AKON
CURTAIN AND
DIVIDER

SEIDEN-F

TRANSPARENT ANTI-STATIC PVC FILM

Because plastic films in general are very effective electro-insulators, they are apt to bear static-electricity , which results in various static-electricity problems. To deal with this, there are several methods such as adding anti-static agents, coating the film, including electro-conductive particles, such as carbon-black. But such measures may not last long or may affect the transparency of the plastic.

"Achilles Seiden-F" has been developed to solve the above problems. It is anti-static PVC film, which is transparent and has excellent anti-static properties.

CHARACTERISTICS OF "ACHILLES SEIDEN-F"

1. Excellent anti-static properties without aging.
2. As transparent as usual flexible PVC film
3. Application can be extended to other applications because its base film is "Achilles Flarrē", fire-retardant film approved by Fire Agencies.

WHY "ACHILLES SEIDEN-F" DOES NOT BEAR STATIC-ELECTRICITY

"Achilles Seiden-F" has a lattice-like electro-conductive print on its surface, which exhibits an excellent anti-static effect. When usual plastic film is charged with static-electricity, a fictitious line-charge called electro-static force, is generated by the charge vertically against the film toward the infinite distance (Fig. 1). We feel the electro-static phenomenon by this electro-static force line, usually over 3KV for human body. Now, if a grounded electro-conductor exists as part of the film, the electro-static force line is likely to be absorbed into the electro-conductive material and the phenomenon disappears. (Fig. 2).

The anti-static results of "Achilles Seiden-F" and the application of this phenomenon is shown in Figure 2. This will not change with aging.

PROPERTIES OF "ACHILLES SEIDEN-F"

1. ANTI-STATIC EFFECT:

	CHARGED VOLTAGE (22°C, 49% RH)
ACHILLES SEIDEN-F	-0.2 KV
FLEXIBLE PVC FILM WITH ANTI-STATIC AGENT COMPOUNDED	-13 KV
GENERAL FLEXIBLE PVC	-22 KV

2. LEAKAGE OF STATIC-ELECTRICITY: Half-life periods of static-electricity were measured to evaluate leak ability of "Achilles Seiden-F".

	HALF-LIFE PERIOD	
	5 SEC. OR LESS	10 SEC. OR LESS
PRINTED SURFACE	10 points	——
REVERSAL FACE	8 points	2 points

(CONDITION: 20°C, 73%RH)

- Half-Life periods of 8KV charge were measured at 10 points with Syncroscope.
- The safety standard of a half-life period of charge voltage is said to be less than one minute. In relation to this value, half-life with "Achilles Seiden-F" is far shorter and assumed to be safe.

3. PREVENTION OF ELECTRO-STATIC ATTRACTIVE FORCES: After wiping 10 times with a nylon cloth, the film is drawn near cigarette ashes, and distances at which the film begins to attract ashes are measured.

	DISTANCES (22°C, 49%RH)
ACHILLES SEIDEN-F	1 cm
FLEXIBLE PVC FILM WITH ANTI-STATIC AGENT COMPOUNDED	10 cm
GENERAL FLEXIBLE PVC FILM	18 cm

4. ELECTRO-STATIC SHIELDING: Ability of electro-static shielding was tested with a Braun tube, which generates static-electricity when power is turned off.

	TRANSMISSION VOLTAGE
ACHILLES SEIDEN-F	0.4 KV
FLEXIBLE PVC FILM WITH ANTI-STATIC AGENT COMPOUNDED	20 KV
GENERAL FLEXIBLE PVC FILM	20 KV

- Electrification of Braun tube was measured through films placed in front of the tube.

5. ELECTRIC CHARGE DENSITY, SURFACE CHARGE POTENTIAL AND ELECTROSTATIC ENERGY: "Achilles Seiden-F" has an excellent anti-static ability which meet the strict requirements for electronics industries such as IC manufacturers

- ANTI-STATIC ABILITY OF "ACHILLES SEIDEN-F"

	UNIT	NOT GROUNDED	GROUNDED
ELECTRIC CHARGE DENSITY (Q)	uc / m2	1.9	0.33
SURFACE CHARGE POTENTIAL (V)	KV	-6.6	-0.27
ELECTROSTATIC ENERGY $(W=\frac{1}{2}QV)$	uj / m2	6.3×10^3	0.045×10^3
ELECTROSTATIC ENERGY PER ONE LATTICE PATTERN UNIT $(W\text{-}Wx \frac{\text{One Lattice area}}{100 \times 100})$	uj / 3.2cm2	2.0	0.014

- Tested according to RECOMMENDED PRACTICE for protection against hazards arising out of Static Electricity in General Industries published by The Research Institute of Industrial Safety of Ministry of Labour, Japan. (1978 edition).

In general, IC and other electronics parts are said to be destroyed by electrostatic energy of over 5 uj - 100 uj. As shown in the table above, "Achilles Seiden-F" has enough anti-static ability not to destroy IC, because Electrostatic Energy per One Lattice Area without grounding is less than the lower limit of destructive energy (5 uj).

6. SURFACE RESISTANCE / VOLUME RESISTANCE:

	SURFACE RESISTANCE			
	AVERAGE	MAXIMUM	MINIMUM	CONDITION
PRINTED SURFACE	8.5×10^6	9.5×10^6	6.4×10^6	23°C X 60% PH
REVERSAL	3.3×10^{14}	9.4×10^{14}	2.1×10^{13}	
PRINTED SURFACE	7.8×10^4	8.5×10^4	6.9×10^4	23°C X 70% PH
REVERSAL	7.4×10^{12}	1.3×10^{13}	2.8×10^{11}	

	VOLUME RESISTANCE			
	AVERAGE	MAXIMUM	MINIMUM	CONDITION
PRINTED SURFACE	7.3×10^{11}	8.7×10^{11}	6.1×10^{11}	23°C X 60% PH
REVERSAL	2.1×10^{13}	3.7×10^{13}	2.6×10^{12}	
PRINTED SURFACE	3.3×10^{11}	4.1×10^{11}	2.69×10^{11}	23°C X 70% PH
REVERSAL	2.1×10^{12}	3.0×10^{12}	1.3×10^{11}	

- A solid body may be electrostatically safe with a resistance value of less than 10^{11}, which make the static electricity leak easily.

7. LEAK ABILITY OF LATTICE-LIKE ELECTRO-CONDUCTIVE PRINT AS CIRCUIT: Electric current on lattice-like electro-conductive print (A1) was measured as an electrical conductor for grounding of pin-point electrical discharges and compared with iron plate.

	ELECTRIC CURRENT (A1)	
	ON PRINT LINE	BETWEEN THE LINES
ACHILLES SEIDEN-F	130 uA	90 uA
IRON PLATE	140 uA	
GENERAL PVC FILM	5 uA	

- Similarly, measured electric current running in iron plate (A2) and in electro-conductive print line of "Achilles Seiden-F" placed on the iron plate (A1).

	ELECTRIC CURRENT (A1)					
	ON PRINT LINE			BETWEEN THE LINES		
	A1	A2	A1/A2	A1	A2	A1/A2
ACHILLES SEIDEN-F	51uA	50uA	1.02	43uA	43uA	1.00

- Lattice-like electro-conductive print has electro-leak ability equal to iron plate.

PHYSICAL PROPERTIES ON THE PRINTED ANTI STAT

	TEST METHOD	UNIT	RESULTS
FIRE RESISTANCE " "	FIRE DEEENSE ACT 8-3 MVSS NO. 302 DOMESTIC AUTO MAKER'S SAFETY STANDARD		APPROVED APPROVED APPROVED
100% MODULE	JIS K-6732	kg / cm2 "	VERTICAL 125 TRANSVERSAL 102
TENSILE STRENGTH	JIS K-6732	kg / cm2 "	VERTICAL 265 TRANSVERSAL 205
ELONGATION	JIS K-6732	% %	VERTICAL 291 TRANSVERSAL 315
TEAR STRENGTH	JIS K-6732	kg / cm "	VERTICAL 58 TRANSVERSAL 50
COLD RESISTANCE	ASTM D-1593	" "	VERTICAL -26 TRANSVERSAL -21

APPLICATION

Please don't fail to ground the electro-conductive print

HIGH-FREQUENCY WELDING

: Seiden-F" can be processed by high-frequency welding because its base material is flexible PVC film. However, it is important to cover the electrode with fluorocarbon film of over 0.07mm thickness to prevent sparks as it has electro-conductive printing. And please also note that the film should be placed at the machine with the printed surface downward.

Do not store near heat or direct/indirect sunlight. Shelf life of one year when stored in original packaging. Avoid roll unwinding. Do not store film in an unwound condition.

NOTE: This information is, to the best of the company's knowledge, accurate under numerous conditions; however, it does not apply in all cases. The summary chart is intended only as a guideline and all recommendations are made without guarantee, since conditions of use are beyond our control.

ACHILLES SEIDEN-F Series Inventory Items --- Sizes and Physical Properties

		Seiden-F			Yellow S/F	Black S/F	Test method and remarks
		Face/Back	Face/Back	Face/Back	Face/Back	Face/Back	
Thickness	(mm)	0.10	0.30	0.50	0.30	0.30	
Width	(mm)	1370	1370	1370	1370	1370	
Roll Length	(mtr)	50	30	20	30	30	
Hardness	(phr)	36	44	44	50	44	DOP equivalent
Color		Clear			Yellow	Black*	*Dull finish.
Physical Properties							
100% Modules (kg/cm)	MD	2.15	4.52	7.40	3.60	4.90	JIS K-6732
	CD	1.82	4.15	6.90	3.00	3.83	
Tensile Strength (kg/cm)	MD	3.30	8.50	13.20	8.53	9.12	n=5 (average excluding max. and min. figure)
	CD	2.95	7.67	12.30	7.53	6.65	
Elongation (%)	MD	230	280	290	310	260	
	CD	270	290	290	320	280	
Tear Strength (kg)	MD	0.78	2.19	4.05	1.93	2.34	
	CD	0.81	2.39	3.97	1.87	2.10	
Cold Crack (°C)	MD	-27	-23	-20	-33	-18	ASTM D-1593
	CD	-24	-19	-21	-31	-11	
Light Transmission (%)		80.8	82.8	78.5	68.6	0	JIS K-7105 n=5
Resistance to Chemicals							
Hydrochloric Acid 10%		◎	◎	◎	◎	◎	JIS K-7114 Size of specimen: 5cm x 5cm, dipped for 168 hrs. ◎>○>△>×>×× Good >>> Bad
Sulfuric Acid 10%		◎	◎	◎	◎	◎	
Acetic Acid 5%		◎	◎	◎	◎	◎	
Sodium Hydroxide 10%		◎	◎	◎	◎	◎	
Aqueous Ammonia 10%		◎	◎	◎	◎	◎	
Ethyl Alcohol 50%		△	×	×	×	△	
Acetone 95%		×	△	△	×	×	
Benzene 95%		×	×	×	×	×	
Formalin 95%		○	◎	◎	◎	◎	
CarbonTetrachlorides 95%		△	×	×	×	×	
Kerosene		△	△	△	△	△	
Electrical Properties							
Specific Surface Resistivity (Ω)	a	$<10^7$	$<10^7$	$<10^7$	$<10^7$	$<10^7$	a: Printed side, b: Back
	b	9×10^{11}	3×10^{11}	2×10^{11}	3×10^{11}	4×10^{11}	JIS K-6911
Volume Resistivity (Ω cm)		1×10^{12}	6×10^{11}	3×10^{11}	4×10^{11}	5×10^{11}	20°C x 60%RH
Friction Electrocharge (V)		90/70	30/22	30/20	9/8	12/15	*1
Decay Time (second)	50%	0.00/0.00	0.00/0.00	0.00/0.00	0.00/0.00	0.01/0.00	MIL B-81705B
	90%	0.38/0.27	0.05/0.06	0.03/0.03	0.04/0.03	0.04/0.04	17°C x 20%RH
	100%	19.8/17.8	1.63/1.71	0.86/0.78	1.08/0.93	1.58/1.56	(Static Decay Meter)
UV Resistance							
Appearance	Yellowing	×	△	△	◎	◎	*2
	Bleeding	△	△	○	×	○	
100% Decay time (sec.)	Prior to UV exposure	1.21/1.19	0.12/0.12	0.07/0.06	0.14/0.14	0.14/0.12	MIL B-81705B 29°C x 31%RH (Static Decay Meter)
	After UV exposure	2.41/2.04	0.24/0.22	0.09/0.09	0.18/0.22	0.20/0.21	
Heat Transmission		$2.3 \sim 2.6 \times 10^{-4}$ cal/cm·sec·24°C					JIS A-1412
Oxygen Index		28.0					JIS K-7201

*1: Measured with Electric Static Field Meter from 10cm distance 23°C x 24%RH, after 10 times rubbing with cotton cloth.

*2: Matsushita Sterilizing Lamp GL-40 projected for 144 hrs. from 10cm distance.