

ISM-DL400

SMART MICROSCOPE OPERATION MAUNAL



www.insize.com

MN-ISM-DL400-E

V1

<https://m.insize.com/page-73-248.html>



EN -- Please scan the QR code or visit the website for operation manual.
IT --- Scansiona il codice QR oppure visita il sito web per il manuale d'uso.
CZ -- Pro návod prosím naskenujte QR kód nebo navštivte webovou stránku.
ES -- Por favor, escanee el código QR o visite la página web para ver el manual de instrucciones.
FR -- Veuillez scanner le QR Code ou visiter notre site web pour accéder aux manuels d'utilisation.
DE -- Bitte scannen Sie den QR-Code oder besuchen Sie die Website für die Bedienungsanleitung.
PT -- Para aceder ao manual de instruções, por favor, faça a leitura do código QR ou visite o nosso site.



Product description

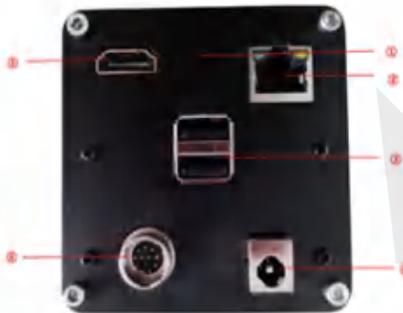
DL400-Camera intelligent visual inspection camera is mainly used in the field of industrial inspection for image analysis and recognition, visual inspection and judgment. The camera has color discrimination, color area calculation, contour search and positioning, object feature grayscale matching, color or grayscale density detection, object counting, size measurement, barcode two-dimensional code recognition and reading, size measurement, mechanical guidance positioning, Character recognition and other functions.

The camera has an HDMI high-definition video output interface, which can be controlled by a mouse. The camera provides a digital IO interface with multiple sets of input and output interfaces, including switch control interface, PLC signal input and output interface, RS232 interface, and Ethernet interface. There are many ways to communicate with peripheral devices and achieve collaborative work.

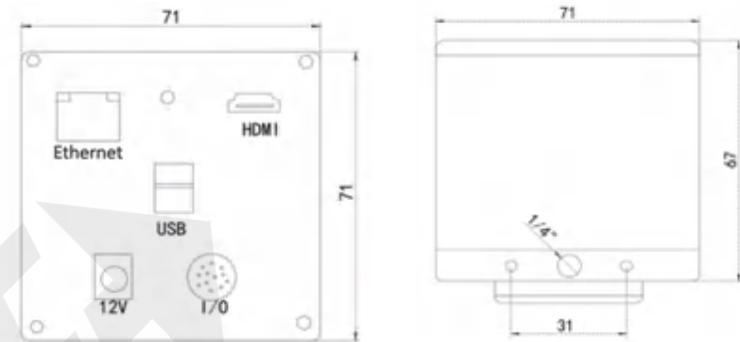
This product has a PLC control input and output interface, which can be integrated with automation equipment, and has a network transmission interface, which can communicate and control through the network.

Application areas: mobile phone internal inspection, LOGO inspection, line sequence inspection, object size measurement, product defect detection, robot guided positioning, multiple barcode recognition and reading, product technology statistics, product surface scratch detection, microscope inspection, etc.

Product structure



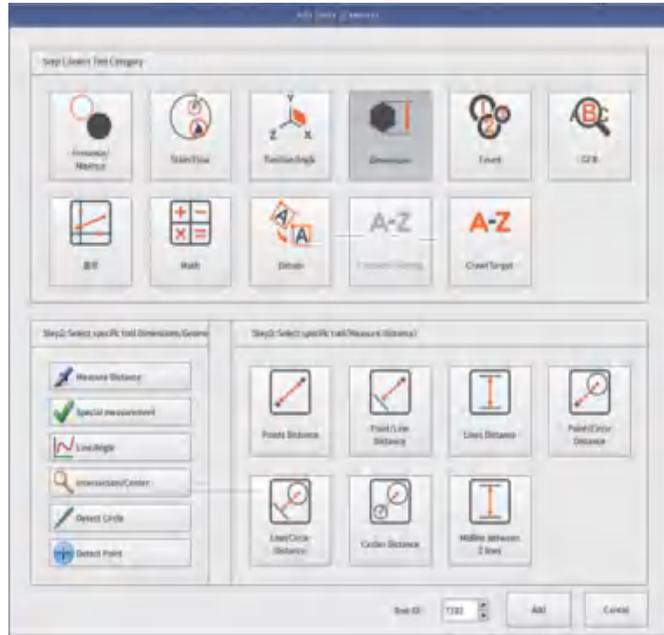
- ①—External microphone
- ②—Ethernet
- ③—USB plug
- ④—Power in
- ⑤—HDMI input/output
- ⑥—I/O output



Technical parameters

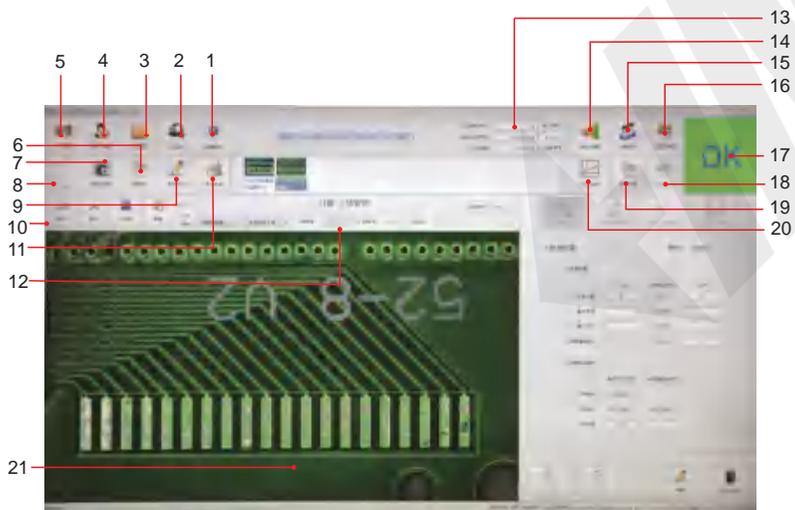
DL400-Camera			
Chip structure	Xilinx Zynq	Optical size	1/1.8 inches
Operating system	LINUX	Pixel size	2.4um*2.4um
Kernel structure	ARM COTEX A9 + FPGA	Resolution	3072*1728 (5.3 million)
Main frequency speed	666MHz	Frame rate	30/25 fps
Output Interface	2 USB ports. Can connect to U disk, wireless mouse or keyboard		
IO Interface	3 groups of input, 3 groups of output, 12V level output interface, can be connected to photoelectric switch, wire control switch, PLC, etc.		
Operating temperature	0-70 degrees	Video output	HDMI digital output
Dimensions	71*71*67mm	Lens interface	Cmount
Weight	450g	Voltage input	DC 12-24V

Product function diagram



Function diagram

Operation instructions



- (1) Configuration options: including system upgrades, network settings, data backup, language settings, basic information settings, etc.
- (2) I0 setting: Set the relevant parameters of signal output.
- (3) File management: Manage system files, and can copy and delete files.
- (4) User management: Manage system user related information and password settings.
- (5) Product management: product settings can be created, opened, and saved.
- (6) Motherboard setting: Register standard products.
- (7) Camera settings: Set various camera parameters, such as exposure time, white balance, brightness, color, wide dynamic and other parameters.
- (8) Camera selection: The system supports multiple cameras, select the currently operated camera.
- (9) Calibrated size: set the ratio of current lens magnification.
- (10) Image zoom: zoom in or zoom out the image.
- (11) Add tools: add new detection tools.
- (12) Display mode: display current inspection information.
- (13) Statistics: Count the number of good and bad products since the last time the data was cleared.
- (14) User management: user authority management can be performed.
- (15) Statistical report: View the statistical results and export them to EXCEL files.
- (16) Operation mode switching: divided into operation mode and setting mode.
- (17) Test result display: test result OK/NG display
- (18) Continuous detection button: automatic continuous detection of products.
- (19) Execute test button: test once every time you press it.
- (20) Execution conditions: Set the test conditions for each test tool.
- (21) Image display area: the current product image display area.

Image preprocessing

The use of preprocessing can greatly improve the condition changes caused by the condition of the workpiece or the external environment and ensure the stability of the image. Preprocessing is to perform related operations on the acquired image first, such as filtering out clutter, performing expansion operations to remove peripheral noise, and using corrosion to remove unstable pixels. It can be used according to specific needs.

The types of pretreatment are:

- (1) Gray binarization
- (2) Expansion
- (3) Corrosion
- (4) Median
- (5) Mean
- (6) Edge filtering 1
- (7) Edge filtering 2
- (8) Edge filtering 3

Image position offset correction (positioning tool)

When inspecting product objects, each time the operator places the inspected product, the position may be deviated. This problem can be solved if a very accurate carrier is used. But most of the time the position shift will cause false detection. Therefore, when adding other inspection tools, you need to add an image position offset correction tool, which can automatically search for the position of the feature point on the inspected product, and search for other inspection points based on the relative position. When there is a deviation in the position and angle of the detected product, the tool will give the deviation angle and displacement value, and other detection tools will use this deviation value to find their respective detection areas. It can effectively improve the accuracy of location search.

Pick point

- ① Select points automatically, click the point to be selected with the mouse, and the system will automatically match the most prominent point near the mouse.
- ② Select a point in the rectangle, drag a rectangle with the mouse, and the software will automatically search for the nearest point around it from the center point of the rectangle, and calculate the closest point that best meets the conditions according to the set edge sensitivity.
- ③ Select points by tangent line, and find the nearest suitable point along the set direction according to the selected rectangular area. The conditions that can be set are "edge sensitivity", "search direction-front and back" and "search direction-light and dark".
- ④ Edge sensitivity, adjust the sensitivity of edge recognition. The smaller the sensitivity, the easier it is to find edges with weak differences. With high sensitivity, edges with insignificant changes will be ignored and only edges with large color differences can be identified.



Choose a straight line

There are several types of line selection tools:

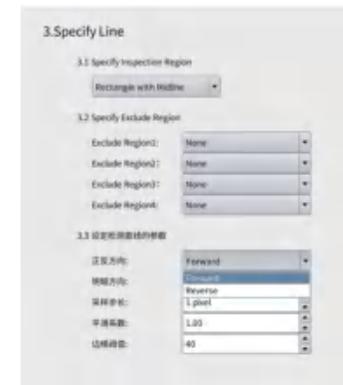
- ① Straight line rectangle, draw a close line along the target line position, the system will find the line with this line as the center line of the rectangle, and automatically find the target line according to the set edge sensitivity.
- ② Rotate the rectangle, use the mouse to draw a rectangular frame with direction, and then find a straight line according to the set direction and light and dark direction.

When looking for a straight line, the system searches for a straight line according to the sensitivity of the edge and adjusts the sensitivity of edge recognition. The smaller the sensitivity, the easier it is to find edges with weak differences. The higher the sensitivity, the edges with insignificant changes are ignored. Identify edges with large changes in color difference.

Select circle

The selected circles are all selected with a ring. First select the ring tool, and then point three points within the circle to be selected, as close as possible to the edge of the selected circle, the software will automatically generate the first circle, and then drag the mouse to automatically generate the second circle, as long as the target circle is in In the circle, the system will automatically search for the target circle according to the direction and the change of brightness. You can adjust the following parameters to select the best circle.

Adjust the parameters, the detection direction is "from inside to outside" or "from outside to inside", and the direction of light and darkness is "from light to dark" or "from dark to light". As shown in the figure below, we choose to find the circle from the inside to the outside, from light to dark. If found, the system will draw a blue circle along that circle. If not found, please continue to adjust the parameters.



Adjust camera parameters

(1) Video frame rate, the frame rate is 50 frames/sec and 60 frames/sec, adjust the frame rate to meet the needs of different displays.

(2) AE is automatic exposure adjustment. Click the camera to adjust to the best value according to the current brightness value. If you need to adjust manually, you can select the appropriate exposure value, and the unit is milliseconds. Under normal circumstances, setting to 2-20ms can meet the requirements

(3) AWB is the automatic white balance button. You can place a piece of white paper or other white objects under the current lens. Click this button and the system will automatically adjust to the appropriate color value. If a certain value is beating, you can change the brightness of the light source or place an object on it.

The color of the RGB channel can be adjusted as needed to change the color of the image and obtain a color balance suitable for highlighting features.

(4) Image optimization can change the quality of image effects.

Contrast: the smaller the value, the softer the image, the larger the value, the black and white image will be distinct and the visual effect will be clear.

HDR (Wide Dynamic): Suppress strong light and increase the brightness of darker parts.

SE (Sharpen): Enhance the brightness of the edge to make the image characteristics more obvious. But if it is too large, it will introduce larger noise.

Gain adjustment: used to adjust the overall color range of the image and enhance the brightness of the image. It can be saved after setting. If you don't want to adjust these parameter values at will, you can press the lock button.

Motherboard login

Before the system is executed, a sample needs to be entered, which we call the mother board. In this way, the system can compare the defects of other products of the same model and find the inspection location based on this motherboard.

3 motherboards can be registered for each product. When you need to operate a certain motherboard after multiple motherboards are logged in, select its motherboard. To delete unnecessary motherboards, you can select the name of the motherboard to be deleted and press the right mouse button, and the delete option will pop up.

Display Master: Switch to the master picture in the master setting window

Display Video: Switch to the real-time video screen in the master setting window

Calibration size

Calibrating the size is a way to calibrate the current lens magnification in advance when the measuring tool needs to be operated.

The specific operations are as follows:

(1) Place the calibration board under the lens, adjust the focus and magnification until you are satisfied.

(2) Click the "Re-Capture Screen" button, and the system will capture and freeze the currently adjusted image in the image display area.

(3) The user can select the "automatic circle finding" tool to select the circular target in the calibration plate. First select 3 points inside the circle (black part) to draw a green circle, and then drag the mouse outside the circle to draw a second green circle. The system will automatically find the outer edge of the black standard circle based on these two green circles

Note:

If you don't find the outer edge of the black standard garden correctly, you can choose the 4 options: 1. From inside to outside 2. From outside to inside 3. From light to dark 4. From dark to light 4 options to determine the current selection method. For example, if the standard circle is a black circle, if you choose from outside to inside first, then the corresponding one should also choose from light to dark. Because the direction is from outside to inside, we can see that the outside of the standard garden is a bright area and the inside is a darker area.

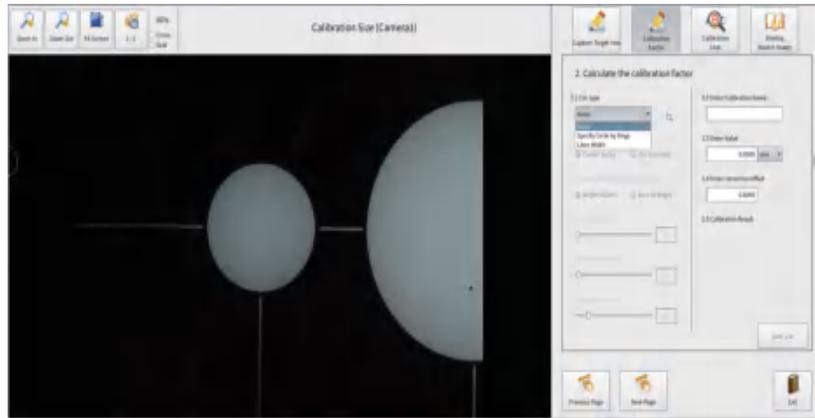
(4) After the outer edge of the standard circle can be found correctly, if the match is correct, then we can drill down the current lens magnification into the calibration name. Then enter the standard size of the circle (input diameter), and the calculated value will appear in the calibration result. Press "Save to List" to save the lens calibration value.

(5) "Bind Motherboard" can save the calibration lens and the detection motherboard correspondingly.

Note:

Be sure to save the motherboard correspondingly, otherwise the test result will be wrong. If the test result is wrong, you can repeat this step. After binding the motherboard, during detection, the current motherboard and calibration coefficients will appear in the "Settings column".

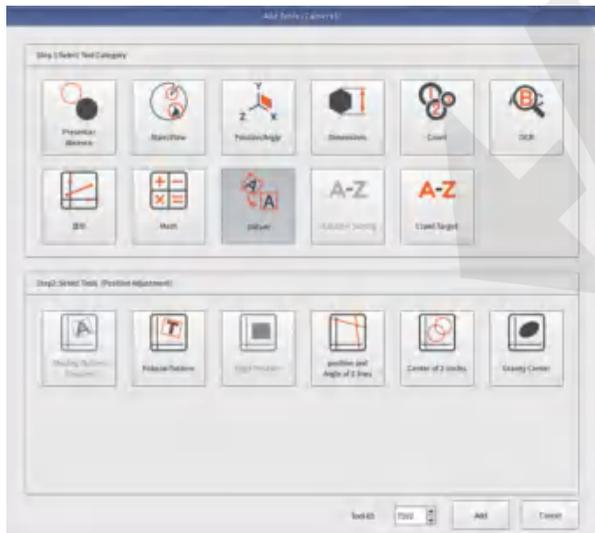
Calibration Name	ibration Leng	Pixels	Correction Factor	Correction Val	Unit
5x	5.000	423.303	0.01181	0.000	mm



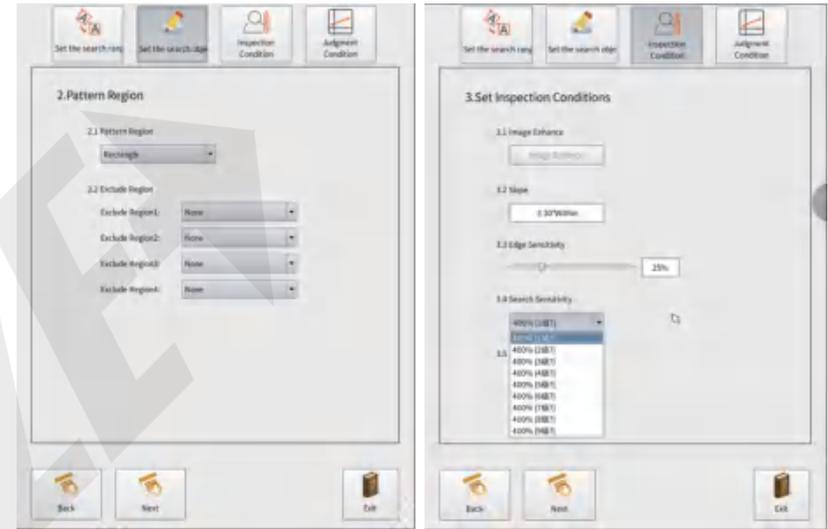
Position offset correction

When inspecting product objects, when the inspection target workpiece is misaligned, the "position offset correction" tool can be used to correct the position of the workpiece. Through this correction processing, the movement of the workpiece can be tracked. This function is to automatically find and locate the product. Note: There are several elements needed to find a feature area that can be located in the product: 1). Uniqueness, 2). Directional, 3). The outline is clear and identifiable without too many irrelevant features.

This category can be set in three ways:



A.  Contour positioning:



Positioning through the recognition of product appearance contours.

After selection, two boxes will appear in the image area. The white dashed box inside is the feature selection box. You can drag this box with the mouse or adjust the size of the box to select the desired target. The box should not be too large or it will reduce the efficiency of the system

The second blue box is the search range box, that is, you need to set a certain range for the searched target (of course you can also find it in full screen). The purpose is also to improve the efficiency of system operation. The smaller the range, the faster the system execution. It will be faster.

Set the search object shielding type----You can shield unwanted search objects as needed to improve the accuracy and anti-interference of the search objects. There are 4 types to choose from.

Set detection conditions:

- (1) Select "Perform preprocessing"
- (2) Tilt angle ---- set the ± angle range when the search object is tilted. The smaller the angle range, the shorter the processing time. Limiting the angle at which products are placed is also to improve operating efficiency.
- (3) Edge sensitivity ---- remove some edges that are not needed (we try to find the edge contour of the product as much as possible instead of reflecting certain features that are not needed or specific to the motherboard, which will cause the product Inaccurate positioning or unable to find the positioning target).
- (4) Search accuracy

(5) The minimum similarity value is the degree of similarity between the set target and other products. If the similarity is too high, matching will be difficult, and if the similarity is too low, the matching accuracy will be inaccurate. It can be finally set through a certain number of product tests.

B.Appropriate similarity value.



The position and angle of the straight line:

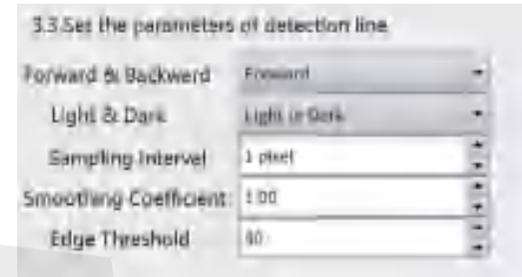
This tool locates the product by specifying the angle between two straight lines

(1)After selecting this tool, first set the first straight line. There are options such as straight rectangle, rectangle, and rotated rectangle.



(2)After selecting the line search tool, use the mouse to drag a rectangular box on the target area. Note that a green arrow will appear in the center of the box. The direction of this arrow is the direction of the line segment detected by the system. The direction of the line segment and the brightness can be corresponding to the detection direction. The system will automatically draw a blue line on the line segment. If it can't find it out correctly, it can be achieved by adjusting the "edge sensitivity".

(3)The second line segment proceeds as described above. After setting both lines, you can exit the setting.



C. Use circle center: This tool determines the positioning direction by calculating the distance between two circle centers.

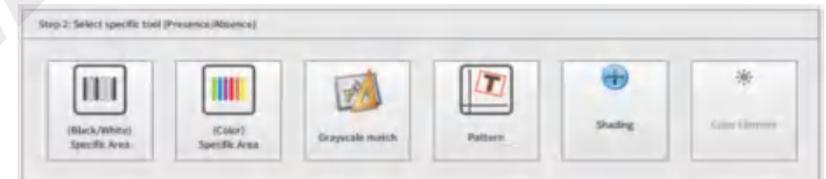
(1) Find the edge of the first circle through the ring

(2) After setting the second circle, the system will automatically connect the centers of the two circles.

Note: The use of two circles to determine the direction is strict for the position of the product, and cannot exceed the range of the circle drawn.

Presence/discrimination

This function can be judged by gray matching, color area, black and white color area, etc.



Specifies the area of black and white

You can judge the presence or absence of the product by binarizing the color of the product to obtain a black or white area.

(1) Tool: If you have set the position offset tool before, you can select and associate here.

(2) Set the detection range---choose to use "rectangle" to drag the mouse to select the target area. Choose white or black to specify the judgment area, and then adjust the "binarization" slider to make the target area reach the ideal state.



The original image



Adjusting the map



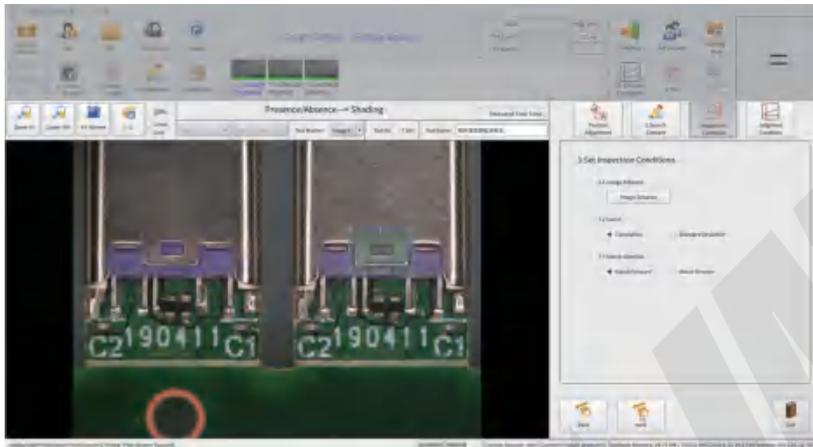
Ideal map

(3) "Set judgment conditions": The system will automatically give the standard value of the color area of the previously operated product, and the user can set the upper and lower limits of the area to distinguish whether the color product exists. Note: The upper limit and lower limit can generally be set at one and half of the standard degree. For example, if the standard value is 2000, then the lower limit can be set to 1000 and the upper limit can be set to 4000.

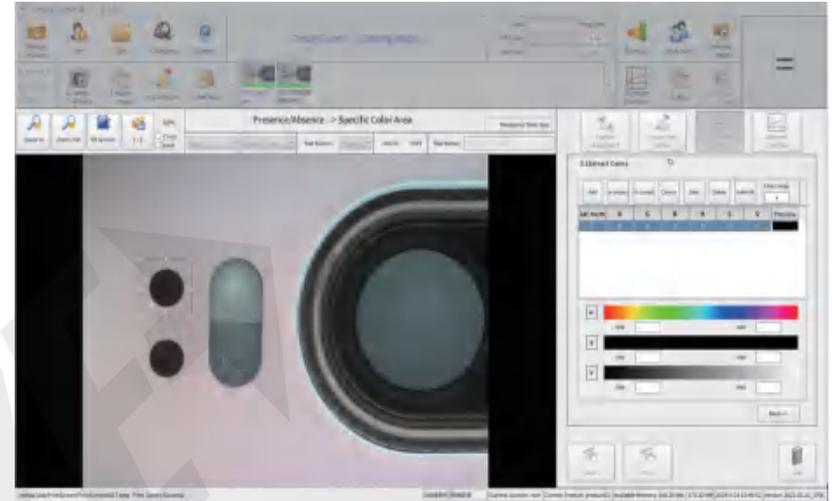
Area of the specified color (color)

It distinguishes whether the product exists by judging the color.

(1) First select the position offset tool: If the position offset tool has been set before, then here You can select and associate.



(2) To set the search range, you can use the rectangular box to select a target that is the product outline that needs to be judged, and use the mouse to drag the size and position of the inner box. The green box is the target box, and the blue box is the search scope box.



(3) Extract color---click "Add" and then click "Color Extraction", and then click on the target product with the mouse, the target will turn green, but there are many other color spots, and then use the mouse to pick the noise one by one. The spots will turn green, and the target will gradually become pure green as the number of clicks increases.



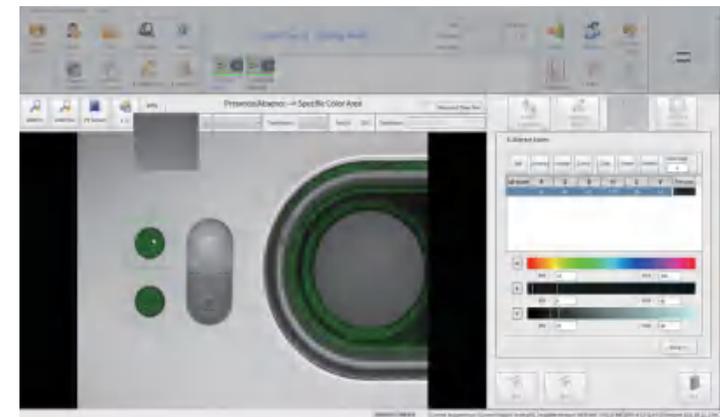
The original image



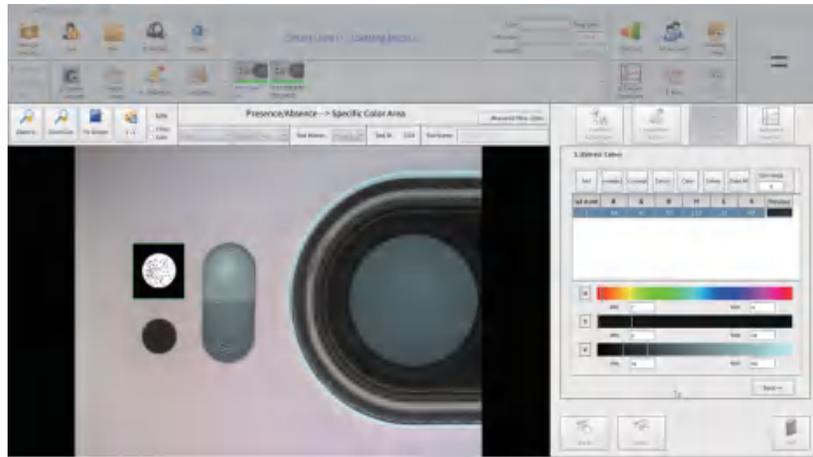
Drawing



Ideal map



Click "Extract End" after completion to complete this operation.



(4) If you are not satisfied with the above operation, you can click the "Delete" button and restart the above operation until you are satisfied.

(5) "Set judgment conditions": The system will automatically give the standard value of the color area of the previously operated product, and the user can set the upper and lower limits of the area to distinguish whether the color product exists. Note: The upper limit and lower limit can generally be set at one and half of the standard degree. For example, if the standard value is 2000, then the lower limit can be set to 1000 and the upper limit can be set to 4000.

Contour

Positioning through the recognition of product appearance contours.

(1) First select the position offset tool: if the position offset tool has been set before, you can select and associate here.

(2) Set the search range, you can use the rectangular box to select a target that is the product outline that needs to be judged, and use the mouse to drag the size and position of the inner box. The green box is the target box, and the blue box is the search scope box.

Set detection conditions:

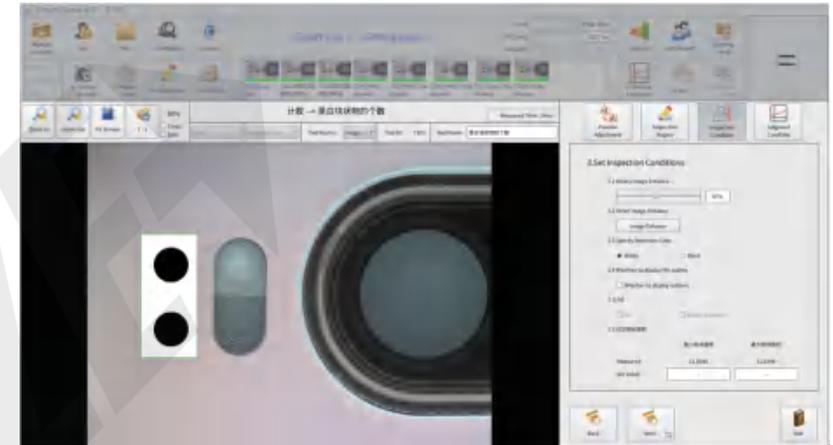
① Select "Perform pretreatment"

② Tilt angle ---- set the \pm angle range when the search object is tilted. The smaller the angle range, the shorter the processing time. Limiting the angle at which products are placed is also to improve operating efficiency.

③ Edge sensitivity ---- remove some unneeded edges (we try to find the edge contour of the product as much as possible instead of reflecting some unneeded or motherboard-specific features, which will cause product positioning Accurate or unable to find the positioning target).

④ Search accuracy

⑤ The minimum similarity value is the similarity between the target and other products. If the similarity is too high, matching will be difficult, and if the similarity is too low, the matching accuracy will be inaccurate. A certain number of product tests can finally set a suitable Similarity value.



Point spacing measurement

Measuring the distance between points

① Select the position offset tool first: If the position offset tool has been set before, you can select and associate here.

② To select points, you can select points through 4 methods (select 2 points).

Note: The fourth method is to share items, its function is to inherit the points (lines) recorded in the previous drawing. Select the shared item, the system will automatically draw the point (line) used in the previous drawing for you, and then manually select a desired point (line).

③ Select the upper and lower limits and specify the range of error.

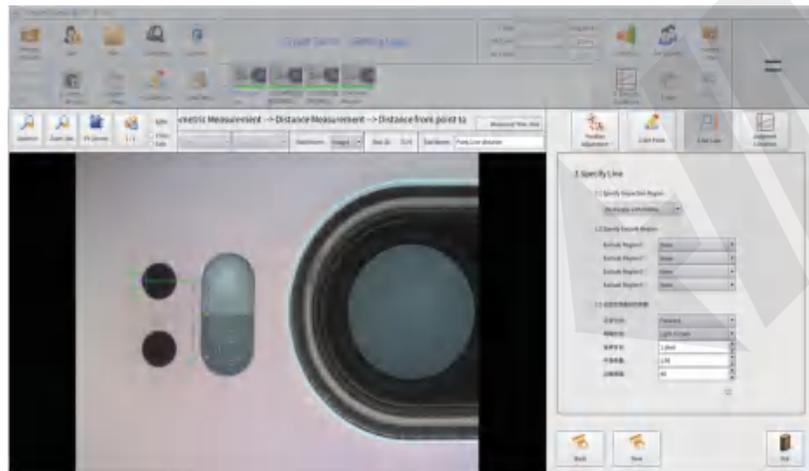




Distance between point and line

Distance between measuring point and straight line

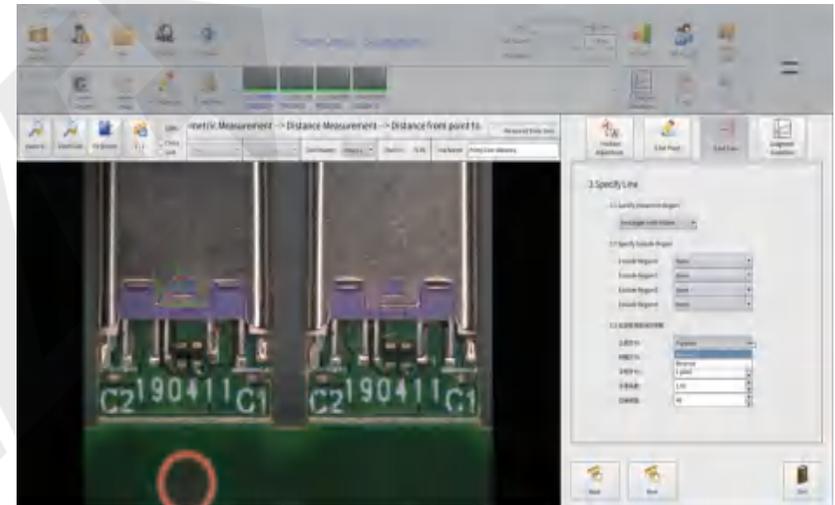
- ① Select the position offset tool first: If the position offset tool has been set before, you can select and associate here.
- ② To select points, there are 4 methods to select points.
- ③ Select the range of the straight line and determine the range of the straight line.
- ④ The upper and lower limits of the fixed distance and the allowable error range.



Distance between two straight lines

Line-to-line position detection

- ① Select the position offset tool first: If the position offset tool has been set before, you can select and associate here.
- ② Select the range of the straight line and determine the range of the two straight lines.
- ③ The upper and lower limits of the fixed distance and the allowable error range.



Distance between point and circle

Distance from a point to the circle

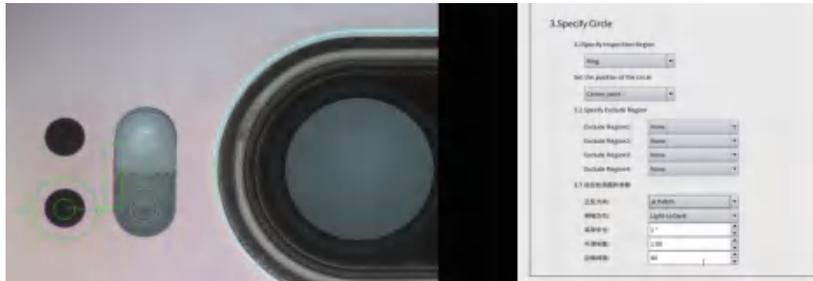
- ① Select the position offset tool first: If the position offset tool has been set before, you can select and associate here.
- ② To select points, there are 4 methods to select points.
- ③ Set the range of the circle and the position of the point.
- ④ The upper and lower limits and error range of the fixed distance.



Distance between line and circle

The distance from the straight line to the point on the circle

- ① Select the position offset tool first: If the position offset tool has been set before, you can select and associate here.
- ② Select the range of the straight line and determine the range of the straight line.
- ③ Set the range of the circle and the position of the point.
- ④ The upper and lower limits and error range of the fixed distance.



Distance between two circles

Measure the distance between the circle and the circle

- ① Select the position offset tool first: If the position offset tool has been set before, you can select and associate here.
- ② Set the range and position of the two circles, and determine the positions of the two circles.
- ③ The upper and lower limits of the distance and the error range.



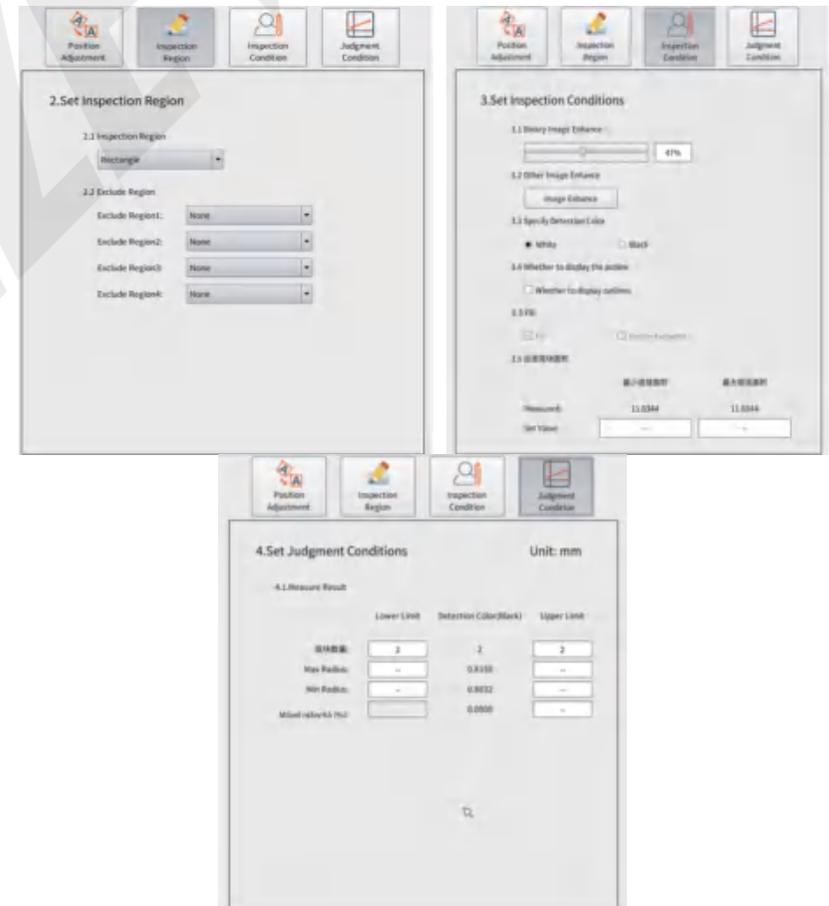
Count

Lump counting is mainly used to automatically calculate the quantity of specific smaller products, suitable for products with similar shapes and sizes. Objects can be placed at will, but do not stick or overlap each other.

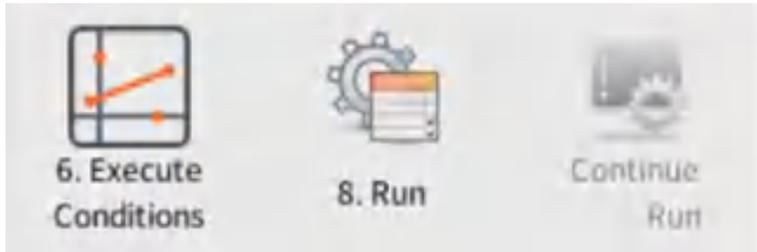
The first step is to add a block counting tool.

The second step is to set the detection range, and generally detect the entire screen. But the larger the selection range, the longer the time.

The third step is to set the detection conditions and adjust the binarization pre-processing value so that the detected object can be clearly distinguished from the background. Some other pre-processing functions can also be added to meet the processing needs. The fourth step is to set the judgment conditions. According to the size of the detected object, set a range, and count the number of those that meet this range.



Perform detection and detection condition setting



Perform testing

After setting up various detection tools, we need to let the program run the detection tools to start the detection. There are currently three ways to start operation.

- ① Manual inspection (execution inspection)
- ② Continuous detection (continuous detection)
- ③ External trigger detection

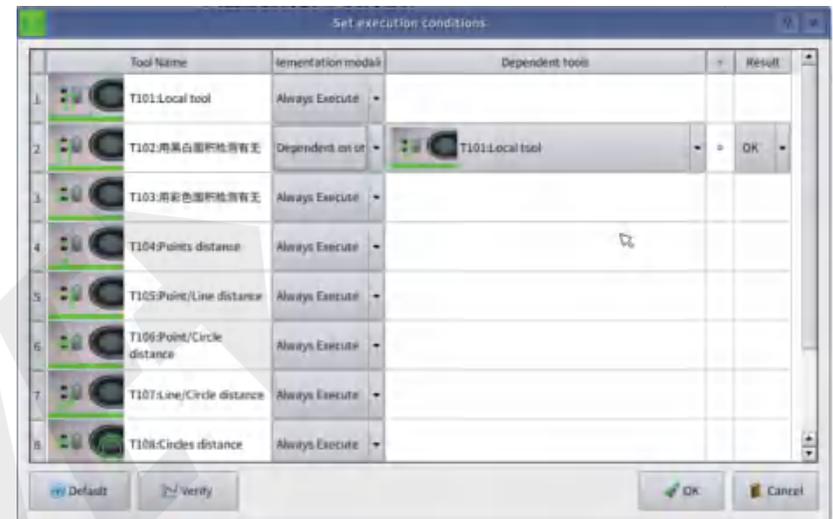
These three detection methods can be adapted to various needs according to the use environment and requirements.

1. Perform detection is to perform a detection every time the left mouse button (external trigger) is pressed, and an OK or NG prompt is given at the same time.
2. Continuous detection means that the next detection will be performed automatically after a delay of 500ms after each detection.
3. In the execution condition setting, the execution status of each tool can be changed separately. The purpose is to easily switch the detection content and use it in one detection setting.

Always execute: Make the tool always execute, simply check the NG/OK of a single tool

Never execute: keep the tool in a non-executed state, and do not run the tool during detection.

Depend on other tools: Make the tool depend on the previous tool, and the running status depends on the OK/NG of the previous tool. After the previous tool is NG, the tool will be checked automatically. (Mostly used for both front and back detection)



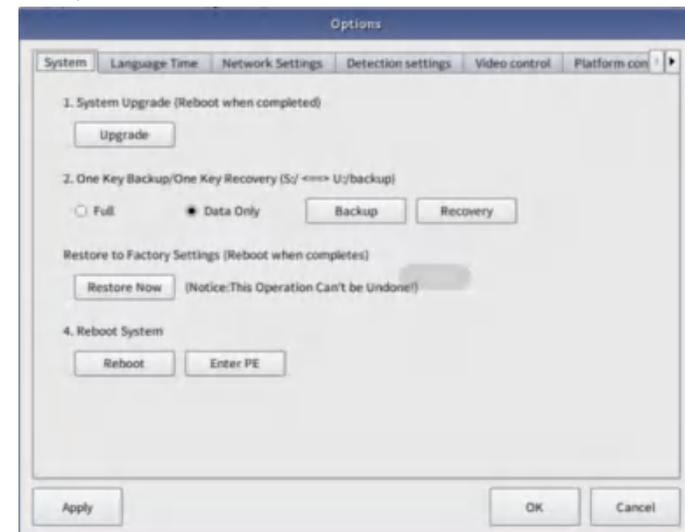
System functions

System upgrade, used to upgrade system files.

Data backup and restoration: backup product files or full disk data and programs.

Restore factory settings: restore to the factory settings file.

Restart the system



Language time

Set the system language environment.

The current system supports Chinese, Traditional Chinese and English). After selecting the desired language, click OK, and the system will restart and switch the language automatically.

Time setting: You need to set the correct system time when you first use it. When you need to change the time, move the mouse to the corresponding input box, scroll the mouse button, and the date or time numbers will change cyclically. Adjust to a suitable time and then save.

