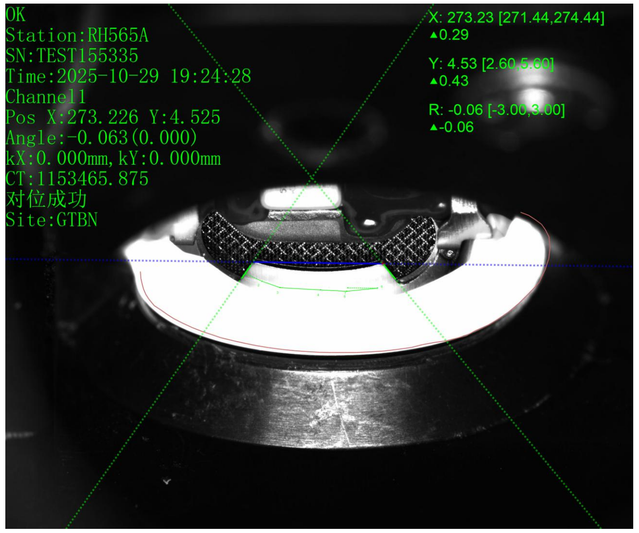
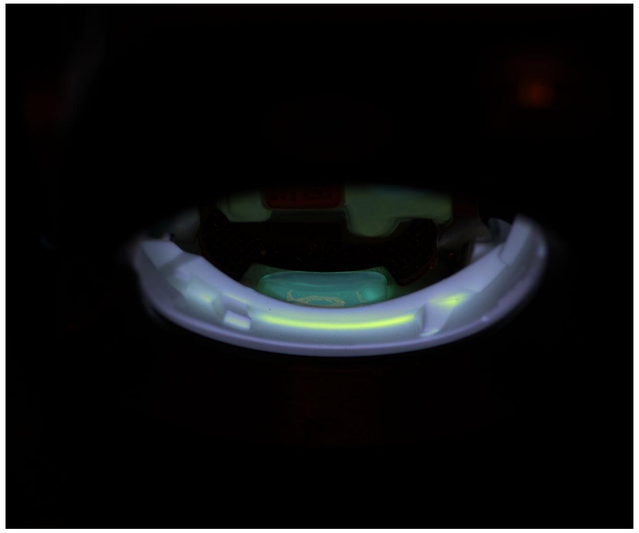
H565A SCUD Vision Flow Ver 1.0

H565A | Glue path AOI Vision flow change list

Station ID	Station Description	Vendor	Process Type		MIL
H565A		Cowain	Dispense		



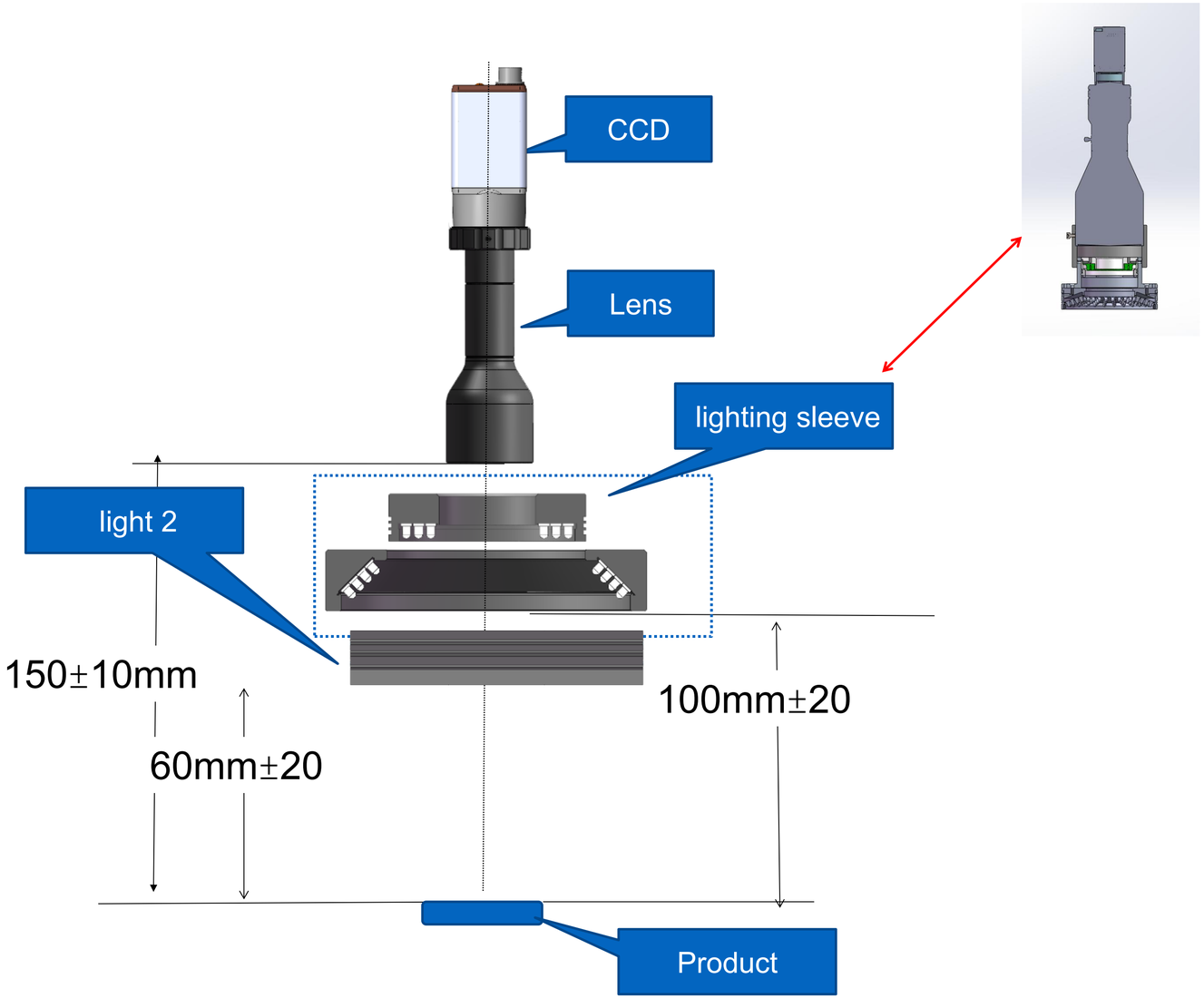


ID	Type	CircleMode	MX	MY	MZ	TX	TY	TZ	TR	TA	Speed	AccSpeed	IOStatus	StartDelay	EndDelay	StartDelay	EndDelay	IC	Section
1	0	-1	-	-	-	-4.624	0.358	-2	0	0	10	10	0	0	0	0	0	2	1
2	0	-1	-	-	-	-4.104	0.608	-3	0	0	10	10	0	0	0	0	0	2	1
3	0	-1	-	-	-	-3.494	0.818	-3	0	0	10	10	1	0	0	0	0	2	1
4	0	-1	-	-	-	-2.124	0.898	-3	0	0	10	10	1	0	0	0	0	2	1
5	0	-1	-	-	-	-1.244	0.938	-3	0	0	10	10	1	0	0	0	0	2	1
6	0	-1	-	-	-	-0.194	0.828	-3	0	0	10	10	1	0	0	0	0	2	1
7	0	-1	-	-	-	-1.204	0.828	5	0	0	10	10	0	0	0	0	0	2	1
MinX	-999	MaxX	999	MinY	-999	MaxY	999	MinZ	-999	MaxZ	999	MinR	-999	MaxR	999	MinA	-99	MaxA	

ID	Type	CircleMode	MX	MY	MZ	TX	TY	TZ	TR	TA	Speed	AccSpeed	IOStatus	StartDelay	EndDelay	StartDelay	EndDelay	IC	Section
1	0	-1	-	-	-	4.624	-0.358	-2	0	0	10	10	0	0	0	0	0	3	1
2	0	-1	-	-	-	4.104	-0.608	-3	0	0	10	10	0	0	0	0	0	3	1
3	0	-1	-	-	-	3.494	-0.818	-3	0	0	10	10	1	0	0	0	0	3	1
4	0	-1	-	-	-	2.124	-0.898	-3	0	0	10	10	1	0	0	0	0	3	1
5	0	-1	-	-	-	1.244	-0.938	-3	0	0	10	10	1	0	0	0	0	3	1
6	0	-1	-	-	-	0.194	-0.828	-3	0	0	10	10	1	0	0	0	0	3	1
7	0	-1	-	-	-	1.204	-0.828	5	0	0	10	10	0	0	0	0	0	3	1
MinX	-999	MaxX	999	MinY	-999	MaxY	999	MinZ	-999	MaxZ	999	MinR	-999	MaxR	999	MinA	-99	MaxA	

Glue Dispense Vision Guidance

The algorithm and work flow to guide the machine to dispense the glue.

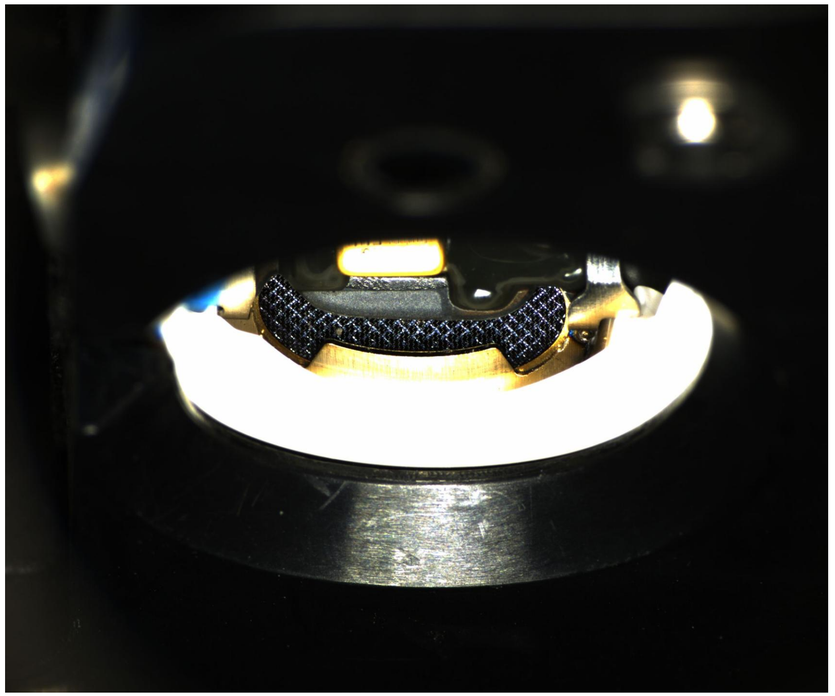


Vision System Diagram

Parameter			
Pixels	FOV	Resolution	DOF
2448*2048	21*17.5mm	0.008mm/pixel	2.5mm

BOM(for Dual_station)				
Item	Type	Description	Brand	Quantity
Camera	LY-H500C	5MP Color camera	Luster	1
Lens	EGXD-RDTD-150-04	Telecentric lens	Luster	1
Sleeve Module	LY-CLS-RS-25-EX-M-D28	Sleeve Module	Luster	1
Light 2	RBM-HBL10228-W	Bar light	Luster	1
License	VW-VA-SW-GLUE10	/	Luster	1

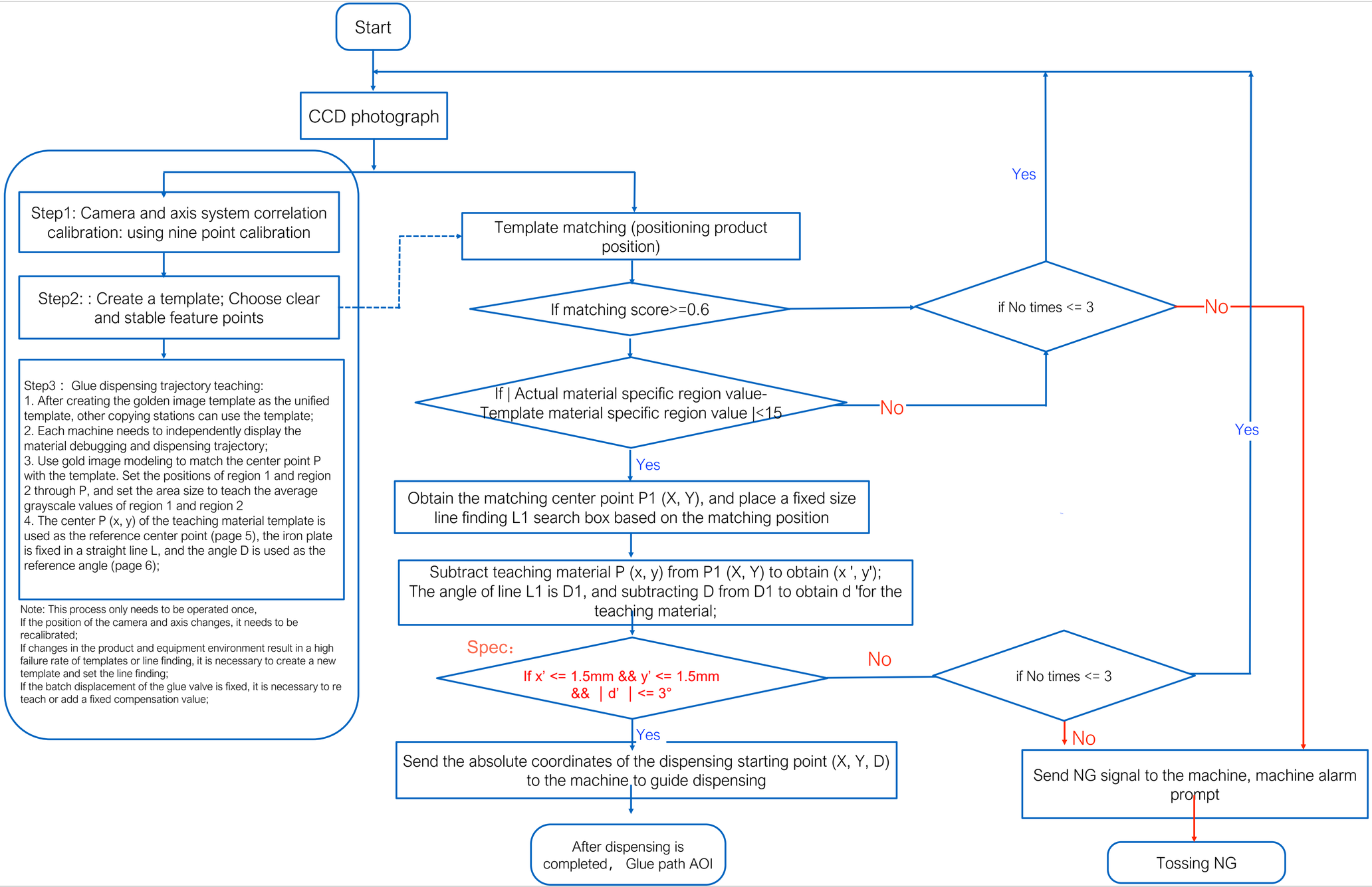
Glue path :
Golden image
A= 10° ±0.5°
R= 0° ±0.5°



Detailed parameters of golden image

Pixel dimension	0.0086mm
CCD resolution	2448*2048
Lens resolution	1000W, 1’
FOV	21*17.5mm
DOF	2.6mm
Lightning Brightness	200
Exposure time	35ms

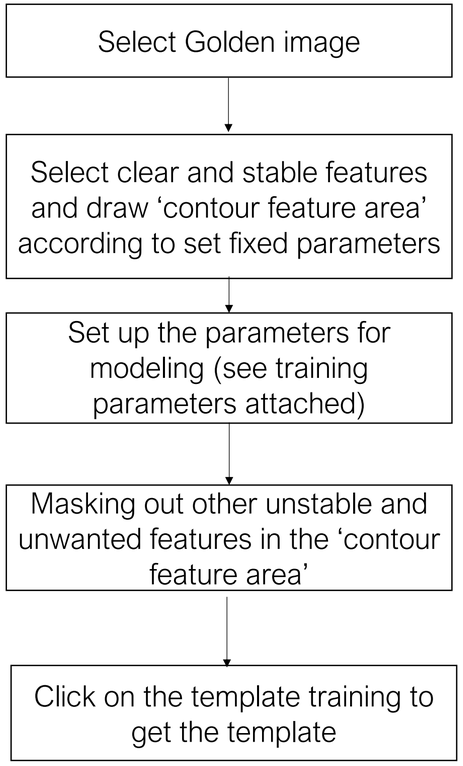
Audio | H565A Vision Flow | Glue path – Workflow



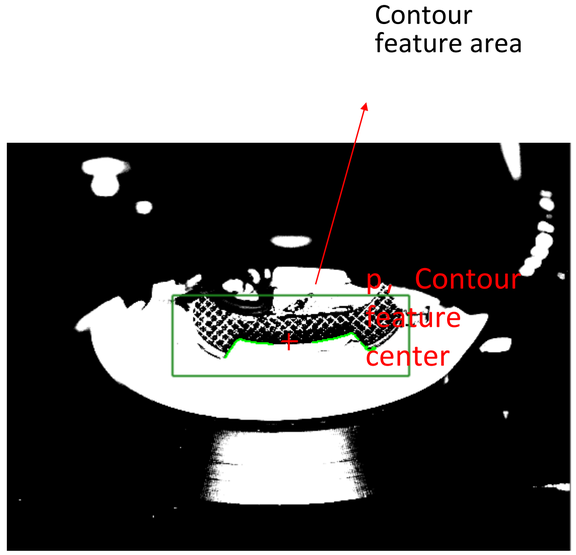
Pose 1 Vision Workflow

Step	Description	Page	Remark
1	Creating coarse finder templates Pose1	9	
2	Pattern Matching in Pose1	10	
3	Finding lines and finding circles	11	
6	Glue path AOI Product Glue Path Edge	18	
7	Glue path AOI Glue Area Region	19	

Audio | H565A Vision Flow | Glue path - Create Template

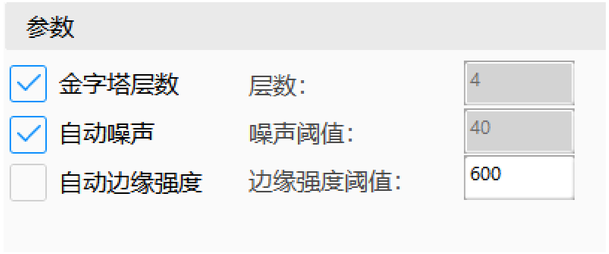


Modeling Process



Template

Contour feature areaparameter



Training parameters

Modeling feature requirements:
1. Stable and clear outline edge, no dirty
2. Do not have multi-layer, complex contours
3. Search area, do not have a close shape of the edge of the contour

When modeling, make good use of the masking function to mask out the unwanted edge contour features. Leaving only stable and clear contour features

After the modeling is completed, need offline test with all the previous material images to confirm the compatibility of this template for all incoming materials.

Note: If the parameters are modified in the future, all other machines in this station need to be updated

Audio | H565A Vision Flow | Glue path - Pattern matching

Set matching parameter

↓

Take image for incoming product

↓

Search for the created template in the "Searching area"

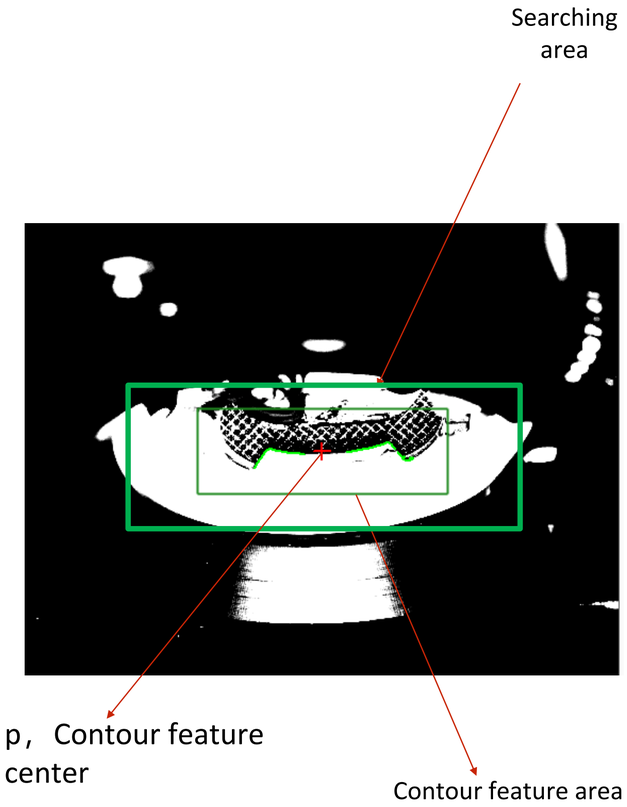
↓

Compare all the contour features in the "search area" with the template for similarity, get all contours with scores greater than 0.55 , and sort all the scores from highest to lowest, then output the contour with the highest score

↓

The algorithm outputs the similarity score, position ("contour feature region" and centroid p), angle, and two-dimensional linear transformation matrix of this contour

Matching process



Actual product

ParameterList	
接受阈值	0.600000
对比度阈值	10.000000
重叠比例阈值	0.800000
贪婪度	0.900000
搜索个数	1

Matching parameter

工位1定位_4196.搜索结果数组	[1]	vector<scGeomSearchExResult>
[0]	{...}	scGeomSearchExResult
二维线性变换	(-31.468661,60.982142),(0.9920...	scPlanarLinearTransform
匹配点	(1156.350651,1161.872473)	scPlanarVector
角度	1.214723	double
分数	0.862178	double

Matching result

Incoming material requirements:
1. to ensure that the difference between the material and the modeled material can not be too large (visual inspection can not have obvious differences in the structure)
2. region1 and region2 detection area, grayscale value and template material difference can not exceed ± 10
3. dirty, foreign matter also can not have a lot, can not obscure the modeled features;

Note: If the parameters are modified in the future, all other machines in this station need to be updated

Take image for incoming product

↓

Get the "template matching" result P as the reference coordinate system

↓

Place the line finding caliper tool at a fixed position according to the reference coordinate system

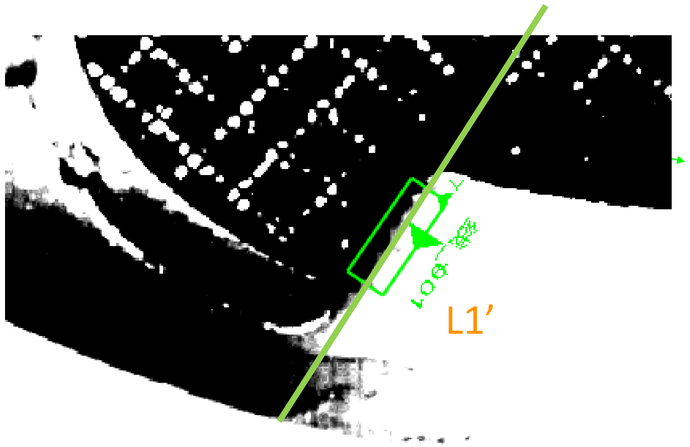
↓

Set the line finding ruler parameters

↓

Find the correct line

Line finding process



L1 Caliper parameters

Detailed parameters of L1'

Search direction: Up to down, light to dark
Capture features:
1. The contour edges are stable and clear, without any dirt or stains
2. Do not have multiple layers or complex contours
3. Within the search area, there should be no edge contours with similar shapes

Note: If the parameters are modified in the future, all other machines in this station need to be updated

Take image for incoming product

↓

Get the "template matching" result P as the reference coordinate system

↓

Place the line finding caliper tool at a fixed position according to the reference coordinate system

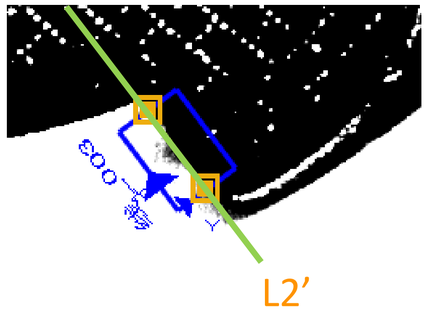
↓

Set the line finding ruler parameters

↓

Find the correct line

Line finding process



L2 Caliper parameters

Detailed parameters of L2'

Search direction: down to up, light to dark
Capture features:
1. The contour edges are stable and clear, without any dirt or stains
2. Do not have multiple layers or complex contours
3. Within the search area, there should be no edge contours with similar shapes

Note: If the parameters are modified in the future, all other machines in this station need to be updated

Take image for incoming product

↓

Get the "template matching" result P as the reference coordinate system

↓

Place the line finding caliper tool at a fixed position according to the reference coordinate system

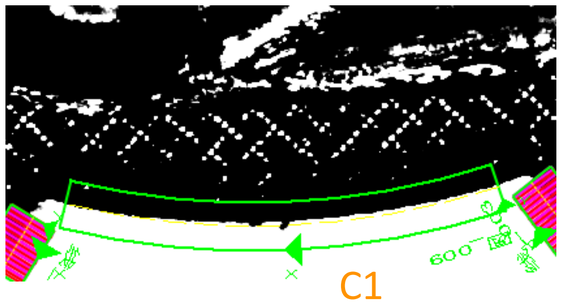
↓

Set the circle finding ruler parameters

↓

Find the correct Circle

Line finding process



C1 Caliper parameters

Detailed parameters of C1

Search direction: bottom to top, light to dark

Capture features:
1. The contour edges are stable and clear, without any dirt or stains
2. Do not have multiple layers or complex contours
3. Within the search area, there should be no edge contours with similar shapes

Note: If the parameters are modified in the future, all other machines in this station need to be updated

According to the template, establish the coordinate system, use the p point as a fixed offset, get the search box's center of finding line tool and finding contour tool

↓

According to the set parameters and caliper parameters, find the correct line L1 and correct line L2 and correct circle C1

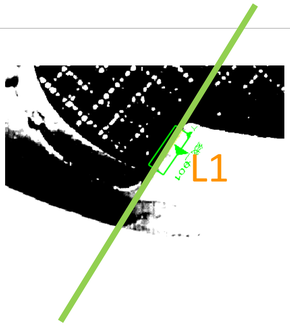
↓

Get intersection P1 as the demonstrate point by L1 and C1,get intersection P2 as the demonstrate point by L2 and C1

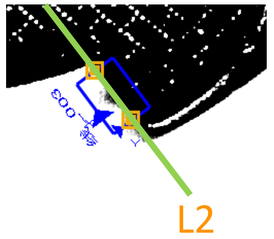
↓

P2 is the guiding point, make a line L3 cross P1 and P2, L3 is the reference angle

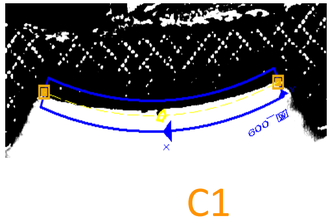
Point demonstration process



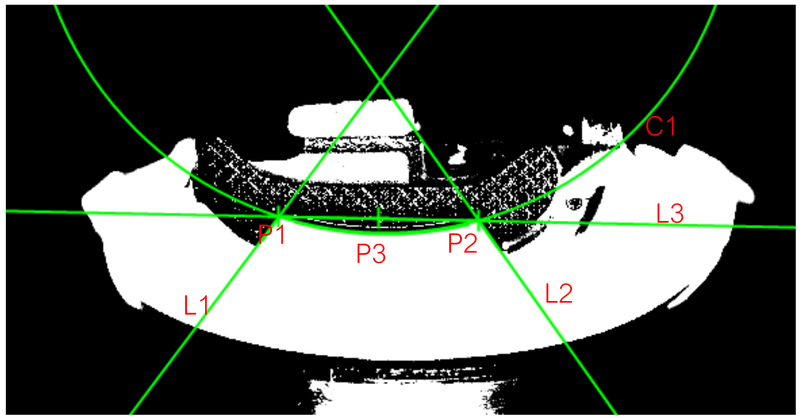
Detailed parameters of L1



Detailed parameters of L2



Detailed parameters of C1



Results

Note: If the parameters are modified in the future, all other machines in this station need to be updated

According to the template, establish the coordinate system, use the p point as a fixed offset, get the search box's center of finding line tool and finding contour tool

↓

According to the set parameters and caliper parameters, find the correct line L1 and correct line L2

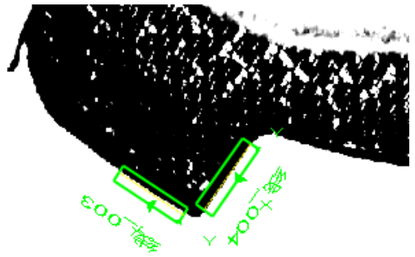
↓

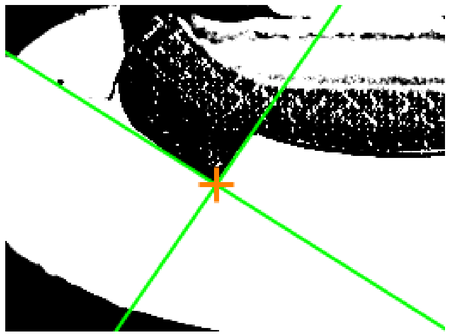
Get intersection P as the demonstrate point by L1 and L2

↓

Point P is the guiding point

Point demonstration process





L1 Caliper parameters

L2 Caliper parameters

Incoming material requirements:
1. to ensure that the difference between the material and the modeled material can not be too large (visual inspection can not have obvious differences in the structure)
2. dirty, foreign matter also can not have a lot, can not obscure the modeled features;

Glue Path AOI MSOP

The algorithm, inspection definition and spec of the glue path AOI.

H565A | Glue path AOI Product Glue Path Edge

No Glue

The areas of the glue > 0mm²

Glue Coverage-Shift

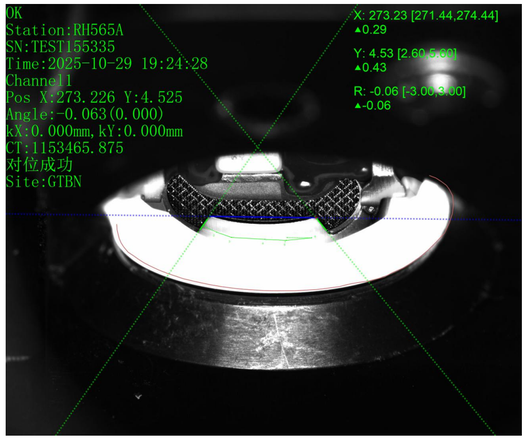
The R1 coverage line should be >=80 % covered by glue path

Glue Missing

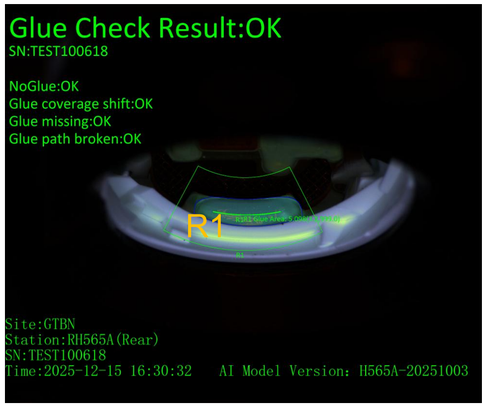
Glue Broken

The gap of glue breakage ≤ 0.1 mm

Pre-dispense image



Post-dispense image



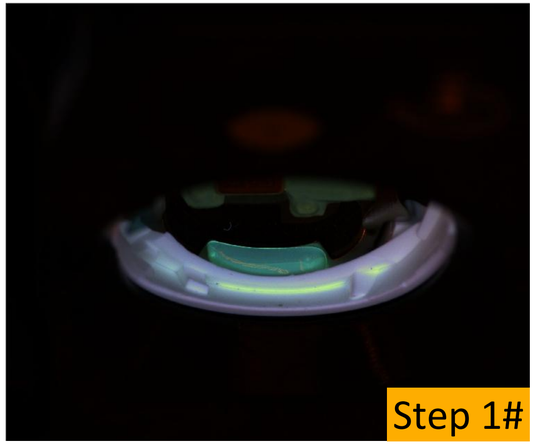
Legend:

- Glue Path Edge
- Glue Coverage Line
- Glue Area Region
- Keep out zone

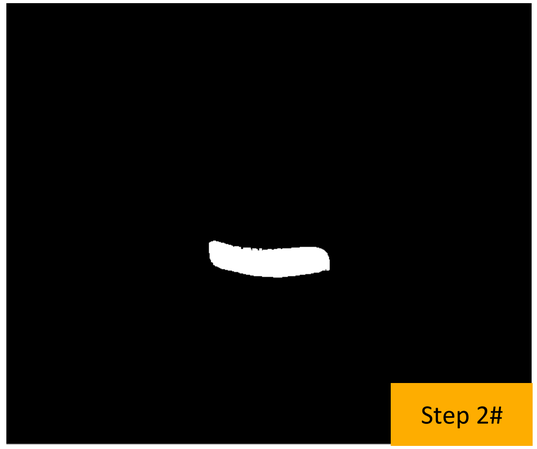
Pix accuracy:0.0086mm/pix

Region	No Glue	Glue Coverage-Shift	Glue Missing-Area	Glue Broken
R1	Glue area > 0mm²	≥80%	Glue area > 3.2mm²	≤0.1mm

Audio | Glue path AOI Product Glue Path Edge



Source image (post-dispense)



extract glue color

extract result

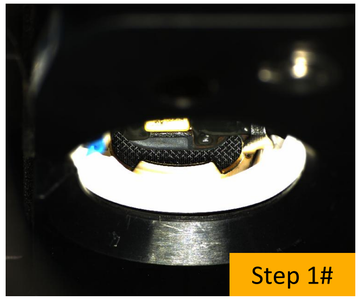
missing

Step 2#

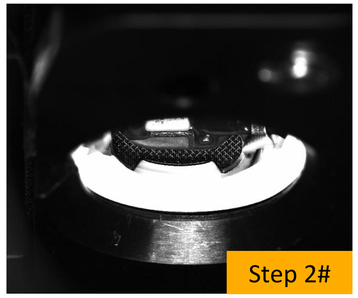
The purpose of this process is used to extract the Glue path

Step 1# Capture pose1 source image
Step 2# Extract the color of glue path
Step 3# Inspect the glue path

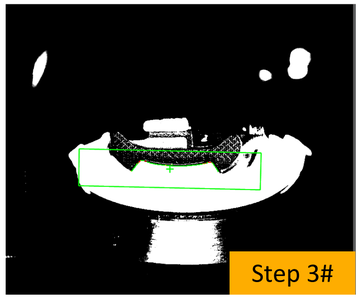
Audio | Glue path AOI Glue Area Region



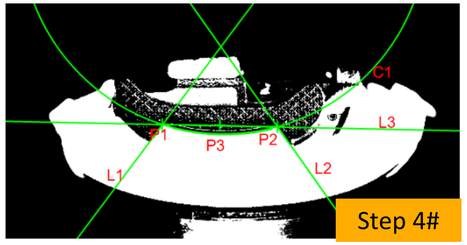
RGB to gray



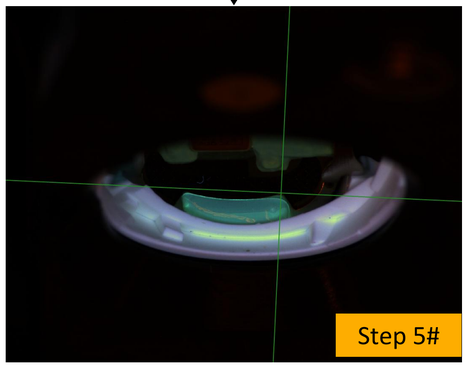
pattern match

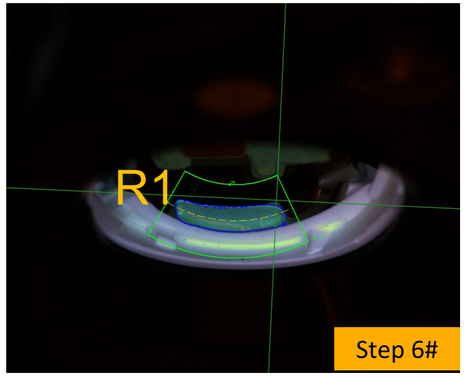


find line/circle



Create
coordinate system



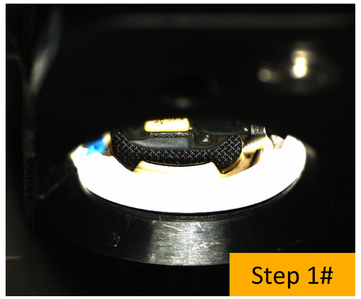


Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	-2.009	-5.056	117.663	-55.388	4.355	3.229	5.771

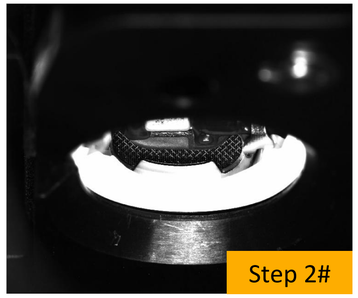
R1

The purpose of this process is used to find the position for dispense and region for coverage inspection:
Step 1# Capture pos1 source image
Step 2# RGB image to gray image
Step 3# Pattern match to get the place of the product
Step 4# Grab the product characteristics of line/circle to obtain L2&C1, P2 is intersection point of L2&C1
Step 5# Establish a product coordinate system by using P2 and L3
Step 6# Place the glue inspection region according to product coordinate system

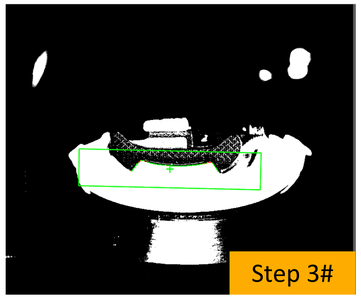
Audio | Glue path AOI Glue Coverage Region



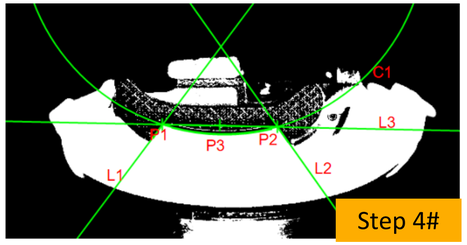
RGB to gray



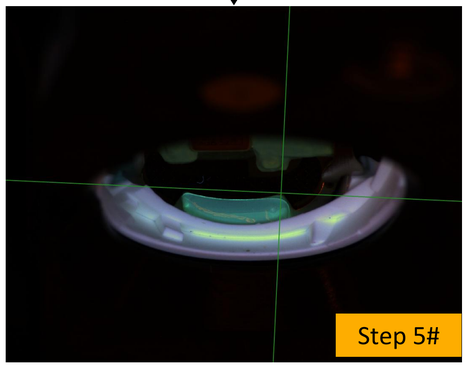
pattern match

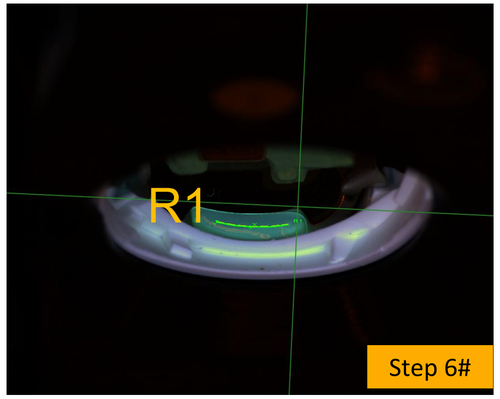


find line/circle



Create
coordinate system





Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	-1.941	-6.526	100.907	-22.987	7.469	0.020	3.000

R1

The purpose of this process is used to find the position for dispense and region for coverage inspection:

Step 1# Capture pos1 source image

Step 2# RGB image to gray image

Step 3# Pattern match to get the place of the product

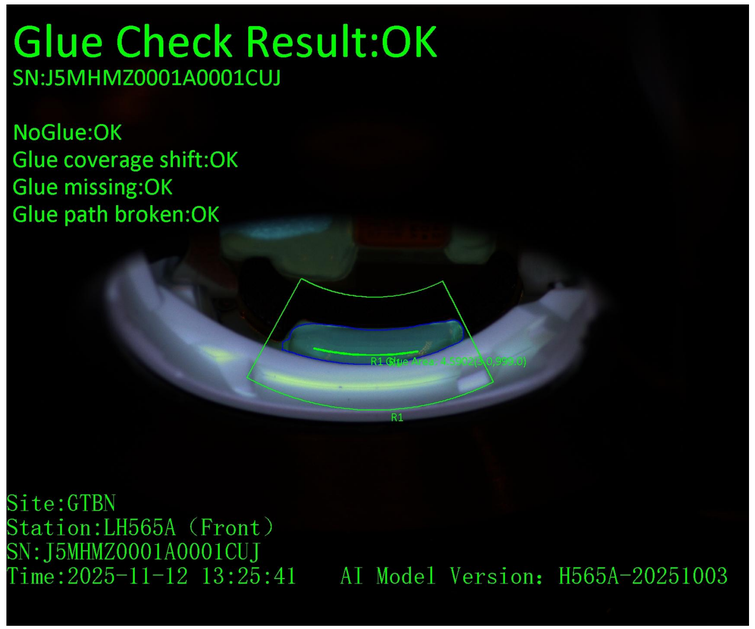
Step 4# Grab the product characteristics of line/circle to obtain L2&C1, P2 is intersection point of L2&C1

Step 5# Establish a product coordinate system by using P2 and L3

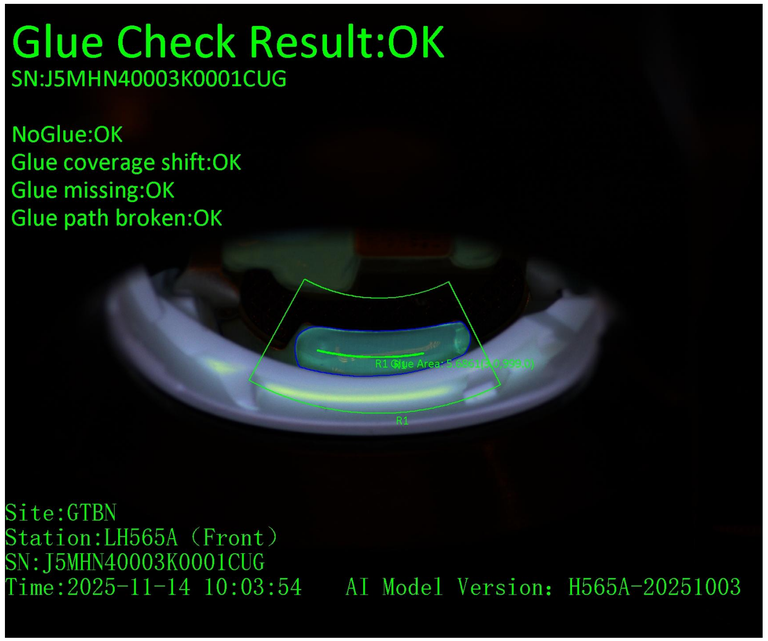
Step 6# Place the glue inspection region according to product coordinate system

H565A | Glue path AOI Product glue Inspection logic

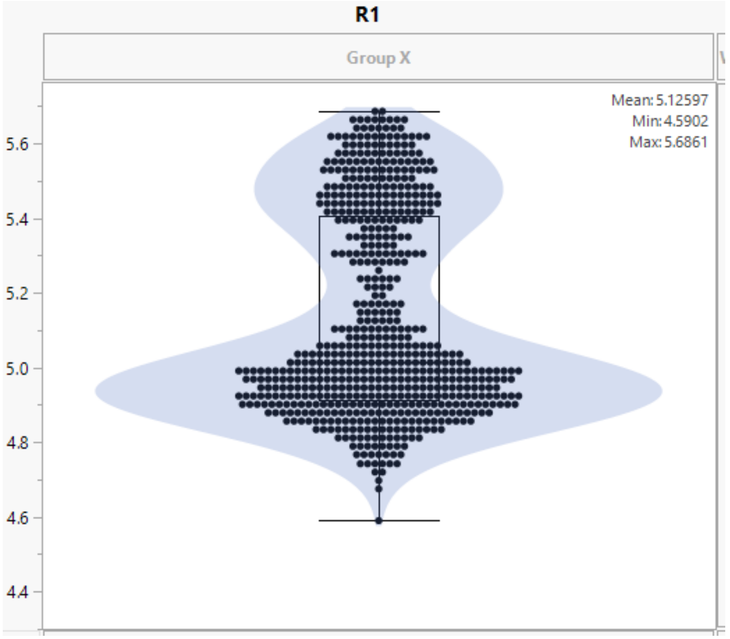
Pose1_Missing_R1 MIN: 4.5902



Pose1_Missing_R1 MAX: 5.6861



Pose1_Missing_R1 Data



R1 Missing spec= Pose1_Missing_R1 MIN*0.7=4.59*0.7=3.21