

OPTIMAX TECHNOLOGY CORPORATION

General Specification of Elliptical Polarizer



Document No.	QI-TD-0031	Issue Date	
Ver.	A7	Effective Date	
Approval	Examination	Design	

OPTIMAX

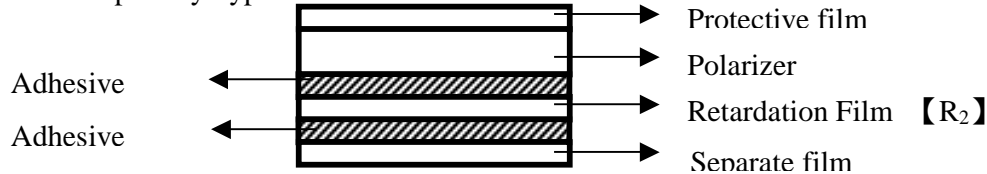
Document No.	QI-TD-0031	Issue Date	
Design	Tech. Dep.	Effective Date	
Ver.	A7	Page	1

General Specification of Elliptical Polarizer

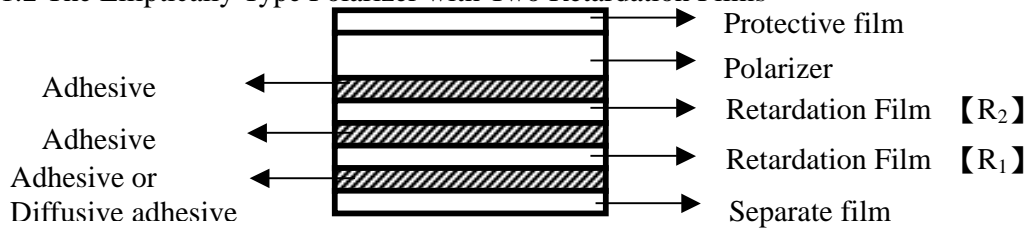
- Purpose : This specification is the general specification of Elliptically Type Polarizer applied to LCD.
- Scope : This specification is applicable to general type of polarizers supplied from Optimax. Characteristics and specified values of each type of polarizers are defined by individual specifications. In the case that there are differences between this specification and individual specification, individual specification takes priority.
- Authority and responsibility :
Technology Department : establish and maintain this specification.
- Definition :
4.1 Lot : The product is the same material and process.
- Contents :

5.1 Structure :

5.1.1 The Elliptically Type Polarizer with one Retardation Film



5.1.2 The Elliptically Type Polarizer with Two Retardation Films



5.2 Thickness : (Unit: μm)

Item		Thickness (μm)	Item		Thickness (μm)
Polarizer	Without AG	180 $\pm 10\%$	Retardation Film	1/2 λ or 1/4 λ	68 $\pm 10\%$
	With AG	185 $\pm 10\%$		R168 · R270	65 $\pm 10\%$
Adhesive		25 ± 5		400~800nm	63 $\pm 10\%$
Diffusive adhesive		35 ± 5		R650	60 $\pm 10\%$
Retardation Film		38 $\pm 10\%$		Z-580 · Z-430	75 ± 10

5.3 Dimensions and tolerance :

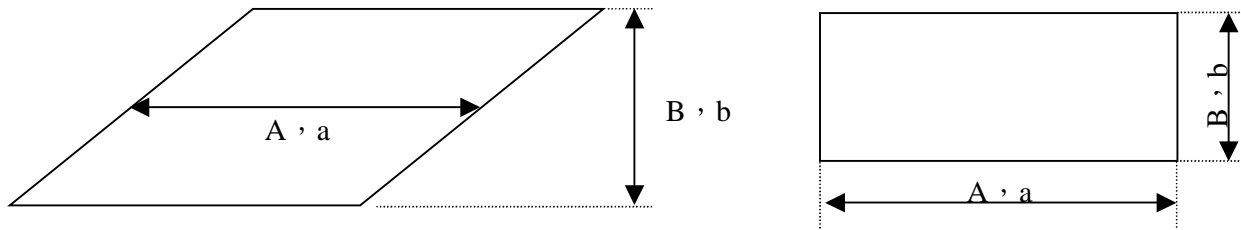
5.3.1 Sheet

- 5.3.1.1 Cutting dimension : Length (A) and width (B) are shown in individual specification table.
- 5.3.1.2 Effective dimension : Length (a) and width (b) are shown in individual specification table.
- 5.3.1.3 tolerance : It is shown in individual specification table.

5.3.2 Chip

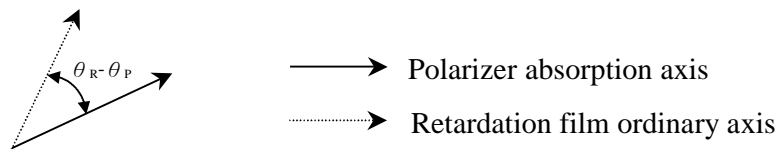
- 5.3.2.1 Cutting dimension : Length (A) and width (B) are shown in individual specification table.
- 5.3.2.2 Effective dimension : Length (a) and width (b) are shown in individual specification table.
- 5.3.2.3 tolerance : Length is 0~360mm, the tolerance is $\pm 0.3\text{mm}$.

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Techno. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	2



5.4 Angle and common difference:

5.4.1 The angle between retardation film ordinary axis angle (θ_R) and polarizer absorption axis angle (θ_P): $\theta_R - \theta_P$ is shown in individual specification table °

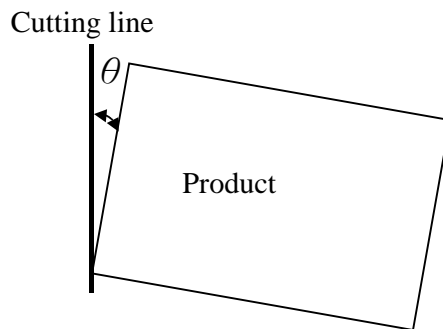


5.4.2 The tolerance of retardation film ordinary axis angle (θ_R) and polarizer absorption axis angle (θ_P) is $\pm 2^\circ$.

5.5 Ortho-angle

5.5.1 The deviation of sheet right-angle is below $\pm 1^\circ$.

5.5.2 The deviation of chip right-angle is below $\pm 0.3^\circ$.



5.6 Curling

5.6.1 Sheet : $\leq \pm 50$ mm.

5.6.2 Chip : $\leq 10\%$ of length at the longer side and less than ± 20 mm.

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Tech. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	3

5.7 Defects

5.7.1 Delamination : Not allowed within effective dimension area .

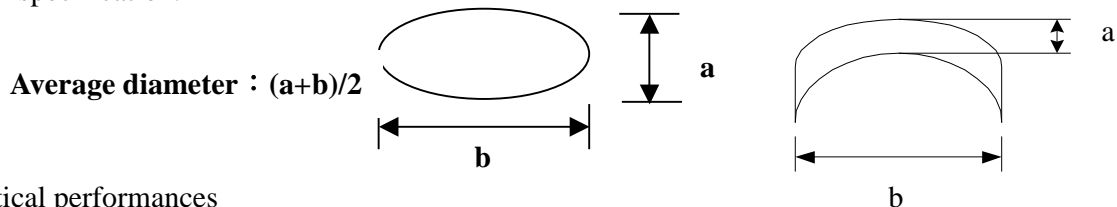
5.7.2 Tunneling : Not allowed within effective dimension area .

5.7.3 Dot defects: Include concave, polarizer scratch, foreign matter bubble, Stain etc. Their average diameter is less than 0.15mm. In the case that numerous dot defects are concentrated 1cm² shall be counted as one defect. The allowed dot defect is shown in individual specification table.

5.7.4 Surface defects: Such defects as dyeing inconsistency, distortion and dirt which obviously have a bad effect on the panel. Are counted 1cm² as one defect, and total defects shall be within allowable quantities. Provided that defects less than 1cm², shall be counted as lot defects.

5.7.5 Line defects: Such defects as scratches and nicks which obviously have a bad effect on panel, are counted 1cm as one defect. However, less than 1cm's length shall be counted as dot defect.

5.7.6 Total defects allowable such as dot defects, surface defects and line defects are shown in individual specification.



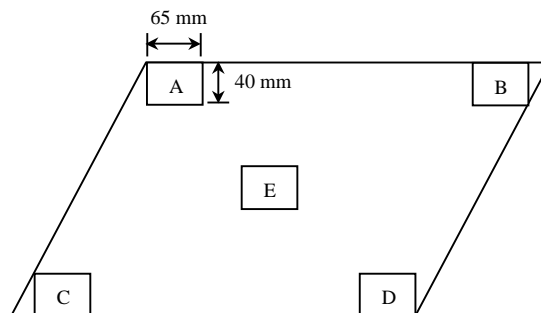
5.8 Optical performances

5.8.1 Polarizer

Single transmittance, crossed transmittance, polarizing co-efficiency, hue, and UV-cut performance are shown in individual specification. The haze of AG-type is shown in individual specification.

5.8.2 Retardation film

Retardation value (R) is shown in individual specification. There are 5 points of an elliptical polarizer shall be measured as below fig.



5.9 Haze and hardness of surface (Applicable to AG polarizers)

Type	Haze (%)	Hardness of surface
AGV	4.5~9.5	$\geq 3H$

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Techno. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	4

5.10 Adhesive performance : The characteristics of adhesive are shown in individual specification.

5.11 Protective film : The characteristics of protective film are shown in individual specification.

5.12 Durability performances

5.12.1 Sample : Polarizer samples are laminated to a glass and treated by autoclave in condition with 50 °C, 5 kg/cm², 20min.

Item	Sample size
Optical performances	40×65 mm
Adhesive performance	200×300 mm

5.12.2 The change of values on single transmittance and polarizing co-efficiency and retardation are shown in individual specification. The changes after durability test shall be free from remarkable color change, delamination, inconsistency of color, bubbles and other visible change. However, the area 0.5mm from each edge shall be out of inspection.

5.12.3 Test condition

5.12.3.1 Commercial grade polarizer

Item	Test condition	Time	Specification		
			Change of single transmission	Change of polarizing co-efficiency	Change of retardation value
Heat resistance	70°C/dry	240h	≤5%	≤5%	≤10nm
Humidity resistance	40°C , 95% RH				
Cold resistance	-20°C				
Resistance against artificial ray	400W mercury lamp from the height of 30cm				

5.12.3.2 High-commercial grade polarizer

Item	Test condition	Time	Specification		
			Change of single transmission	Change of polarizing co-efficiency	Change of retardation value
Heat resistance	80°C/dry	500h	≤5%	≤5%	≤10nm
Humidity resistance	60°C , 90% RH				
Cold resistance	-30°C				
Resistance against artificial ray	400W mercury lamp from the height of 30cm				

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Tech. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	5

5.13 Quality inspection

5.13.1 Inspection item : The used instruments for random sample inspection as below:

Item		Instrumental
Appearance quality	Reflection assay	Eyes
	Cross assay	Light box, eyes
Hue		Color meter, spectrophotometer
Retardation		Retardation meter
Dimension		Electronic caliper for Chip, Tape measure for Sheet
Thickness		Thickness meter
Ortho-angle		Right angle meter
Polarizer absorption axis		Retardation meter
Retardation film ordinary axis		Retardation meter
Curling		Rank JIS iron ruler
Durability performances		Constant temperature and humidity trough 、oven
Adhesive performance		Traction machine
UV cut		UV lamp
Peel strength of protective film		Traction machine

5.14 Inspection methods

5.14.1 Thickness: Thickness shall be measured by using Dial Gauges of 1/1000mm.

5.14.2 Optical performances :

5.14.2.1 Single transmittance: Measured by spectrophotometer on every 10nm(400~700nm). And average transmittance is calculated according to JIS Z 8701. (Method of color definition by X-Y-Z system with view range of 2 degrees.)

5.14.2.2 Polarizing efficiency: Polarizing efficiency (V) is calculated by following formula: ◦

$$V = \sqrt{\frac{H_0 - H_{90}}{H_0 + H_{90}}} \times 100\%$$

Parallel transmittance(H_0): Two polarizers are settled absorption axis in parallel, and measured like 5.14.2.1 as above ◦

Crossed transmittance(H_0): Two polarizers are settled absorption axis in 90 degrees, and measured like 5.14.2.1 as above ◦

5.14.2.3 Hue: Measured by spectrophotometer on every 10nm(400~700nm). And L-a-b values against C-light are calculated according to JIS Z 8730.

5.14.2.4 UV-CUT: Transmittance at 380nm is measured by the same method as above 5.14.2.1 ◦

5.14.2.5 Haze: Haze is measured according JIS K 6714.

5.14.3 Hardness of surface: Hardness of surface is measured according to JIS K 5400 with pressure of 500g.

5.14.4 Scratch: Judgment is done visually whether scratches occur or not after scrubbing 10 times by steel wool #0000 with pressure of 400g.

5.14.5 Durability performance: Polarizer samples are laminated to a glass and treated by autoclave in condition with 50°C, 5kg/cm², 20min. After that, left in room temperature for 1 hours, and put into every test conditions.

5.14.6 Appearance : Under the brightness of >1000 Lux of the fluorescent lamp to inspect the big defects out of the specification.

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Tech. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	6

5.15 Storage condition and guaranteed terms

5.15.1 Storage condition : Polarizers shall be stored with standard packing. (Aluminum bags sealed.)

5.15.2 Temperature and humidity conditions : 23.0±3.0°C , 65.0±5.0% RH ◦

5.15.3 Guaranteed terms : Six months after delivery from Optimax under storage condition as above ◦

5.16 Packaging and marks

5.16.1 Packaging :

5.16.1.1 Sheet : Every 10 pieces of polarizer put into one aluminum foil sack; every 5 aluminum foil sacks put into one cardboard case.

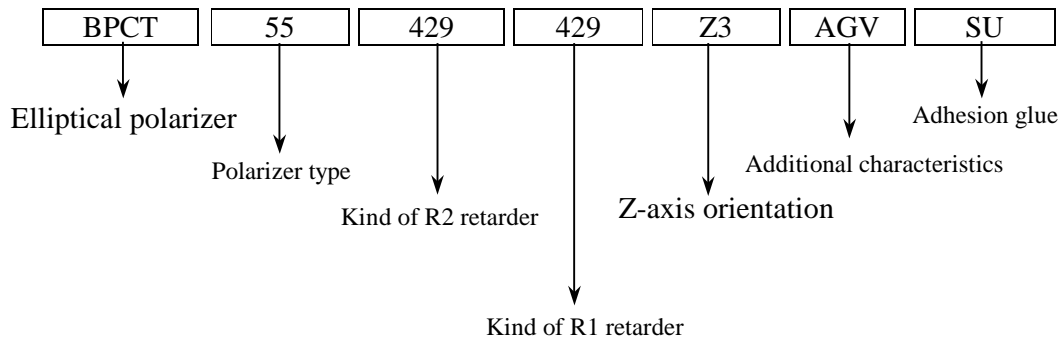
5.16.1.2 Chip : Below 15”(contained), every 50 pieces put into one aluminum foil sack; above 15”, every 30 pieces put into an aluminum foil sack and put into the sacks trays, then put the trays into packing boxes to be bundled.

5.16.2 Marking : Optimax type number, size, quantities, lot number and manufacturer name are marked on every aluminum bags and outer carton boxes.

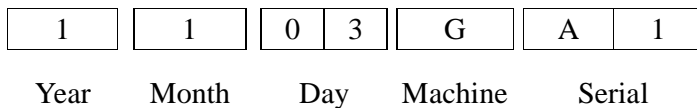
5.16.3 Others : Optimax will be responsible for the bad quality which caused from the packing.

5.17 Code of elliptical polarizer and product lot :

5.17.1 Code :



5.17.2 Lot No. :



5.18 Incidental matters : If there may be any doubt in this specification, discussion shall be held by both parties in order to make settlement.

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Tech. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	7

6. Relative document : JIS K7105, JIS K5400, JIS C2107, Technology reference of Sanritz (No. 931).

7. Table : No.

8. Appendix : Individual specification

8.1 Appendix 1 : The certificate of analysis for chip elliptical polarizer(Sample).

8.2 Appendix 2 : The certificate of analysis for Sheet elliptical polarizer(Sample).

8.3 Appendix 3 : The individual specifications of BPCT92-570SC(495*700mm, $\Theta_{R2} - \Theta_p = -45^\circ$).

8.4 Appendix 4 : The individual specifications of BPCT92-570SC(495*770mm, $\Theta_{R2} - \Theta_p = -40^\circ$).

8.5 Appendix 5 : The individual specifications of BPCT55-570SC(495*700mm, $\Theta_{R2} - \Theta_p = -45^\circ$).

8.6 Appendix 6 : The individual specifications of BPCT55-570SC(495*770mm, $\Theta_{R2} - \Theta_p = -40^\circ$).

OPTIMAX

Document No.	QI-TD-0031	Issue Date	
Design	Tech. Dep.	Effective Date	
Ver.	A7	Page	8

General Specification of Elliptical Polarizer

Appendix 1 : The certificate of analysis for chip elliptical polarizer(Sample).

Sample



力特光電科技股份有限公司
 OPTIMAX TECHNOLOGY CORPORATION
 橢圓偏光板Chip出貨檢驗報告表
 Inspection Report

客戶名稱 Customer:

製品名 Product :

DATE:

製品 Lot No.			
數量 Quantity		----- pcs	
項目 Check point	單位 Unit	規格值 Specified value	實測值 Actual value
寸法 Dimensions	Width	mm	
	Length	mm	
	θP	°	
位相差 Retardation	R	nm	
	$\theta R1$	°	
	$\theta R2$	°	
色相 Hue	a		
	b		
單體透過率 Single transmittance	%		
直交透過率 Crossed transmittance	%		
偏光度 Polarizing efficiency	%		
製品厚度 Thickness	μ		
離型膜之剝離力 Peel strength of release film	g/25mm		
對玻璃之接著力 Peel strength against glass	g/25mm		
翹曲 Curl	mm		
耐熱性 Heat resistance			
耐濕性 Humidity resistance			
抗紫外線 UV-Cut			
外觀 Appearance quality			
備註 Remark :			

品管主管:

檢驗員:

QA-0076-A

OPTIMAX	Document No.	QI-TD-0031	Issue Date	
	Design	Tech. Dep.	Effective Date	
General Specification of Elliptical Polarizer	Ver.	A7	Page	9

Appendix 2 : The certificate of analysis for sheet elliptical polarizer(Sample).

Sample



力特光電科技股份有限公司
OPTIMAX TECHNOLOGY CORPORATION
橢圓偏光板Sheet出貨檢驗報告表
Inspection Report

客戶名稱 Customer:

製品名 Product:

DATE:

製品 Lot No.				
數量 Quantity		----- pcs		
項目 Check point	單位 Unit	規格值 Specified value	實測值 Actual value	
寸法 Dimensions	Width	mm		
	Length	mm		
	θ R1- θ P	°		
	θ R2- θ P	°		
位相差 Retardation	R	nm		
色相 Hue	a			
	b			
單體透過率 Single transmittance		%		
直交透過率 Crossed transmittance		%		
偏光度 Polarizing efficiency		%		
製品厚度 Thickness		μ		
離型膜之剝離力 Peel strength of release film		g/25mm		
對玻璃之接著力 Peel strength against glass		g/25mm		
翹曲 Curl		mm		
耐熱性 Heat resistance				
耐濕性 Humidity resistance				
抗紫外線 UV-Cut				
外觀 Appearance quality				
備註 Remark :				

品管主管:

檢驗員:

QA-0055-B



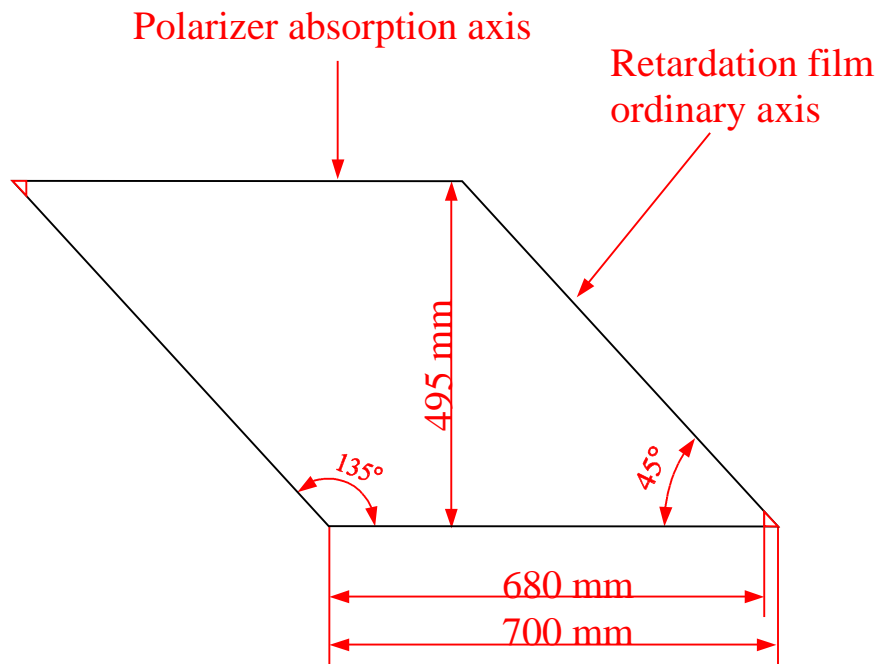
OPTIMAX TECHNOLOGY CORPORATION

Appendix 3

QI-TD-0031

P. 10

Release film on top



Customer					
Product		BPCT-92-570SC			
Size	Length (a) (mm)	700	Angle	Θ_P	180°
	Width (b) (mm)	495		Θ_R	135°



OPTIMAX TECHNOLOGY CORPORATION

Individual specifications

Customer :

Product : BPCT-92-570SC

Polarizer color : Neutral

QI-TD-0031

P. 11

Check point		Unit	Specified value
Cut Dimensions	A	mm	700~710
	B	mm	495~505
Effective Dimensions	a	mm	700
	b	mm	495
Retardation	R	nm	557 ± 10
$\Theta_{R2} - \Theta_p$		°	-45
Effective Thickness		μm	293 ± 10%
Release film Thickness		μm	38 ± 10%
Optical performance	Single transmittance	%	42.00 ± 1.50
	Crossed transmittance	%	≤ 0.30
	Polarizing efficiency	%	≥ 99.80
Single Hue	a	NBS	-1.97 ± 2.00
	b	NBS	+2.98 ± 2.00
Curl		mm	≤ ± 50
UV CUT (at 380nm)		%	≤ 1.000
Adhesive performance	Peel strength against glass	gf/25mm	500~2000
	Peel strength of release film	gf/25mm	4~20
Protective performance	Name		PAC-3T
	Thickness	μm	60 ± 10%
	Peel strength	gf/25mm	≤ 30
Durability Performance			
Grade		High-commercial	
Test condition		Chang of value on single transmittance	
Heat resistance		≤ 3.0%	
Humidity resistance		≤ 3.0%	
Artificial ray resistance		≤ 3.0%	
Cold resistance		≤ 3.0%	
Total defect acceptable		9/Sheet	

REMARKS :

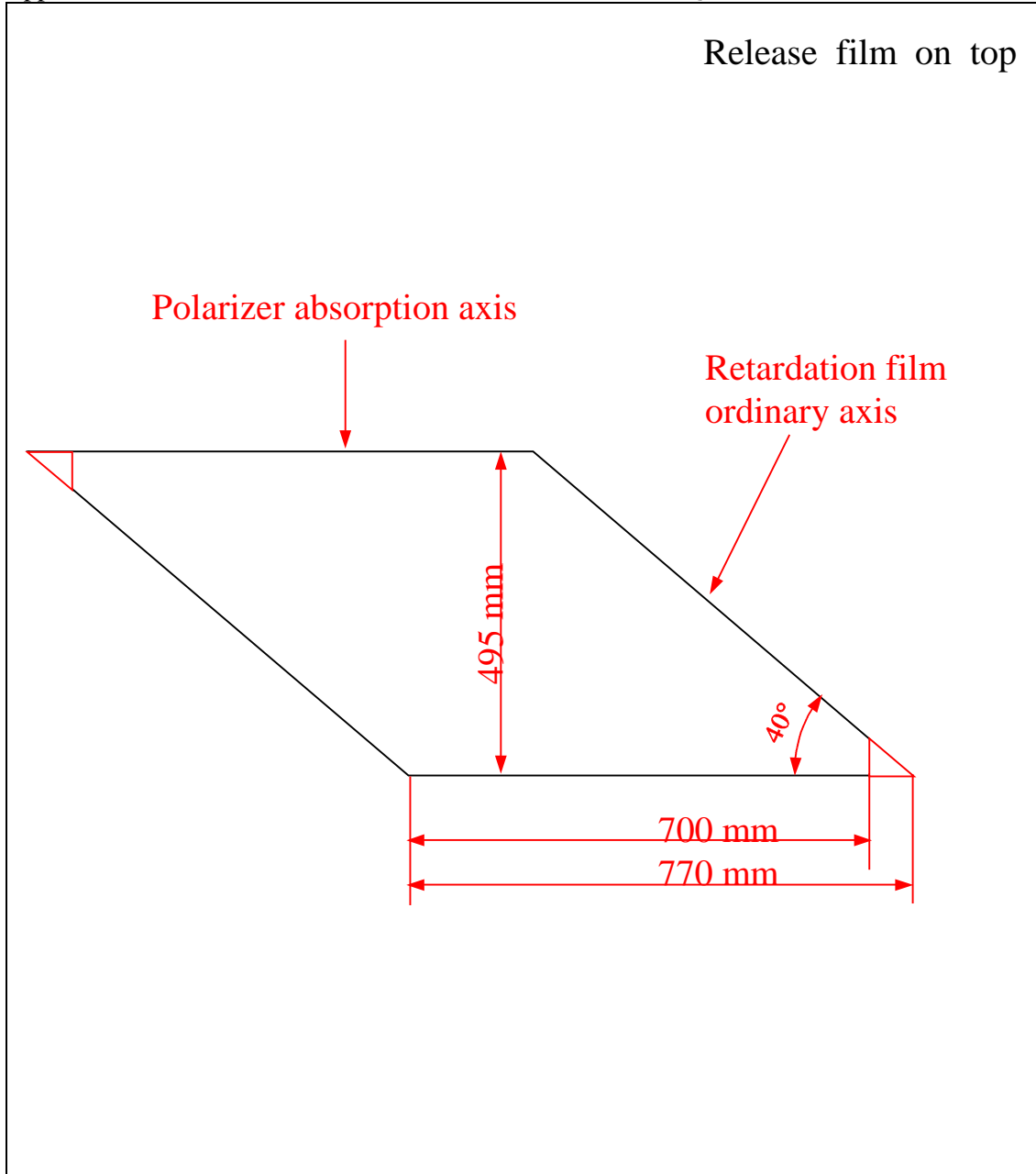


OPTIMAX TECHNOLOGY CORPORATION

Appendix 4

QI-TD-0031

P. 12



Customer					
Product		BPCT-92-570SC			
Size	Length (a) (mm)	770	Angle	Θ_P	180°
	Width (b) (mm)	495		Θ_R	140°



OPTIMAX TECHNOLOGY CORPORATION

Individual specifications

Customer :

Product : BPCT-92-570SC

Polarizer color : Neutral

QI-TD-0031

P. 13

Check point		Unit	Specified value
Cut Dimensions	A	mm	770~780
	B	mm	495~505
Effective Dimensions	a	mm	770
	b	mm	495
Retardation	R	nm	557 ± 10
$\Theta_{R2} - \Theta_p$		°	-40
Effective Thickness		μm	293 ± 10%
Release film Thickness		μm	38 ± 10%
Optical performance	Single transmittance	%	42.00 ± 1.50
	Crossed transmittance	%	≤ 0.30
	Polarizing efficiency	%	≥ 99.80
Single Hue	a	NBS	-1.97 ± 2.00
	b	NBS	+2.98 ± 2.00
Curl		mm	≤ ± 50
UV CUT (at 380nm)		%	≤ 1.000
Adhesive performance	Peel strength against glass	gf/25mm	500~2000
	Peel strength of release film	gf/25mm	4~20
Protective performance	Name		PAC-3T
	Thickness	μm	60 ± 10%
	Peel strength	gf/25mm	≤ 30
Durability Performance			
Grade		High-commercial	
Test condition		Chang of value on single transmittance	
Heat resistance		≤ 3.0%	
Humidity resistance		≤ 3.0%	
Artificial ray resistance		≤ 3.0%	
Cold resistance		≤ 3.0%	
Total defect acceptable		9/Sheet	

REMARKS :



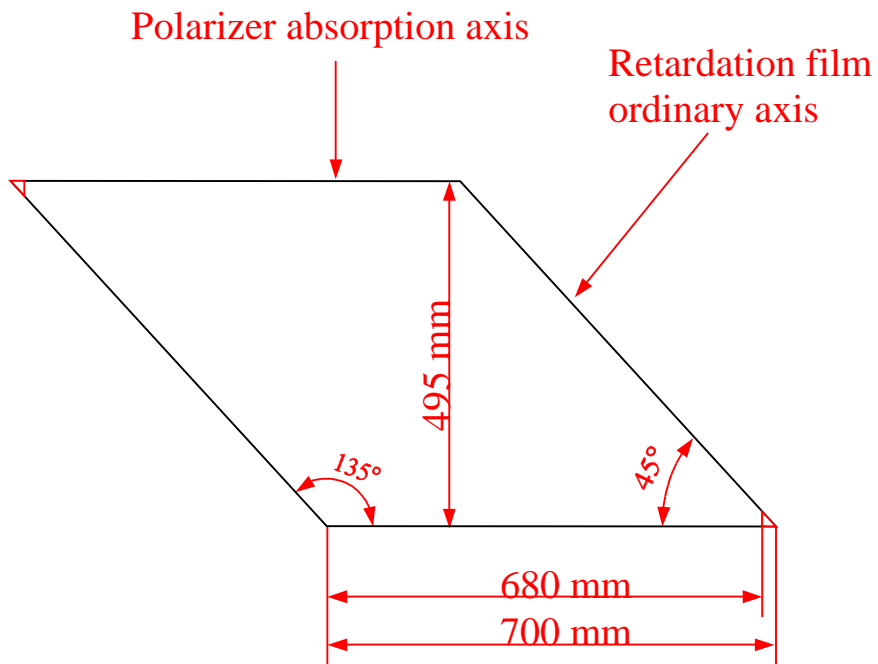
OPTIMAX TECHNOLOGY CORPORATION

Appendix 5

QI-TD-0031

P. 14

Release film on top



Customer					
Product		BPCT-55-570SC			
Size	Length (a) (mm)	700	Angle	Θ_P	180°
	Width (b) (mm)	495		Θ_R	135°



OPTIMAX TECHNOLOGY CORPORATION

Individual specifications

Customer :

Product : BPCT-55-570SC

Polarizer color : Neutral

QI-TD-0031

P. 15

Check point		Unit	Specified value
Cut Dimensions	A	mm	700~710
	B	mm	495~505
Effective Dimensions	a	mm	700
	b	mm	495
Retardation	R	nm	557 ± 10
$\Theta_{R2} - \Theta_p$		°	-45
Effective Thickness		μm	293 ± 10%
Release film Thickness		μm	38 ± 10%
Optical performance	Single transmittance	%	43.00 ± 1.00
	Crossed transmittance	%	≤ 0.3
	Polarizing efficiency	%	≥ 99.80
Single Hue	a	NBS	-1.40 ± 1.50
	b	NBS	+2.98 ± 1.50
Curl		mm	≤ ± 50
UV CUT (at 380nm)		%	≤ 1.000
Adhesive performance	Peel strength against glass	gf/25mm	500~2000
	Peel strength of release film	gf/25mm	4~20
Protective performance	Name		PAC-3T
	Thickness	μm	60 ± 10%
	Peel strength	gf/25mm	≤ 30
Durability Performance			
Grade		High-commercial	
Test condition		Chang of value on single transmittance	
Heat resistance		≤ 3.0%	
Humidity resistance		≤ 3.0%	
Artificial ray resistance		≤ 3.0%	
Cold resistance		≤ 3.0%	
Total defect acceptable		9/Sheet	

REMARKS :

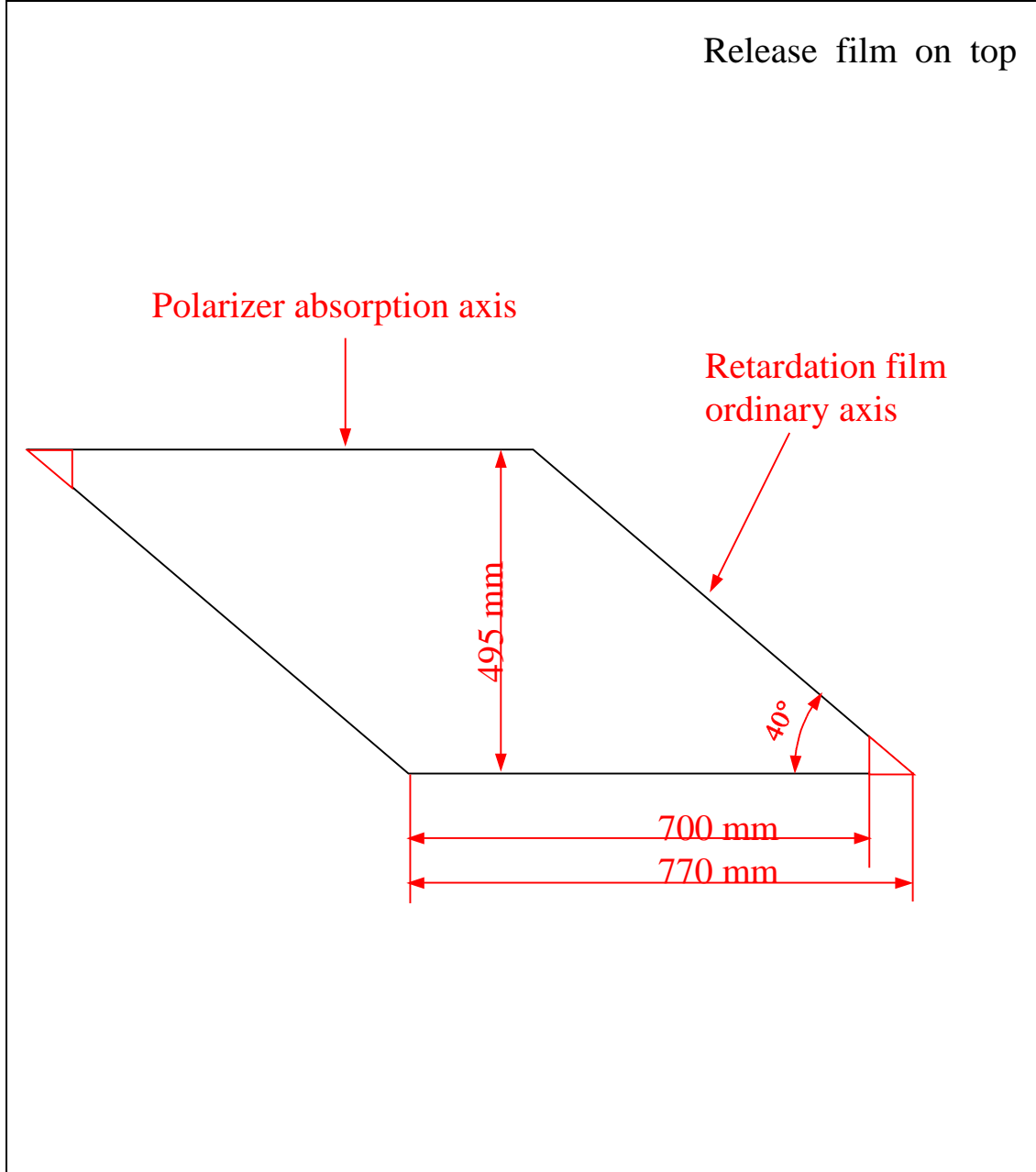


OPTIMAX TECHNOLOGY CORPORATION

Appendix 6

QI-TD-0031

P. 16



Customer					
Product		BPCT-55-570SC			
Size	Length (a) (mm)	770	Angle	Θ_P	180°
	Width (b) (mm)	495		Θ_R	140°



OPTIMAX TECHNOLOGY CORPORATION

Individual specifications

Customer :

Product : BPCT-55-570SC

Polarizer color : Neutral

QI-TD-0031

P. 17

Check point		Unit	Specified value
Cut Dimensions	A	mm	770~780
	B	mm	495~505
Effective Dimensions	a	mm	770
	b	mm	495
Retardation	R	nm	557 ± 10
$\Theta_{R2} - \Theta_p$		°	-40
Effective Thickness		μm	293 ± 10%
Release film Thickness		μm	38 ± 10%
Optical performance	Single transmittance	%	43.00 ± 1.00
	Crossed transmittance	%	≤ 0.3
	Polarizing efficiency	%	≥ 99.80
Single Hue	a	NBS	-1.40 ± 1.50
	b	NBS	+2.98 ± 1.50
Curl		mm	≤ ± 50
UV CUT (at 380nm)		%	≤ 1.000
Adhesive performance	Peel strength against glass	gf/25mm	500~2000
	Peel strength of release film	gf/25mm	4~20
Protective performance	Name		PAC-3T
	Thickness	μm	60 ± 10%
	Peel strength	gf/25mm	≤ 30
Durability Performance			
Grade		High-commercial	
Test condition		Chang of value on single transmittance	
Heat resistance		≤ 3.0%	
Humidity resistance		≤ 3.0%	
Artificial ray resistance		≤ 3.0%	
Cold resistance		≤ 3.0%	
Total defect acceptable		9/Sheet	

REMARKS :