

正本

REF/A-DG-1060-E

SPECIFICATION

ITEM : NITTO Polarizing Film(NPF-Q Type)

SUBMITTED : OP Sales(Tokyo)

DATE : February, 2001.

RECEIVED BY : _____

DATE : _____

ONOMICHI PLANT
QUALITY ASSURANCE DEPT.
NITTO DENKO CORPORATION

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HISTORY OF ISSUE AND REVISION

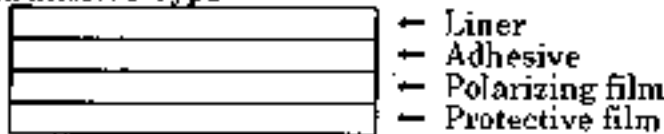
Date	Details
February, 2001	Issued.

1. Application

This common specification prescribes it about the Nitto Polarizing Film (NPF-Q Type) for the foreign countries

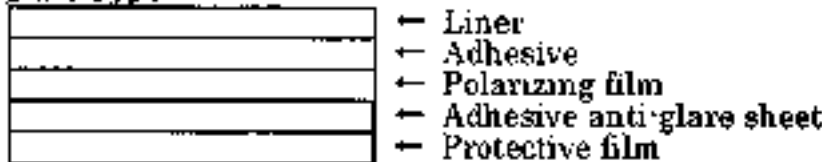
2. Structure

2.1 Transmissive Type



- ← Liner
- ← Adhesive
- ← Polarizing film
- ← Protective film

2.2 Antiglare Type



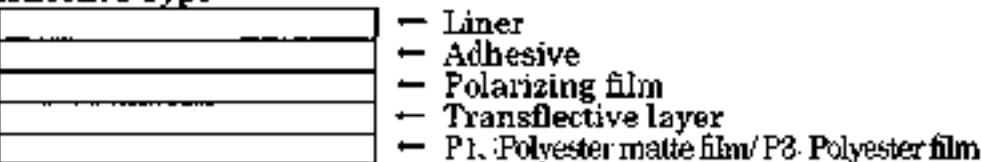
- ← Liner
- ← Adhesive
- ← Polarizing film
- ← Adhesive anti-glare sheet
- ← Protective film

2.3 Reflective Type



- ← Liner
- ← Adhesive
- ← Polarizing film
- ← Adhesive
- ← Reflector

2.4 Transflective Type

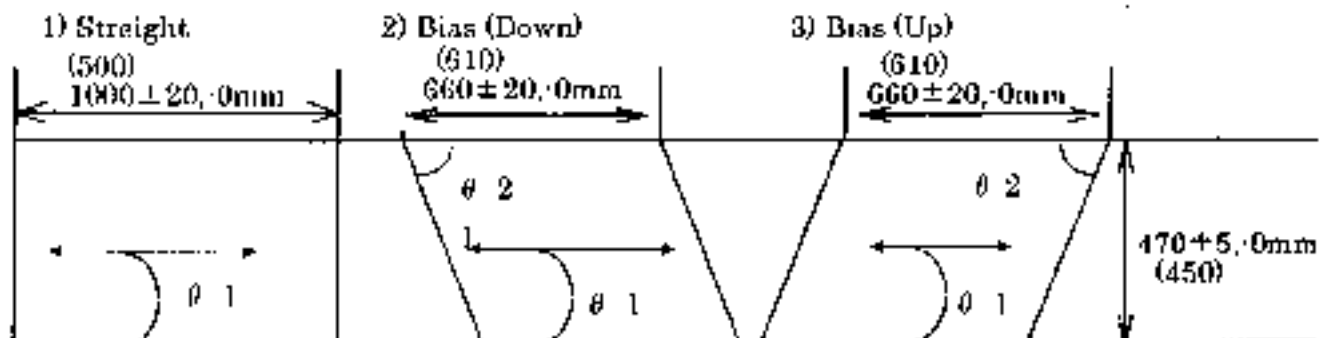


- ← Liner
- ← Adhesive
- ← Polarizing film
- ← Transflective layer
- ← P1 Polyester matte film/P2 Polyester film

Note: The total thickness shall not include the Liner and the surface protective film.

3. Size(Show a basic dimension)

3.1 Transmissive type · Antiglare type · Reflective type · Transflective type

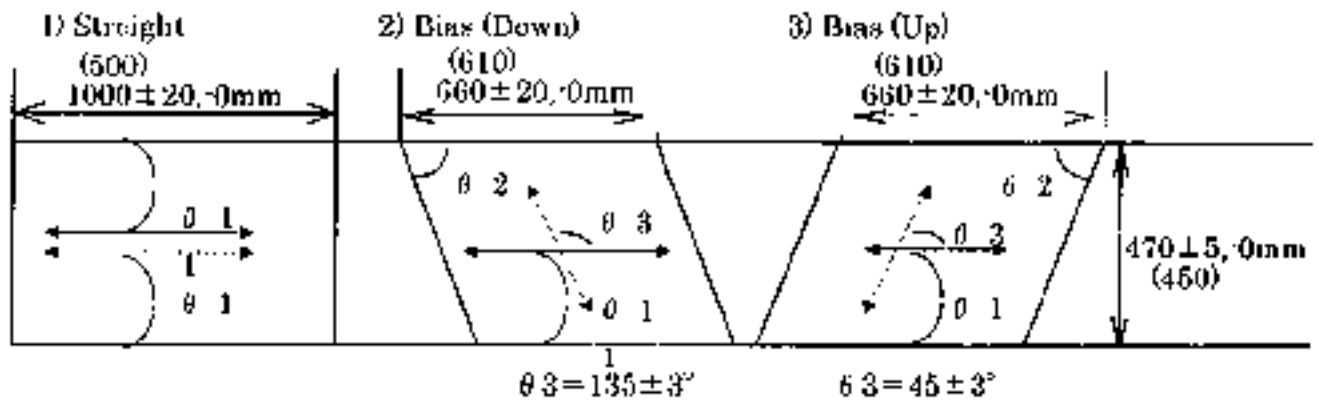


*1 Viewed from release liner side.

*2 The arrows show Absorbing axis. ← →

*3 $\rho 1 = 0 \pm 2^\circ$, $\theta 2 = 45 \pm 1^\circ$

3.2 Al reflective type with hairline



*1 Viewed from release liner side.

*2 The arrows show Absorbing axis. \longleftrightarrow Al with hairline is shown. $\cdots\cdots\cdots\longleftrightarrow$ *3 $\theta 1 = 0 \pm 2^\circ$ $\theta 2 = 45 \pm 1^\circ$

4. Quality

4.1 Properties

Table 1

Item		Unit	Q-10	Q-10R	Q-10G
Thickness	Total thickness	μm	215 ± 30	215 ± 30	215 ± 30
	Adhesive	μm	25/±10.5	25/±10.5	25/±10.5
Peeling strength	Liner	g/25 mm	50 or less	50 or less	50 or less
	Protective Film	g/25 mm	100 or less	100 or less	100 or less
Adhesive to glass plate		g/25 mm	500 or more	500 or more	500 or more
*4 Optical Property	Single transmittance	%	43.0/±2.0, -4.0	56.5 ± 3.5	56.0 ± 4.0
	Polarization efficiency	%	80.0 or more	40.0 or more	35.0 or more
	Transmittance at 380nm	%	1.0 or less	1.0 or less	1.0 or less
*4 Hue	a	NBS	0 ± 1.0	30.0 ± 2.5	-18.5 ± 3.0
	b	NBS	5.0 ± 2.5	3.5 ± 3.0	2.0 ± 3.0
Air bubbles		—	No visible air bubbles		
Delamination by humidity		—	None		
Dimensional shrinkage rate*		%	3.0 or less	3.0 or less	3.0 or less
Curling		mm	50 or less	50 or less	50 or less
Appearance (Number of defects)		Note D	0.45 or less	0.45 or less	0.45 or less
Durability*		see 5.13	Testing condition 1		

*4 This item shows property of polarizing film.

* Warranty item

Note 1) In size 100cm², see 5.14

Table 2

Item		Unit	Q-10B	Q-12	Q-12-30
Thickness	Total thickness	μm	215 ± 30	215 ± 30	215 ± 30
	Adhesive	μm	$25 \pm 10 \cdot 5$	$25 \pm 10 \cdot 5$	$25 \pm 10 \cdot 5$
Peeling strength	Liner	g/25 mm	50 or less	50 or less	50 or less
	Protective Film	g/25 mm	100 or less	100 or less	100 or less
Adhesive to glass plate		g/25 mm	500 or more	500 or more	500 or more
*4 Optical Property	Single transmittance	%	53.5 ± 4.0	$42.0 \pm 2.0, -4.0$	27.0 ± 3.0
	Polarization efficiency	%	40.0 or more	85.0 or more	95.0 or more
	Transmittance at 380nm	%	1.0 or less	1.0 or less	1.0 or less
*4 Hue	a	NBS	-5.0 ± 3.0	-1.0 ± 1.0	-1.5 ± 2.0
	b	NBS	-21.0 ± 4.0	1.0 ± 2.5	2.5 ± 3.0
Air bubbles		—	No visible air bubbles		
Delamination by humidity		—	None		
Dimensional shrinkage rate*		%	3.0 or less	3.0 or less	3.0 or less
Curling		mm	50 or less	50 or less	50 or less
Appearance (Number of defects)		Note D	0.45 or less	0.45 or less	0.45 or less
Durability*		see 5.13	Testing condition 1		

*4 This item shows property of polarizing film.

☆ Warranty item

Note 1) In size 100cm², see 5.14

Table 3

Item		Unit	Q-12-35	Q-12AG80
Thickness	Total thickness	μm	215 ± 30	330 ± 35
	Adhesive	μm	$25 \pm 10, 5$	$25 \pm 10, 5$
Peeling strength	Liner	gf/25 mm	50 or less	50 or less
	Protective Film	gf/25 mm	100 or less	400 or less
	Antiglare sheet	gf/25 mm	—	500 or more
Adhesive to glass plate		gf/25 mm	500 or more	500 or more
*4 Optical Property	Single transmittance	%	34.5 ± 3.0	$42.0 \pm 2.0, 4.0$
	Polarization efficiency	%	95.0 or more	85.0 or more
	Transmittance at 380nm	%	1.0 or less	1.0 or less
*4 Hue	a	NBS	0.4 ± 1.5	1.0 ± 1.0
	b	NBS	2.9 ± 2.5	1.0 ± 2.5
Haze Value		%	—	$5.0 \pm 2.0, 3.0$
Air bubbles		—	No visible air bubbles	
Discoloration by humidity		—	None	
Dimensional shrinkage rate etc		%	3.0 or less	
Curling		mm	50 or less	50 or less
Appearance (Number of defects)		Note 1)	0.45 or less	0.85 or less
Durability ☆		see 5.13	Testing condition 1	Testing condition 3

*4 :This item shows property of polarizing film.

☆:Warranty item

Note 1):In size 100cm^2 , see 5.14

Table 4

Item		Unit	Q-30	Q-32	Q-32S
Thickness	Total thickness	μm	320 ± 40	320 ± 40	320 ± 40
	Adhesive	μm	$25/+10,-5$	$25/+10,-5$	$25/+10,-5$
Peeling strength	Liner	gf/25 mm	50 or less	50 or less	50 or less
	Reflector	gf/25 mm	500 or more	500 or more	500 or more
Adhesive to glass plate		gf/25 mm	500 or more	500 or more	500 or more
*4 Optical Property	Single transmittance	%	$43.0/+2.0,-4.0$	$42.0/+2.0,-4.0$	$42.0/+2.0,-4.0$
	Polarization efficiency	%	80.0 or more	85.0 or more	85.0 or more
	Transmittance at 380nm	%	1.0 or less	1.0 or less	1.0 or less
*4 Hue	a	NBS	0 ± 1.0	-1.0 ± 1.0	-1.0 ± 1.0
	b	NBS	-5.0 ± 2.5	1.0 ± 2.5	1.0 ± 2.5
Air bubbles		—	No visible air bubbles		
Delamination by humidity		—	None		
Dimensional shrinkage rate*		%	—	—	—
Curling		mm	50 or less	50 or less	50 or less
Appearance (Number of defects)		Note 1)	0.45 or less	0.45 or less	0.45 or less
Durability*		see 5.13)	Testing condition 2		

*4 :This item shows property of polarizing film.

*:Warranty item

Note 1):In size 100cm², see 5.14

Table 5

Item		Unit	Q-40P1	Q-40P3	Q-42P1
Thickness	Total thickness	μm	300 ± 35	300 ± 35	300 ± 35
	Adhesive	μm	$25 \pm 10, -5$	$25 \pm 10, -5$	$25 \pm 10, -5$
Peeling strength	Liner	gf/25mm	50 or less	50 or less	50 or less
	Transreflective layer	gf/25mm	500 or more	500 or more	600 or more
Adhesive to glass plate		gf/25mm	500 or more	500 or more	500 or more
Luminosity (L-value)	Transmission	NBS	9.5 ± 1.0	23.0 ± 4.0	9.5 ± 4.0
	Reflection	NBS	30.5 ± 4.0	32.5 ± 4.0	36.5 ± 4.0
*4 Optical Property	Single transmittance	%	$48.0 \pm 2.0, -4.0$	$48.0 \pm 2.0, -4.0$	$42.0 \pm 2.0, -4.0$
	Polarization efficiency	%	80.0 or more	80.0 or more	85.0 or more
	Transmittance at 380nm	%	1.0 or less	1.0 or less	1.0 or less
*4 Hue	a	NBS	0 ± 1.0	0 ± 1.0	-1.0 ± 1.0
	b	NBS	-5.0 ± 2.5	-5.0 ± 2.5	1.0 ± 2.5
Air bubbles		-	No visible air bubbles		
Delamination by humidity		-	None		
Dimensional shrinkage rate☆		%	-	-	-
Curling		mm	50 or less	50 or less	50 or less
Appearance (Number of defects)		Note 1)	0.45 or less	0.45 or less	0.45 or less
Durability☆		see 5.13	Testing condition 3		

*4 :This item shows property of polarizing film.

☆:Warranty item

Note 1):In size 100cm², see 5.14

Table 6

Item		Unit	G-12P3
Thickness	Total thickness	μm	300 ± 35
	Adhesive	μm	$25/+10,-5$
Peeling strength	Liner	gf/25 mm	50 or less
	Transreflective layer	gf/25 mm	500 or more
Adhesive to glass plate		gf/25 mm	500 or more
Luminosity (L-value)	Transmissivity	NBS	28.0 ± 4.0
	Reflection	NBS	33.5 ± 4.0
*4 Optical Property	Single transmittance	%	$12.0/+2.0,-4.0$
	Polarization efficiency	%	95.0 or more
	Transmittance at 380nm	%	1.0 or less
*4 Hue	a	NBS	-1.0 ± 1.0
	b	NBS	1.0 ± 2.5
Air bubbles		—	No visible air bubbles
Delamination by humidity		—	None
Dimensional shrinkage rate Δ		%	—
Curling		mm	50 or less
Appearance (Number of defects)		Note 1)	0.45 or less
Durability \star		see 5.13	Testing condition 3

*4 This item shows property of polarizing film.

\star : Warranty item

Note 1) In size 100cm², see 5.14

5. Testing Method

5.1 Testing conditions

Unless otherwise specified, the test must be executed in conditions of temperature $23 \pm 2^\circ\text{C}$ and humidity $65 \pm 15\%\text{RH}$. The specified quantity of specimen of specified size must be taken carefully so that sampling does not affect the polarizer and adhesive, and the specimen must be held for more than 2 hrs. in the above stated testing conditions.

5.2 Thickness

The thickness is measured on 3 points arranged widthwise with the aid of 1/1,000 mm dial gauge, and an average is taken.

5.3 Peeling Strength

The measurement is performed according to NIS-TM 28T B method.

5.4 Adhesive to glass plate

The measurement is performed according to NIS-TM 20T E method.

5.5 Optical properties (measured by using polarizing film)

5.5.1 Single transmittance

The transmittance of a sample taken at absorption axis 45° is treated to correct the luminosity factor (700 to 400nm, 10nm increments) with the aid of spectrophotometer according to JIS Z 8701 (2-degree visual field XYZ system) so as to determine the single transmittance.

5.5.2 Polarization efficiency

The polarization efficiency is determined by using the following formula.

$$\text{Polarization efficiency} = \sqrt{(H_{00} \cdot H_{90}) / (H_{00} + H_{90})} \times 100(\%)$$

where, H₀₀ : Parallel transmittance

H₉₀ : Orthogonal transmittance

5.5.3 380nm transmittance

The transmittance at 380nm is measured by using the sample stated in Item 5.5.1 above.

5.6 Hue (measured by using polarizing film)

The transmittance of a sample taken at absorption axis 45° is treated to correct the luminosity factor (700 to 400nm, 10nm increments) with the aid of spectrophotometer according to JIS Z 8701 (2-degree visual field XYZ system) as in case of item 5.5.1 so as to determine the hue (a, b).

5.7 Luminosity (L-value)

A luminosity of a sample taken at absorption axis 45° as Item 5.5.1 is treated to correct the luminosity (L-value) with the aid of a color difference meter.

5.8 Haze value

In accordance with JIS K 7105 6.4.

5.9 Air bubbles

A sample (50×150 mm) is applied to a clean glass plate. After autoclave treatment, peel off protective film, normal temperature for 24hrs or 80°C for 3 hrs more than 3hrs leaving and the sample is kept at 90 °C for 24 hrs. to check visually for air bubbles. And, it reflective type and a sample in the case of the transfective type is made 20×50mm.

* Autoclave treatment condition : 70° C×5 kg f/c m² · 15 minutes

5.10 Delamination on humidity

A sample (50×150 mm) is applied to a clean glass plate. After autoclave treatment, peel off protective film, normal temperature for 24hrs or 80°C for 3 hrs more than 3hrs leaving and the sample is kept at 80° C×90%RH for 24 hrs. to check visually for air bubbles. And, it reflective type and a sample in the case of the transfective type is made 20×50mm.

* Autoclave treatment condition : 70° C×5 kg f/c m² · 15 minutes

5.11 Dimension shrinkage rate (Warranty item)

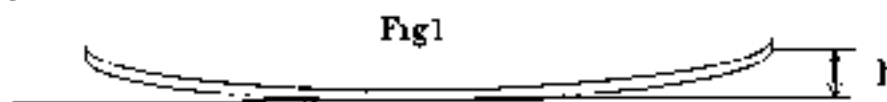
Of a sample after tested in conditions of disbondment in wet state (item 5.10) and the dimension shrinkage in the longitudinal direction is determined.

5.12 Curling

It is examined that the curl quantity (h)(in the inside bag, a mean in the bag) that a big board sample was put horizontally and which was made the bottom figure and which was measured is within the standard value.

And curl measurement is decided to be done right after it is opened more than packing condition in the delivery.

*Testing conditions: 23±2°C, 65±15%RH



5.13 Durability(Warranty item)

Specimens shall be exposed to the aging conditions specified in Table 1 below, then, the single piece transmittance shall be determined in accordance with Para.4.5.1. The change shall not exceed 5% in the absolute value under each condition listed below, compared with the initial value.

<Table 1>

Test condition	Properties	Testing conditions
1	Heat resistance	90°C, 250hrs
	Humidity resistance	80°C×90%RH,250hrs
2	Heat resistance	80°C, 250hrs
	Humidity resistance	60°C×90%RH,250hrs
3	Heat resistance	85°C, 250hrs
	Humidity resistance	60°C×95%RH,250hrs

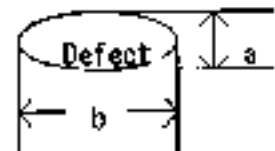
5.14 Appearance (Defect number)

Defects of the size specified shall be visually inspected under one 20w fluorescent tubes, about 30cm away from the specimen. The size of defect shall be bigger than 150 μ m ϕ for transmittance type and 200 μ m ϕ for antiglare type, reflective type, transfective type.

One 10mm long linear defect shall be counted as point. 1white one 1cm² areal defect shall be as point 1. The total number of defects shall not exceed the acceptable limit. The edge of each sheet in 10mm width shall be negligible.

*5: Size of foreign substance defect $\epsilon=(a+b)/2$

*6: Other defects must be evaluated according to the limit samples which are specified as necessary.



6. Inspection

6.1 Definition of lot

The products produced continuously from the same material in the same conditions are taken as products of the same lot.

6.2 Inspection system

1) Properties

The sampling inspection is executed in conditions of $n=3$, $c=0$ per a lot in order to decide pass or rejection. The warranty item must be guaranteed by a material and manufacturing condition management, and inspections for each lot is not be performed.

2) Appearance

100% inspection

6.3 Issue of test report

Upon your request, the test report shall be submitted following items of 4.1 except "Warranty item" and curling and appearance.

7. Packing and Marking

7.1 Packing

Each specific number of products are packaged with aluminum moistureproof bag and put in the external packaging corrugated cardboard box for transportation.

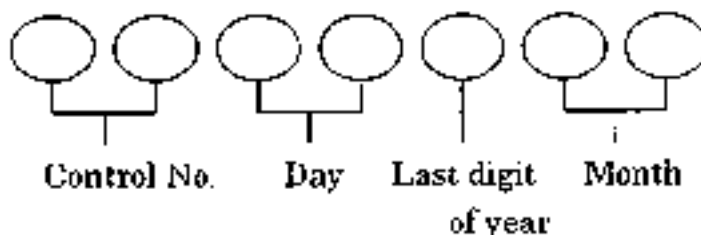
7.2 Marking

The following information is shown on the label which is applied to the easy-to-see place on the moisture-proof bag and on the external packaging corrugated cardboard box.

(1) Product name

(2) Size

(3) Date of manufacture or its abbreviation (7 consecutive figures)



(4) Name of manufacturer

(5) Quantity

8. Warranty Period and Storing Conditions

6 months after delivery. The products must be stored in conditions of 35° C × 85%RH or less as packaged for supply.

9. Effectuation

(1) If any doubt is found in this specification, it must be solved as mutually agreed by both parties.

(2) This specification is tentatively put into force on the day of its submission.

(3) The specification must be put into force as a final specification if the customer does not have any objections to it after the customer receives it or when one month elapses after it is submitted.

*** Safety precaution**

By burning the polarizer produce a poisonous gas. If you disuse it, please must do appropriate disposal as bury.

*** Handling precaution:**

(1)The polarizing film tends to absorb moisture and dry, resulting in curl or other failures.

It is recommendable to use as soon as possible after the moisture-proof bag is unpacked. The once unpacked polarizer must be stored so that moisture does not affected.

(2)Some organic solvents may affect adversely the polarizer surface.

Before using the organic solvent to clean the polarizer, the user must check it in advance.

It must be taken into account that some organic solvents may dissolve the adhesive, impairing the product appearance.

(3)The polarizer is designed for LCD and it's sensitive to temperature, humidity, solvents or chemicals, and a strong light.

If you use the polarizer other than LCD application, please contact us or use it after evaluating your application throughly.

(4) It asks that it asks to our company in advance and it used after sufficient evaluation in your company to avoid a problem by the change when your manufacture process or usage is changed about the use of polarizer.

- E & O.E. -