



**HERCULUX** Chengdu HercuLux Photoelectric  
 恒坤光电 Technology Co.,Ltd  
**Product Approval**

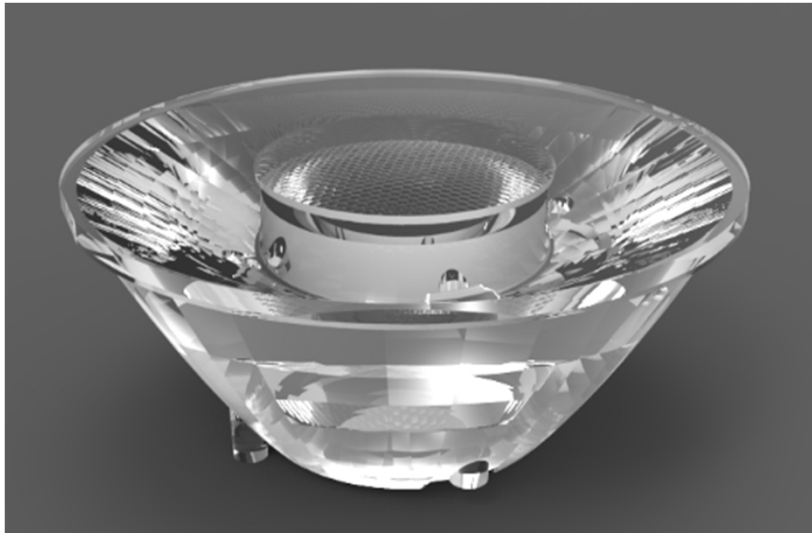
Approval number :

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Customer :

PN	Code	Product
HK-55@21-15-D9-20-1g-1	1. 01. 5498	55@21-15° Lens
HK-55@21-20-D9-20-1g-1	1. 01. 5495	55@21-20° Lens
HK-55@21-24-D9-20-1g-1	1. 01. 7990	55@21-24° Lens
HK-55@21-36-D9-20-1g-1	1. 01. 7991	55@21-36° Lens
HK-55@21-60-D9-20-1g-1	1. 01. 81457	55@21-60° Lens

Manufacturer : Chengdu HercuLux Photoelectric Technology Co.,Ltd



Supplier confirmation				Client confirmation			
Proposed		DATE		Qualified <input type="checkbox"/>		DATE	
Project manager		DATE		Unqualified <input type="checkbox"/>		DATE	
Audit		DATE		Audit		DATE	
Approved		DATE		Approved		DATE	
Stamp		DATE		Stamp		DATE	

( Confirmation of acceptance by both parties must be signed and sealed )

Factory: Chengdu Shuangliu District, Iot industrial park 2 road HercuLux Photoelectric Park  
 Phone : 028-85887727 ( 801 ) 028-85887990 ( 801 ) Fax : 028-85887730 www.hkoptics.com  
 Sales Dept: Shenzhen Nanshan District Nanshan Cloud Valley Innovation Industrial Park Comprehensive Service Building,  
 TEL: 0755-2937 1541 FAX: 0755-2907 5140

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\*Approval In duplicate , for both supplier and customer.

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**HERCULUX**  
恒坤光电

# Product Approval

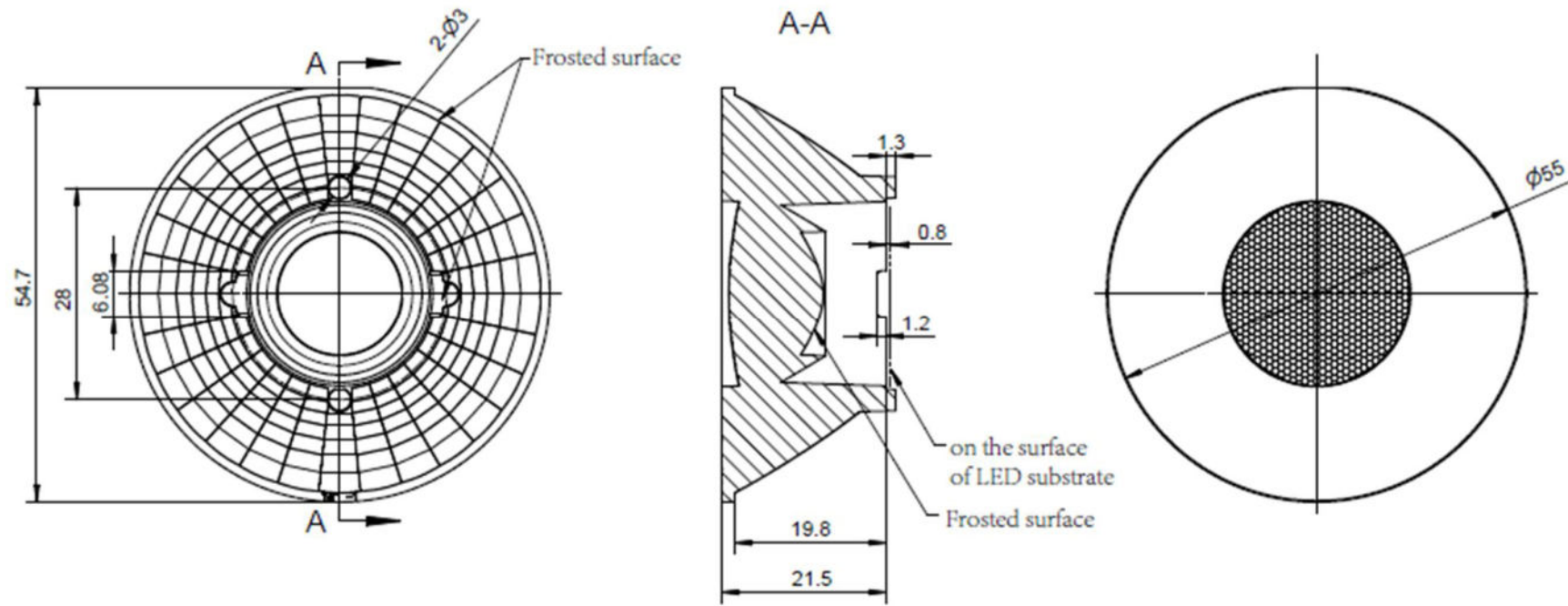
TEL: 0755-2937 1541

FAX: 0755-2907 5140

www.hkoptics.com

Date updated: 2019/2/15

Product Picture:	
PN:	HK-55@21-15-D9-20-1g-1
Size(L*W*H/Φ*H):	Φ:55mm; H:21.5mm
1.07.81418_HK-166@03-0223-S	PMMA
Efficiency:	\
Temperature(Topr):	-40°C to +80°C
FWHM:	15°/20°/24°/36°/60°
Matched LES:	D9

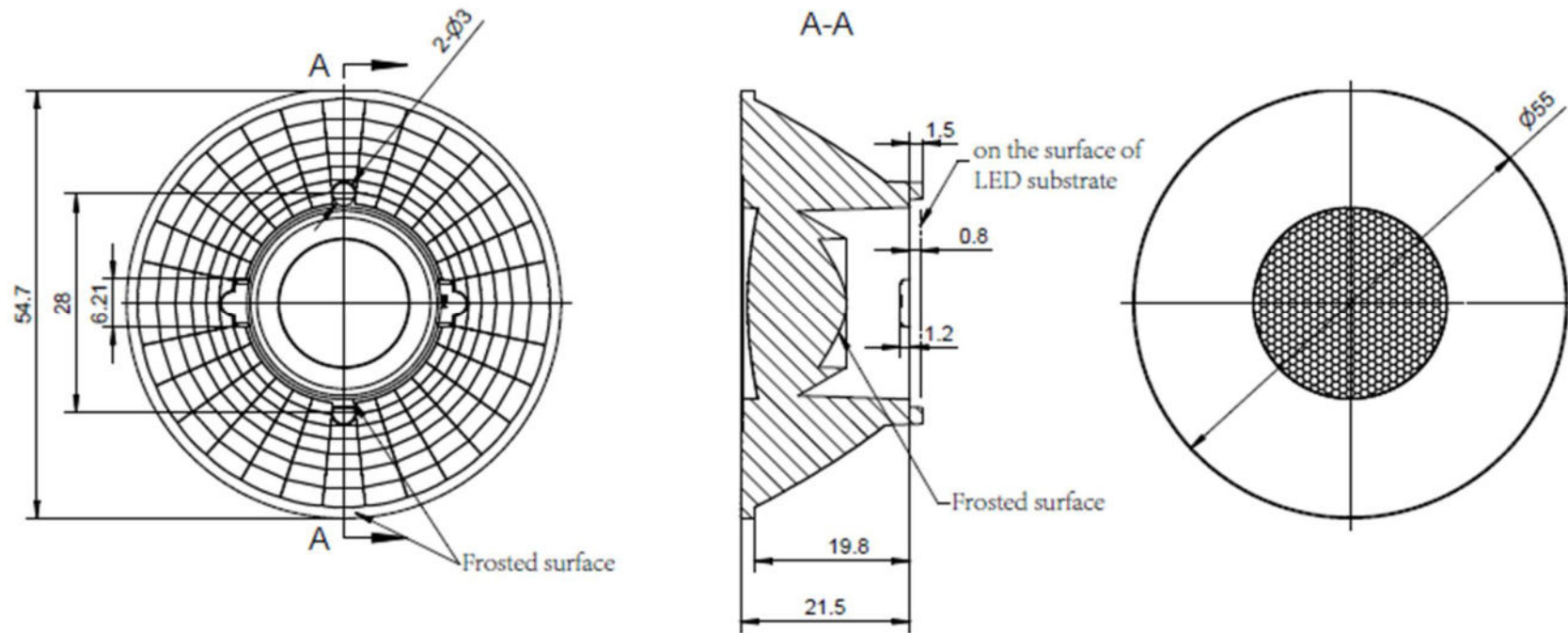


**Technical remark:**

1. The 3D map is not indicated for rounded corners and draft angle.
2. The dimensional tolerances are not specified according to GB/T 14486 2008 MT5.
3. The surface has no flash, shrinkage, bubbles and other defects.

Optical design			55@21-15°Lens		HK-55@21-15-D9-20-1g-1		
Structure design			55@21-15°Lens		1.01.5498		
Review					Number of drawing	qty	weight
Validation			Material:	PMMA	CDHK		

MT5 Tolerance table (mm)	Basic size	<3	3~10	24~65	65~140	140~250	250~450	>450
	olerance value	±0.1	±0.15	±0.35	±0.50	±0.80	±1.2	±2.0

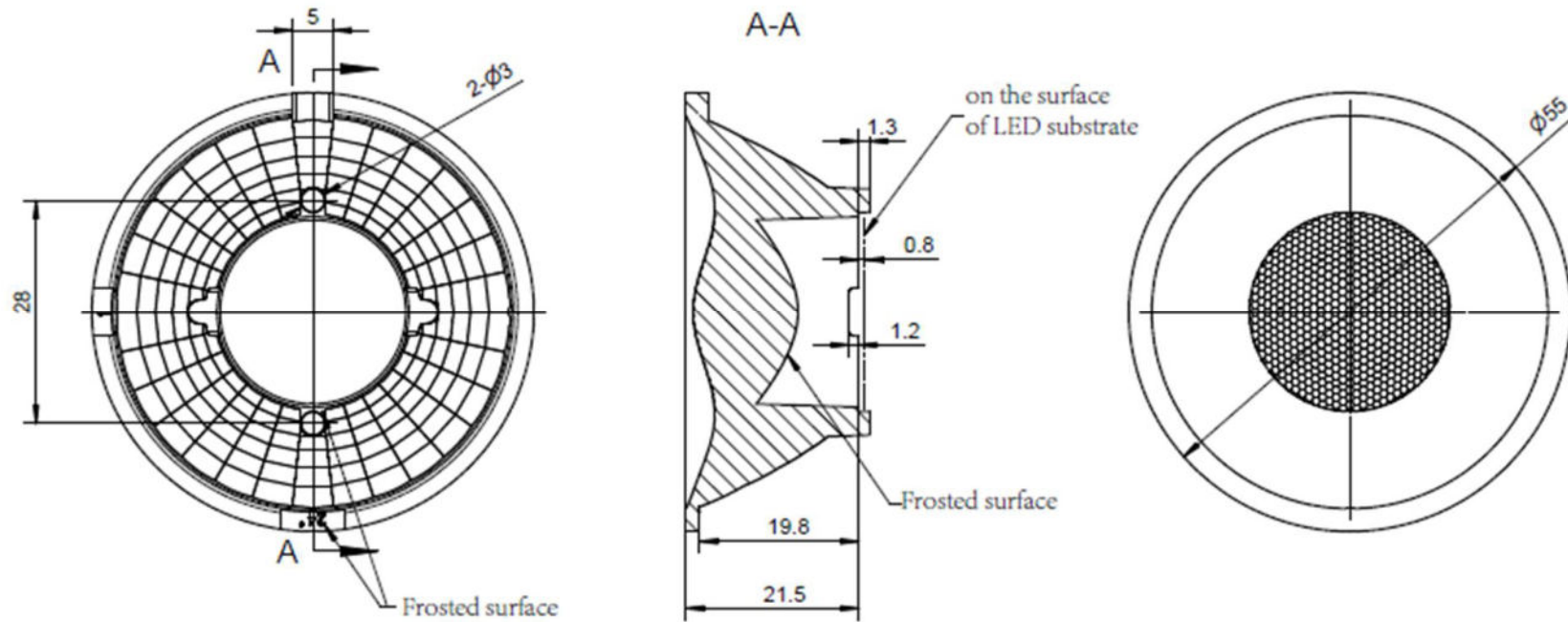


**Technical remark:**

1. The 3D map is not indicated for rounded corners and draft angle.
2. The dimensional tolerances are not specified according to GB/T 14486 2008 MT5.
3. The surface has no flash, shrinkage, bubbles and other defects.

Optical design			55@21-20°Lens		HK-55@21-20-D9-20-1g-1		
Structure design			55@21-20°Lens		1.01.5495		
Review					Number of drawing	qty	weight
Validation			Material: PMMA		CDHK		

MT5 Tolerance table (mm)	Basic size	<3	3~10	24~65	65~140	140~250	250~450	>450	
	tolerance value	±0.1	±0.15	±0.35	±0.50	±0.80	±1.2	±2.0	

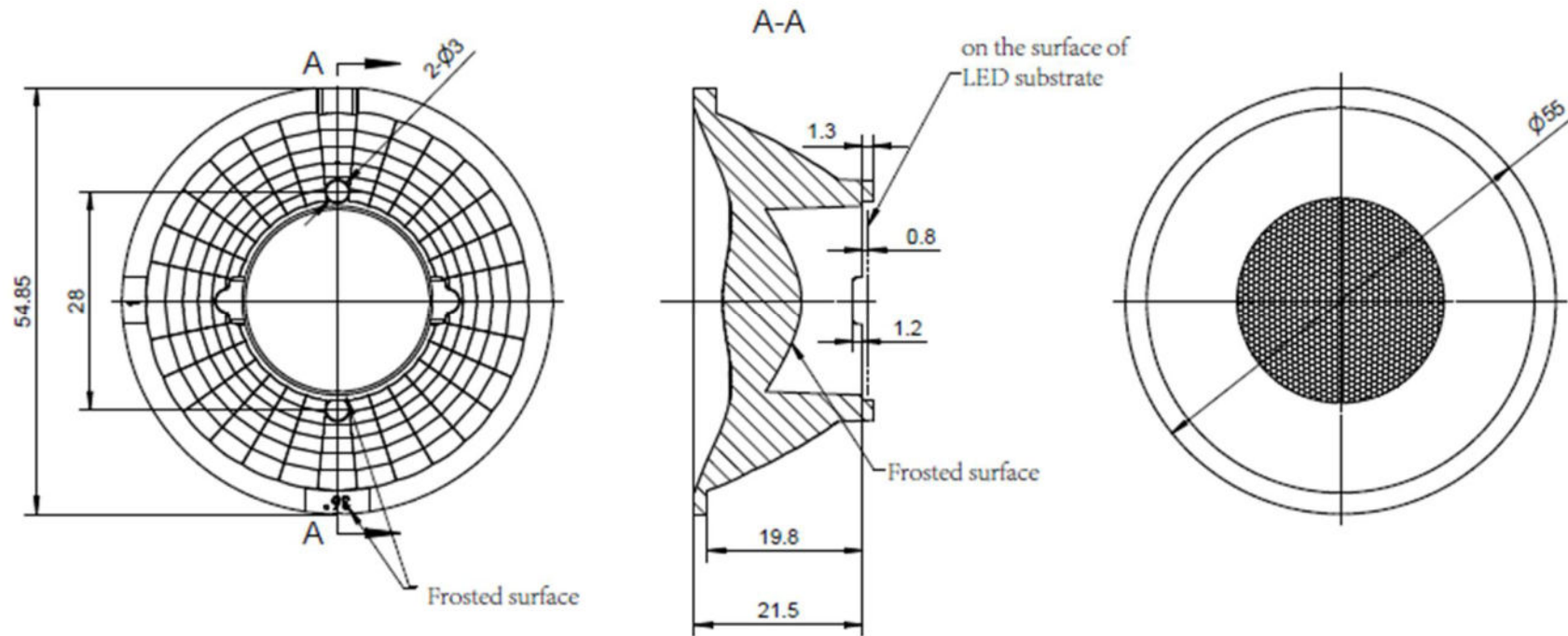


**Technical remark:**

1. The 3D map is not indicated for rounded corners and draft angle.
2. The dimensional tolerances are not specified according to GB/T 14486 2008 MT5.
3. The surface has no flash, shrinkage, bubbles and other defects.

Optical design			55@21-24°Lens			HK-55@21-24-D9-20-1g-1		
Structure design						1.01.7990		
Review			Material: PMMA			Number of drawing	qty	weight
Validation						CDHK		

MT5 Tolerance table (mm)	Basic size	<3	3~10	24~65	65~140	140~250	250~450	>450	
	olerance valu	±0.1	±0.15	±0.35	±0.50	±0.80	±1.2	±2.0	

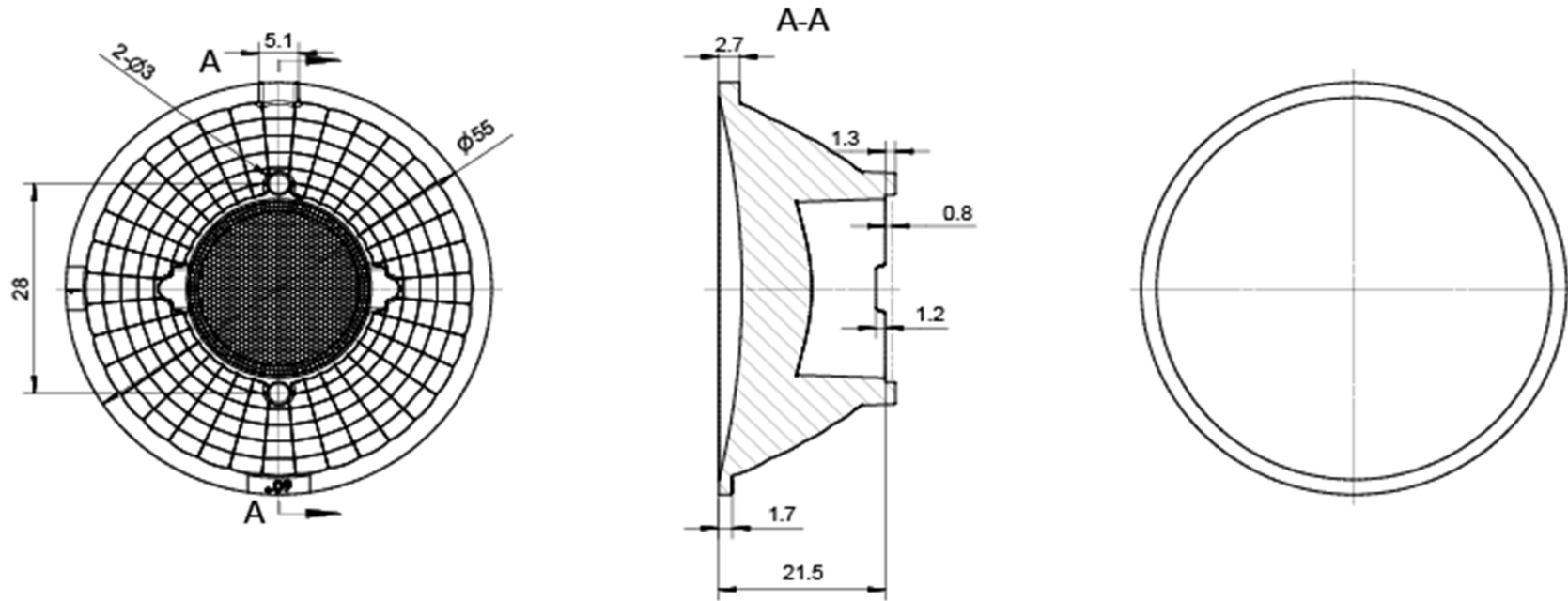


**Technical remark:**

1. The 3D map is not indicated for rounded corners and draft angle.
2. The dimensional tolerances are not specified according to GB/T 14486 2008 MT5.
3. The surface has no flash, shrinkage, bubbles and other defects.

Optical design			55@21-36°Lens		HK-55@21-36-D9-20-1g-1		
Structure design			55@21-36°Lens		1.01.7991		
Review					Number of drawing	qty	weight
Validation			Material:	PMMA	CDHK		

MT5 Tolerance table (mm)	Basic size	<3	3~10	24~65	65~140	140~250	250~450	>450	
	tolerance value	±0.1	±0.15	±0.35	±0.50	±0.80	±1.2	±2.0	

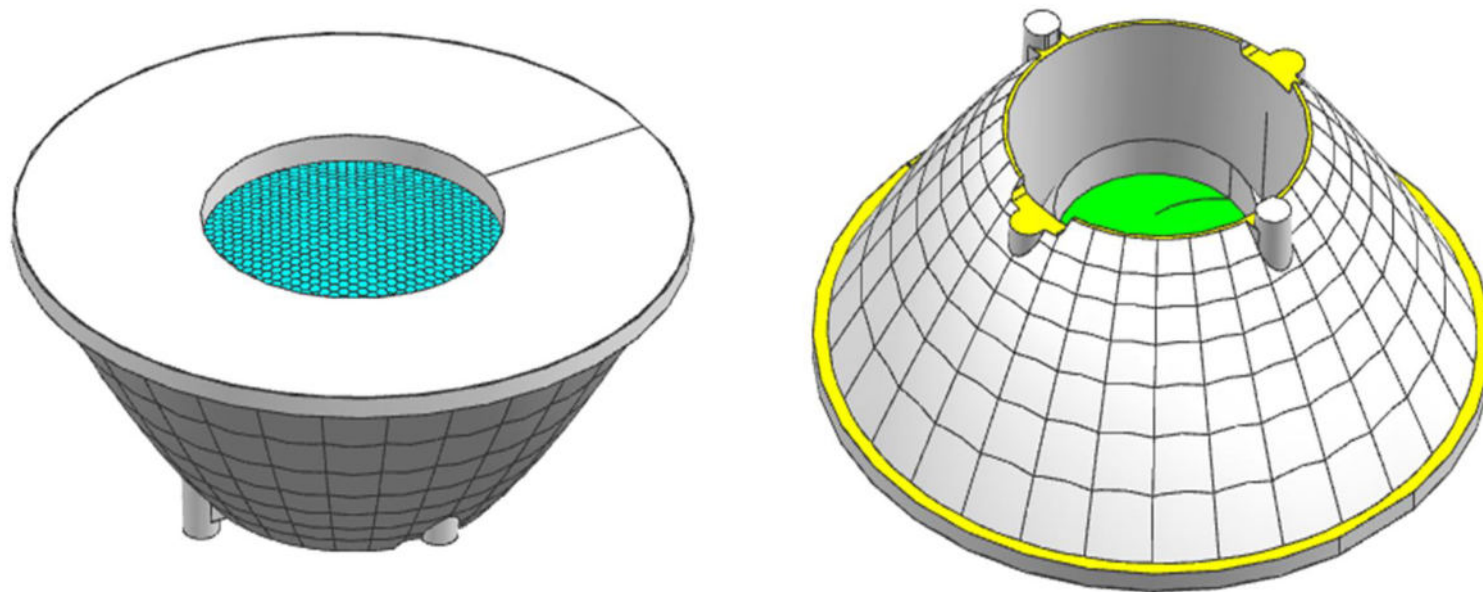


**Technical remark:**

1. The 3D map is not indicated for rounded corners and draft angle.
2. The dimensional tolerances are not specified according to GB/T 14486 2008 MT5.
3. The surface has no flash, shrinkage, bubbles and other defects.

Optical design			55@21-60°Lens		HK-55@21-60-D9-20-1g-1		
Structure design					1.01.81457		
Review				Number of drawing	qty	weight	
Validation			Material:	PMMA	CDHK		

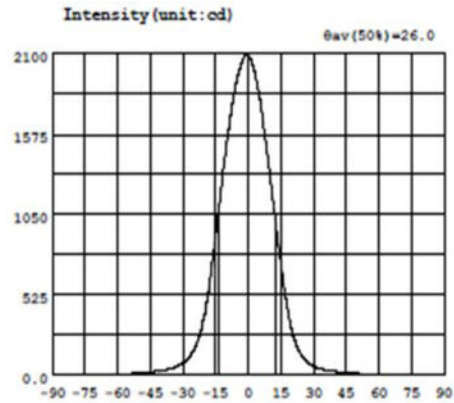
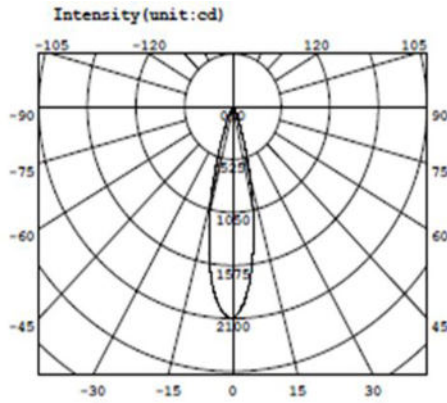
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	olerance value	±0.1	±0.15	±0.35	±0.50	±0.80	±1.2	±2.0











Intensity data:(deg , cd) C0-180

A	I	A	I	A	I	A	I	A	I	A	I
-90.0	0.2694	-88.5	0.5485	-87.0	0.8546	-85.5	1.148	-84.0	1.353	-82.5	1.633
-81.0	1.940	-79.5	2.284	-78.0	2.640	-76.5	2.964	-75.0	3.308	-73.5	3.749
-72.0	4.265	-70.5	4.692	-69.0	5.251	-67.5	5.879	-66.0	6.409	-64.5	6.898
-63.0	7.291	-61.5	7.725	-60.0	8.156	-58.5	8.654	-57.0	9.262	-55.5	9.916
-54.0	10.66	-52.5	11.57	-51.0	12.53	-49.5	13.69	-48.0	15.11	-46.5	16.68
-45.0	18.48	-44.0	20.62	-42.0	23.11	-40.5	26.34	-39.0	30.25	-37.5	34.80
-36.0	40.14	-34.5	46.81	-33.0	55.28	-31.5	65.76	-30.0	79.32	-28.5	97.49
-27.0	121.5	-25.5	152.6	-24.0	196.1	-22.5	254.1	-21.0	322.8	-19.5	408.9
-18.0	578.8	-16.5	749.8	-15.0	919.7	-13.5	1094	-12.0	1274	-10.5	1448
-9.0	1612	-7.5	1758	-6.0	1880	-4.5	1975	-3.0	2044	0.0	2089
3.0	2050	4.5	1874	6.0	1741	7.5	1587	9.0	1421	10.5	1244
12.0	1067	12.0	1067	13.5	892.5	15.0	721.0	16.5	574.8	18.0	440.1
18.0	240.5	18.0	240.5	19.5	319.2	21.0	240.5	22.5	182.8	24.0	140.5
25.5	109.6	25.5	109.6	27.0	87.32	28.5	71.03	30.0	58.94	31.5	49.46
33.0	42.09	33.0	42.09	34.5	36.10	36.0	31.42	37.5	27.43	39.0	24.05
40.5	21.34	40.5	21.34	42.0	19.06	43.5	17.14	44.0	15.53	45.0	15.53
46.5	14.11	46.5	14.11	48.0	12.94	49.5	11.83	50.0	11.83	51.0	10.97
51.0	10.97	51.0	10.97	52.5	10.19	54.0	9.520	55.5	8.854	57.0	8.249
58.5	7.052	58.5	7.052	60.0	7.474	61.5	7.076	62.0	6.663	63.0	6.663
64.5	7.052	64.5	7.052	66.0	6.663	67.5	6.208	69.0	5.5350	70.5	5.2011
72.0	4.265	72.0	4.265	73.5	3.749	75.0	3.308	76.5	2.964	78.0	2.640
79.5	2.284	79.5	2.284	81.0	1.677	82.5	1.426	84.0	1.252	85.5	0.9291
87.0	0.6696	87.0	0.6696	88.5	0.5350	90.0	0.4828				

Electricity Parameter:

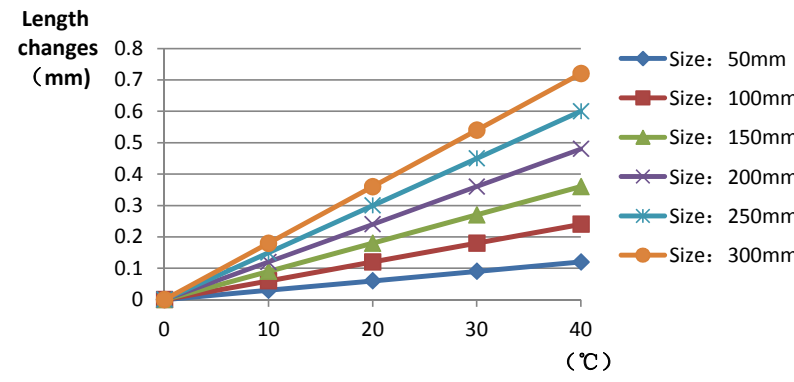
Current I: 0.1000A      Power: 3.470W  
 Voltage V: 34.70V      PF: 1.000

Optical Parameter(Distance=2.559m):

Equivalent Luminous flux:  $\Phi_{eff} = 516.71m$       Efficiency:  $Eff=148.92lm/W$   
 Diffuse angle: @ (25%): 35.5deg@ (50%): 26.0deg@ (75%): 16.9deg@ (50%): 26.0deg  
 Diffuse angle: @ (25%): 35.5deg@ (50%): 26.0deg@ (75%): 17.0deg@ (50%): 26.0deg  
 I<sub>max</sub>=2093cd (C=0.0deg,G=-0.5deg)      C0-180Plane I<sub>max</sub>= 2093cd(G=-0.5deg)  
 C0-180Plane I<sub>0</sub>= 2089cd





	Standard size	Upper Size limit	Lower size limit	Test result1	Test result2	Test result3	Test result4	Judgment	Remarks																																									
1.Size	diameter	55		54.96	55.04	55.01	55.01		Test environment: In 20 °C -25 °C environment to achieve thermal equilibrium after the test.																																									
	height	21.5		21.68	21.67	21.64	21.67																																											
	height2	19.8		19.85	19.9	19.85	19.86																																											
	Registration mast	3		2.97	2.95	2.96	2.97																																											
	Location column	28		28.09	28.1	27.98	28.07																																											
Gate shear can not affect the appearance of the lamp																																																		
See attachment "Appearance Inspection Standards"																																																		
2.Appearance Quality	See attachment "Appearance Inspection Standards"	E	No burr	No burr	No burr	No burr	OK																																											
			No stains	No stains	No stains	No stains																																												
3.Material	PMMA			Color	Transparent			OK																																										
4.Optical index	Testing LED	D9																																																
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	FWHM	See light distribution curve																																																
	angle		14.2	14	14	14																																												
	K-value		10.53	10.65	10.59	10.74																																												
	Efficiency		93.21%	93.73%	93.31%	93.19%																																												
Facula	See the signature sample																																																	
Comprehensive judgment	Qualified																																																	
Remarks:	<p>1、 Tool Number: V-Vernier Caliper 2D-Quadratic H-Height Gauge M-Tool Microscope P-Needle T-Thick Gauge R-Radius Gauge E-Visual.</p> <p>2、 Ambient temperature on the size of the product refer to the table on the right</p>																																																	
	<p style="text-align: center;"><b>PMMA product size changes with temperature table</b></p>  <table border="1"> <caption>PMMA product size changes with temperature table</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Size: 50mm</th> <th>Size: 100mm</th> <th>Size: 150mm</th> <th>Size: 200mm</th> <th>Size: 250mm</th> <th>Size: 300mm</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> </tr> <tr> <td>10</td> <td>0.05</td> <td>0.08</td> <td>0.12</td> <td>0.15</td> <td>0.18</td> <td>0.22</td> </tr> <tr> <td>20</td> <td>0.10</td> <td>0.15</td> <td>0.22</td> <td>0.28</td> <td>0.35</td> <td>0.42</td> </tr> <tr> <td>30</td> <td>0.15</td> <td>0.22</td> <td>0.30</td> <td>0.38</td> <td>0.48</td> <td>0.58</td> </tr> <tr> <td>40</td> <td>0.20</td> <td>0.28</td> <td>0.38</td> <td>0.48</td> <td>0.60</td> <td>0.72</td> </tr> </tbody> </table>									Temperature (°C)	Size: 50mm	Size: 100mm	Size: 150mm	Size: 200mm	Size: 250mm	Size: 300mm	0	0.00	0.00	0.00	0.00	0.00	0.00	10	0.05	0.08	0.12	0.15	0.18	0.22	20	0.10	0.15	0.22	0.28	0.35	0.42	30	0.15	0.22	0.30	0.38	0.48	0.58	40	0.20	0.28	0.38	0.48	0.60
Temperature (°C)	Size: 50mm	Size: 100mm	Size: 150mm	Size: 200mm	Size: 250mm	Size: 300mm																																												
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<p>Precautions:</p> <ol style="list-style-type: none"> <li>1、 Wear clean gloves during lens assembly to prevent contamination of the lens surface.</li> <li>2、 Take the lens try to avoid touching the total reflection surface.</li> <li>3、 When the lens surface contamination, you can only gently wipe with soft cotton sticky neat neutral solvent, not allowed to wipe with industrial solvents.</li> </ol>																																																		

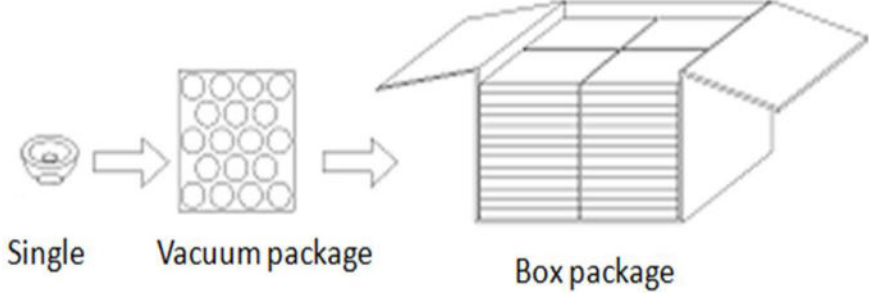
	Standard size	Upper Size limit	Lower size limit	Test result1	Test result2	Test result3	Test result4	Judgment	Remarks																																									
1.Size	diameter	55		54.99	54.97	54.92	54.98		Test environment: In 20 °C -25 °C environment to achieve thermal equilibrium after the test.																																									
	height	21.5		21.39	21.34	21.34	21.34																																											
	height2	19.8		19.56	19.6	19.56	19.56																																											
	Registration mast	3		2.97	2.95	2.96	2.97																																											
	Location column	28		27.84	27.89	27.89	27.89																																											
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	FWHM	See light distribution curve																																																
	angle		17.4	17.7	17.9	17.9																																												
	K-value		7.65	7.51	7.30	7.31																																												
	Efficiency		90.56%	90.63%	90.19%	90.56%																																												
Facula	See the signature sample																																																	
Comprehensive judgment	Qualified																																																	
Remarks:	<p>1、 Tool Number: V-Vernier Caliper 2D-Quadratic H-Height Gauge M-Tool Microscope P-Needle T-Thick Gauge R-Radius Gauge E-Visual.</p> <p>2、 Ambient temperature on the size of the product refer to the table on the right</p>																																																	
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	Standard size	Upper Size limit	Lower size limit	Test result1	Test result2	Test result3	Test result4	Judgment	Remarks																																									
1.Size	diameter	55		54.99	54.97	54.92	54.98		Test environment: In 20 °C -25 °C environment to achieve thermal equilibrium after the test.																																									
	height	21.5		21.49	21.47	21.52	21.53																																											
	height2	19.8		19.56	19.75	19.72	19.81																																											
	Registration mast	3		2.97	2.95	2.96	2.97																																											
	Location column	28		27.84	27.89	27.89	27.89																																											
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	FWHM	See light distribution curve																																																
	angle		26.6	25.9	26.4	25.6																																												
	K-value		3.91	4.13	3.97	4.12																																												
	Efficiency		92.03%	92.51%	92.10%	92.39%																																												
Facula	See the signature sample																																																	
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1.Size	diameter	55	/	/	55.08	55.09	55.14	55.1	/	Test environment: In 20 °C -25 °C environment to achieve thermal equilibrium after the test.																																									
	height	21.5	/	/	21.54	21.45	21.59	21.57	/																																										
	height2	19.8	/	/	19.76	19.7	19.82	19.78	/																																										
	Registration mast	3	/	/	2.93	2.93	2.94	2.93	/																																										
	Location column	28	/	/	28	27.99	27.99	27.96	/																																										
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	FWHM	See light distribution curve																																																	
	angle	/	35	36.2	36.4	34.5	/																																												
	K-value	/	2.35	2.25	2.22	2.40	/																																												
	Efficiency	/	91.33%	92.78%	91.36%	91.04%	/																																												
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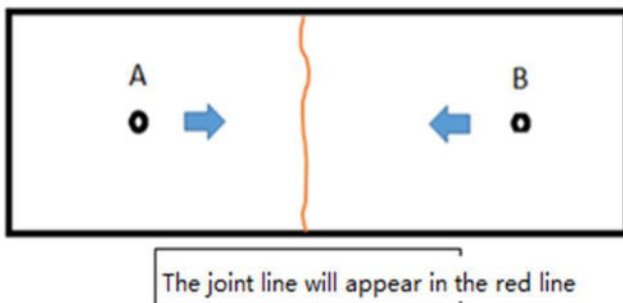
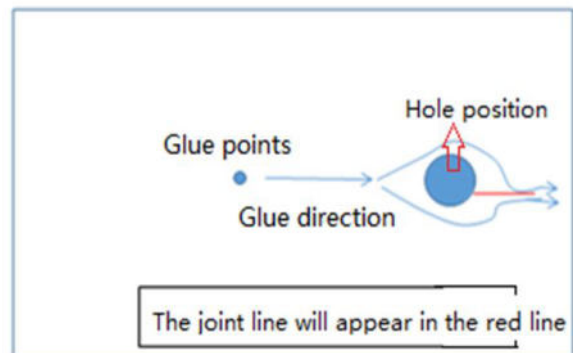
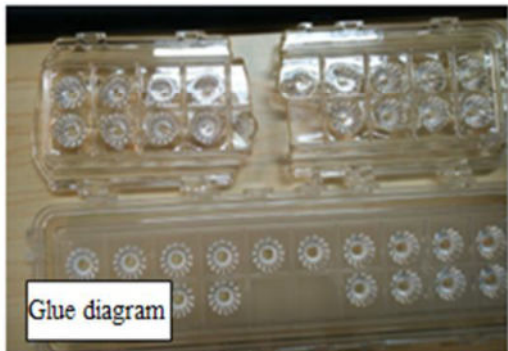
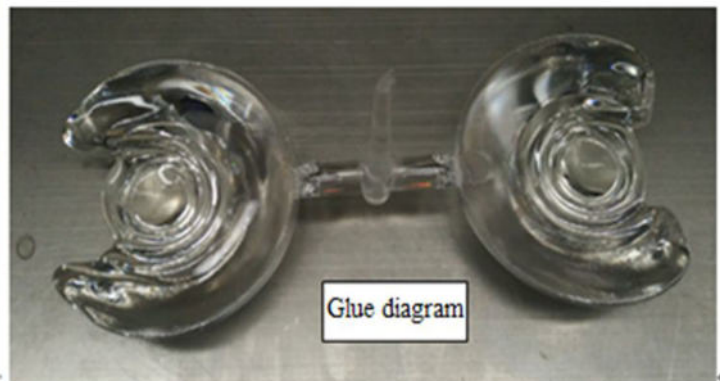
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PN		HK-55@21-15-D9-20-1g-1		Product Name		55@21-15°Lens	
Product material		PMMA		Customer			
Package diagram		 <p style="text-align: center;"> <span>Single</span>      <span>Vacuum package</span>      <span>Box package</span> </p>					
Product packing		10	A/ Box	4	Box/Layer		
		12	Layer/Box	480	A/ Carton		
Packaging Materials	NO.	Part No	Part name	Size	Dosage	Unit	Remarks
	1	2.07.0081	Blister box	23cm*21cm	48	BAG	
	2	2.08.0001	PE film	30cm*30cm	48	PCS	
	3	2.06.0005	Reel label paper	6.2cm*8cm	48	PCS	
	4	2.06.0005	Box label paper	6.2cm*9.2cm	1	PCS	
	5	2.06.0003	big plate	46.8cm*42.8cm	13	PCS	
	6	2.06.0011	big carton	48cm*44cm*37cm	1	PCS	
Remarks	The loose packing is not subject to this specification. Customer's requirements shall prevail						

Special notice

When glue pass through holes, columns and other structures, or part of the thin structure, will form a weld line. The product which uses multi-point injection welding line will appear because of the combination of sol, as shown below:

Symtner



Please note :

The appearance of lines in the structure of the product as well as at the screw hole is a normal phenomenon, will not affect the actual use of the product, and can not be avoided at this stage.

## Appearance inspection standards

### 1 Operating procedures

#### 1.1.1 Sampling standards, sampling plan and AQL

Test level : GB/T2828.1-2012 The first part is according to the acceptance quality limit (AQL) retrieval batch inspection sampling plan, general inspection level II level, CR class defect coefficient 0, MA defect rejection level AQL = 0.65, MI class defect rejection level AQL = 1.0; defect level please see 5.4.

#### 2 Code table

Code	Code description	Unit	Code		Code description	Unit
N	Amount/pcs	pcs	D		Diameter	mm
L	Length	mm	H		Depth	mm
W	Width	mm	DS		Distance	mm
S	Proportion	mm <sup>2</sup>	SS		Offset	mm

### 3 Test conditions

3.1 Sight distance and working hours: Sight distance should be 30-35cm, each side of the inspection time does not exceed 12s, the visual angle of 45-135 degrees;

3.2 Light: 2x40w cool white fluorescent lamp, the light source is 500-550mm away from the lens surface; in order to make the appearance defect can be correctly recognized, the illumination should be 500-1000Lux, and the observation time is 10 seconds.

3.3 Visual inspection staff should be 1.0 (including corrected visual acuity) above, no color blindness, color weakness.

### 4 Appearance inspection standards

Test items	Judging standard	Inspection equipment	Defect level		
		Testing method	MI	MA	CR
Check the sample	When start the machine and process, all products have to check the appearance of the sample, the appearance of the sample is divided into qualified samples and limited samples.	Sample comparison , visual			
	1: Qualified sample refers to the appearance and structure standard of the product which recognized by the client, the sample size should be confirmed before mass production;				

	2: The limited sample refers to the limit of a particular exceptionally developed sample. Limit the sample only for its specific point of exception to confirm; The priority is higher than the other criteria in this table. When there is a limited sample, the limit sample shall prevail.				
Raw edge	Not allowed to affect the size and assembly	Visual, point card		√	
Scratch	1: Non-optical surface and non-exposed surface scratches should be visually insignificant and the length is less than 1/10 of the maximum surface size.	Visual, point card, calipers		√	
Fingerprint	Fingerprints are not allowed on all products	Visual		√	
Foreign objects, black spots, white spots	The product may not be attached to foreign objects, including oil, fiber, dregs of water gap and so on				√
Deformation	Insufficient filling shall not affect the appearance of the assembly and the exposed surfaces.	Visual, feeler			√
Poor ejection	Products may not appear bad ejection, including no convex top, thimble printed on the assembly surface shall not be higher than the product surface, non-assembled surface thimble height should not exceed the product size tolerances; thimble printing should be less than the product surface and no more than 0.3; thimble surface treatment should be consistent with the product side.	Visual, point card		√	
	Ejection strain: the optical surface and the appearance of the exposed surface after assembly are not allowed to have a strain, and the structural surface does not allow visual obvious strain.				
Insufficient filling	Insufficient filling shall not affect the appearance of the assembly and the exposed surfaces , The signature sample shall prevail.	Visual, point card		√	
Shrink	When the entire surface of the product shrinks, the optical properties and dimensions must meet the requirements, and the visual will not significantly affect the appearance.Part shrink reference point defects	Visual, point card		√	
Flow marks、Welding line	1 : Product does not allow the presence of flow marks and welding lines unless the structure can not be avoided;	Visual		√	
	2: The remaining flow marks shall not appear in the optical surface, a single L ≤ 10mm, no more than two				

Bubble	No bubbles are allowed	Visual		√	
Foreign objects, black spots, white spots	Not obvious or $D \leq 0.3\text{mm}$ black spots and foreign bodies in the area of 100x100mm not more than 1; Exceeded foreign matter black spots is judged bad.	Visual, point card	√		
Damaged	No damage is allowed	Visual			√
Cold glue	Optical surface may not have cold glue, non-optical surface cold glue should meet the visual is not obvious.	Visual	√		
Bad incision	1: Do not affect the product size, shall not penetrate the optical surface, the cut should be smooth;	Visual			√
	2: Laser cutting products, the optical surface burns shall not occur after the processing is completed. Beading must not affect product installation				
	3: Three molds and hot runner gate shall not appear residue.				
Scrub	Scrub surface should be uniform, off the scrub phenomenon should not be obvious , A single off scrub imprint requires $D \leq 1\text{ mm}$ and no more than 1 area within a 50x50 mm area	Visual		√	