and the lower the value, the dimmer it is.

Gamma (1-4) : The auxiliary function of brightness and contrast adjusts the brightness and contrast of the image based on this value.

Light source brightness: Manually adjust the brightness value of the light source.

- **Step 2- Registration benchmark:** Set the benchmark image for the scheme and perform position correction on the product.



Set reference image: Set the reference image for the current scheme.

Real time image registration as benchmark: Click on this menu to register the current real-time image as the benchmark image.

Display real-time image: Click on the menu to switch to real-time image.

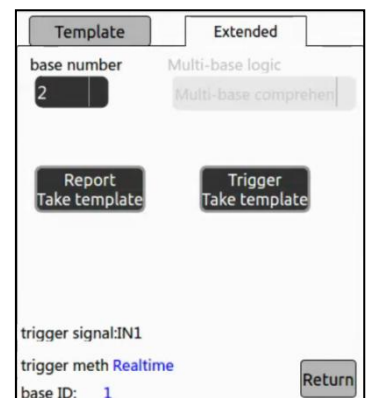
Extended parameters:

Number of benchmarks (1-4): Set the number of benchmarks for the current plan, with a default of one benchmark.

Multi benchmark judgment method: When multiple benchmarks are used, the logic for selecting the output result is whether to make a comprehensive judgment of multiple benchmarks or to make a separate judgment for each benchmark.

Register Historical Report as Benchmark: Enter the Historical Report and select the desired image to register as the benchmark.

Trigger capture registration as benchmark: Register benchmark by triggering capture through signal.



Trigger Delay Time: Trigger the photography delay time. (The first step is to select a delay trigger for external triggering, and this menu will only be displayed)

✧ **Position correction:** Adjust the position of the product through contour matching.

Whether position correction is enabled: Confirm whether the current plan requires position correction function. If necessary, manually enable it and disable it by default.

Edit Area: Click to enter the submenu and edit the effective area and search range for position correction.

Adjust parameters: Click to enter the submenu and adjust the position correction parameters.

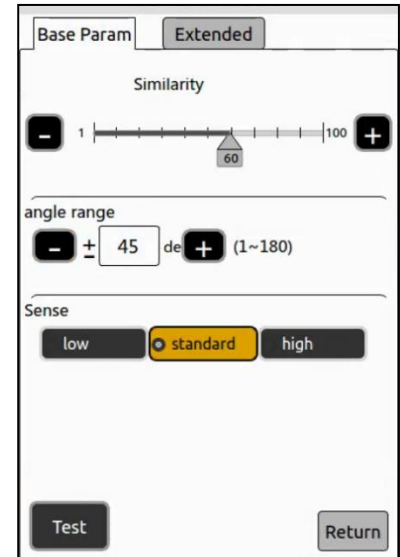
Similarity: Adjust the contour similarity value for position correction to meet the set value before determining OK and taking effect.

Angle range: Adjust the position to correct the angle range of the search, and only search within the set range.

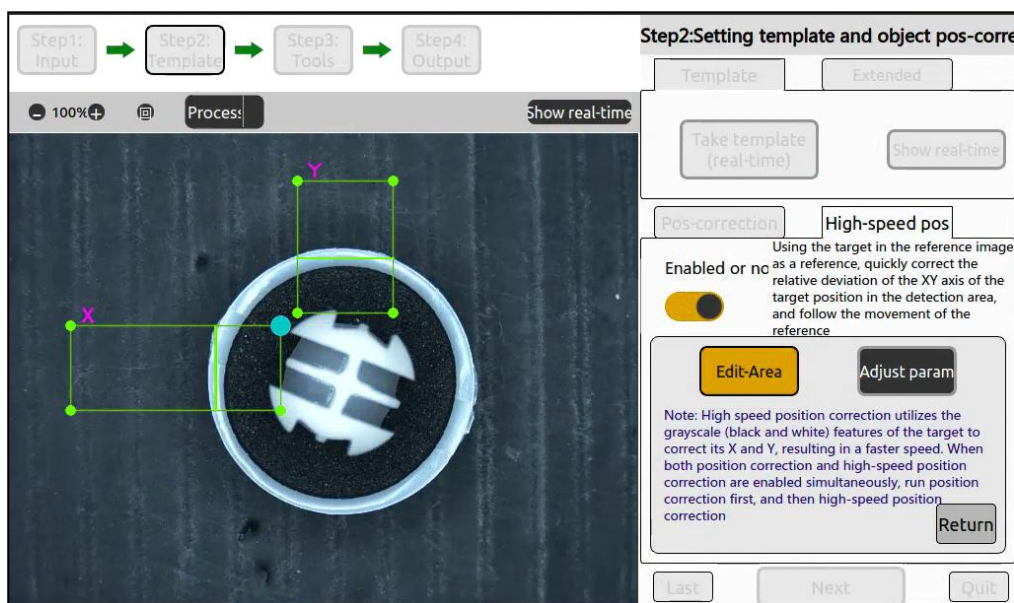
Contour sensitivity: Adjust the intensity parameter values for extracting edge contour feature points. High sensitivity, some feature points with weak black and white edges will also be calculated; Low sensitivity, requiring feature points with clear black and white edges for calculation.

Contour ignore: You can set the contour features of the local image to not take effect.

Search algorithm: The higher the accuracy of the selection, the more contour feature points are extracted, and the slower the computation speed.



✧ **High speed position correction:** The product is corrected in the X and Y directions by searching for black and white features of the target.



Enable: Confirm whether the current plan requires high-speed position correction function. If necessary, manually enable it and disable it by default.

Edit Area: Edit the effective detection area for high-speed position correction.

Adjust parameters: Click to enter the submenu and adjust the high-speed position correction parameters.

Basic parameters:

Correction direction: Adjust the direction of high-speed position correction.

Two axes (X+Y): high-speed position correction is used in both X and Y directions.

1 axis (X): Only use high-speed position correction in the X-axis direction.

2-axis (Y): Only use high-speed position correction in the Y-axis direction.

Edge extraction: Select the required feature edges for correction, and switch the edges using - and+.

Automatic extraction: The software automatically extracts the most prominent edges.

Display All: Display all extractable edges.

Test: Test the effect of high-speed correction on real-time images.

Extended parameters:

Target sensitivity: Adjust the intensity parameter values for extracting edge features.

Automatic adjustment: The default software automatically adjusts the appropriate sensitivity threshold through algorithms.

Manual adjustment: Adjust the sensitivity threshold manually through -,+.

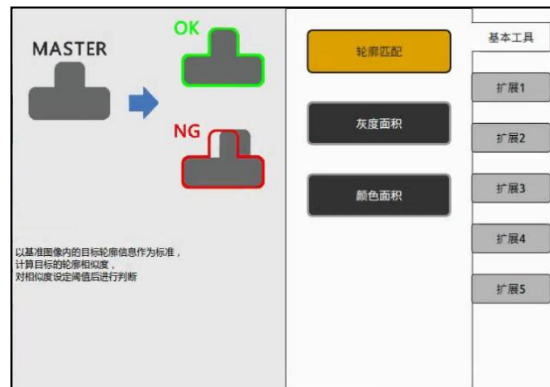
Target Color: The color of the selected feature target, automatically selected by default. (White block, black block)

Target minimum area: Determine the minimum area of the extracted target. If it is less than the set value, it will not take effect.

Connected body operation: Determine whether the extraction target is corroded first and then expanded or expanded first and then corroded.

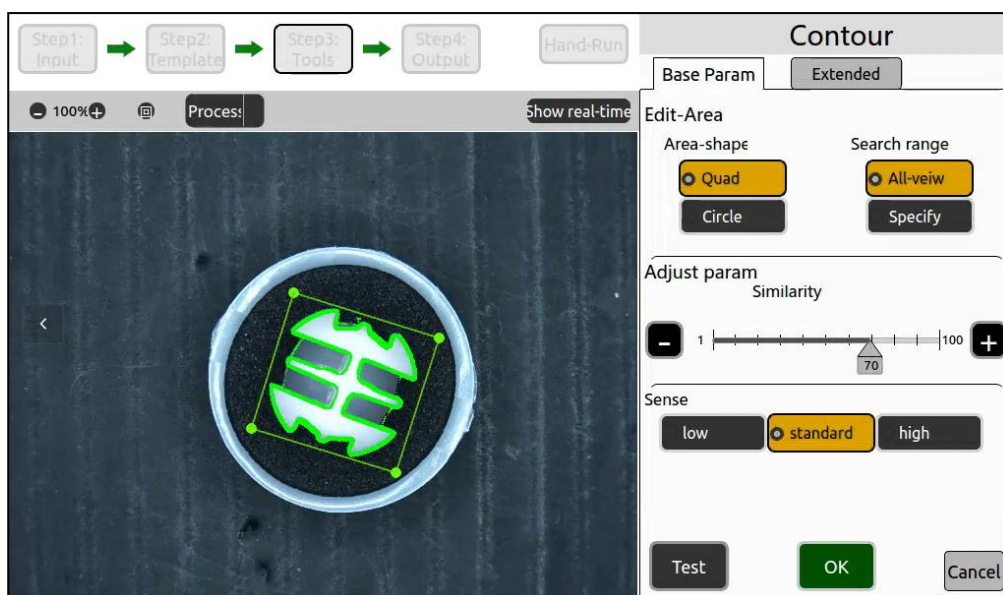
Connecting body size: Determine the corrosion expansion level of the connecting body operation. (default none)

- **Step 3- Algorithm Tools:** Add corresponding algorithm tools for detection based on the characteristics and detection requirements of the product.



Click on the add tool to enter the menu. Basic tools include **contour**, **grayscale area**, and **color area**; Then select the tools that need to be added.

1) Contour



Basic parameters:

Edit Area: Edit the effective area and search range for contour matching.

Adjust parameters: Adjust the algorithm parameters for contour matching.

Similarity: Adjust the similarity value of contour matching, and only determine OK if it is greater than the set value.

Contour sensitivity: Adjust the intensity parameter values for extracting edge contour feature points. High sensitivity, some feature points with weak black and white edges will also be calculated; Low sensitivity, requiring feature points with clear black and white edges for calculation.

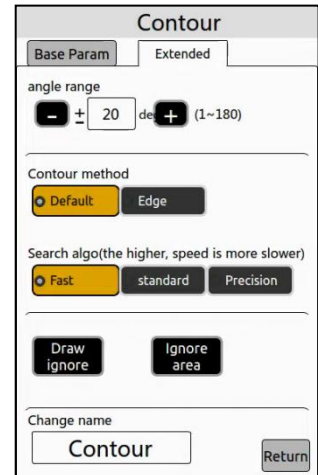
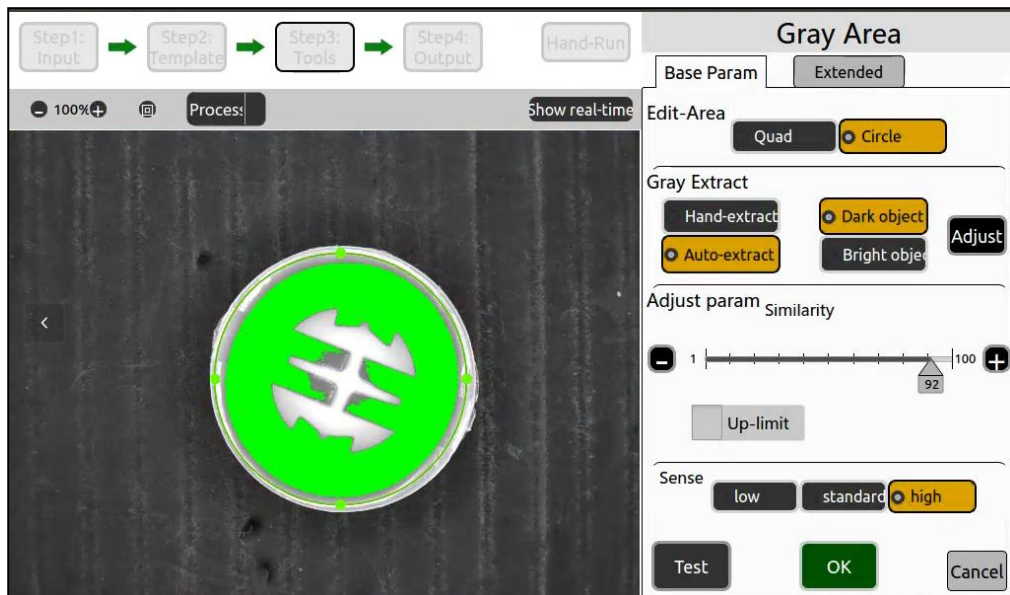
Extended parameters:

Angle range (1-180): Adjust the angle range for contour matching search, and the search will only be effective within the set range.

Search algorithm: The higher the accuracy, the more contour feature points are extracted, and the slower the operation speed.

Contour ignore: Local contour features can be set to not take effect.

Change Name: You can modify the name of the current contour tool.

**2) Gray Area****Basic parameters:**

Edit Area: The effective detection area for editing the grayscale area.

Grayscale extraction: Determine the range of grayscale values to be extracted.

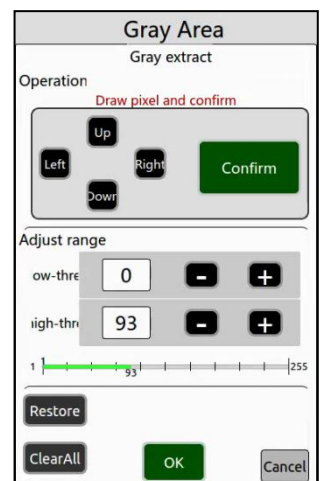
Manual Extraction: Click on Extract to enter the Extraction menu and perform manual extraction. (As shown in the figure on the right)

Operation: Move the cross coordinate point on the image to the desired extraction position, and then click OK to complete the grayscale extraction.

Adjust the extraction range: manually adjust the range of high and low thresholds.

Restoration: Revoke the previous extraction.

Clear All: Clear all extracted grayscale values.



Automatic extraction: Based on the detection requirements, select to automatically extract the corresponding dark or bright targets.

Adjust parameters: Adjust the algorithm parameters of the tool's grayscale area.

Similarity: Adjust the similarity value of the grayscale area, and only determine OK if it is greater than the set value.

Upper limit switch: When turned on, the similarity value between the upper and lower limits can be set.

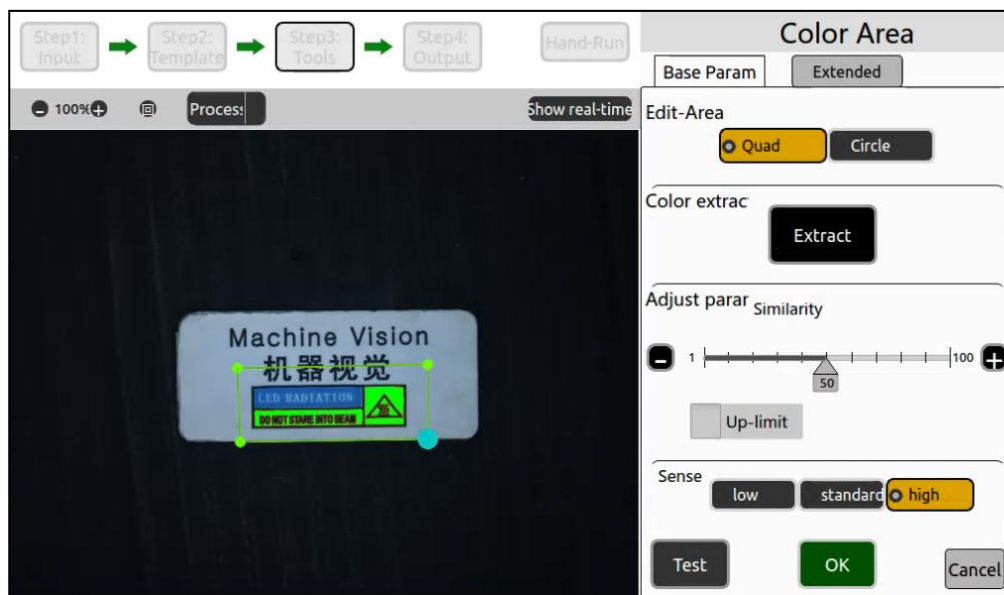
Sensitivity: Adjust the grayscale threshold range captured during detection; The lower the sensitivity, the wider the grayscale threshold range captured during detection.。

Extended parameters:

Region ignore: It is possible to set the grayscale value extraction of local regions to be ineffective.

Change Name: You can modify the name of the current grayscale area tool.

3) Color Area



Basic parameters:

Edit Area: The effective detection area for editing color areas. (Regional shapes are divided into quadrilaterals and circles)

Color Extraction: Confirm the color to be extracted, click Extract to enter the Extraction menu.

Operation: Move the cross coordinate point on the image to the desired extraction position, and then click OK to complete the color extraction.

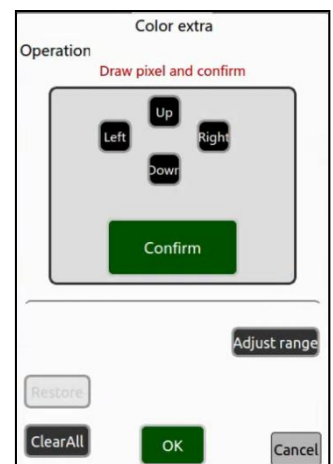
Adjust the extraction range: manually adjust the range of HSV threshold.

Restoration: Revoke the previous extraction.

Clear All: Clear all extracted HSV values.

Adjust parameters: Adjust the threshold parameter of the tool's color area.

Similarity: Adjust the area similarity value of the color to be greater than the set value to determine OK.



Upper limit switch: When turned on, the upper and lower limit similarity values can be set.

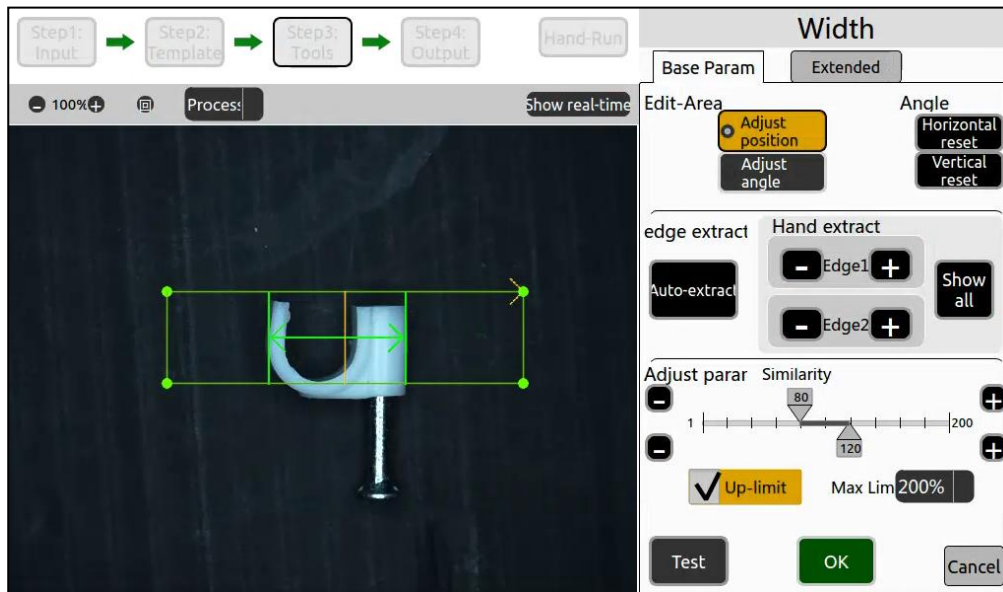
Sensitivity: Adjust the color threshold range captured during detection; The lower the sensitivity, the wider the color threshold range captured during detection.

Extended parameters:

Region ignore: You can set the color value extraction of local regions to not take effect.

Change Name: You can modify the name of the current color area tool.

4) Width



Basic parameters:

Editing area:

Adjust position: Adjust the effective detection range of the width.

Adjust angle: Adjust the angle of the width detection area.

Angle reset:

Horizontal reset: Reset the angle of the detection area to the horizontal direction.

Vertical reset: Reset the angle of the detection area to the vertical direction.

Edge extraction:

Automatic extraction: Automatically extract the most prominent edge as the two edges for width measurement.

Manual extraction: Manually select the measurement edges for edge 1 and edge 2. (Click -+to adjust)

Display All: Display all selectable measurement edges.

Similarity: Adjust the similarity value of the width measurement result to determine OK between the set values.

Upper limit switch: When turned on, the upper and lower limit similarity values can be set. (The maximum upper limit value can be set to 999%)

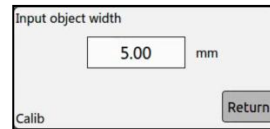
Extended parameters:

Adjust edge sensitivity: manually adjust the threshold sensitivity for obtaining edges.

Measurement method:

Percentage: The precision unit of similarity when selecting a percentage (Default accuracy is 1%)

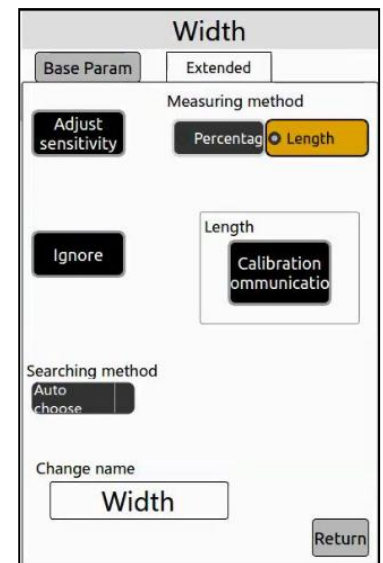
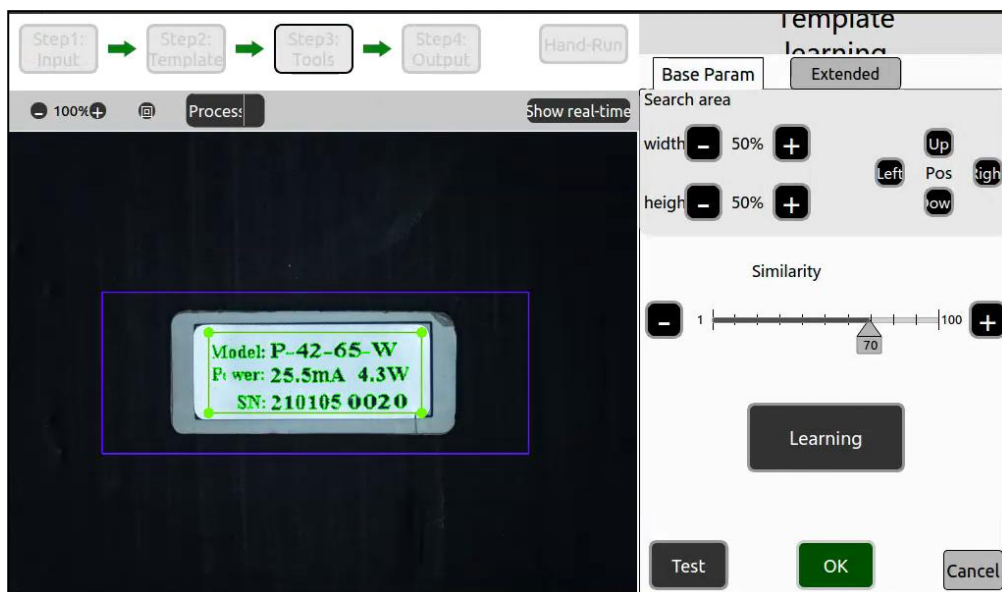
Actual length: When selecting the actual length, it is necessary to calibrate the relationship between pixels and actual size.



Target search method: Confirm the method of searching for the width edge. (Automatic selection, target size, target distance)

Region ignore: You can set the edge extraction of local regions to be ineffective.

Change Name: You can modify the name of the current width tool.

**5) Template learning****Basic parameters:**

Search Area: The effective search area for editing template learning. (Not detected outside the search area)

Width: Adjust the left rear range of the search area.

Height: Adjust the upper and lower range of the search area.

Position: Adjust the overall position of the search area.

Similarity: Adjust the similarity value of the template learning to be greater than the set value to determine OK.

Template learning: Multiple template images can be added on top of the benchmark image; When template learning detection, as long as it matches an image in the template library, it is considered OK.

Extended parameters:

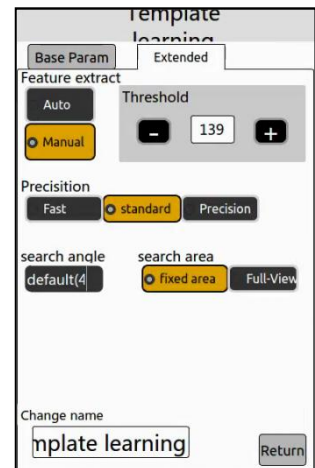
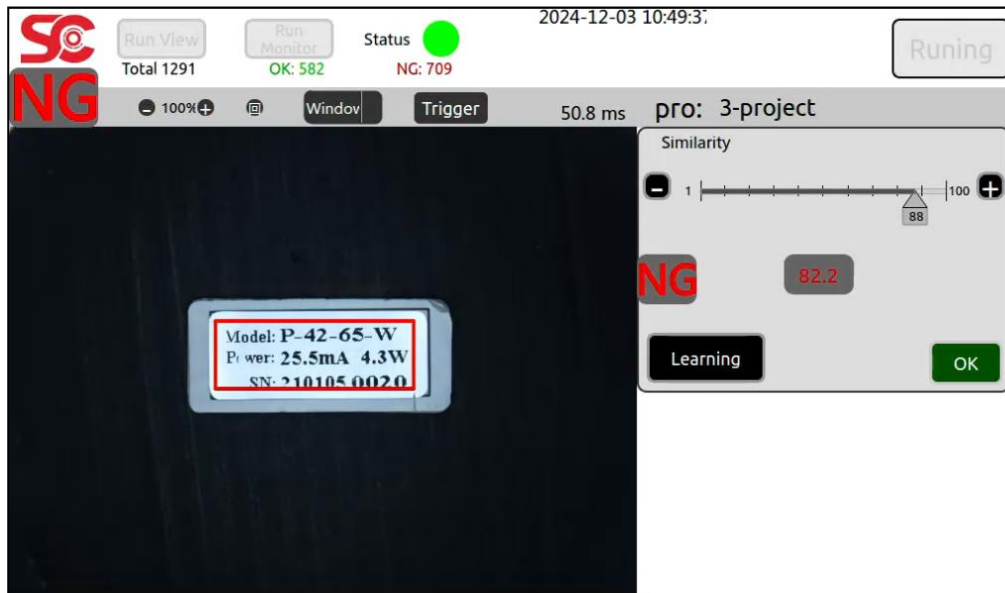
Feature extraction: Adjust the black and white threshold sensitivity for edge extraction. (default automatic extraction)

Detection accuracy: The higher the accuracy, the more contour feature points are extracted, and the slower the computation speed.

Rotate search angle: Adjust the angle range of the template learning search, and the search is only effective within the set range.

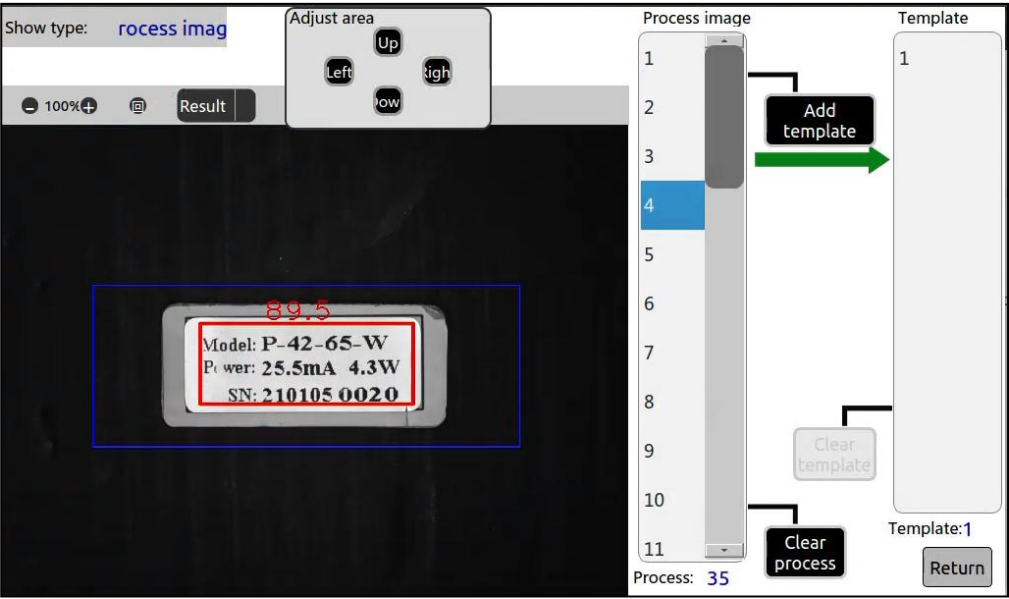
Image search range: The template learning search range defaults to a specified area, and full image search can be selected.

Change Name: You can modify the name of the current template learning tool.

**Template learning operation process:**

When using template learning tools, if an alarm occurs during detection and adjusting similarity cannot effectively eliminate false positives, sample learning can be used to add multiple template images to achieve detection results.

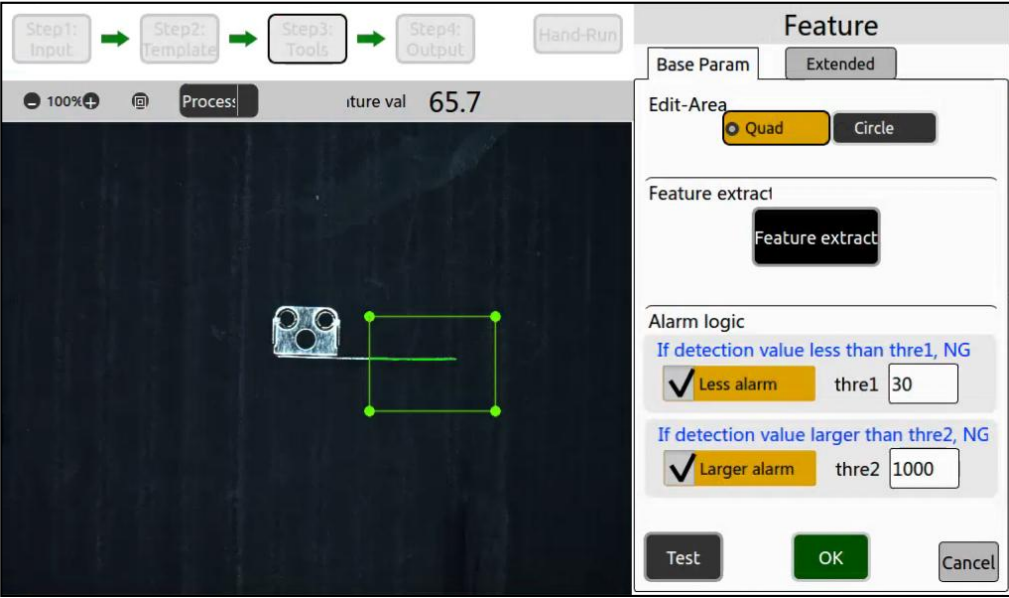
Firstly, enter the sample learning interface.



In the image processing library, we select images where the product is good but there is a misjudgment, and add them to the template image library. The next time the current situation occurs during detection, it will not be judged as NG.

Attention: The added image must confirm that the product is good but has false alarms. Adding an incorrect template may result in the inability to detect defective products.

6) Feature



Basic parameters:

Editing area: The effective detection area for editing the presence or absence of features. (Regional shapes are divided into quadrilaterals and circles)

Feature extraction: Determine the extracted feature parameters, click on feature extraction to enter the extraction menu.

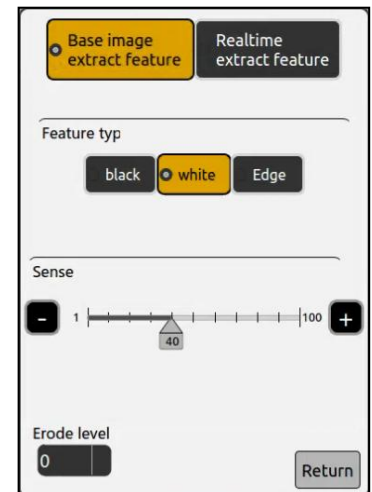
Extract features from the reference image: Adjust parameters on the reference image to view the extracted features.

Extracting features from real-time images: Adjust parameters on the real-time image to view the extracted features.

Feature type: Select the extracted type . (black block, white block, edge)

Feature sensitivity: Adjust the threshold for obtaining feature points to determine whether the obtained features are the desired features. By adjusting parameters, some features with unclear brightness can be extracted.

Corrosion level: The higher the level, the more small particles and noise are removed around the target area, and the more the boundary of the target object shrinks inward.



Alarm logic: Determine the range and direction of the alarm, which can be opened separately or simultaneously.

When the detected feature value is less than the threshold 1, it is judged as NG

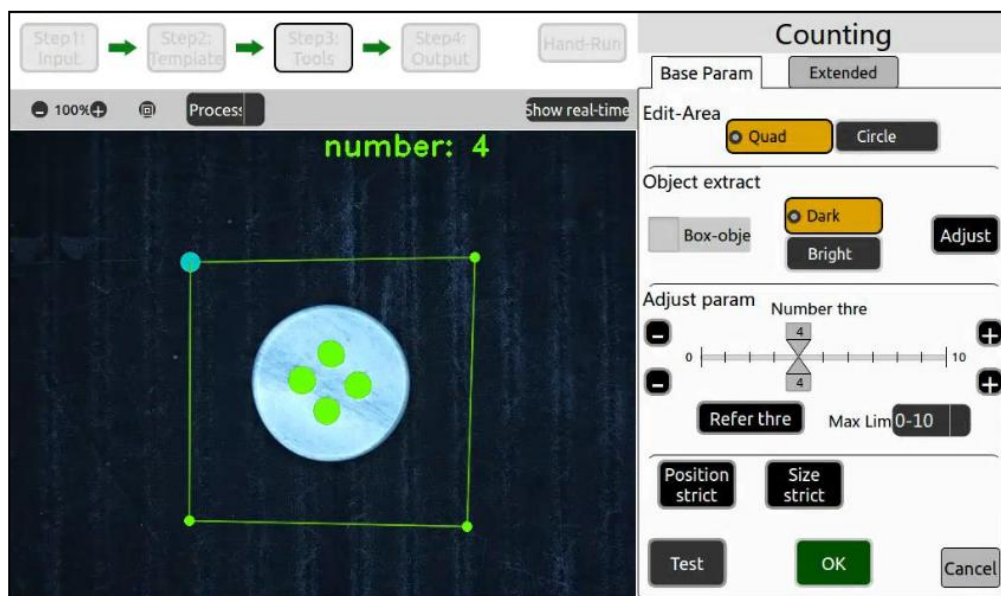
When the detected feature value is greater than threshold 2, it is judged as NG

Extended parameters:

Region ignore: You can set the feature extraction of local regions to be ineffective.

Change Name: You can modify the name of the tool for the current feature.

7) Counting



Basic parameters: (Extended parameters, when selecting black and white spot color)

Edit Area: The effective detection area for editing spot counts. (Quadrilateral, circular)

Spot extraction: Determine the threshold range for extracting spots.

Box selection of spots: After box selection, each effective spot is displayed independently with a region.

Dark spots: Comprehensive detection of grayscale values within the area, automatically extracting spots that are close to black.

Bright spots: Comprehensive detection of grayscale values within the area, automatically extracting spots that are close to white.

Adjustment: Manually adjust the threshold range for extracting spots.

Adjust parameters: Adjust the algorithm parameters for tool spot counting.

Threshold for the number of spots: Adjust the similarity value of the grayscale area, and only determine OK if it is greater than the set value.

Reference threshold: Based on the current benchmark template, automatically select the corresponding threshold for the number of spots obtained.

Maximum upper limit: The threshold range for the number of spots can be set for both upper and lower limits.

Spot position restriction: Set whether the spot overflow detection area is valid outside. (Calculate all spots, only middle spots)

Spot size limit: Set the conditional parameters for effective spot detection. (Spot area range, spot width range, spot height range)

Extended parameters:

Region ignore: You can set the spot extraction of local regions to not take effect.

Spot color: When the spot counting tool extracts spots, choose black and white or color. (default black and white)

Connected body operation: Corrosion and expansion of the binary image of the connected body.

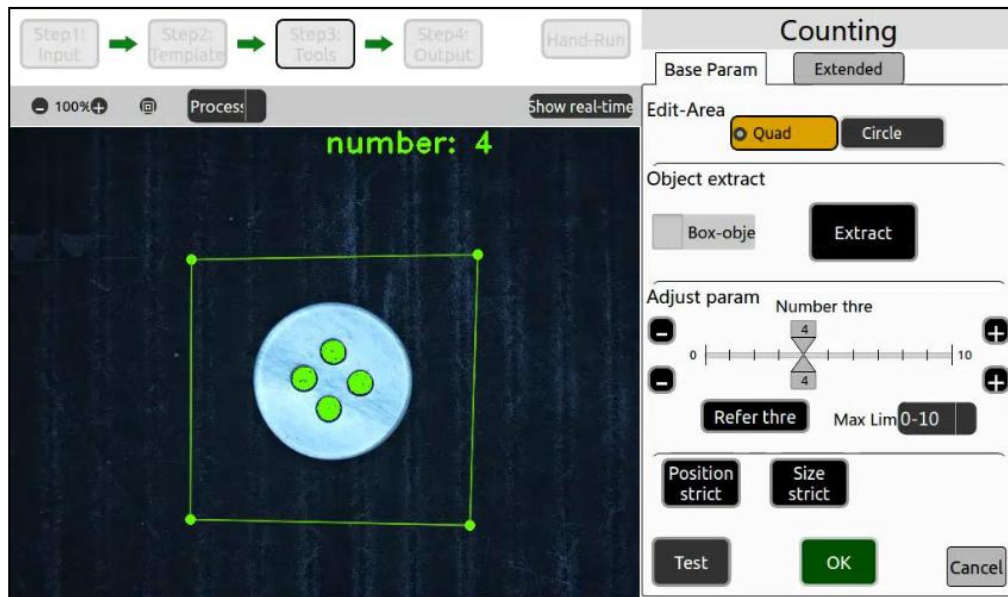
Erosion followed by dilation: also known as opening operation, it is commonly used to eliminate small noise points or small objects, remove fine points adhering to the boundaries of objects to achieve the effect of separating object boundaries, and can maintain the basic size of the object area unchanged.

Expansion followed by erosion: also known as closing operation, it is commonly used to fill small cavities within the target and connect disconnected adjacent targets, while maintaining the basic size of the object unchanged.

Corrosion level: The higher the level, the more small particles and noise are removed around the target area, and the more the boundary of the target object shrinks inward.

Expansion level: The higher the level, the more small holes are filled in the target area, and the more the target boundary expands outward.

Change Name: You can modify the name of the current spot counting tool.



Basic Parameters: (Extended Parameters, Spot Color Selection for Color)

Edit Area: The effective detection area for editing spot counts. (Quadrilateral, circular)

Spot extraction: Manually extract the threshold for the required spots.

Box selection of spots: After box selection, each effective spot is displayed independently with a region.

Extraction: Enter the extraction interface and manually extract the desired color spots.

Operation: Move the cross coordinate point on the image to the desired extraction position, and then click OK to complete the color extraction.

Adjust the extraction range: manually adjust the range of HSV threshold.

Restoration: Revoke the previous extraction.

Clear All: Clear all extracted HSV values.

Adjust parameters: Adjust the algorithm parameters for tool spot counting.

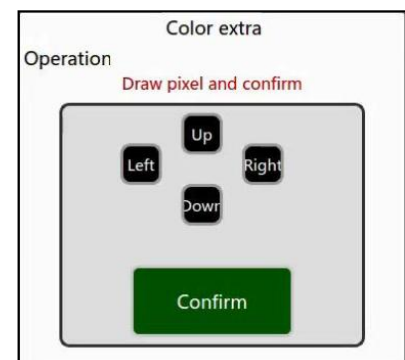
Threshold for the number of spots: Adjust the similarity value of the color area, and only determine OK if it is greater than the set value.

Reference threshold: Based on the current benchmark template, automatically select the corresponding threshold for the number of spots obtained.

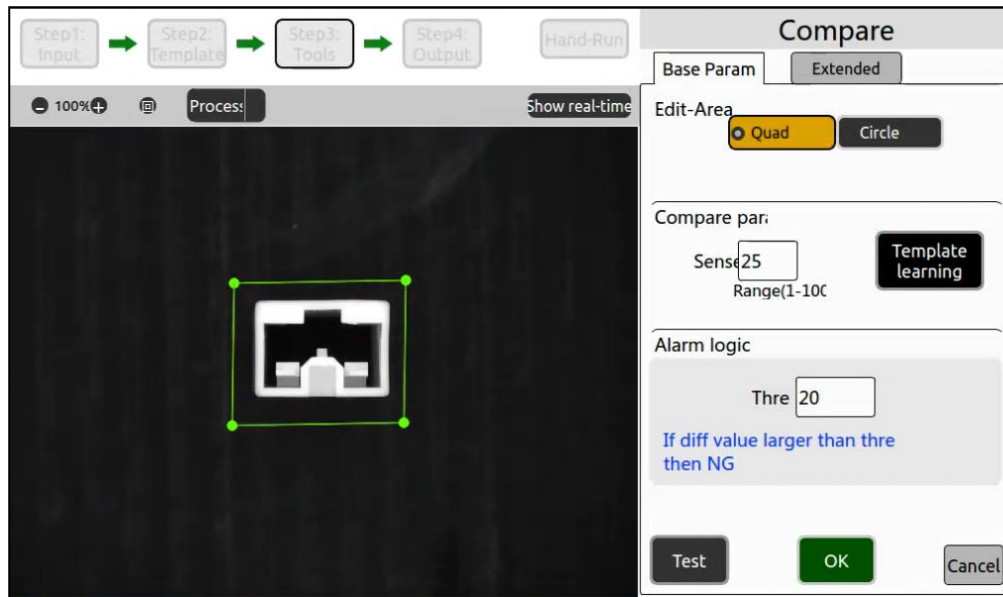
Maximum upper limit: The threshold range for the number of spots can be set for both upper and lower limits.

Spot position restriction: Set whether the spot overflow detection area is valid outside. (Calculate all spots, only middle spots)

Spot size limit: Set the conditional parameters for effective spot detection. (Spot area range, spot width range, spot height range)



8) Compare



Basic parameters:

Editing area: The effective detection area for editing grayscale contrast. (Regional shapes are divided into quadrilaterals and circles)

Comparison parameters: Determine the parameters for grayscale comparison.

Sensitivity: The comparison standard between the pixel grayscale values of the detection image in the current area and the reference image. The smaller the value, the higher the accuracy, and the larger the value, the lower the accuracy.

Template learning: Multiple template images can be added on top of the benchmark image; When performing grayscale contrast detection, as long as it matches one image in the template library, it is considered OK.

Alarm logic: When the difference in grayscale contrast is greater than the set threshold, it is judged as NG.

Threshold: Compare with the reference template during detection and calculate the area of abnormal pixels; The numerical value is related to the sensitivity value, and the larger the sensitivity value, the fewer abnormal pixels will be detected during detection.

Extended parameters:

Region ignore: You can set the grayscale contrast tool for local regions to not take effect.

Corrosion level: The higher the level, the more small particles and noise are removed around the target area, and the more the boundary of the target object shrinks inward.

Comparison algorithm: (The higher the accuracy, the slower the speed) The higher the accuracy, the more pixels are obtained, and the corresponding detection speed is slower.

Change Name: You can modify the name of the current grayscale comparison tool.

Template learning operation process:



When using grayscale comparison tools, if an alarm occurs during detection and adjusting the threshold cannot effectively eliminate false alarms, template learning can be used to add multiple template images to achieve detection results.

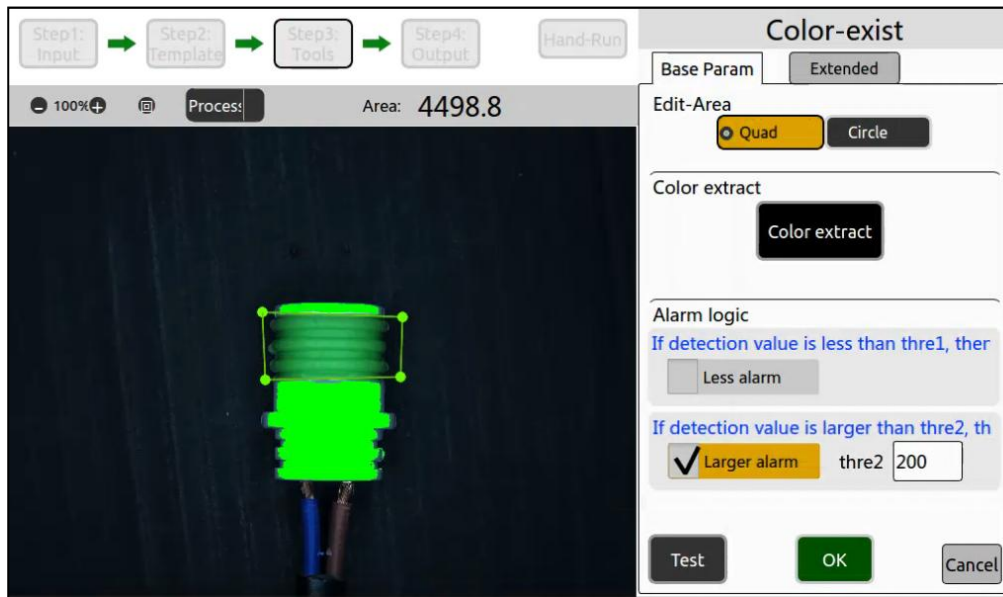
Firstly, enter the template learning interface.



In the image processing library, we select images where the product is good but there is a misjudgment, and add them to the template image library. The next time the current situation occurs during detection, it will not be judged as NG.

Attention: The added image must confirm that the product is correct but with false alarms. Adding an incorrect template may result in the inability to detect defective products.

9) Color -exist



Basic parameters:

Editing area: The effective detection area for editing the presence or absence of colors. (Regional shapes are divided into quadrilaterals and circles)

Color extraction: Determine the extracted color parameters, click on color extraction to enter the extraction menu.

Extract features from the reference image: Adjust parameters on the reference image to view the extracted color features.

Extracting features from real-time images: Adjust parameters on the real-time image to view the extracted color features.

Extraction: Enter the extraction interface and manually extract the desired color spots.

Operation: Move the cross coordinate point on the image to the desired extraction position, and then click OK to complete the color extraction.

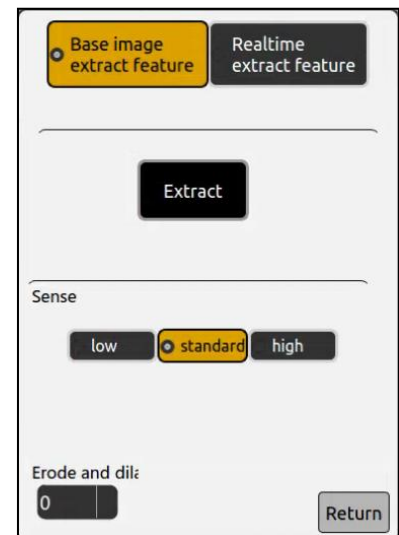
Adjust the extraction range: manually adjust the range of HSV threshold.

Restoration: Revoke the previous extraction.

Clear All: Clear all extracted HSV values.

Sensitivity: Adjust the intensity parameter values for extracting feature points. Some feature points with high sensitivity and weak edges will also be calculated; Low sensitivity, requiring feature points with distinct edges for calculation.

Corrosion and expansion of connected bodies: The higher the level, the more small particles and noise are removed around the target area, and the more the boundary of the target object shrinks inward.



Alarm logic: Determine the alarm range and direction of the detection area, which can be opened separately or simultaneously.

When the color feature value of the detection area is less than the threshold 1, it is judged as NG

When the color feature value of the detection area is greater than the threshold 2, it is judged as NG

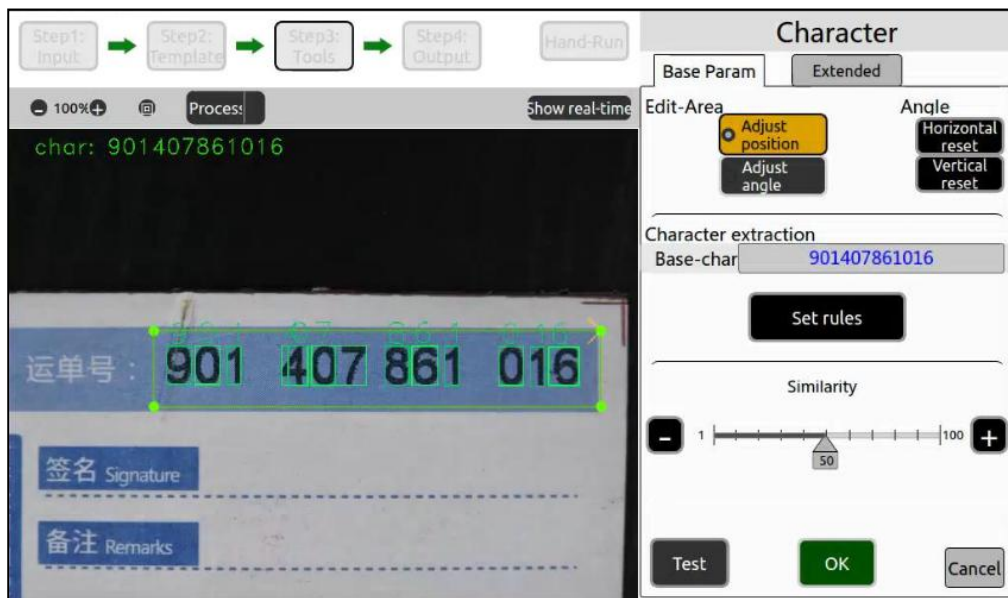
Extended parameters:

Region ignore: You can set the color extraction of local regions to not take effect.

Change Name: You can modify the name of the tool for the current color.

10) Character

Basic parameters:



Editing area:

Adjust position: Adjust the effective detection range of character recognition.

Adjust angle: Adjust the angle of the character recognition detection area.

Angle reset:

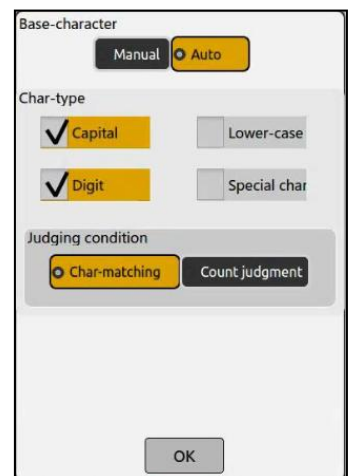
Horizontal reset: Reset the angle of the detection area to the horizontal direction.

Vertical reset: Reset the angle of the detection area to the vertical direction.

Character extraction:

Reference character: Automatically recognize and extract reference characters.

Set extraction rules: Set rules for character recognition extraction. (As shown in the figure on the right)



Set reference characters: manual/automatic. When selecting manual, manually edit and input the reference characters; When automatic, extract automatically through the following option rules.

Character type: Select the rules for character extraction.

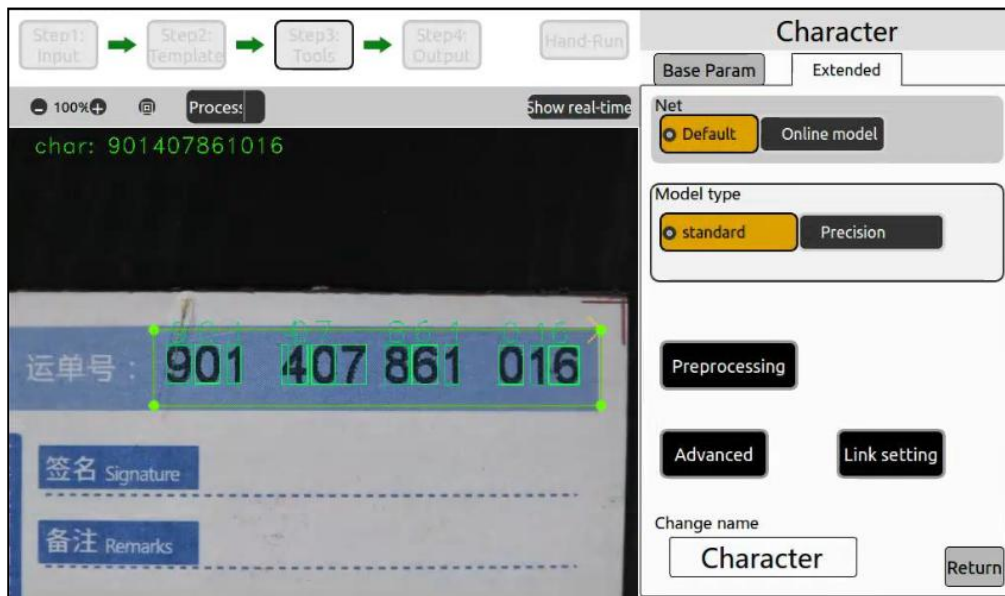
Judgment condition: The condition for character recognition judgment during detection.

Character matching: Full character detection, reading and recognition, identifying whether the content matches the reference character.

Only judging the number of characters: During detection, only the number of recognized characters is judged to be consistent with the reference number of characters, and the content is not recognized.

Similarity: Adjust the similarity value of character recognition judgment to meet the similarity value before determining OK.

Extended parameters:



Network model: The default system comes with model detection, and online models can update the model library online.

Default Model Size: (Network Model Selection Default)

Standard: During recognition, the recognition accuracy is average and the detection speed is fast.

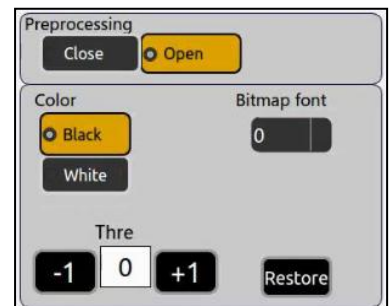
High precision: During recognition, the recognition accuracy is high but the detection speed is slow.

Character preprocessing: disabled by default, enabled to set relevant parameters. (As shown in the figure on the right)

Font color: Select the color of the font that needs to be recognized.

Dot matrix font processing: For dot matrix character detection, optimize recognition success rate.

Threshold: Manually adjust the black and white threshold for dividing characters.



Advanced parameters:

Search mode: (selection criteria for character matching)

Only search for reference characters: only search for those related to the reference characters, do not recognize others.

Search All: Search for all recognizable characters.

Character filtering:

Height restriction: Filter out characters with lower heights when recognizing them.

Width limit: Filter out characters with smaller widths when recognizing them.

Similarity limit: Filter out characters with low similarity when recognizing them.

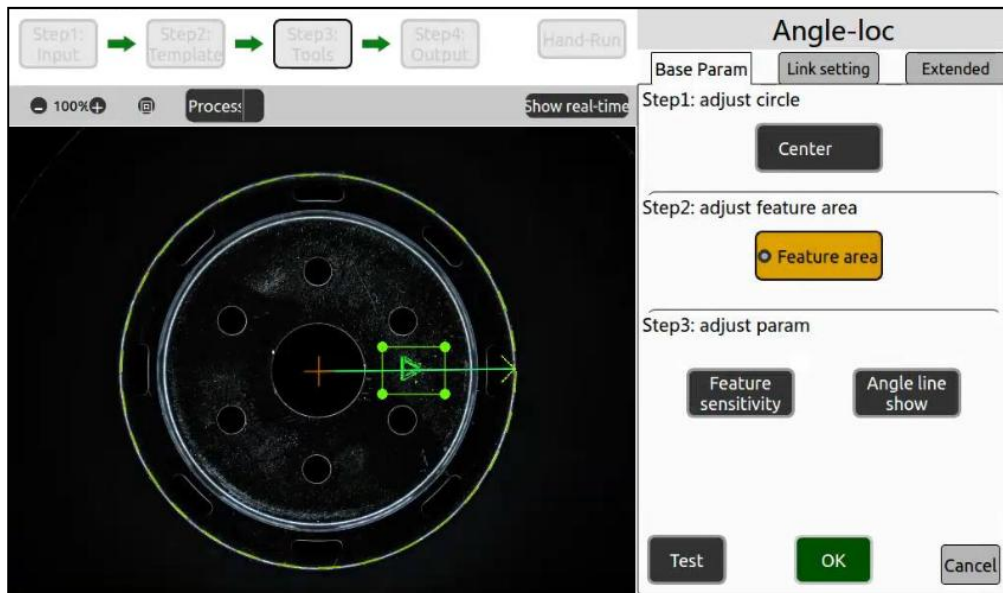
Character segmentation mode:

Default (character block): By default, character blocks are used for segmentation and recognition.

Uniform segmentation of single line characters: recognize by dividing evenly based on distance.

Communication settings: (Please refer to Chapter 6 for specific settings)

Change name: You can modify the name of the current character recognition tool.

11) Angle-loc**Basic parameters:****Step 1: Adjust the center circle**

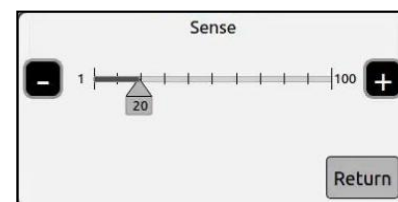
Adjust the detection center circle area to perfectly match the edge of the product, and the software will automatically calculate the center point of the product.

Step 2: Adjust the feature area

Observe the contour features used to locate the product and adjust the feature area.

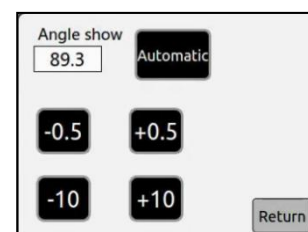
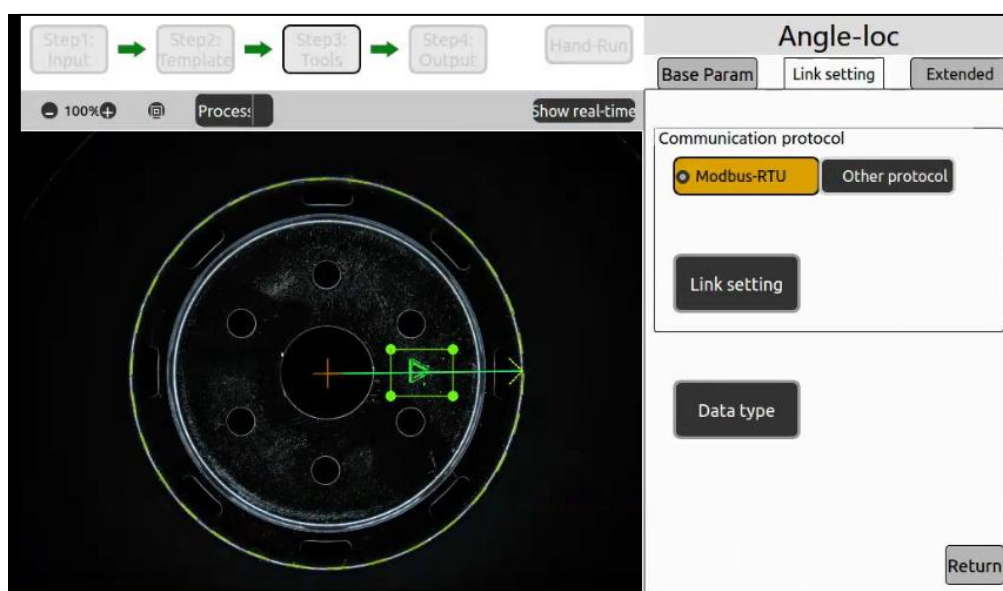
Step 3: Adjust parameters

Feature sensitivity: The threshold for obtaining contour feature points. The lower the value, the more feature points are obtained, and some contour feature points with unclear brightness and darkness will also be extracted.



Angle line display: By default, the 12 o'clock direction of the reference image serves as the reference angle of 0 degrees. The angle line is assumed to coincide with the reference angle of 0 degrees, meaning that a 0-degree angle is sent when the product and reference images align. When our feature is not aligned with the reference angle of 0 degrees, we can calculate the angle compensation value needed to compensate the direction of the feature to the reference angle of 0 degrees by adjusting the angle line. (In simple terms, the default value sent is the angle value of the feature angle line.)

Automatic acquisition: The system automatically calculates the specific position of the angle line based on the feature area, and can also be fine tuned through the menu below.

**Link setting:**

- Communication parameters:**

Modbus-RTU: Using standard serial port RS-232 for communication, the serial protocol is Modbus RTU. The intelligent camera serves as the Modbus master station and can read and write data to the PLC end.

Serial port parameters: Confirm the PLC serial port parameters and select the corresponding parameters one by one.

Baud rate: Confirm the baud rate of the PLC end and select the corresponding parameter.

Data bit: Confirm the data bit on the PLC end and select the corresponding parameter.

Stop position: Confirm the stop position on the PLC end and select the corresponding parameter.

Calibration type: Confirm the calibration type of the PLC end and select the corresponding parameters.

Modbus Station Number: Confirm the main station number and fill in the corresponding parameters.

Register address: The angle and flag data are both integers.

Flag address: Confirm the register address received by the PLC to determine the OK/NG status, and fill in the parameters. (Test result OK, flag 1; test result NG, flag 2)

Angle address: Confirm the register address of the PLC receiving angle data and fill in the parameters.

Other agreements: (Please refer to Chapter 6 for specific settings)

- **Data format:**

Sending angle range: Select the range of angle values to send.

Sending angle accuracy: Determine the accuracy of the sending angle.

Send compensation angle range (0-360): This compensation can be used to modify the actual sending angle. (For example, if our current sending angle is 100 degrees and we compensate for 30 degrees, the actual sending angle will be 130 degrees. If we compensate for 330 degrees, the actual sending angle will be 70 degrees)

Extended parameters:

Number of characteristic regions:Select the number of feature regions for angle positioning (default 1, maximum 4).

Expand search scope:The search range of the feature area can be adjusted, and when the feature position deviation is large, the range can be appropriately increased.

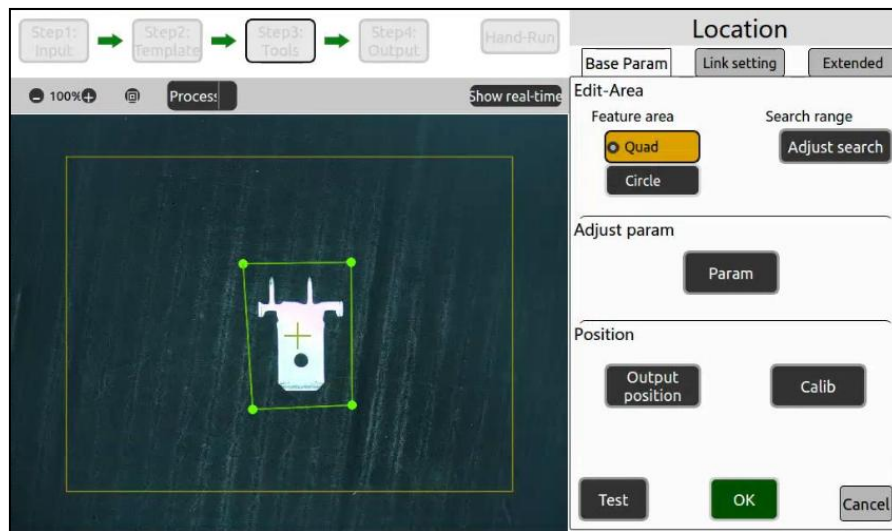
Feature search algorithm: (The higher the accuracy, the slower the speed)The higher the accuracy, the more feature points obtained, and the slower the corresponding detection speed.。

Similarity:The threshold for feature similarity (matching degree), if the similarity is greater than the set threshold during detection, it is OK.

Change name:You can modify the name of the current angle positioning tool.

12) Location

Basic parameters:



- **Editing area:**

Feature area: Adjust the area for target localization and feature extraction.

Search Range: Adjust the range of the search feature area.

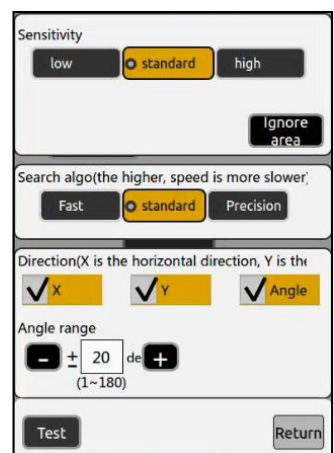
- **Adjust parameters:**

- **Positioning parameters:** (extended parameters, positioning feature selection contour)

Search sensitivity: Adjust the intensity parameter values for extracting contour feature points. Some feature points with high sensitivity and weak edges will also be calculated; Low sensitivity, requiring feature points with distinct edges for calculation.

Ignore Region: You can set the search's local area to not take effect.

Search algorithm: The higher the accuracy of the selection, the more edge feature points are extracted, and the slower the computation speed.。



Positioning direction: Select the requirement for this positioning, default positioning is X Y、 Angle; You can also set to only locate in a certain direction.

Search angle range: Set the angle range for feature search, and match within the angle range to determine OK.

- **Positioning parameters:** (extended parameters, positioning feature selection connected body)

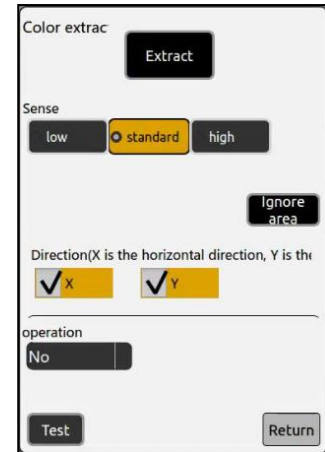
Color Extraction: Determine the extracted color parameters, click Extract to enter the Extraction Parameters menu.

Operation: Move the cross coordinate point on the image to the desired extraction position, and then click OK to complete the color extraction.。

Adjust the extraction range: manually adjust the range of HSV threshold.

Restoration: Revoke the previous extraction.

Clear All: Clear all extracted HSV values.



Sensitivity: Adjust the intensity parameter values for extracting connected body feature points. Some feature points with high sensitivity and weak edges will also be calculated; Low sensitivity, requiring feature points with distinct edges for calculation.

Ignore Region: Local features of connected bodies can be set to not take effect.

Connected body operation: Corrosion and expansion of the binary image of the connected body.

Erosion followed by dilation: also known as opening operation, it is commonly used to eliminate small noise points or small objects, remove fine points adhering to the boundaries of objects to achieve the effect of separating object boundaries, and can maintain the basic size of the object area unchanged.

Expansion followed by erosion: also known as closing operation, it is commonly used to fill small cavities within the target and connect disconnected adjacent targets, while maintaining the basic size of the object unchanged.

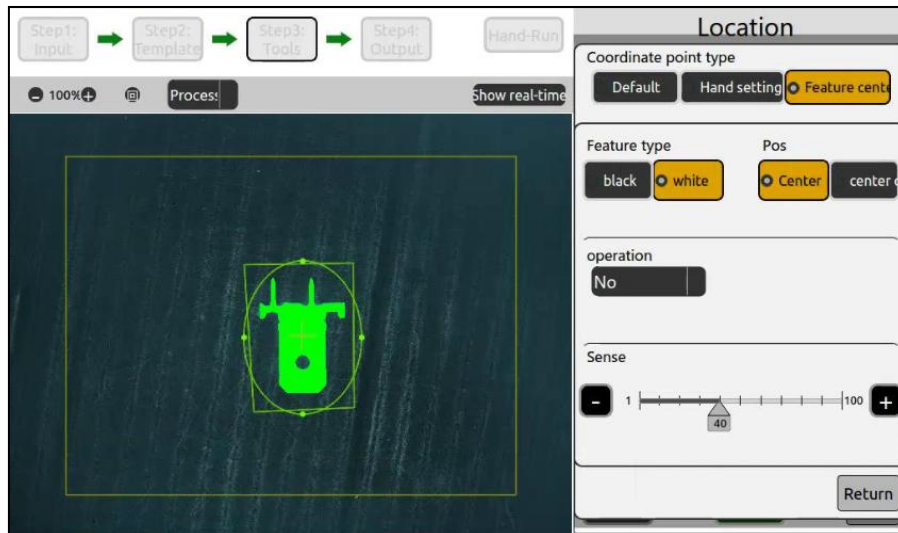
Corrosion level: The higher the level, the more small particles and noise are removed around the target area, and the more the boundary of the target object shrinks inward.

Expansion level: The higher the level, the more small holes are filled in the target area, and the more the target boundary expands outward.

- **Output coordinates:** Set the position of the output coordinate point.

Set output coordinate points: automatically recognize extracted reference characters.

Coordinate point type:



Default: The default output is based on the center point of the feature area as the coordinate point.

Manual setting: Manually set a point within the feature area as the coordinate point output.

Feature center: Output based on the coordinate point of a connected feature center of the product.

Feature type: Select the type of connected body to extract (black block, white block).

Connected body operation: Corrosion and expansion of the binary image of the connected body.

Erosion followed by dilation: also known as opening operation, it is commonly used to eliminate small noise points or small objects, remove fine points adhering to the boundaries of objects to achieve the effect of separating object boundaries, and can maintain the basic size of the object area unchanged.

Expansion followed by erosion: also known as closing operation, it is commonly used to fill small cavities within the target and connect disconnected adjacent targets, while maintaining the basic size of the object unchanged.

Corrosion level: The higher the level, the more small particles and noise are removed around the target area, and the more the boundary of the target object shrinks inward.

Expansion level: The higher the level, the more small holes are filled in the target area, and the more the target boundary expands outward.

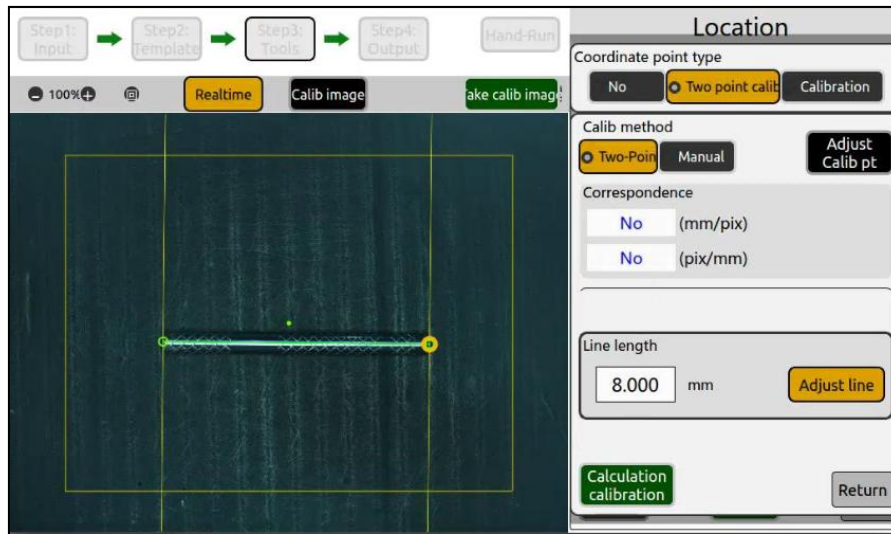
Feature sensitivity: Adjust the black and white threshold for obtaining features to determine whether the obtained features are the black and white features we need.

- **Calibration:** Calibrate the coordinate relationship between automated equipment and intelligent cameras.

Coordinate point type:

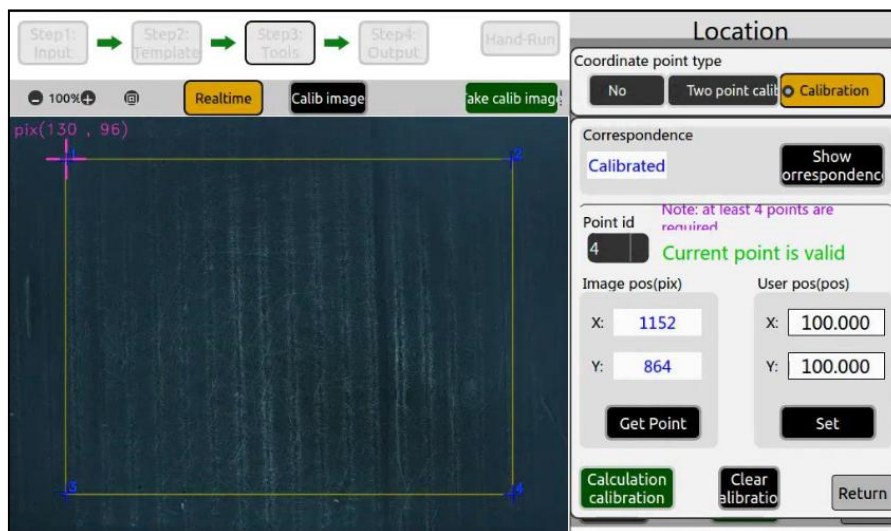
None: No calibration is required, directly output pixel coordinates and angles.

Two point calibration: Output relative coordinate data values.

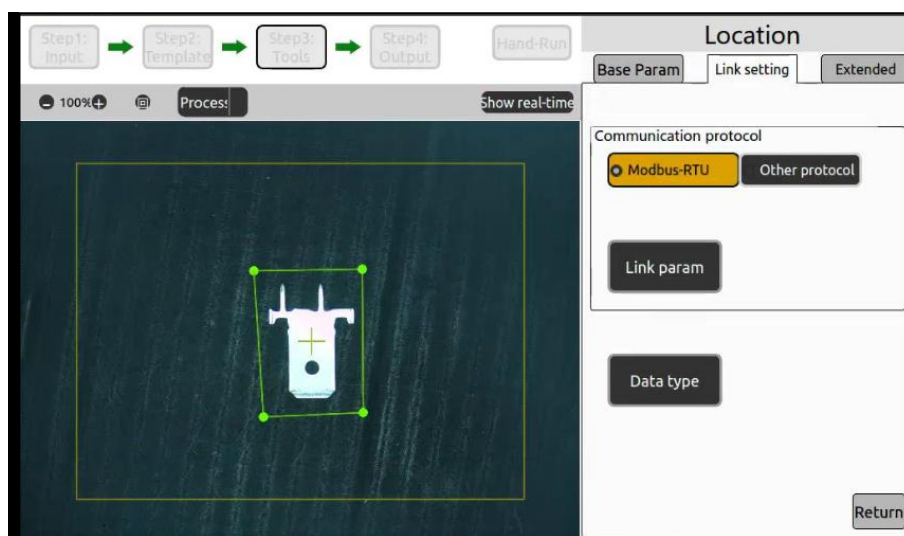


Click on the real-time image, place an object within the current field of view that is at the same height as the product and can confirm the actual size, select two points for calibration, click on adjust the line segment, adjust the two ends of the line segment to correspond to two known actual lengths, fill in the actual size data of the calibration line segment in the input line segment actual length menu, and click on calibration calculation; Confirm the origin position of the automation equipment and smart camera by adjusting the calibration origin.

Coordinate system calibration:



Select 1 as the calibration point ID, then choose a coordinate on the image, click on the point to obtain pixel coordinates, and then fill in the actual X and Y coordinate values of the automated equipment in the user coordinates. After filling in, click on the settings to take effect; Then, in the same way, calibrate points 2, 3, and 4. At least four points need to be calibrated for coordinate system calibration. Finally, click on the calibration calculation to complete the coordinate system calibration.

Communication settings:

- **Communication parameters:**

Modbus-RTU: Using standard serial port RS-232 for communication, the serial protocol is Modbus RTU. The intelligent camera serves as the Modbus master station and can read and write data to the PLC end. (As shown in the figure on the right)

Serial port parameters: Confirm the PLC serial port parameters and select the corresponding parameters in sequence.

Baud rate: Confirm the baud rate of the PLC end and select the corresponding parameter.

Data bit: Confirm the data bit on the PLC end and select the corresponding parameter.

Stop position: Confirm the stop position on the PLC end and select the corresponding parameter.

Calibration type: Confirm the calibration type of the PLC end and select the corresponding parameters.

Modbus Station Number: Confirm the main station number and fill in the corresponding parameters.

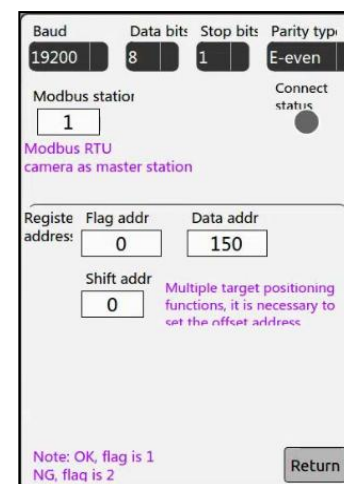
Register address:

Flag Address: Fill in the starting address of the register that receives OK/NG status. (Test result OK, flag 1; test result NG, flag 2)

Data address: Receive X Y、 The starting address of the register for angle data.

Offset address: When locating multiple targets, set the number of interval addresses between the two targets.

Other agreements: (Please refer to Chapter 6 for specific settings)



- **Data format:** (as shown in the figure on the right)

Sending angle range: Select the valid range of angle values to be sent.

Send compensation angle range (0-360): This compensation can be used to modify the actual sending angle. (For example, if our current sending angle is 100 degrees and we compensate for 30 degrees, the actual sending angle will be 130 degrees. If we compensate for 330 degrees, the actual sending angle will be 70 degrees)

Rotating coordinate system: When selecting the right-hand system, the angle value increases counterclockwise; When selecting the left-hand system, increase the angle value in a clockwise direction.

Data value format: When selecting an integer, multiply the sent value by 1000, and the PLC end needs to divide the received data by 1000 to obtain the correct value; When selecting floating-point numbers, send as many actual values as possible.

Extended parameters:

Localization feature: Select the feature type for target localization.

Contour: locates the position and angle of a product by matching features with the contour.

Connected body: Localization is achieved by finding the center point of a connected body with features.

Edge extraction algorithm: (feature selection contour)

Automatic: Extract contour edges through adaptive algorithms.

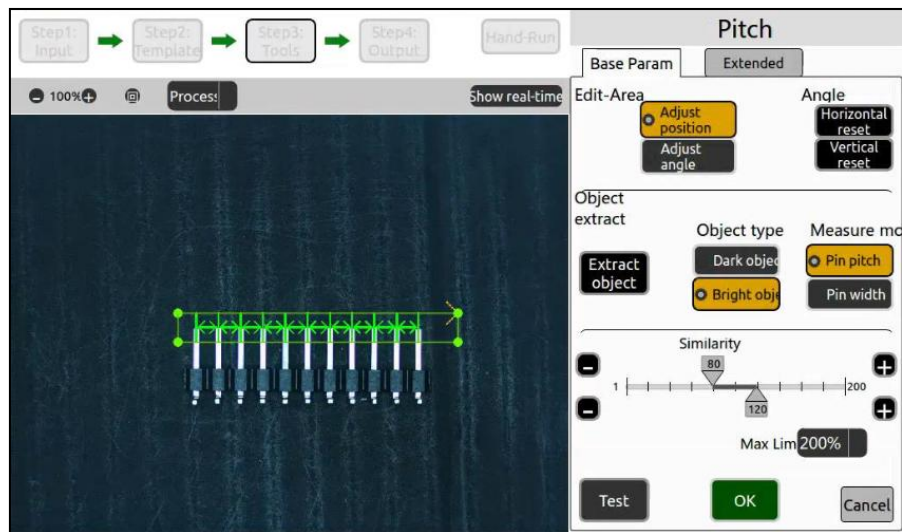
Black and white edges: Extract contour edges from the black and white pixels of an image.

Sobel: Extract contour edges using the Sobel algorithm.

Similarity: Adjust the similarity threshold for target localization, and if the detection result is greater than the set value, it is judged as OK.

Change Name: You can modify the name of the current target positioning tool.

13) Pitch



Basic parameters:

Editing area:

Adjust position: Adjust the effective detection range of the pitch.

Adjust angle: Adjust the angle of the pitch detection area.

Angle reset:

Horizontal reset: Reset the angle of the detection area to the horizontal direction.

Vertical reset: Reset the angle of the detection area to the vertical direction.

Target extraction:

Extract target: Adjust the relevant algorithm parameters for extracting the target.

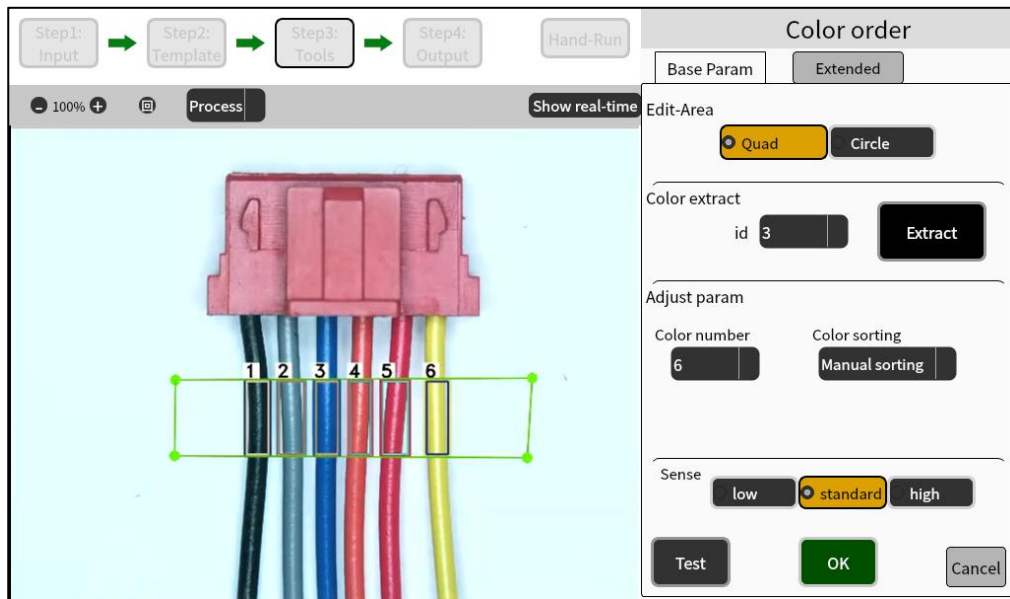
Target type: Set whether the stitch color is a dark target or a bright target.

Measurement mode: Select whether the detection mode is pin pitch or pin width.

Similarity: Adjust the similarity range value of the pitch to determine OK between the set values.

Maximum upper limit: Set the maximum upper limit value for familiarity. (The maximum upper limit value can be set to 999%)

14) Color order



Base Param:

Edit-Area: Edit the valid detection area for wire sequence inspection; available area shapes include quadrilateral and circle.

Color Extraction: Select the extraction ID and click Extract to open the color extraction menu.

Operation: Move the cross cursor on the image to the target sampling position, then click Confirm Extract to complete color extraction.

Extraction Source: Sampling defaults to reference image; real-time image is available as an alternative.

Wire Sequence ID: Select to switch the extracted wire sequence ID.

Color Sensitivity: Adjust the color value capture range during inspection; lower sensitivity corresponds to a broader captured color range.

Neutral Color Option: Check if the sampled color belongs to black, white or gray; select the corresponding option if applicable to optimize extraction performance.

Tune Extraction Range: Manually adjust the threshold range of HSV.

Restore: Undo the previous color extraction operation.

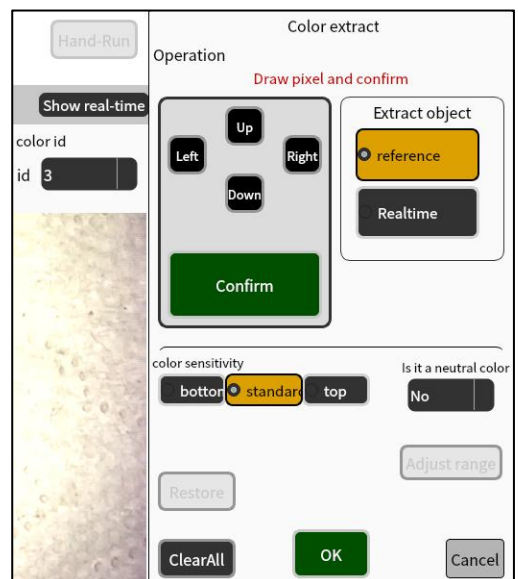
Clear All: Erase all saved HSV threshold values.

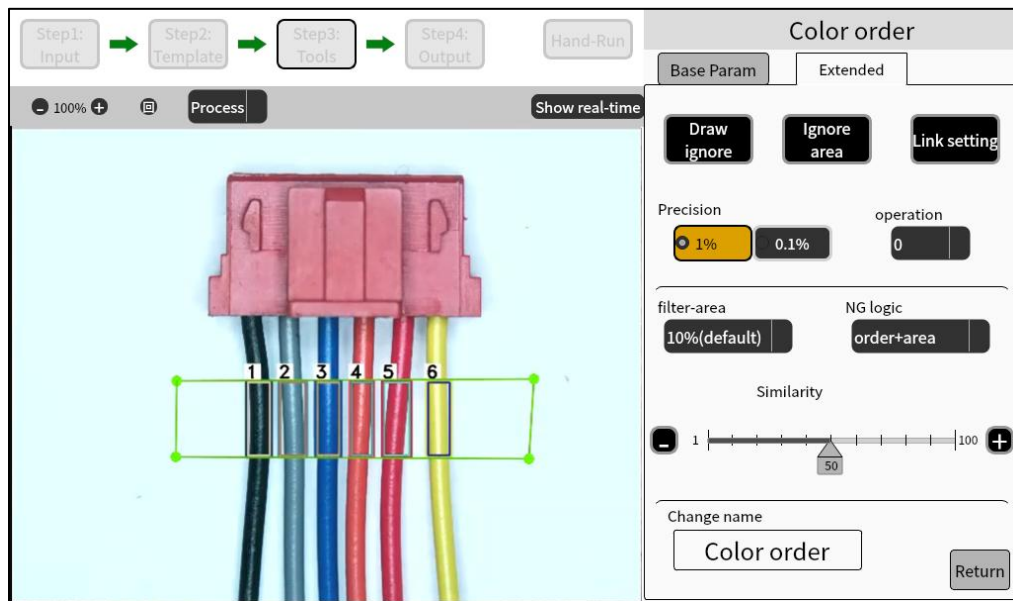
Parameter Adjustment: Modify threshold parameters for the tool's color area.

Color Count: Define the core quantity of the cable.

Color Sorting: Manual sorting follows the ID sequence of manually sampled colors; automatic sorting arranges colors from left to right by default.

Sensitivity: Adjust the color threshold capture range for inspection; lower sensitivity yields a wider captured color threshold range.



Extended :

Ignore Area: Configure partial regions to disable color value extraction, either by freehand drawing or frame selection.

Communication Settings: (Refer to Chapter 6 for detailed configuration.)

Similarity Precision: Minimum unit of measurement for similarity value.

Blob Operation: Higher level removes more tiny particles and noise surrounding target regions, accompanied by greater inward shrinkage of target boundaries.

Area Filter: Set the area percentage threshold for each wire sequence inspection; specimens failing to meet this area percentage shall be judged NG. (Default: 10%)

Color Strting:

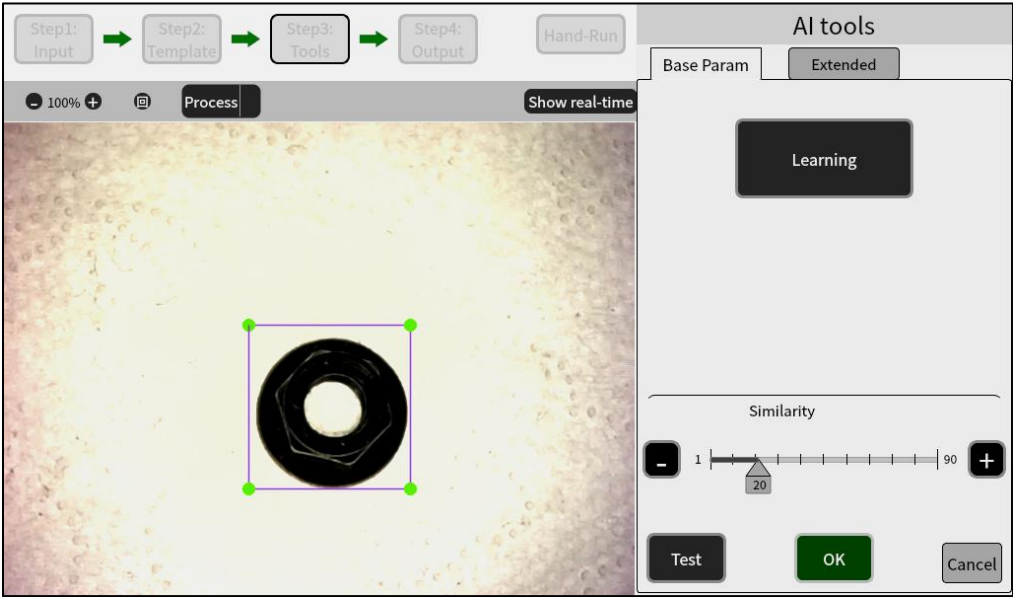
Manual Sorting: Pass criteria only verifies sufficient area of each wire core without checking wire sequence order.

Auto sorting: Verify both adequate area of each wire core and correctness of wire arrangement order.

Similarity: Adjust the area similarity threshold for each wire sequence; result is OK only when the measured value exceeds the set threshold.

Rename: Modify the name of the current wire sequence inspection tool.

15) AI Tool



Base Param:

Sample Learning: Enter the submenu, manually label samples of each category on the live image. Upload labeled data to the cloud for automatic model training, then download the trained model to the local model library.

Adjust Region: (AI Model: Single-Target Positioning & Recognition Selected)

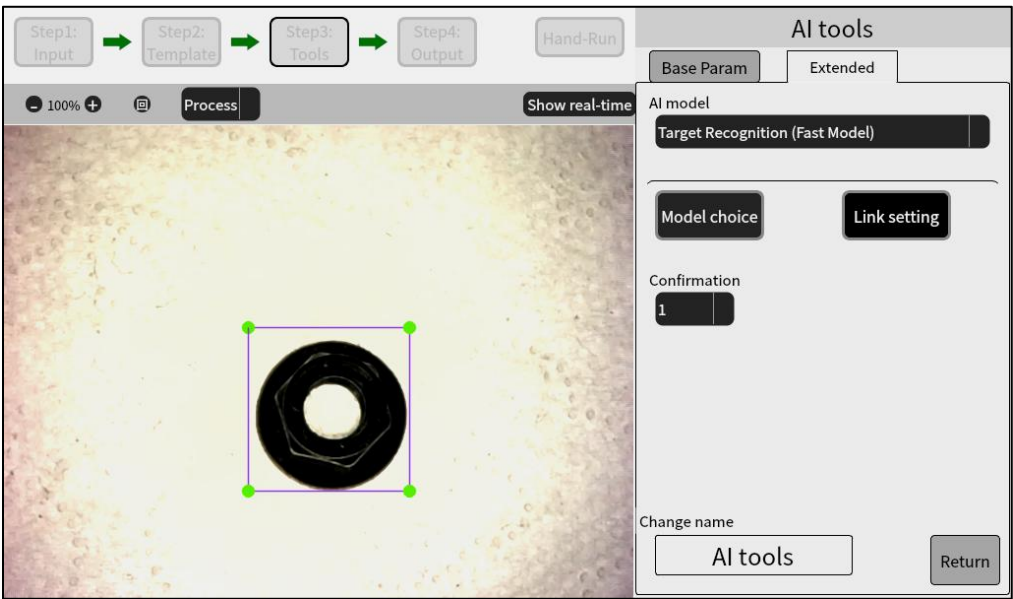
Target Area: Edit the valid detection region of the learning tool.

Search Area: Edit the effective search region of the learning tool.

Target Count Threshold: Set the acceptable quantity range of identified targets; judgment passes only when the detected count falls within the specified range. (Applicable when multi-object detection AI model and target counting inspection task are selected.)

Similarity: Adjust the similarity threshold of the learning tool; the result is OK only if the detected value exceeds the set value.

Extended :



AI Model: Confirm the AI model type prior to sample training.

Single-Target Positioning & Recognition: Locate targets within the search area prior to target identification and inspection.

Target Recognition (Fast Model): Perform identification inside the target area; acceptable only with limited target position deviation and features high processing speed.

Target Recognition (Standard Model): Conduct recognition within the target area with limited allowable target position deviation, delivering high detection accuracy.

Multi-Target Detection Model: Model designed for scenarios containing multiple targets within the detection area.

Object Presence: Detect the presence or absence of products within the inspection area.

Object Counting: Count the number of targets inside the inspection area.

Defect Detection: Detect defects on products within the inspection area.

Model Choice: Select locally pre-trained AI models for inspection execution.

Link Settings: Refer to Chapter 6 for detailed configuration.

Confirmation: The system makes internal judgments for a fixed number of times before outputting results during inspection. (Available when target recognition AI model is selected.)

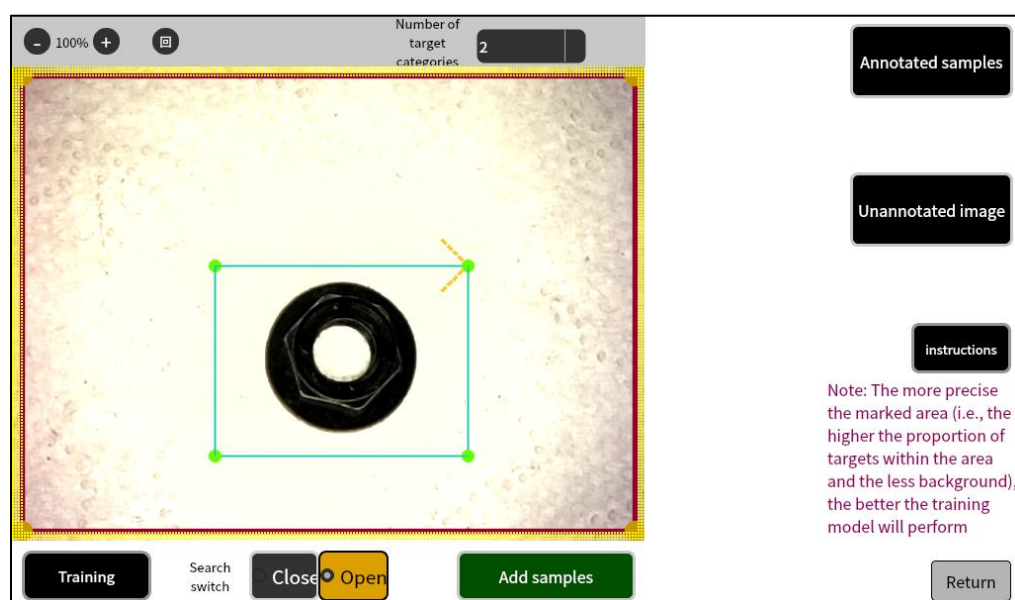
OK/NG Judgment Logic: Displayed only when the selected number of target categories is greater than 2; OK or NG result can be configured individually for each category.

Multi-category Signal Output: Available for display when the selected number of target categories exceeds 2; a corresponding output signal can be assigned to each category.

Rename: Modify the name of the current learning tool.

➤ Sample Learning Operation Procedure:

- ◆ **Applicable AI Models (Single-Target Positioning & Recognition, Fast Target Recognition Model, Standard Target Recognition Model)**



Before using this model, prepare sample images in advance.

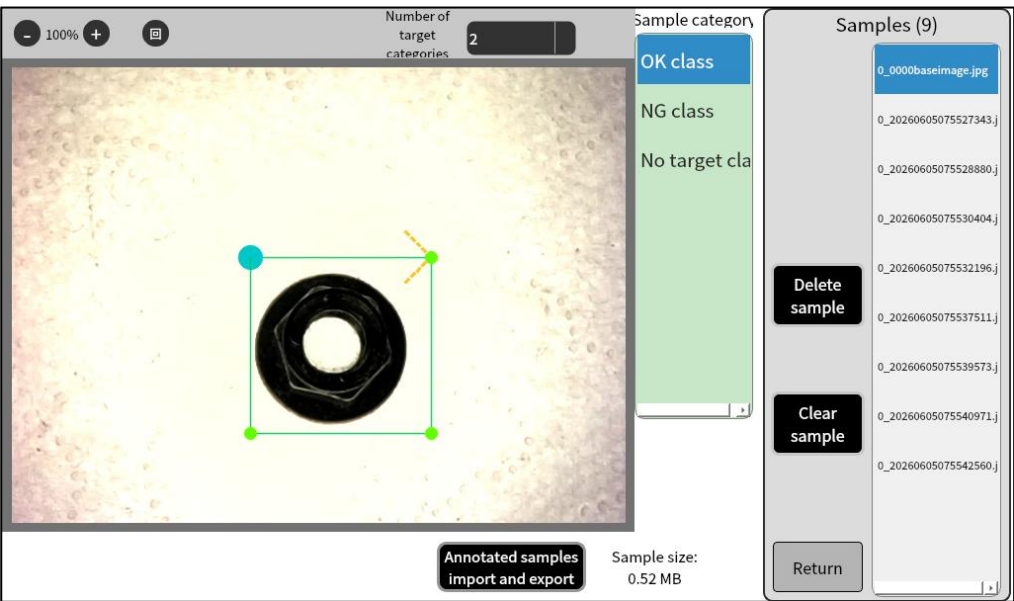
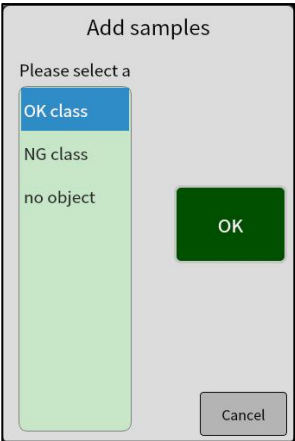
If multiple product categories exist, prepare several samples for each category. For cases only distinguishing front and reverse sides with obvious appearance differences, a small quantity of annotated images per class is sufficient. Generally, more annotated samples contribute to superior detection performance.

Operation Steps

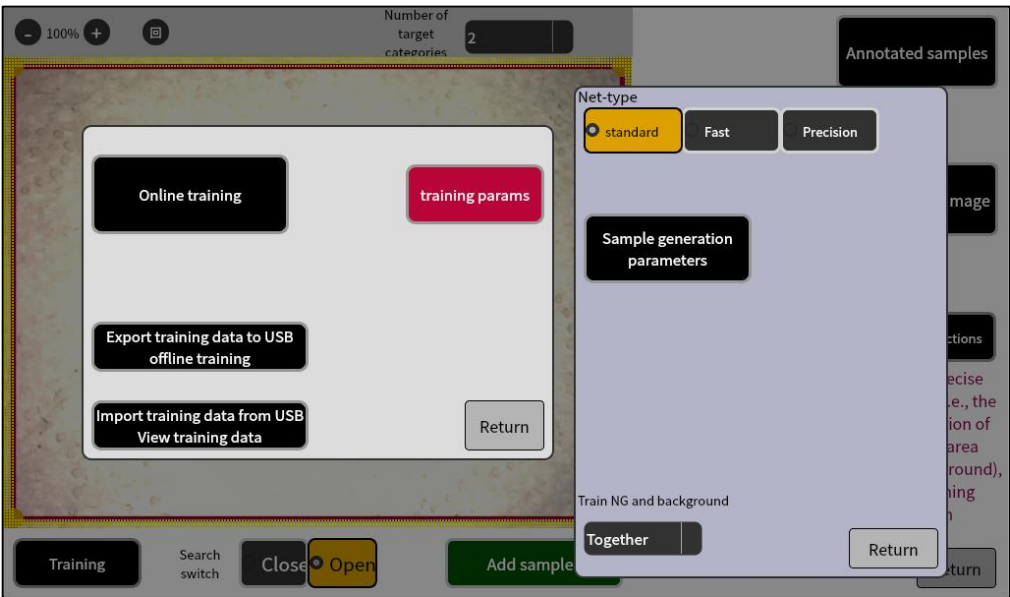
First enter the sample learning interface and define detection categories by setting the corresponding parameter for target category count (default: 2 categories). Place the sample, frame the product region, click Add Annotated Sample to open the corresponding menu, select the matching category (refer to the right figure), and confirm. After successful annotation, replace with a new sample and repeat the above steps to finish annotating all samples.

Search Area Switch: Displayed under Single-Target Positioning & Recognition mode; used to mask redundant background.

Click annotated samples to preview existing labeled images and check for mislabeled ones. Erase incorrect samples manually by tapping Delete Current Sample when needed.

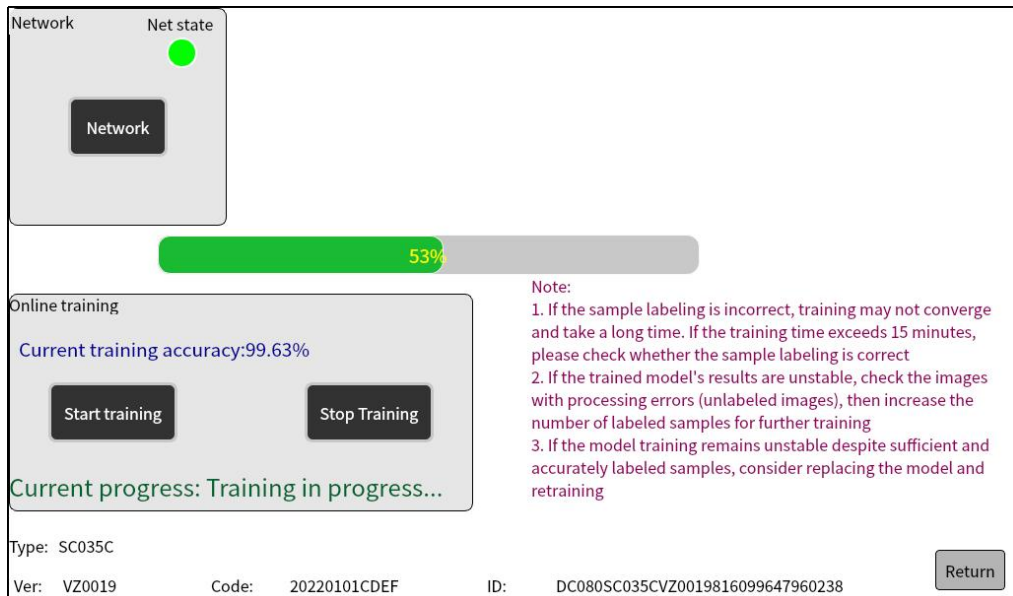


Unannotated Images: These are result images captured during runtime recognition. Misrecognized images can be supplemented as new samples on this interface for retraining.



After all samples are annotated, click Model Training. Training parameters can be adjusted appropriately according to inspection requirements; default settings are normally acceptable.

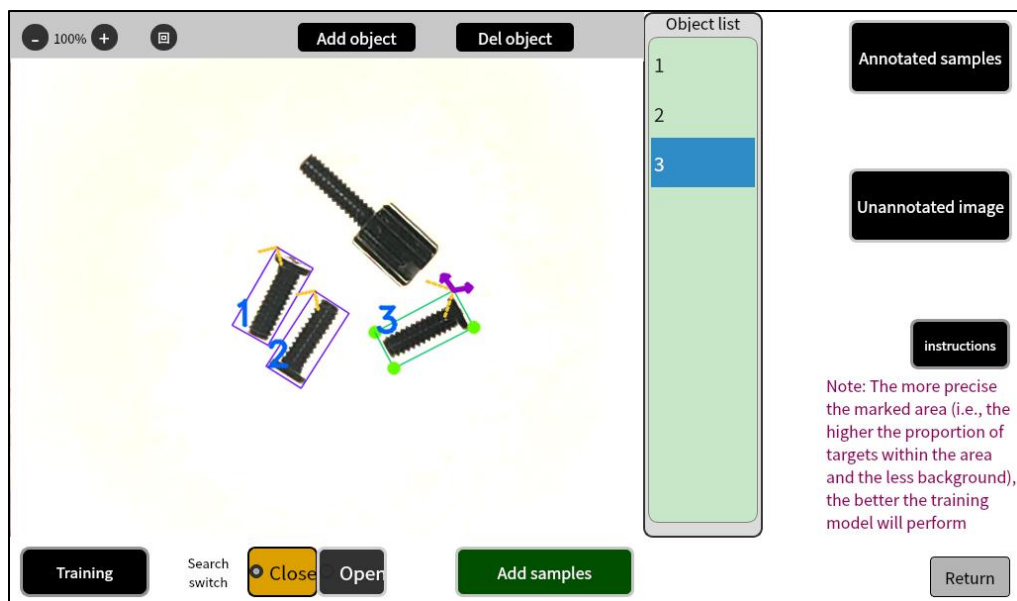
Click Online Training to enter the interface, then upload annotated samples to the cloud for model training.



Online Training Operation:

For online training, establish external network connection first. Tap Network Access to open the subpage, select an available Wi-Fi from the list, input the password and connect. A green indicator at the upper right corner signals successful network linkage. If no on-site Wi-Fi is available, enable mobile hotspot and connect to it instead. After network setup, click Start Training. Training duration ranges from 2 to 10 minutes, varying with training parameters and total annotated sample quantity.

◆ Applicable AI Model (Multi-Object Detection Model)



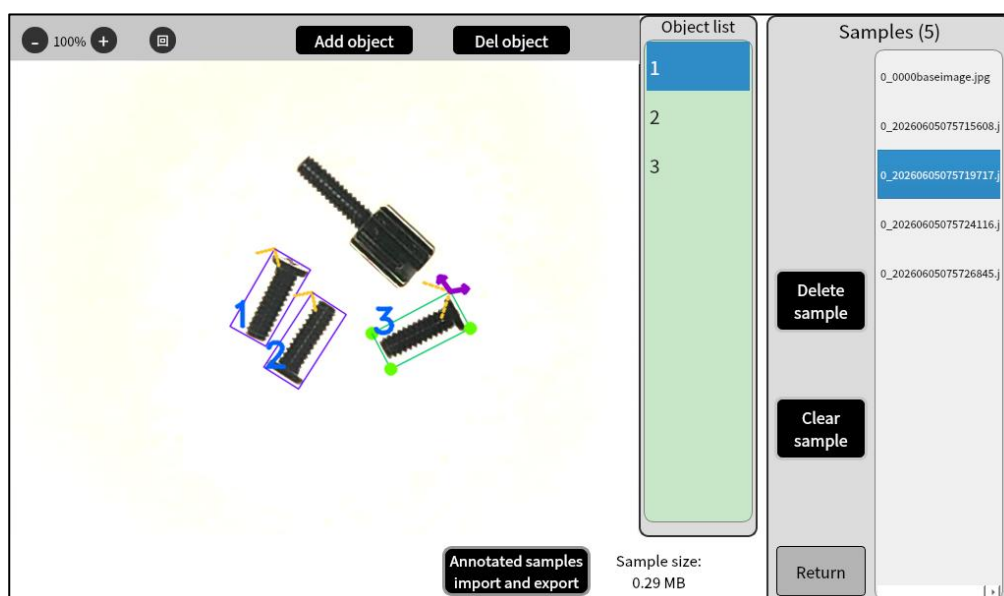
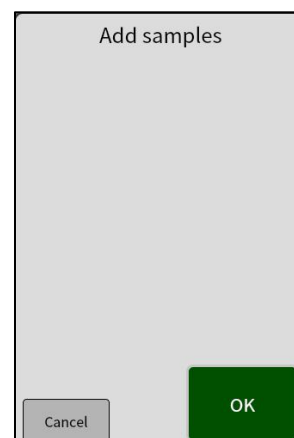
Before using this model, prepare sample images in advance.

Before using this model, prepare samples in advance. If multiple types of targets need to be identified, prepare several samples for each product. For defect detection applications, sufficient samples of both non-defective and defective products shall be prepared. Generally, more annotated samples lead to improved inspection performance.

First enter the sample learning interface and click Add Target. Draw bounding boxes for all target products in the field of view; add a corresponding target for every visible product with no omissions. For defect detection, enclose all defective regions with bounding boxes, then click Add Annotated Sample (refer to the right figure) and confirm.

After finishing labeling one sample, replace it with a new specimen. When inspecting defects, qualified products can be loaded directly without adding targets, simply click Add Annotated Sample. Repeat this workflow to complete labeling of all samples.

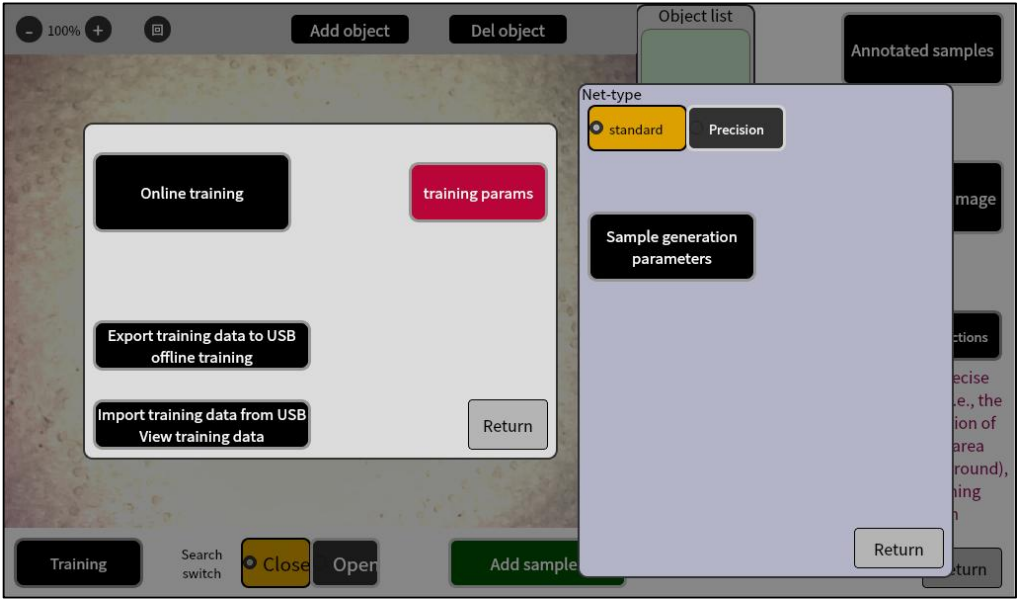
Search Area Switch: used to mask redundant background.



Click Annotated Samples to view labeled images and check for labeling errors. For missing targets, click Add Target; for incorrect targets, select and delete them accordingly.

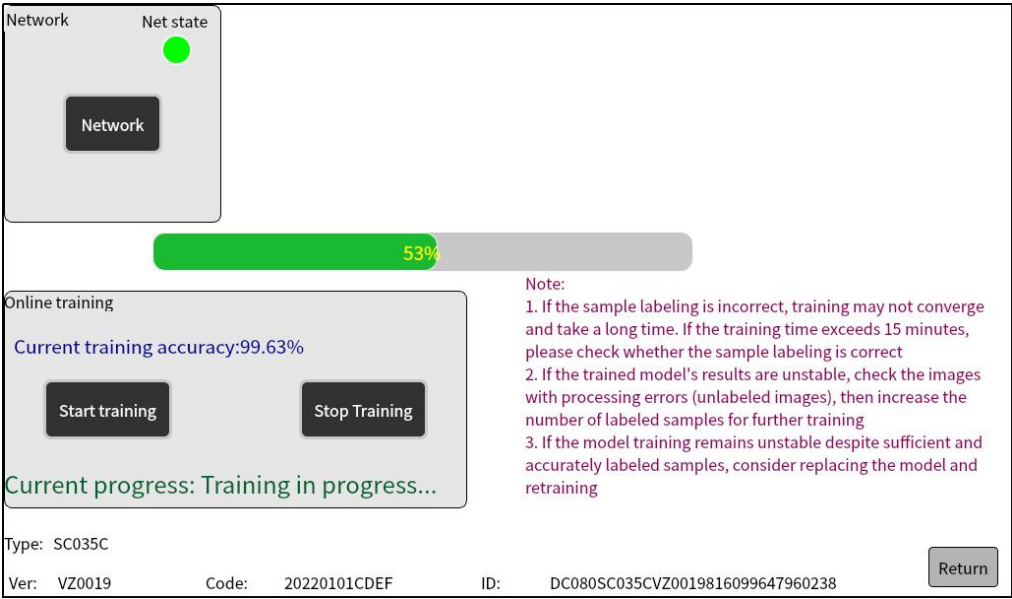
Annotated samples support import and export via USB flash drive: labeled samples can be exported to the USB drive or imported from the drive into the device.

Unannotated images are recognition result pictures generated during operation. Misrecognized images can be added as new samples on this page for retraining.



After all samples are annotated, click Model Training. Training parameters can be adjusted properly according to inspection requirements; default values work for most scenarios.

Click Online Training to open the interface and upload annotated samples to the cloud for training.

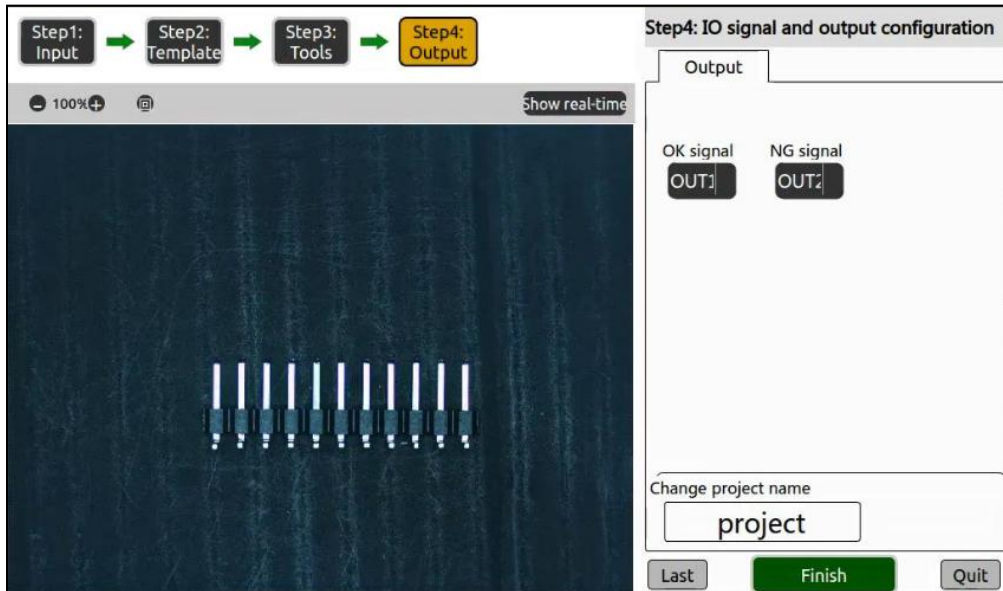


Online Training Operation:

For online training, establish external network connection first. Tap Network Access to open the subpage, select an available Wi-Fi from the list, input the password and connect. A green indicator at the upper right corner signals successful network linkage. If no on-site Wi-Fi is available, enable mobile hotspot and connect to it instead. After network setup, click Start Training. Training duration ranges from 2 to 10 minutes, varying with training parameters and total annotated sample quantity.

➤ Step 4- Output Configuration: Set the IO signal and output configuration.

- ✧ **Single benchmark output configuration:** Configure the IO output definition for the current benchmark.
(OK、NG)



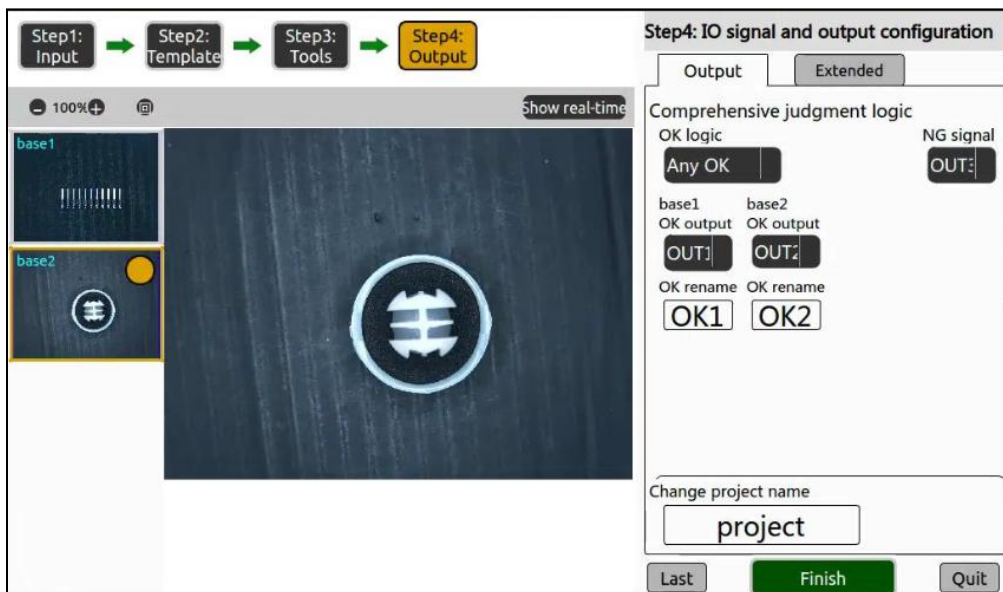
OK output: Configure the IO port output after determining OK.

NG output: Configure the IO port output after determining NG.

OK judgment logic: The condition for determining the final OK result based on the current benchmark when using multiple tools. (All tools OK, any tool OK)

Change scheme name: Change the name of the current scheme.

- ✧ **Multiple benchmark output configuration:** Configure the IO output definition for each benchmark. (OK、NG)



Benchmark comprehensive judgment logic

OK judgment logic: When there are multiple benchmarks, the logical condition for judging the final result as OK. (Any benchmark is OK, all benchmarks are OK)

Benchmark 1 OK output: Configure the IO port output after benchmark 1 is OK.

Benchmark 2 OK output: Configure and determine the IO port output after benchmark 2 is OK.

Benchmark 1 OK nickname: You can modify the OK name of the current benchmark 1.

Benchmark 2 OK nickname: You can modify the OK name of the current benchmark 2.

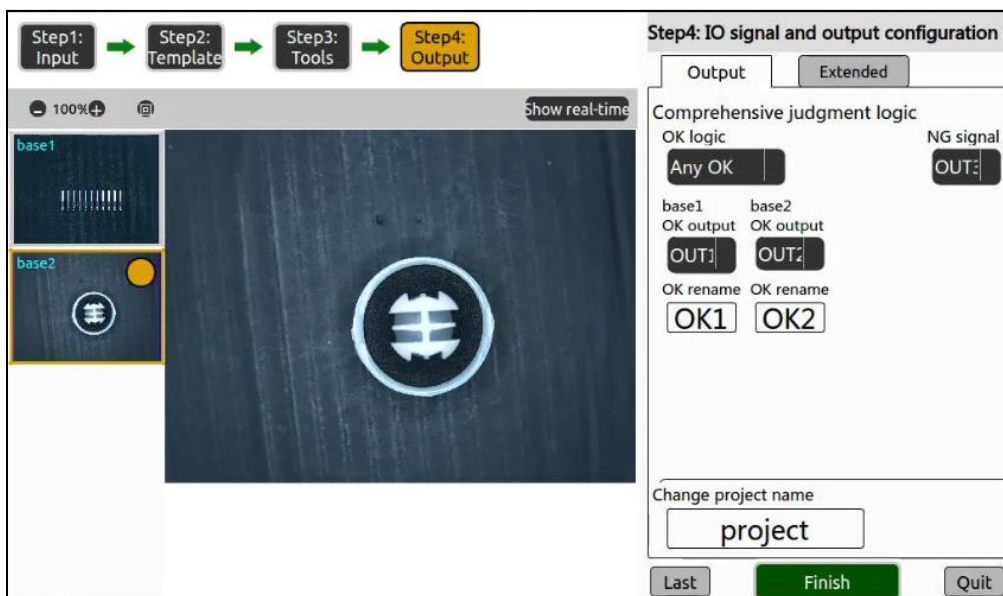
NG output: Configure the IO port output of NG after comprehensive judgment.

Change scheme name: Change the name of the current scheme.。

Extended parameters:

OK judgment logic: When using multiple tools, the condition for each benchmark to ultimately determine an OK result. (All tools OK, any tool OK)

- ✧ **Tool Output Signal Logic Configuration:** Configure the output signal logic for each tool. Path: System Settings → Signal Logic Settings → Signal Output Unit Settings.



Set Output Signal, Tool ID:

Select the corresponding tool on the right and set the OK and NG outputs for each tool group.

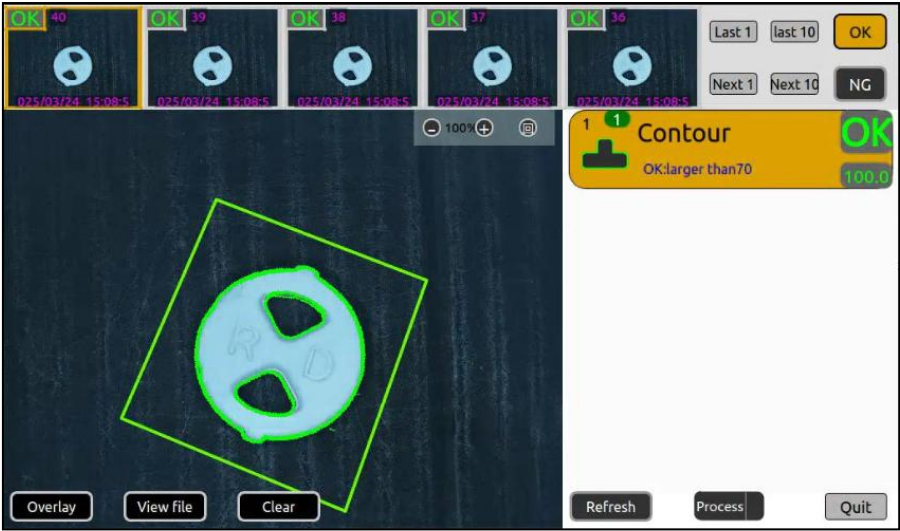
NG Signal Output Logic: The output logic of the NG signal can be selected as required. (The tool is a learning tool.)

Chapter 4 Introduction to Common Function Menu

4.1 Operation Management

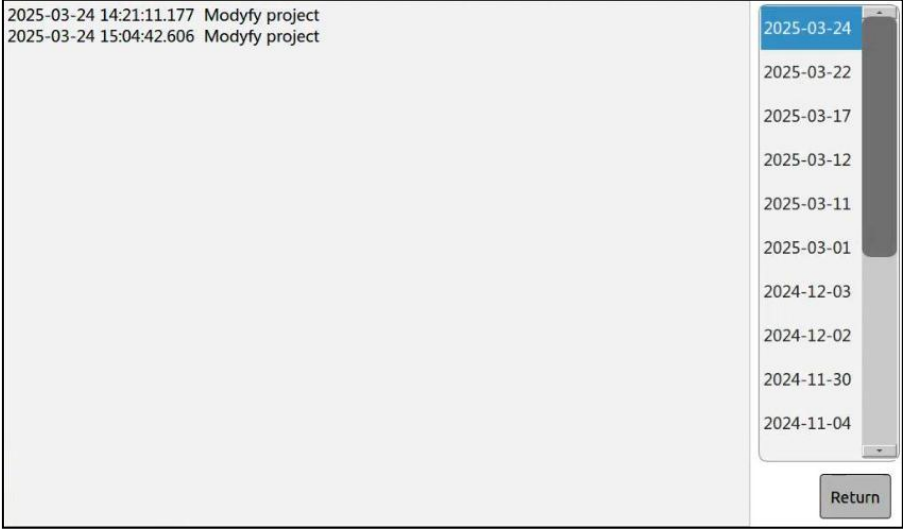
1) Report

The test results can be saved as images, and detailed information can be viewed for each image in the report.



2) Diary

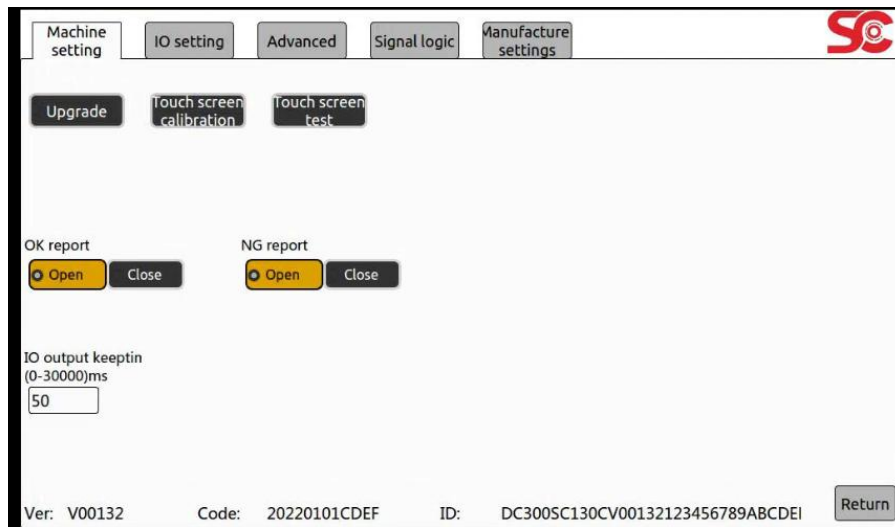
The operation records of the software can be traced (as shown in the figure below).



3) Count reset: Reset the current OK/NG count to zero.

4.2 System Settings

1) Machine settings



Upgrade: Version upgrade can be performed remotely or through a USB drive.

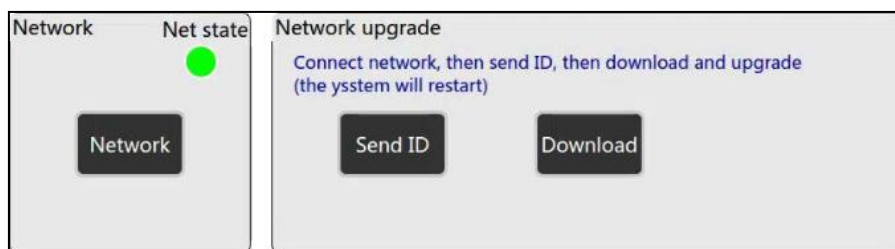
Touch screen calibration: If the touch position is not accurate, screen calibration can be performed again.

Touch screen testing: manually test whether there is any deviation in the touch position.

OK report storage: whether to save the OK image.

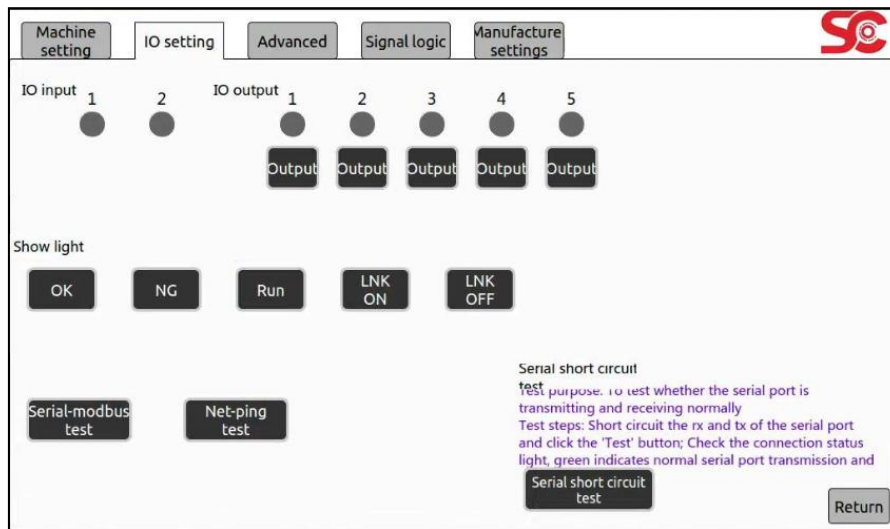
NG report storage: whether to save NG images.

IO output holding time (0-30000 milliseconds): The holding time of the OK/NG output signal after detection is completed.

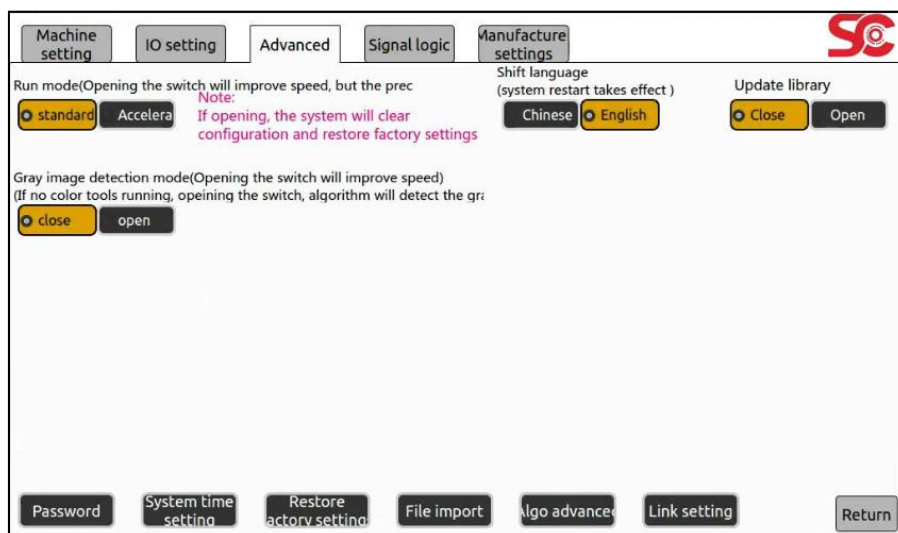


- **Upgrade operation process:** First, you need to successfully connect to the external network. Click "Connect" to enter the sub interface, find the available network in the wifi list, enter the password, and click "Connect". After the network connection is successful, the "Network Status" in the upper right corner will display a green light (due to on-site environmental issues, we usually turn on our phone hotspot and connect to our own phone hotspot to connect to the network). Follow back to the upgrade interface, click "Send ID", then contact the manufacturer's technical team to upload the corresponding version. After confirming the upload is complete, click "Download". Once completed, click on the "Upgrade" menu and confirm to complete the upgrade.

2) IO testing



3) Advanced Settings



Operation mode: Select standard, higher detection accuracy, relatively slower calculation speed; Choosing acceleration will increase the computation speed during detection.

Switching between Chinese and English: Switch between Chinese and English versions.

Black and White Detection Mode (Enabling it will increase detection speed): After enabling it, except for color related tools, other tools use black and white images for detection.

Password restriction: Passwords for system related parameters can be set.

Set System Time: Set the current device system time.

Factory reset: Clear all parameters and settings and restore to the factory settings.

File import: Update files can be imported through a USB drive.

Advanced algorithm parameters: advanced settings related to position correction.

Whether the position correction in the contour matching function is effective: whether the position correction takes effect on the contour matching tool after it is turned on.

Whether the position correction in the sample learning function is effective: whether the position correction takes effect on the template learning tool after being enabled.

Communication settings: (Please refer to Chapter 6 for specific settings)

4) Signal logic setting

Whether to output the signal again at intervals: Repeat the photo detection to see if the previous output signal continues to be valid.

Whether to cancel other output signals when receiving a trigger signal: cancel/not cancel.

Light source flash/steady state: Select the flash or steady state mode of the external light source.

Continuous multi frame trigger switch: When triggered externally, internal trigger photography is activated through external signals. (After activation, expand parameter settings in the first step)

IN1/IN2 continuous trigger frame rate: the number of internal triggers after startup.

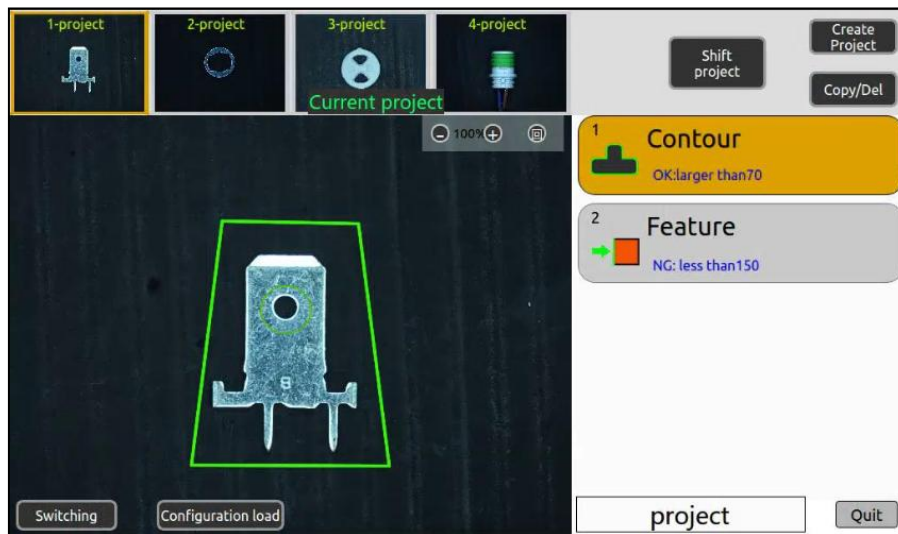
Trigger stop condition: Internal trigger stop detection condition.

Continuous unlimited frame triggering method: parallel triggering or serial triggering.

When a position correction alarm is triggered, should an NG signal be output: Passwords for system related parameters can be set.

IO input filtering time (1-20) milliseconds: The interval between two input signals must be greater than the set value, otherwise it is judged as an invalid trigger.

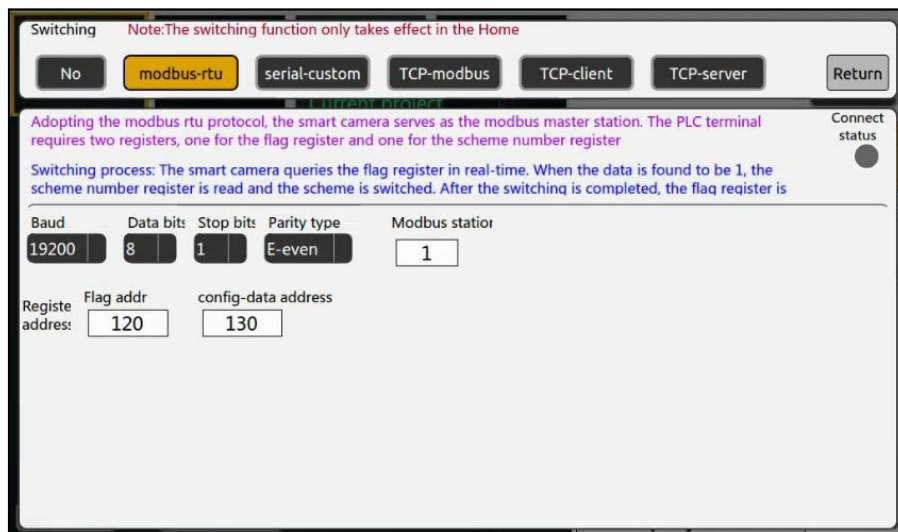
4.3 Scheme Management/Switching



- 1) **New plan:** Create a new plan.
- 2) **Copy/Delete:** Copy or delete an existing scheme.
- 3) **Configure import and export:** The scheme can be exported or imported through a USB drive.
- 4) **Switching plan:** Switch to another plan.

Switching methods: None, Serial Modbus, Serial Custom

- 1) **None:** Default scheme switching is done manually.
- 2) **Serial port modbus:** Switch solutions through the 232 modbus rtu protocol via serial port.



3) Serial port - Custom: Use the serial port to customize the protocol and switch solutions.

Switching Note: The switching function only takes effect in the Home

Buttons: No, modbus-rtu, **serial-custom**, TCP-modbus, TCP-client, TCP-server, Return

Using a custom protocol, with the smart camera as the receiving end and the upper computer as the sending end, send a custom format string to the smart camera

Baud: 19200, Data bits: 8, Stop bits: 1, Parity type: E-even

Format:
Starting + project id + Termination
start= end

Switching process: The smart camera searches for serial port data sent by the upper computer in real-time. When the data content meets the conditions (custom format string), it starts switching configurations and returns "OK" to the upper computer. If the received data is "start=1 end" in the default format, switch to configuration 1; If the received data is "start=5end", switch to configuration 5

Read and write testing

Read: [Text area] Clear

Write: [Text area] Write

4) TCP modbus: Switch solutions through the Modbus rtu protocol via the network port.

Switching Note: The switching function only takes effect in the Home

Buttons: No, modbus-rtu, serial-custom, **TCP-modbus**, TCP-client, TCP-server, Return

Using the modbus tcp protocol, the smart camera serves as the modbus master station. The PLC end requires two registers, one is the flag register and the other is the project number register. Switching process: The smart camera queries the flag register in real-time. When the data is found to be 1, the scheme number register is read and the scheme is switched. After the switching is completed, the flag register is cleared

PLC ip: [Text area] Local ip address: [Text area] Set local ip Connect

modbus port: 502 Note: The local IP and PLC IP are set to the same network segment

Modbus station: 0 Register address: 120 Flag addr: 130 config-data address: 130

Reading test

Flag: [Text area] Read Write Config-data: [Text area] Read

5) TCP client: The smart camera serves as the client for scheme switching.

Switching Note: The switching function only takes effect in the Home

Buttons: No, modbus-rtu, serial-custom, TCP-modbus, **TCP-client**, TCP-server, Return

TCP/IP protocol, smart camera as client, connecting to PC server, smart camera as receiver, PC as sender, sending custom format string to smart camera

Server ip: [Text area] Server ip port: [Text area] Local ip address: [Text area] Set local ip Connect

Note: The local IP and server IP are set to the same network segment

Switching process: The smart camera searches for string data sent by the PC in real-time. When it receives data content that meets the conditions (custom format string), it starts switching project and returns "OK" to the PC at the same time. If the received data is "start=1 end" in the default format, switch to project 1; If the received data is "start=5end", switch to project 5

Format:
Starting + project id + Termination
start= end

Read: [Text area] Clear

Write: [Text area] Write

6) TCP Server: The smart camera serves as the server for scheme switching.

Switching Note:The switching function only takes effect in the Home

No modbus-rtu serial-custom TCP-modbus TCP-client TCP-server Return

TCP/IP protocol, smart camera as server, connecting to PC client, smart camera as receiver, PC as sender, sending custom format string to smart camera

Local ip address Set local ip local ip port Connect ☐

Note: The local IP and client IP are set to the same network segment

Format:
Starting + project id + Termination

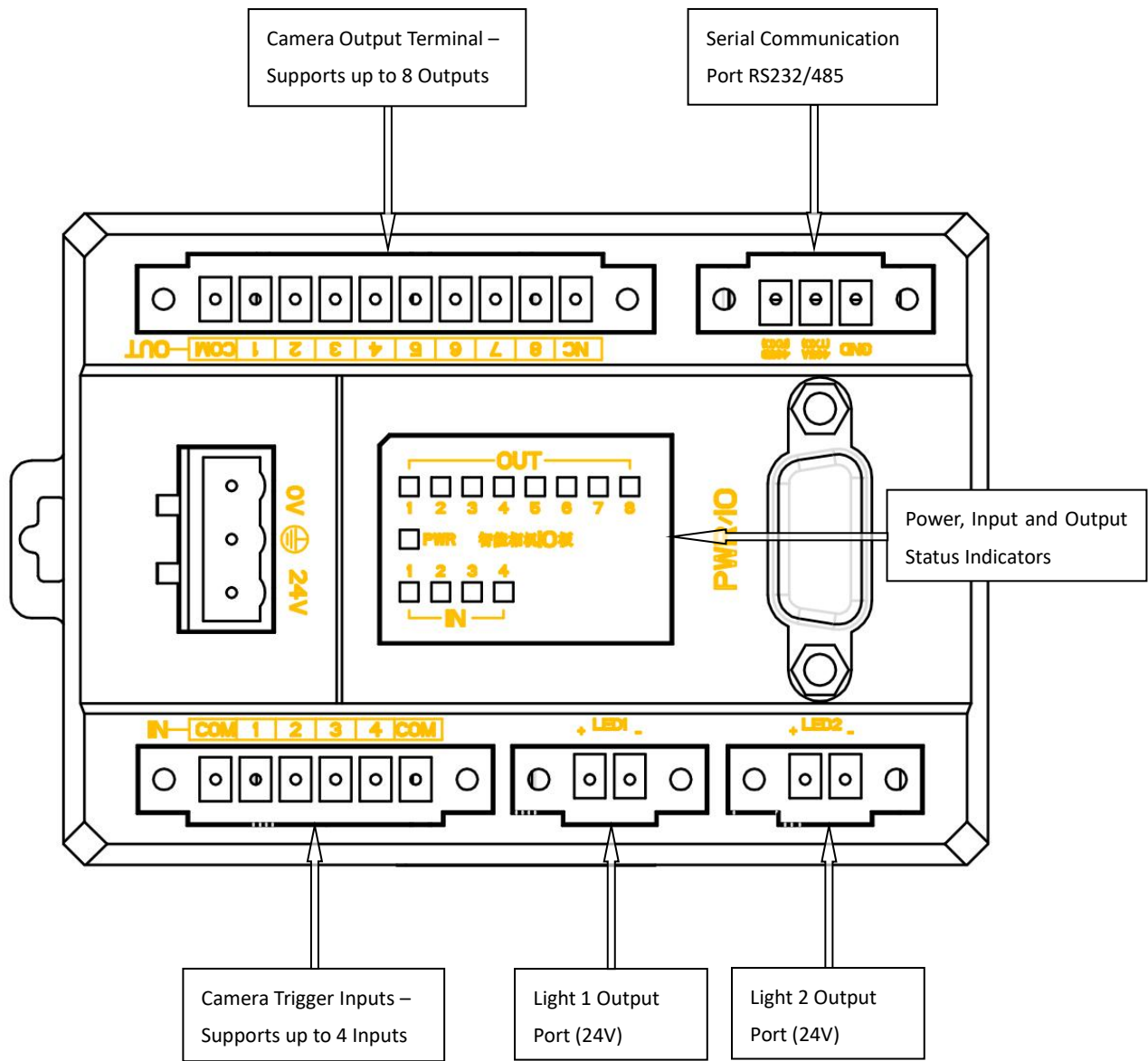
Switching process: The smart camera searches for string data sent by the PC in real-time. When it receives data content that meets the conditions (custom format string), it starts switching project and returns "OK" to the PC at the same time
If the received data is "start=1 end" in the default format, switch to project 1; If the received data is "start=5end". switch to project 5

Read Write

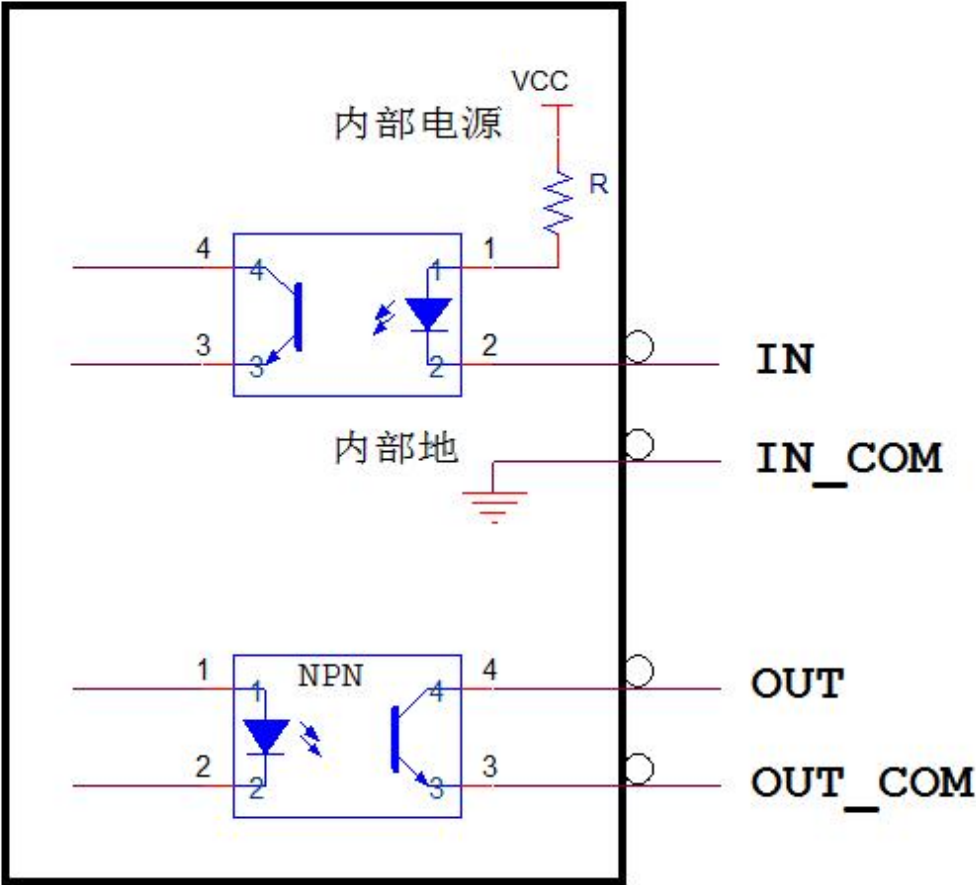
Clear Write

Chapter 5 IO Signal Description

Standard Power / I/O Board



I/O Circuit Diagram:



Chapter 6 Communication Settings

Communication method

☒ No ☐ Serial ☐ Net

OK

Communication method

☐ No ☒ Serial ☐ Net

String transfer(Serial)

☒ Manual ☐ Modbus-RTU

Set

OK

Communication method

☐ No ☐ Serial ☒ Net

String transfer(Net)

☒ TCP Client ☐ TCP Server

☐ Modbus-TCP ☐ No

Set

Picture transfer(FTP)

☒ Close ☐ Open

Set

OK

Communication method:

None: Data does not require communication, output OK and NG through IO.

Serial port: String data is sent through a serial port. (Custom, Modbus RTU)

Customization: Using a custom protocol, the smart camera serves as the sender and the upper computer as the receiver, sending strings to the upper computer.

Using custom protocols, smart cameras send and receive string data

Baud: 19200 Data bits: 8 Stop bits: 1 Parity type: E-even

General interactive commands

Heartbeat packet: The camera receives the string heartbeat a
Restart: The camera receives the string reboot and returns O
Shutdown: The camera receives the string poweroff and retu

output tool result

☒ No ☐ Yes

Read and write testing

Read

Write

Clear

Write

OK

Modbus-RTU: Using Modbus RTU protocol, the smart camera serves as the Modbus master and writes data to the PLC end.

Using the Modbus RTU protocol, the smart camera serves as the modbus master station and writes data to the register address of the receiving end. The receiving end needs to clear the data

Baud: 115200 Data bits: 8 Stop bits: 1 Parity type: N-none Modbus station: 1 Connect status: ☐

output tool result

☒ No ☐ Yes

trigger switch

☒ No ☐ Yes

Read test (manual reading and writing of registers)

Addr: 0 Data: 0

Read Write

OK

Network port: String data is sent through the network port.

CP client: The smart camera serves as the server, connects to the PC server, and sends data to the server.

TCP/IP protocol, smart camera as server, connecting to PC client, sending string to client

Local ip address local ip port

Note: The local IP and client IP are set to the same network segment

output tool result

☒ No ☐ Yes

TCP server: The smart camera serves as a server, connects to the PC client, and sends data to the client.

TCP/IP protocol, smart camera as client, connecting to PC server, sending string to server

Server ip Local ip address

Server ip port

Note: The local IP and server IP are set to the same network segment

output tool result

☒ No ☐ Yes

Modbus-RTU: Using Modbus RTU protocol, the smart camera serves as the Modbus master and writes data to the PLC end.

Using the Modbus TCP protocol, the smart camera serves as the modbus master station and writes data to the receiver register. After receiving the data, the receiver needs to clear the quantity to 0

PLC ip Modbus station Local ip address

modbus port: 502

Note: The local IP and PLC IP are set to the same network segment

output tool result

☒ No ☐ Yes

Trigger switch

☒ No ☐ Yes

Read test (manual reading and writing of registers)

Addr Data

None: Backup

Image Transfer (FTP): Whether to transfer the current photographed image to the FTP server.

Using the FTP protocol to transfer the report images of the smart camera to the FTP server

Connect

FTP Server Settings

FTP server IP address:

FTP server port: 21

用户名:

Password:

Local ip setting

Local ip address

Note: The local IP and server IP are set to the same network segment

Set local ip

Test

OK

Data format:

Angle range c
0 ~ 360

Offset angle
0.0 degree

Rotate direction

Right-hand

Left-hand

Data format

Integer

Float

Note: Integer data=floating-point data x1

Data type

Data value(32 bit):X,Y,angle

Flag(32 bit): OK corresponds to 1, NG corresponds to 2

After the receiving the flag bit and reads the data value, it is necessary to clear the flag bit to 0

Return

Chapter 7 List of Common Problems

Problem description	Possible reasons	solution
Black screen with no display	The device is not powered on	Check if the power connection is normal (observe if the top PWR light is on)
	Abnormal physical connection between screen and camera	Check if the pins of the connectors at both ends of the wire are bent or broken
During scheme debugging, the image screen is completely black/too dark	The light source is not turned on or the brightness is too low	Turn on the light source and increase its brightness
	Exposure and gain adjustment are too small	Appropriately increase exposure and gain
The detection and processing time during operation is too long	Confirm if the debugging parameters are correct	The search area can be appropriately reduced, and the detection accuracy can be adjusted to standard or low
No trigger signal detection during operation	Is the trigger signal connected incorrectly	Check if the trigger signal provided by the device is connected incorrectly and if a signal is emitted during detection
No signal output detected during operation	Whether the output IO signal is connected incorrectly or the parameter settings are incorrect	Check if the signal connected to the device is wired correctly, and proceed to the fourth step of the modification plan to confirm if the IO ports defined as OK and NG are correct
During operation, the area of the detection tool cannot follow the movement of the product	The position correction function is not turned on	Enter the second step of modifying the plan, turn on the position correction function, and set the relevant parameters

Chapter 8 Precautions

1. Other precautions

- 1) The fluctuation range of power supply voltage is within 10%
- 2) Please make sure to connect the ground wire
- 3) Do not place it near the welding machine
- 4) Do not place it near strong magnetic fields or devices that can generate strong magnetic fields
- 5) The ambient temperature is within the range of -10 °C to 50 °C
- 6) Please clean the through holes of the main body once a month
- 7) In case of an abnormal situation, for safety reasons, please manually set the stop state first, handle the exception properly, and then proceed with the operation.。

2. Warranty Regulations

This product has been strictly inspected and qualified by our company

In the event of a malfunction during normal use by the customer, it shall be handled in accordance with the after-sales service regulations.。

1) Warranty period

The warranty period is within 12 months after installation is completed

2) Items outside of warranty

The following situations outside the warranty period are paid repairs

- a. In case of malfunction or damage due to improper use such as dropping or impact during customer transportation or movement.
- b. In the event of natural disasters such as fires, earthquakes, floods, and abnormal voltage causing malfunctions or damages.
- c. Connect machines other than those designated by our company to this product in case of malfunction.
- d. In the event of a malfunction due to the use of operating methods other than those specified in the instruction manual or our company's designated methods.
- e. In case of malfunction due to use under special conditions or environments.
- f. In the event of a malfunction due to incomplete engineering equipment or inadequate maintenance management.。

3) Operating obligations of this device

This machine is recorded in the operating manual. Please follow the operating methods to operate it. In order to be able to use it permanently, please be sure to follow the specified items.。

4) Post warranty processing fees

Malfunctions that occur after the warranty period and repair costs outside of warranty items will be charged based on material costs, repair costs, travel expenses, etc.。

