

# ANTI-STATIC MATERIALS

vol.11



For the latest information from our Static Control Products Division, visit our web site:

[www.achilles-esd.com](http://www.achilles-esd.com)



## ACHILLES CORPORATION Industrial Material Division

### ACHILLES TOKYO HEAD OFFICE

22 Daikyo-cho, Shinjuku-ku, Tokyo 160-8885

Phone +81-3-5379-4582  
Fax +81-3-3225-9688

### ACHILLES KANSAI BRANCH OFFICE

1-14-15 Nishi-honcho, Nishi-ku, Osaka 550-0005

Phone +81-6-6534-2168  
Fax +81-6-6534-2194

### ACHILLES KYUSHU SALES OFFICE

1-1-4, Tanotsu, Higashi-Ku, Fukuoka 813-6591

Phone +81-92-622-2871  
Fax +81-92-622-2590

### ACHILLES HONGKONG CO., LTD

Unit A, 5/F., Winner Building, 36 Man Yue Street,  
Hung Hom, Kowloon, HONG KONG

Phone +852-2362-8324  
Fax +852-2764-1024

### ACHILLES (SHANGHAI) INTERNATIONAL TRADING CO., LTD.

Room 2207A, Shanghai Global Times Square 1666 Sichuan  
North Road, Shanghai, P.R. CHINA

Phone +86-21-63648024  
Fax +86-21-63247707

### ACHILLES USA., INC.(HEAD QUARTERS)

1407, 80th Street, S.W., Everett,  
Washington 98203, U.S.A.

Phone +1-425-353-7000  
Fax +1-425-347-5785

### ACHILLES ADVANCED TECHNOLOGY CO., LTD.

5F., No.415, Sec. 2, Gongdao 5th Rd.,  
Hsinchu City 30069, TAIWAN

Phone +886-3-5737300  
Fax +886-3-5737355

### ACHILLES THAILAND REPRESENTATIVE OFFICE

Unit 1809, 18th Floor, One Pacific Place, 140 Sukhumvit Road,  
Klongtoey, Klongtoey, Bangkok 10110

Phone +66-2-653-2251  
Fax +66-2-653-2253

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always with you . . .

**Achilles**  
ACHILLES CORPORATION

# FOR THE FUTURE, FOR THE WORLD

## Globalization History

<b>1961</b> Technical cooperation with ICI of Great Britain is launched; polyurethane foam production begins.	<b>1992</b> Guangzhou Supatra Co.,Ltd. a shoemaking company is established in China.	<b>2002</b> Achilles(Shanghai) International Trading Co.,Ltd. is established for the sales and import/export of Achilles products in China.
<b>1965</b> Achilles K.C.I. Corp. is established in New York. (It is absorbed in 1978 by Achilles USA, INC. )	<b>1993</b> Kunshan Achilles Artificial Leather Co.,Ltd. is established via joint venture in China.	<b>2004</b> Operations begin at the Kunshan Achilles Artificial Leather Co.,Ltd.Factory No.2.
<b>1973</b> Achilles Hong Kong Co.,Ltd. is established in Hong Kong.  Kohkoku USA., Inc. (currently Achilles USA, INC. ) is established in Everett, Washington.	<b>1994</b> Exclusive contract signed with Skechers of the USA to sell Skechers brand shoes in Japan.	<b>2006</b> Acquires Sanshin Enterprises Co.,Ltd. as a subsidiary by acquiring 100% of shares issued.
<b>1988</b> Technical cooperation with Tarkett Sommer AG of Sweden, relating to the manufacture of industrial flooring materials, begins.	<b>1998</b> Production of the revolutionary new electron conjugated conductive polymer "ST-Poly" begins.	<b>2008</b> Achilles Advanced Technology Co.,Ltd. is established in Taiwan to meet demands from the ever-expanding semiconductor market A sales office of Achilles USA, INC. opens in Detroit, USA.. Achilles Corporation Thailand Representative Office is established in Bangkok,Thailand.
	<b>2001</b> Achilles E-tech(Dongguan) Co.,Ltd. is established in Guangdong,China; this company specializes in processing HDD-related products with conductive ST-Poly treatment.	

## Corporate Profile

Achilles Corporation  
Capital ¥ 14.64 Billion  
Employees 1,496 (as of Mar. 2010)

## Head Office, Branch Office, and Sales Office

### 《Head Office》

22, Daikyo-Cho,Shinjyuku-ku,Tokyo 160-8885  
Tel +81-3-3225-2170

### 《Kansai Branch Office》

14-15,1 Chome,Nishihon-Machi,Nishi-Ku,  
Osaka-Fu 550-0005  
Tel +81-6-6534-2111

### 《Other Sales Office》

Hokkaido,Kyushu Shintomi Annex

### 《Factories》

Ashikaga Factory No.1 / Ashikaga Factory No.2 Shiga / Factory No.1 / Shiga Factory No.2 /  
Bibai Factory / Kyushu Factory

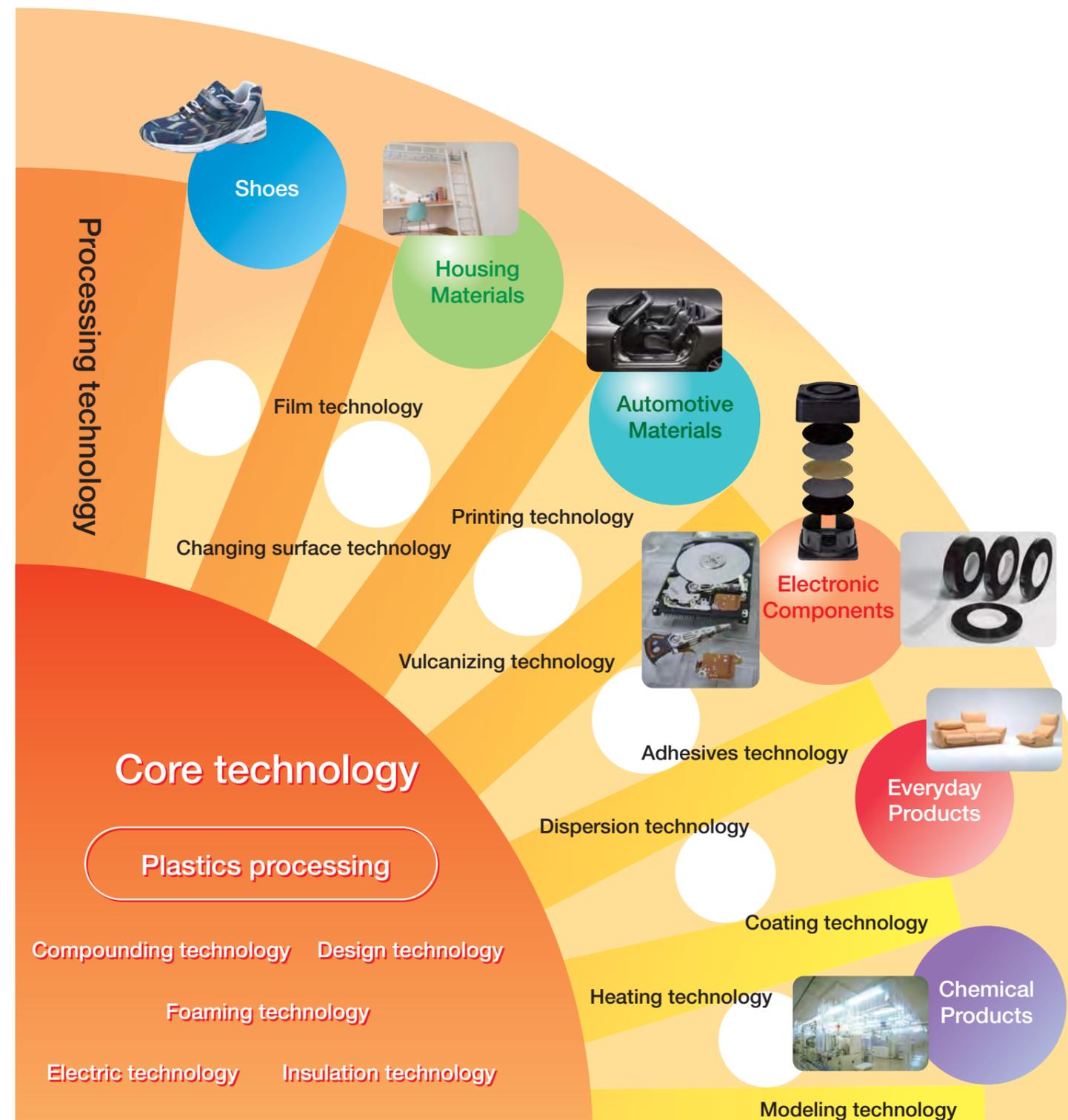
## World Offices

- ① Achilles USA, INC.
- ② Achilles Hong Kong Co. LTD.
- ③ Supatra LTD.
- ④ Guang Zhou Supatra Co. LTD.
- ⑤ Kunshan Achilles Artificial Leather Co. LTD.
- ⑥ Winfast Technology LTD
- ⑦ Achilles E-Tech(Donguan) Co., LTD.
- ⑧ Achilles (Shanghai)International Trading Co., LTD.
- ⑨ Achilles Corporation Shanghai Representative Office
- ⑩ Achilles(Taiwan) Advanced Technology Co.LTD.
- ⑪ Achilles Corporation Thailand Representative Office

# For the Future, For the World

## Various technologies and products

New values that will lead the way for the new generation of corporations and society: This is what our technology constantly strives for.



# Achilles Complete ESD Solutions

We can help you to inspect your facility, to determine your exact needs to recommend the appropriate ESD control materials and procedures for your successful ESD control program implementation.

## “Hardware” Approach for your ESD control

### ● Product Lineup

We offer various ESD control materials for your facility and packaging needs.

### ● Complete Report

We document findings from our process evaluation and recommend appropriate ESD control measures and hardware needed.

### ● Process Evaluation

We help operators and engineers identify the root cause of ESD events in accordance with IEC61340 standard.



### ● Training Seminar

We offer ESD training seminar at your site. Operators and engineers must have good understanding of ESD management.



☆ There are subject areas and not subjected areas.

**Higher Yield  
Quality Assurance  
Reliable Manufacturing**

## “Software Approach” for your ESD control

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- 20.....Wrist Strap Monitoring System

### Static dissipation

- 21.....Static Dissipating Brushes
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### Stationary

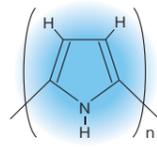
- 22.....Conductive Clear Files
- 22.....Conductive Binders
- 22.....Conductive Clear Folders
- 22.....Conductive Clip Boards
- 22.....Conductive Hook and Loop Fasteners
- 22.....Conductive Pouches

# ST Poly

## ST Poly conductive processing technology

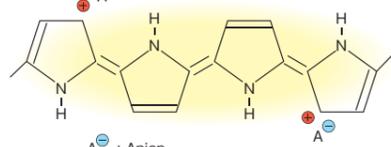
Achilles' ST Poly is made with polypyrrole, a conductive polymer with an electronic conjugated system that provides uniform coating, compounding, and conductivity on surfaces of various materials and shapes of base materials.

### ST Poly construction



Polypyrrole  
Conductive polymer that has an electronic conjugated system.

### Mechanism of electron conduction



Bipolaron (Di-cation) on the polymerized complex move between main complex structure to carry electrons.

ST

$1 \times 10^8 \Omega$   
Dissipative  
To  
Conductive  
 $1 \times 10^2 \Omega$

# Antistatic agent

## Antistatic agents processing technology

Antistatic additives are heavily used as antistatic processing agents. Achilles does not allow compromises in even antistatic additives.

### Surface active agent based antistatic agent



### Mechanism of antistatic agent



### features of Achilles' antistatic agent

- Stable bleed out performance.
- Low level of pollution and decay.

AS

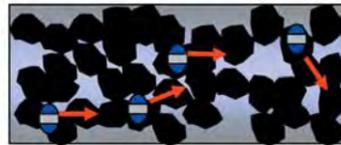
$1 \times 10^{11} \Omega$   
Dissipative  
 $1 \times 10^9 \Omega$

# Carbon

## Carbon conductive processing technology

Carbon offers optimum stability for conductive processing technology. Taking advantage of this property, we at Achilles continue to develop various products according to purposes and material types.

### Mechanism of carbon conduction



### Features of Achilles' carbon

- Stable conductive performance.
- Allows appropriate compounding of carbon power and carbon fiber according to each purpose.

CB

$1 \times 10^6 \Omega$   
Conductive  
 $1 \times 10^4 \Omega$

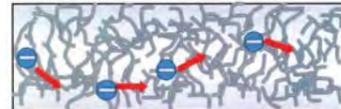
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# Metal

## Metal conductive processing technology

Metal has the highest conductive performance. Achilles develops various products using materials such as evaporated metal, plating, aluminum flakes, and stainless fiber.

### Mechanism of metal conduction



### Features of Achilles' metal

- Stable conductive property
- Less particle

MT

$1 \times 10^8 \Omega$   
Conductive  
 $1 \times 10^4 \Omega$

# ST Poly

## Achilles' Original conductive technology.

### Five features of ST Poly

- 1 Conductive polymer makes extremely thin films and transparent conductivity possible.
- 2 Clean and stable conductive performance with minimum bleeding and defluxion.
- 3 Highly flexible to accommodate a wide range of materials and forms.
- 4 Excellent chemical properties - low out-gas, low ion contamination silicon-free etc.
- 5 Accommodates various after-processing such as laminating, printing, adhesion processing etc.

### Compared to other conductive technologies

Item	Conductive technologies	ST poly	Antistatic additives	Carbon	Metal
Conductivity		○	△	○	◎
Transparency		◎	◎	×	△
Cleanness		◎	○	×	○
Out Gas		◎	△	×	○
Contamination		◎	△	△	○
Durability		○	△	◎	○
Depend on humidity		◎	×	○	◎
Cost		○	◎	○	△

### Compatibility with base material

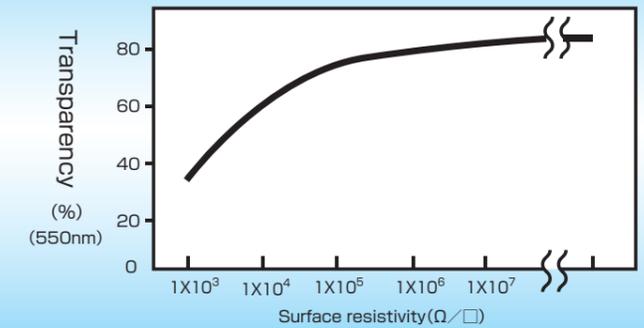
Material	Compatibility	Material	Compatibility
PET	◎	PA6	○
A-PET	◎	PA66	○
PE	○	PES	◎
PS	◎	PEEK	◎
PP	○	PEI	◎
POM	×	PI	◎
PC	◎	PVC	○
ABS	◎	LCP	△
PAN	◎	Glass	×
PMMA	×	Metal	×

◎ : Excellent    △ : Fair  
○ : Good        × : Poor

### Warning

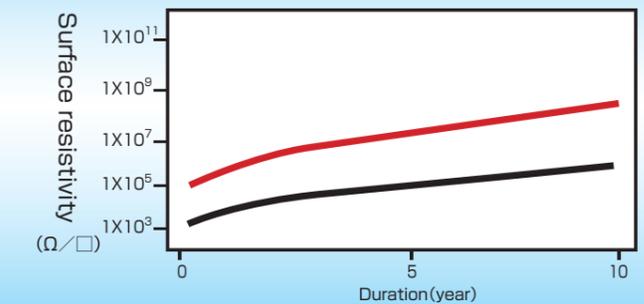
- Caution is required when using ST-Poly in contact with alkaline materials. ST Poly is comprised of highly chemical resistant macro molecules. Alkaline materials may adversely affect performance of ST-Poly.
- Not suggested to use ST-Poly devices that can generate strong friction. The layer of ST Poly film, though rigid, may wear when used in locations with constant friction.
- Other notes  
Exposure to strong UV light for long time may deteriorate its property.

### Good Transparency



### Stable conductive performance

Comparison with different initial values



### Applications

ST Poly can be used in a wide variety of applications for antistatic properties.

#### Applications in different categories

Applications	
Film	Protection film
	Clean curtain
	Spacer film
Sheet	Vacuum forming sheet
	Carrier tape base sheet
	Stationery
Molded plastic	HDD parts, copy machine parts
	Wafer carrier / Photo mask case
	IC tray, HDD tray
Electrical parts	FPC
Fiber / Thread	Glove / Cloth
	Wiper
Tooling	Resin tooling

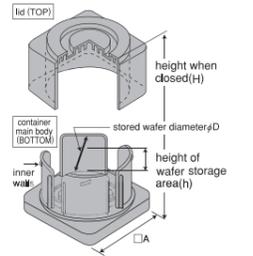
## Wafer Shipping Boxes



**Product name** Protos Carrier MA Series

### Features

1. Static protection during shipment.
2. Compact design contributes to more efficient handling.
3. Can be applied to wafer transfer equipment.
4. Excellent air tightness
5. ESD protection
6. Double wall structure for wafer protection
7. Can store 3.5 inch floppy disks.
8. Able to ship wafer size of :4"/5"/6"/8"/12"
9. Two carrier designs available, standard type and slim type.
10. Recyclable



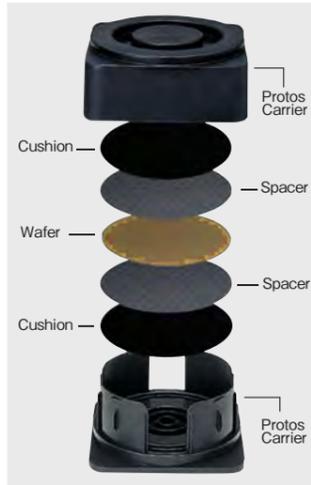
**Product Code** **Specification**

Product code	Wafer size	H (mm)	h (mm)	D (mm)	A (mm)
MA-5	5 inch	90	50	128±1	150
MA-6	6 inch	90	50	153±1	175
MA-6S	6 inch	63	38	153±1	175
MA-8	8 inch	103	54	203±1	226
MA-8S	8 inch	65	38	203±1	226
MA-12	12 inch	76	44	302±1	328

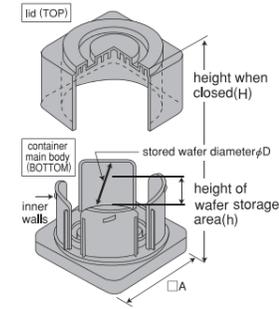
**Surface Resistance**  $1.0 \times 10^9 \Omega$  or less

**Material** Conductive PP

**To store wafers** Protos carrier MA series can carry maximum of 25 wafers using spacers and cushions in coin-stack fashion.



## Wafer Boxes for Frame Wafers Carriage



**Product Code** **Specification**

Product code	Applied Wafer size	H (mm)	h (mm)	D (mm)	A (mm)
ND-6	6 inch frame wafers	83	40	230±1	252
ND-8	8 inch frame wafers	92	57	299±1	322
ND-12	12 inch frame wafers	74	45	403±1	430



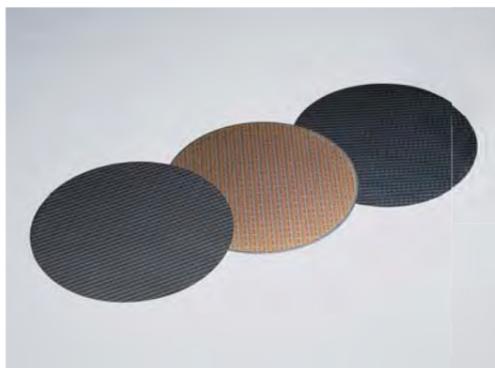
**Product name** Protos® Carrier ND Series

**Features** Protos Carrier ND Series can carry maximum 13 frame wafers using spacers and cushions in coin-stack fashion.

**Surface Resistance** ND-6,ND-8:  $1.0 \times 10^9 \Omega$  or less  
ND-12:  $1.0 \times 10^{12} \Omega$  or less

**Material** ND-6,ND-8:Conductive PP  
ND-12: :Antistatic PC/ABS

## Spacers (Separators)



**Product name** Protos Spacer

Achilles clean technology and special processing technique have developed the spacer that protects silicon wafers safely during transportation.

**Product Code** PEA-□-350  
CPS-□-250

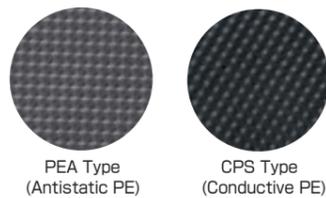
\* "□" : applies sizes of wafers in inch, thus 4,5,6,8 and 12.

### Features

1. low particle
2. low ion contamination
3. antistatic measure
4. anti-scratching measure
5. reversible
6. Can be used with wafer transfer device.

**Surface Resistance** PEA type:  $1.0 \times 10^{12} \Omega$  or less  
CPS type:  $1.0 \times 10^9 \Omega$  or less

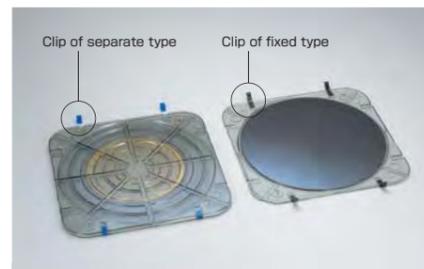
**Material** PEA type: Antistatic PE  
CPS type: Conductive PE



PEA Type  
(Antistatic PE)

CPS Type  
(Conductive PE)

## Wafer Cases for Single Wafer Carriage



**Product Code** MA-12/ONE-SP (with separate-type blue clips)  
MA-12/ONE-FX (with fixed-type black clips)

**Features** Can carry a 12 inch size wafer safely. Since clean conductive material (ST-Poly) is used for the case, hazards to wafer caused by out-gassing during wafer storage is eliminated.

**Surface Resistance**  $1.0 \times 10^9 \Omega$  or less

**Material** Wafer Case Conductive PC  
Blue clip PC  
Black clip PP

## Wafer Cases for Single Frame Wafer Carriage



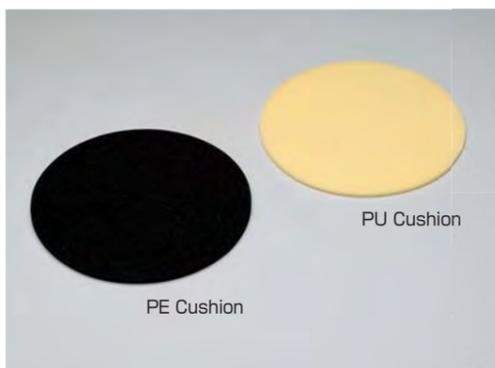
**Product Code** VFP-ND-6R-90 for 6-inch wafer  
VFP-ND-8R-90 for 8-inch wafer

**Features** Can carry a 6 or 8-inch frame wafer safely. Since it is set to the case by its frame part. The wafer itself does not contact the case. Excellent transparency enables the user to easily identify the contents without opening the case.

**Surface Resistance**  $1.0 \times 10^7 \Omega$  or less

**Material** Conductive A-PET

## Cushions



PE Cushion

PU Cushion

**Product name** Protos Cushion

**Product Code** MA-□U-5/10/15/20

\* "□" : applies to sizes of wafers in inch, thus 4,5,6,8 and 12.

### Features

1. Antistatic
2. Low ion contamination

**Specifications** Cushion thicknesses are 5mm, 10mm, 15mm and 20mm.

**Surface Resistance**  $1.0 \times 10^{11} \Omega$  or less (23°C, 60%RH)

**Material** Antistatic PU

**Product Code** MA-□PESD-1/3/5/10

\* "□" : applies to sizes of wafers in inch, thus 4,5,6,8 and 12.

### Features

1. Conductive
2. Low ion contamination
- 3 Excellent shock absorbing

**Specifications** Cushion thicknesses are 1mm, 3mm, 5mm and 10mm.

**Surface Resistance**  $1.0 \times 10^9 \Omega$  or less

**Material** Conductive PE

## Cushioning for Wafer Boxes

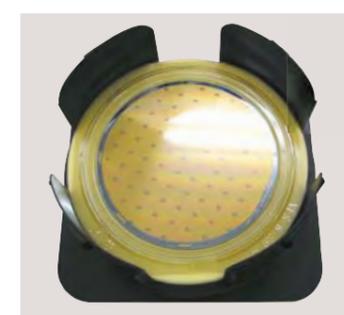


**Product Code** MA-12PP

**Features** 1. Can be stored in piles.  
2. Reusable

**Material** Poly-propylene

## Bumped/Compounded Wafer Carriages



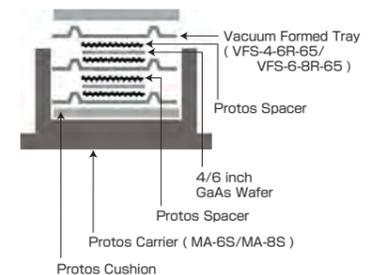
### Features

BWPS(Bumped Wafer Package System):  
By 1)fixing bumped / CCD wafer to vacuum formed tray in 2)wafer box, maximum of 12 wafers can be carried .

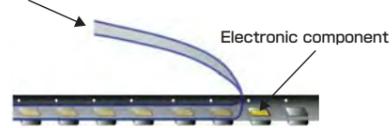
GWPS (GaAs Wafer Package System):  
By using the vacuum formed trays, protos spacers, cushions, in 2)wafer box; maximum of 25 GaAs wafers can be carried.

- 1)Wafer's pattern surface does not contact the tray directly.
- 2)Using Protos Carrier MA series

※ Patented



**Achilles Top Cover tape**



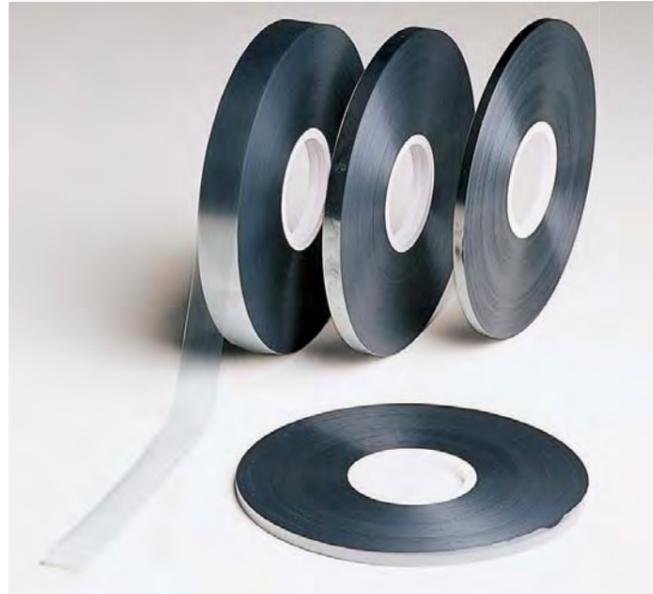
Various embossed carrier tapes

Achilles Top Cover Tape with its excellent antistatic characteristics and transparency provides various types of embossed carrier tapes with stable sealing property.

**Product name** ST-Cover Tape (Conductive)

**Product Code** ST-9 / ST-931

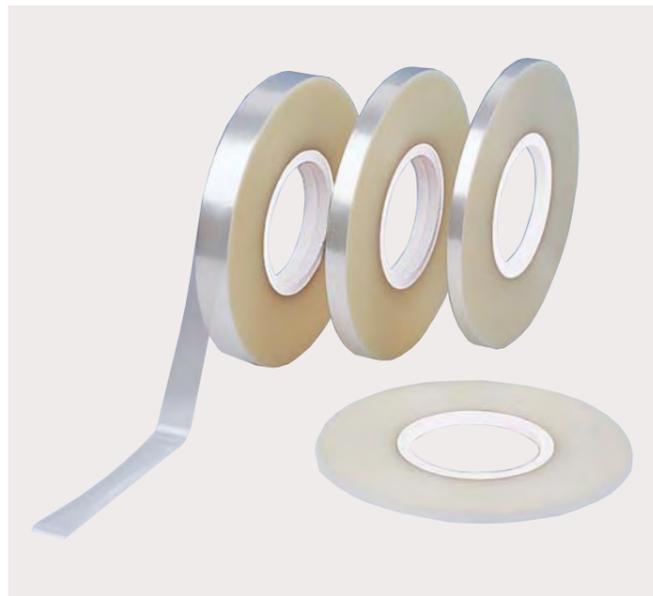
**Applications** Heat seal type top cover tape for embossed carrier tape.



**Product name** AS Cover Tape (Antistatic)

**Product Code** AS-20 / AS-931

**Applications** Heat seal type top cover tape for embossed carrier tape.



**Features** ● **Stable peeling property** can keep small chips components secure and avoid jumping problems.

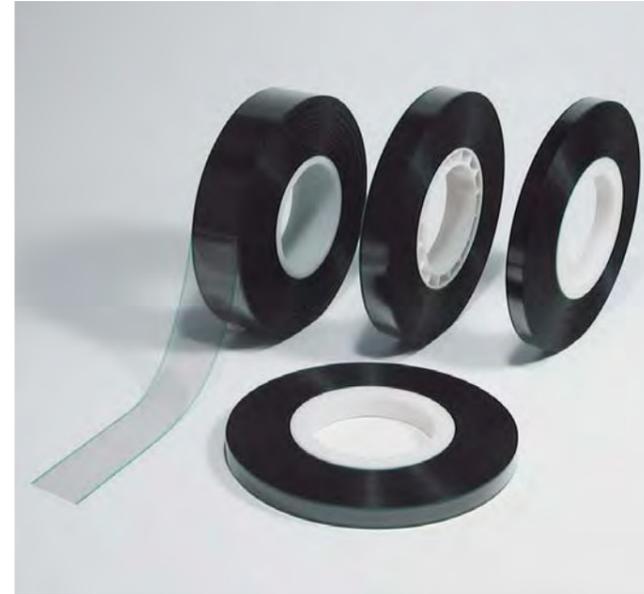
● **High transparency with little haze** enables recognition of IC chips even after they are taped to embossed carrier tape, facilitating efficiency for quality control purposes.

● **Excellent ESD protection** prevents electrification caused by peeling and friction which may lead to electrostatic damage or jumping to semiconductor parts. Conductive layer "ST-Poly" for ST-cover Tape; antistatic layer for AS cover tape makes this possible.

**Specification**

Product Code		ST-9 / ST-931	AS-20 / AS-931
Item	Unit	Conductive type	Antistatic type
Product Width	mm	*minimum width : 2.7 maximum width : 81.8	
*Roll Length	m	300 or 600 or 900	
Plastic Roll Core	inch	3	

\*We'll take your request



**Product name** ST-PSA Cover Tape (Conductive)

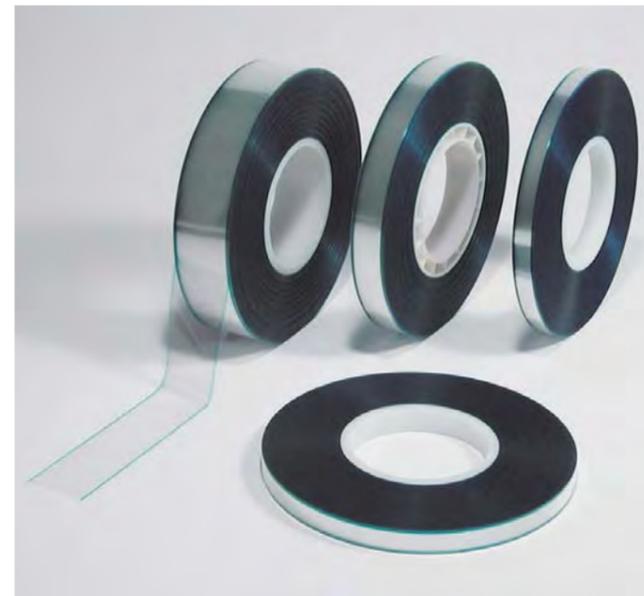
**Product Code** ST-PSA / STSI-PSA

**Applications** \*Adhesive type top cover tape for embossed carrier tape.  
\*adhesive:acrylic-base

**Product name** AS-PSA Cover Tape (Antistatic)

**Product Code** AS-PSA

**Applications** \*Adhesive type top cover tape for embossed carrier tape.  
\*adhesive:acrylic-base



**Features** ● **High ESD protection performance** prevents electrostatic damage or jumping problems to semiconductors from occurring.

● **Adhesive provides stable sealing properties** for a wide variety of embossed carrier tape base materials. No need for thermo-compressing (possibly cut energy costs). Easy to peel & re-tape.

● **Good transparency** enables easy inspection after taping, facilitating efficiency for quality control purposes.

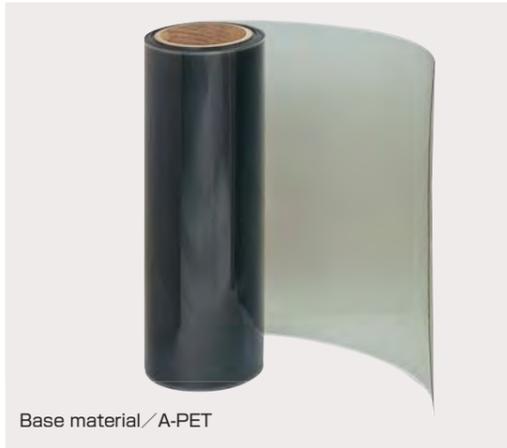
● **Good heat-resisting property** (STSI-PSA)

**Specification**

Product Code		STSI - PSA				ST-PSA / AS-PSA			
Item	Unit	Adhesive : Silicone-base				Adhesive: Acrylic-base			
Product Width	mm	5.4	9.3	13.3	21.3	25.5	37.5	49.5	
Roll Length	m	300 or 500							
Plastic Roll Cores	inch	3							

\*We'll take your request

## Conductive Sheets for Vacuum Forming

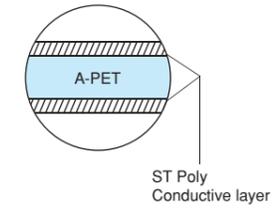


Base material / A-PET



Material / A-PET

### 【Composition】



**Product name** ST-A-PET

**Product Code** ST-1A

**Applications** ST-A-PET can be used as base material for trays to pack electronic components or embossed carrier tapes.

- Features**
- **Clean material** containing limited particles, out gassing, and ion contamination, and silicon-free.
  - **High transparency** makes it easy to recognize the components packed in trays.
  - **Made-to-order trays are also available upon request.**

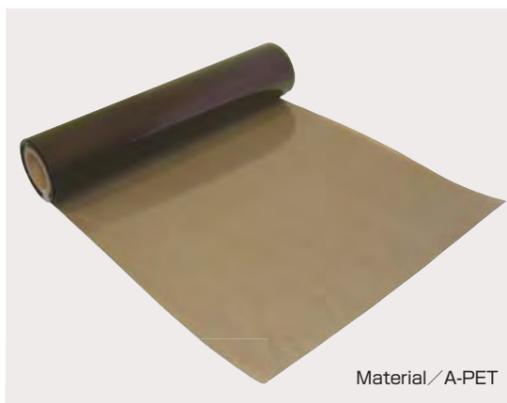
Specification	Thickness	Width	Length
	0.5mm	640mm	300m /roll
	0.65mm		200m /roll
	0.8mm		
	0.9mm		

**Surface Resistance**  $1.0 \times 10^6 \Omega$  or less (Base material; before vacuum forming)

### Characteristics / ST-A-PET

Item	Unit	*Value	Test method
Specific gravity	—	1.34	Inclination pipe density test
Heat resistance			
Tg	°C	77	DSC
Tc	°C	143	DSC
Tm	°C	240	DSC
Heat deformation point	°C	80	Vicat method
Tensile elasticity	MPa	1,842	JIS K 7113
Yield strength	MPa	46.1	JIS K 7113
Breaking strength	MPa	54.9	JIS K 7113
Elongation	%	680	JIS K 7113
Impact strength	N	970	Speed impact test
Absorptive capacity	%	0.4	

\*Representative values, not for guarantee

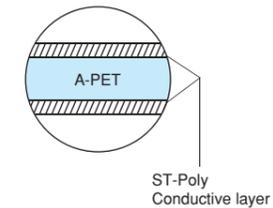


Material / A-PET



Trays

### 【Composition】



**Product name** STN-A-PET

**Product Code** STN-200

**Applications** STN-A-PET can be used as base material for trays to pack electronic components.

- Features**
- **Low-price conductive polymer sheet** useful for vacuum forming of trays.
  - **Stable surface resistance** even after vacuum forming.
  - **Brings out stable antistatic performance** independent of humidity.
  - **Good mold release** prevents blocking problem from occurring when vacuum formed or when trays (using STN-A-PET) are stacked.

Specification	Thickness	Width	Length
	0.5mm	640mm	350m /roll
	0.65mm		300m /roll
	0.9mm		210m /roll

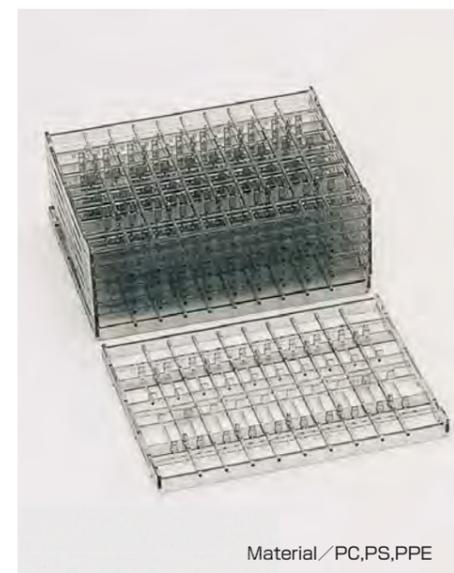
### Characteristics / STN-A-PET

Item	Unit	*Value	Test method
Specific gravity	—	1.34	—
Heat resistance			
Tg	°C	69	DSC
Tc	°C	137	DSC
Tm	°C	248	DSC
Tensile elasticity	MPa	756	JIS K 7113
Yield strength	MPa	58	JIS K 7113
Breaking strength	MPa	34	JIS K 7113
Elongation	%	477	JIS K 7113
Surface resistance	$\Omega$	$3.0 \times 10^9$	JIS K 6911
Surface resistance After elongation	150%	$3.0 \times 10^9$	JIS K 6911
	230%	$1.0 \times 10^9$	JIS K 6911
	440%	$4.0 \times 10^9$	JIS K 6911
Abrasion resistance	DRY grade	4~5	JIS L 0849
	WET grade	4~5	JIS L 0805
Light transmission	%	39	JIS K 7105

\*Representative values, not for guarantee

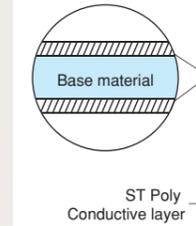
## Conductive Injection Molding Trays

ST-Poly can be applied not only to sheet and film but also injected into molding trays



Material / PC,PS,PPE

### 【Composition】



**Product name** ST-Poly Injection Trays

**Product Code** ST-10

**Applications** Trays to pack electronic components.

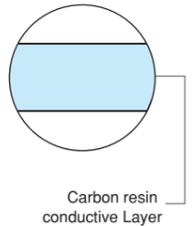
- Features**
- Base material is **clean with limited particles, out gassing, and ion contamination.**
  - **Suitable for clean room usages:** Less concerned about contamination when washing trays in the tank.
  - **Made-to-order trays** are also available upon request.

**Surface Resistance**  $1.0 \times 10^7 \Omega$  or less



Material / Conductive PC,POM

### 【Composition】



**Product name** CNT Injection molding trays

**Product Code** CNT-10

**Applications** Trays to pack electronic components.

- Features**
- Base material is clean with **limited particles, out gassing, and ion contamination.**
  - **Incorporated with carbon nanotube resin in base material which enhances durability** as conductive molding tray in washing processes.

**Surface Resistance**  $1.0 \times 10^4 \Omega \sim 1.0 \times 10^9 \Omega$

## Antistatic Protect Films



**Product name** ST-Protect Film

**Product Code** ST-2

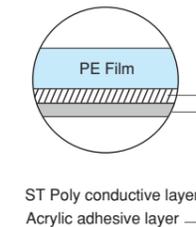
**Applications** Surface protection of display units such as LCD · PDP; Optical films and panels.

- Features**
- **Excellent ESD protection** prevents electrification due to peeling and friction and **high conductive performance** controls adhesion of particles to the film.
  - **High transparency** maintains clear visibility of the FPD screen after the film is installed.
  - **No contamination of bleeding** since no antistatic agent is contained in this film.

Specification	Product Name		ST-Protect film	AS-Protect film
	Thickness [μm]	Base film	60	60
	Adhesive	10	5	
Surface Resistance [Ω]	Base film	$7.8 \times 10^{13}$	$< 1.0 \times 10^{14}$	
	Adhesive	$3.5 \times 10^{10}$	$5.2 \times 10^9$	
Width [mm]		50~1,250	50~1,250	
Length [m]		100	100 or 200	

\*Representative values, not for guarantee

### 【Composition】



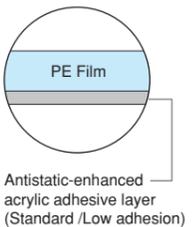
**Product name** AS-Protect Film

**Product Code** AS-30

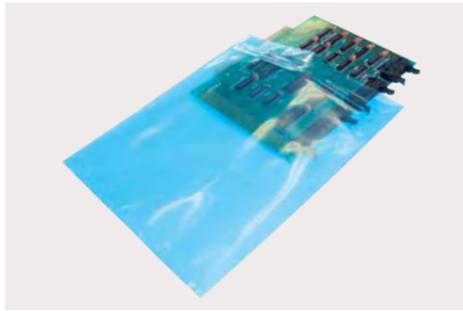
**Applications** Surface protection of display units such as LCD · PDP; Optical films and panels.

- Features**
- **Excellent ESD protection** prevents electrification due to peeling and friction and **high conductive performance** controls adhesion of particles to the film.
  - **High transparency** maintains clear visibility of the FPD screen after the film is installed.
  - **Unique acrylic adhesive minimizes glue left over** from peeled film.

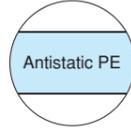
### 【Composition】



## Transparent Antistatic Bags



[Composition]



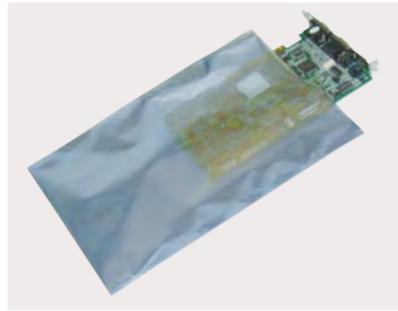
Product name **Skypoly bag**

Product Code **SKY-1**

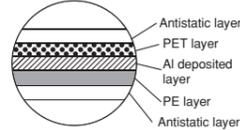
Applications For packaging of electronic parts.

- Features
- Antistatic
  - Transparent

## Electrostatic Shielding Bags



[Composition]



Product name **Al shield bag NV**

Product Code **AL-05**

Applications For packaging of electronic parts.

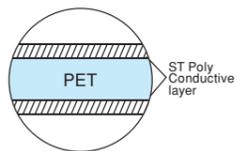
- Features
- Excellent ESD protection because of the antistatic outer/inner layer
  - Durability is enhanced by Al layer inserted between PET and PE layer
  - Minimum quantity for supplied: 100pcs

## Transparent Conductive Films



Material/ PET

[Composition]



Product name **ST-PET film**

Product Code **ST-8**

Applications Static shield screen for CRT monitor, surface shield cover, room divider for clean room and equipment.

- Features
- Suitable for clean room use; limited outgas, and ion contamination
  - High transparency

Surface Resistance  $1.0 \times 10^7 \Omega$  or less

Specification

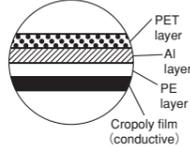
Thickness	*Width	Length	Packing
0.25mm	1000mm (effective conductive width:960mm)	20m/roll	1roll

\*The above shows typical example.Made-to-order films are also available.

## Moisture Vapor Barrier Bags



[Composition]



Product name **Al Damp proof Conductive Bag**

Product Code **AL-01**

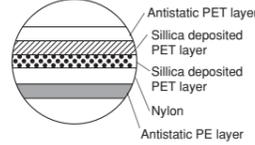
Applications For packaging of electronic parts.

- Features
- Conductive
  - Damp proof
  - 100% light proof & high electrostatic shielding property.

## Transparent Moisture Vapor Barrier Bags



[Composition]



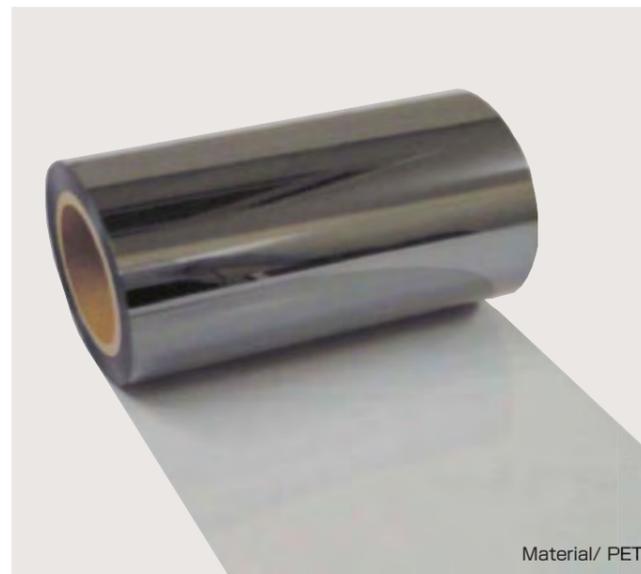
Product name **Silica deposited moisture barrier bag**

Product Code **Si-01**

Applications For packaging of electronic parts.

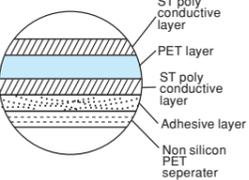
- Features
- Excellent protection from moisture & oxidation without using metalized film or metal foil.
  - Transparent
  - Easily disposable

## Conductive Adhesive Films



Material/ PET

[Composition]



Product name **ST-SF Film**

Product Code **ST-14-500-20**  
**ST-14-1000-20**

Applications Room divider for clean room, static control film for observation window used on equipment.

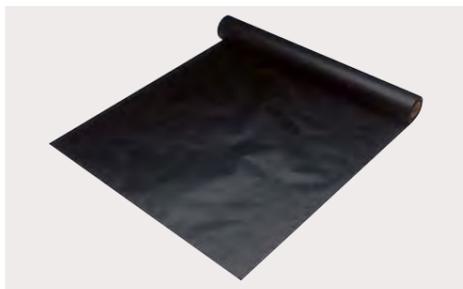
- Features
- Good antistatic property
  - Limited outgas, and ion contamination
  - High light transparency
  - Cost-effective

Surface Resistance  $1.0 \times 10^7 \Omega$  or less

Specification

Parts No.	Width	Length
ST-14-500-20	500mm	20M
ST-14-1000-20	1,000mm	20M

## Conductive Films



[Composition]



Product name **Cropoly film**

Product Code **E-100**

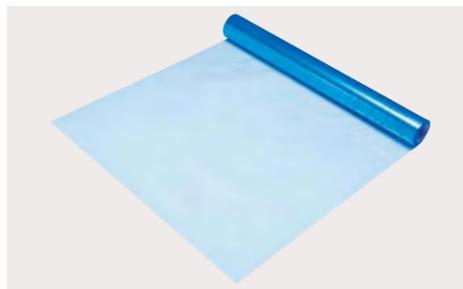
Applications For packaging of electronic parts.

- Features
- Excellent conductive property

Surface Resistance  $1.0 \times 10^6 \Omega$  or less

Specification	Thickness	Width	Length
	50μm	1,200mm	200m /roll
	100μm		100m /roll

## Transparent Antistatic Films



[Composition]



Product name **Skypoly film**

Product Code **SKY-4**

Applications For packaging of electronic parts.

- Features
- Antistatic property with transparency

Surface Resistance  $1.0 \times 10^{12} \Omega$  or less (23°C,60%RH)

Specification	Thickness	Width	Length
	50μm	1,200mm	200m /roll
	100μm		100m /roll

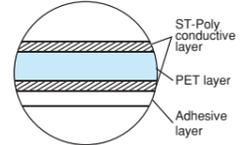
## Conductive Adhesive Tapes



Plastic(PP)

Material/ PET

[Composition]



Product name **IC Tape**

Product Code **ST-6**

Applications Packing tape for semiconductor devices.

- Features
- Good antistatic property
  - Clean material; Neither carbon materials nor contamination-causing agents are used.
  - Good ESD protection minimizes electrification caused by peeling of tape.
  - High Transparency

Surface Resistance  $1.0 \times 10^9 \Omega$  or less(conductive side)

Specification

Width	Length	Shipping unit
15mm	50m/roll	40rolls/carton
50mm	50m/roll	12rolls/carton

## Soft Partition Films

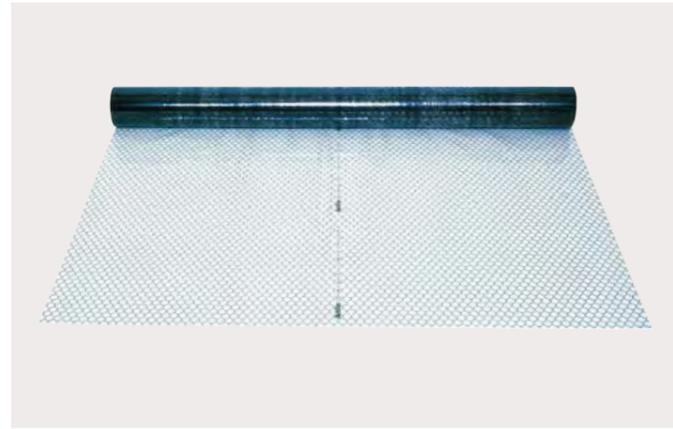
**Product name** Achilles Seiden F

**Applications** For partition purposes in areas where high level ESD protection is needed, as in clean rooms.

**Features**

- **Unique \*conductive printed design** on surface of flexible PVC film.  
\*There are 2 types. One side or both sides printing design. Surface resistance level of  $10^6\Omega/\square$  (JIS K-6911).
- **Good transparency**
- **Flame Retardant grade 2** (in accordance with JIS A-1322 test method)

Specification	Product Name Achilles Seiden F			
	Conductive printing		Achilles Seiden F	
Color	One side		Both sides	
Thickness [mm]	0.1	0.3	0.5	0.3
Width [cm]	137	137	137	137
Length [M]	50	30	20	30
Oxygen index (In accordance with JIS K-7201)	Over 27			



**Product name** Achilles Seiden Crystal

**Applications** For partition purposes in areas where high level ESD protection is needed as in clean rooms.

**Features**

- **Maintains high \*antistatic property** by using our original PVC formulation technology.  
\*Surface resistivity level of  $10^{10}\Omega/\square$  (JIS K-6911).
- **Good transparency**
- **Flame Retardant grade 2** (in accordance with JIS A-1322 test method).

Specification	Product Name Achilles Seiden Crystal					
	Color Clear					
Thickness [mm]	0.10	0.3	0.5	1.0	2.0	3.0
Width [cm]	183	137/183	137		120	
Length [M]	50	30	20	10	10	10
Oxygen index (In accordance with JIS K-7201)	Over 26					



**Product name** Achilles Yellow Seiden-F, Achilles Seiden-F UV Guard

**Applications** For partition purposes or for areas where high level ESD protection and UV guard is needed, as in clean rooms.

**Features**

- **High UV guard property** as well as maintaining base properties of Achilles Seiden-F (conductive & flame retardant).

Specification	Product Name Achilles Yellow Seiden-F Achilles Seiden-F UV Guard	
	Color Yellow	
Thickness [mm]	0.3	0.3
Width [cm]	137	122
Length [M]	30	30
Oxygen index (In accordance with JIS K-7201)	Over 28	Over 29



**Product name** Achilles Seiden Crystal UV

**Applications** For partition purposes or for areas where high level ESD protection and UV guard is needed, as in clean rooms.

**Features**

- **High UV guard property**, as well as maintaining base properties of Achilles Seiden-crystal (antistatic & flame retardant).

Specification	Product Name Achilles Yellow Seiden Crystal UV	
	Color Yellow	
Thickness [mm]	0.3	
Width [cm]	137	
Length [M]	30	
Oxygen index (In accordance with JIS K-7201)	Over 26	

**Product name** Achilles Black Seiden F, Achilles Seiden Crystal UV

**Applications** For partition purposes in areas where high level ESD protection & shading property is needed as in clean rooms.

**Features**

- **Excellent \*shading property**  
\*100% shading
- **Maintains property of base film;**

Specification	Product Name Achilles Black Seiden F Achilles Seiden Crystal UV	
	Color Black	
Thickness [mm]	0.3	
Width [cm]	137	
Length [M]	30	
Oxygen index (In accordance with JIS K-7201)	Over 26	
Base properties	conforms to Achilles Seiden F	conforms to Achilles Seiden Crystal UV



**Product name** Achilles Flarre

**Applications** For partition purposes in areas where high flame retardant property is needed.

**Features**

- **Transparent flexible PVC film.**
- **Flame Retardant grade 2** (in accordance with JIS A-1322)
- **Passes flammability MVSS test No.302**

Specification	Product Name Achilles Flarre				
	Color Clear				
Thickness [mm]	0.15	0.3	0.5	1.0	
Width [cm]	183	183/137	183	91.5/137	
Length [M]	50	30	30	10	
Oxygen index (In accordance with JIS K-7201)	Over 27				



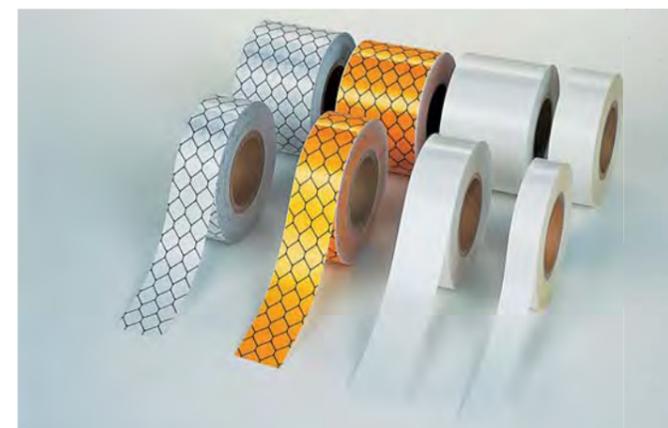
**Product name** Achilles Flarre Insect Guard

**Applications** For partition purposes in areas where high flame retardancy and insect guard properties is needed.

**Features**

- **High insect guard property** while maintaining base properties of Achilles Flarre (flame retardant)

Specification	Product Name Achilles Flarre Insect Guard		
	Color Orange		
Thickness [mm]	0.3	0.5	1.0
Width [cm]	183	137	137
Length [M]	30	20	10
Oxygen index (In accordance with JIS K-7201)	27		



**Product name** Achilles Vinitape

**Applications** Supplements for curtain-partitioned cleanrooms or cleanbooths, mark for alert areas.

**Features**

- **Adhesive tape**
- **Easy installment**
- **Antistatic & flame retardant.** Since it uses the same vinyl film for base, it will not impair the necessary performances of the curtain itself.

Specification	Product Name Vinitape			
	Corresponding PVC film	Seiden-F	Yellow Seiden-F	Black Seiden-F
Color	Clear	Yellow	Black	
Width [mm]	50 or 100	50 or 100	50	
Length [M]	50			

**Warning** Should be grounded when in use.

Do not use solvent-based cleaners which may damage printing surface.

(For Achilles Seiden-F, Achilles Yellow Seiden-F, Achilles Yellow Seiden-F UV guard, Achilles black Seiden F)

When Achilles Yellow Seiden-F is used, may become sticky over time because of UV. In such a case, replace it with a new one.

## ESD Shoes



Product name IC Shoes 101 slip-on type

Product Code ICI-1010

Color Ivory white



Product name IC Shoes 102 T-strap type

Product Code ICI-1020

Color Ivory white



Product name IC Shoes 103 Hook and Loop type

Product Code ICI-1030

Color Ivory white



Product name IC Shoes 105 Hook and Loop type

Product Code ICI-1050

Color Ivory white

### Features

- **Suction- cup-shaped heel bottoms absorbs the shock** of heel strike at landing and reduces burden to your foot.
- **Unique Sole "Heal Gap Design"** provides comfortable movement, emphasizing on workability and walk-ability.
- **Stable electro-conductivity** according to JIS T 8103 test method.
- **Air ventilation holes** on toes and both sides of the shoe provide superior comfort.
- **Anti-bacterial deodorant finish** provides refreshing comfort and keeps shoes clean.
- **Anti-slip soles design** enhances resistance to slipping.
- Its durable and **keeps its shape intact after machine washing.**

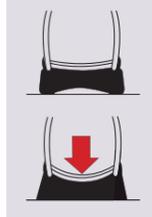
### Warning

Wash in water no hotter than 40°C.  
Danger of electric shock when a metal piece is stuck to sole, or when sole is worn out.

## ESD Safety Shoes



structure of cushion



Product name Work Up

Product Code OKS-0040

Color Ivory white

Features Plastic protector guards toe. (Soles and uppers aren't protected)

## ESD Safety Slipper

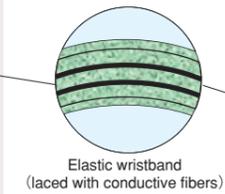


Product name IC Slipper

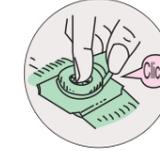
Product Code ICS-0200

Color Brown

## Wrist strap



Elastic wristband (laced with conductive fibers)



Easy to put on and take off due to the pushbutton latch.



Product name Color Wrist NV

Product Code D-053

Applications For static controlled areas such as electronic parts assembling or inspection areas.

Specification Banana plug with alligator clip, detachable alligator clip

Features ● **Most cost effective in the industry** by optimizing supply sources of materials  
● Can be **shipped in small lots.**  
● Specifications in accordance with IEC61340-5-1/5-2

Packing Unit 20sets / shipment

**Warning** Avoid using bleaching agent when washing straps. For human protection, there is 1MΩ of resistance set at resin part of coiled cord. Do not attempt to modify the resistance as it may cause electric shock.

Product name One-Touch Wrist

Product Code D-051

Applications In static controlled area such as electronic parts assembling or inspection area

Specification Push hook, banana plug with alligator clip, maximum 2M long coiled cord.

Packing Unit 50sets / carton

## Ground Wires



Material:Antistatic ABS

Product name

Ground-wire

Product Code

SKY-8E

Applications

For grounding conductive mats and floor material

Features

● Easy to ground

Specification Lead wire with stainless steel plate

Length	Packing Unit
2m	10 pcs /case

Product name Ground-wire with Banana Jack

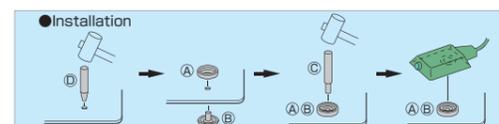
Product Code D-070

Applications Ground-wire for conductive mat

Features ● **Can ground both the antistatic table mat and wrist strap at the same time.**  
● **Can connect to the wrist strap with banana plug through banana jack.**

Specification Lead wire which has 1MΩ resistance

Length	Packing Unit	Accessories
2m	10pcs / carton	(A) snap hook(female) 10 pcs (B) snap hook(male) 10 pcs (C) hitting rod 2 pcs (D) punch 2 pcs



Accessories



Product name

Conductive Plate

Product Code

SKY-8T

Applications

For conduction of joint parts for installation of conductive floor materials.

Features

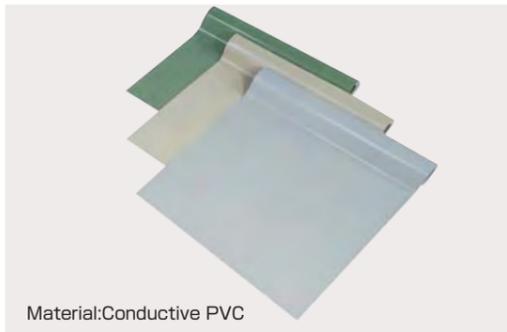
● Easy to connect

Specification Stainless steel tape with adhesive.

Packing Unit
20 pcs /case



## Floor Mats



- Green(9725C)
- Beige(9724C)
- Gray(9726C)

Material:Conductive PVC

**Product name** Elefeel Floor

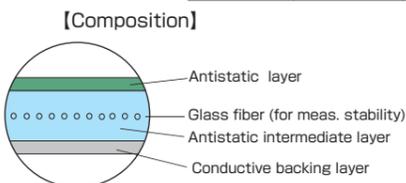
**Product Code** SKY-20W

**Applications** Flooring material for clean rooms or rooms for assembling of semiconductor/electronic components.

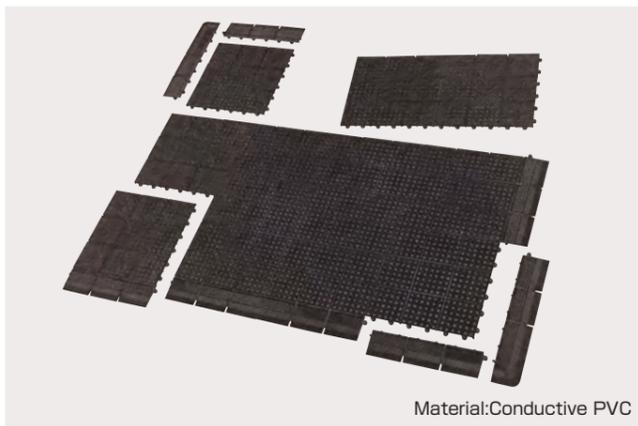
- Features**
- Conforming with **clean room class of 100/SCC(F)**
  - Excels in **abrasion resistance and load bearing capacity.**
  - Maintains **stable leak resistance** using high performance antistatic agents.

**EPA grounding resistance**  $1.0 \times 10^5 \leq R \leq 1.0 \times 10^8 \Omega$  (Conforms with IEC61340-4-1)

Specification	Thickness	Width	Length	Packing Unit
	2mm	1,820mm	10M/roll	1roll



## Conductive Unit Floor Mats



Material:Conductive PVC

**Product name** J Floor

**Product Code** J-100

**Applications** For the preparation of clean room space and working/storage areas where a lot of relocation work is involved.

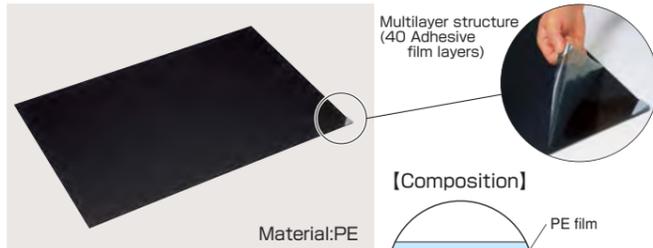
- Features**
- Easy to join and rejoin the mats.
  - Conforming with **clean room of class 1000.**

**EPA grounding resistance**  $R \leq 1.0 \times 10^8 \Omega$  (Conforms with JIS A 1454)

Specification	Dimensions			Packing Unit
	Thickness	Width	Length	
Body	10mm	300mm	300mm	36 pcs / carton
Corner Material: L type (Male, Female)	10mm	75mm	375mm	8 pcs / carton
Corner Material: S type (Male, Female)	10mm	75mm	300mm	20 pcs / carton

**Warning** Floor should be grounded with connector cable when in use.

## Sticky Mats for Clean Room



Material:PE

**Product name** ST Clean Mat

**Product Code** ST-4

**Applications** Mat to remove dusts/dirts from shoes mainly in clean rooms.

- Features**
- Multi adhesive film layer
  - Mat's base conductive material(ST poly) **controls generation of static electricity, minimizing generation of dust** when the PE film is removed.

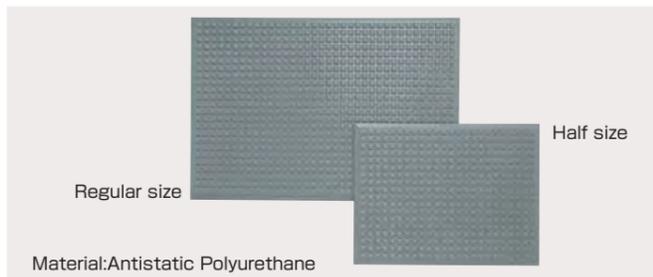
Specification	Width	Length	Layers	Packing Unit
	600mm	900mm	40layers/mat	5mats / 1 case

**Physical properties**

Item	Unit	※1 Value	Test method / Remarks
Thickness	μm	70	PE film layer: 60 μm Adhesive layer : 10 μm
Surface Resistance	Ω	$5.0 \times 10^{10}$	Measured the adhesive side. Used high resistance tester
Adhesive strength (against SUS)	N / 25mm	1.47	JIS Z 0237
Backside peeling strength	N / 25mm	2.00	JIS Z 0237
Ball tack	30 degrees	2	JIS Z 0237
Peeling electrification	V	Less than 20	※2
Static decay time (Applied Voltage±5V)	Sec.	Less than 1	Adhesive side. FTMS-101C-4046(20°C 15%RH) (±5V→0V)

※1 Representative value, not guarantee.  
※2 Use the sample at 25°C×40%RH. Then measure static electricity generated after peeling it in 1~2 seconds

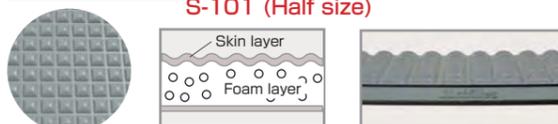
## Antistatic Cushion Mats



Material:Antistatic Polyurethane

**Product name** Sofmat D

**Product Code** S-100 (Regular size)  
S-101 (Half size)



**Applications** For areas where workers work in a standing position, and for cold areas.

- Features**
- Eases **foot fatigue** with adequate softness.
  - Good **heat insulation** and prevents heat loss from cold floors.
  - ESD protection

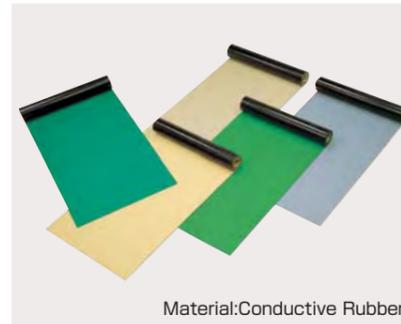
**EPA grounding resistance**  $5.0 \times 10^9 \Omega$  (Conforms with JIS A 1454)

**Hardness** 70° (C-type rubber hardness tester)

Specification	Dimensions			Packing Unit
	Thickness	Width	Length	
Product Code				
S-100 (Regular size)	18mm	618mm	910mm	5pcs / carton
S-101 (Half size)	16mm	473mm	618mm	5pcs / carton

**Warning** For securing stable conductivity, use the mat on conductive flooring material which is grounded.

## Conductive Table Mats



Material:Conductive Rubber

**Product name** PF Color Seiden Mat

**Product Code** SKY-50

**Applications** Working tables and storage shelves requiring ESD protection.

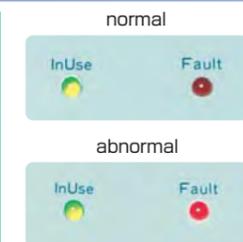
- Features**
- Excellent strength, dimensional stability, and flatness owing to reinforced cloth.
  - Specially treated surface **reduces the reflection of light.**
  - In accordance with **phthalate ester instructions, meets criteria 2005/84/EC**

**EPA grounding resistance**  $1.0 \times 10^6 \leq R \leq 1.0 \times 10^8 \Omega$  (Conforming with IEC61340-5-1/5-2)  
\*Use ground wire SKY-8E(sold separately).Ground the mat from back (black) side.



Specification	Thickness	Width	Length	Packing Unit	Accessories
	1.5mm	1,000mm	10M/ roll	1roll	SKY-8E/ Ground cables 2sets SKY-8T/Conductive plates 2pcs

## Wrist Strap Monitoring System



- warning with buzzer
- (Detail of 1 set of accessory)
- ① AC adaptor ——— 1
  - ② Earth wire ——— 1
  - ③ Banana plug ——— 1
  - ④ Instruction manual ——— 1

**Product name** Wristalarm

**Product Code** D-001

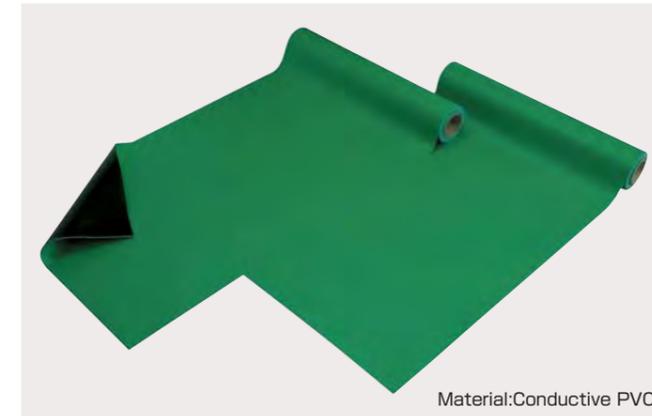
**Applications** Wrist strap monitor

- Features**
- Full-time monitoring
  - Notifies disconnection/, bad connection, and abnormality of grounding

**Packing Unit** 10sets / carton

**Accessories/set** AC adaptor, grounding wire, banana plug

Specification	Voltage	AC adaptor DC 7.5V (AC 100V,50/60Hz)
	Condition in use	Temp 10~40°C
	Sensitivity adjustment	Humidity 80%RH or less
	Dimension	With adjustment knob(15 rotations)
	Weight	72 × 92 × 27.5mm
	Material of case	90g
		ABS resin(Anti static)



Material:Conductive PVC

**Product name** Elefeel Mat NV

**Product Code** SKY-40

**Applications** Working tables and storage shelves requiring ESD protection.

- Features**
- Focused on **cost effectiveness** while maintaining high quality conductive mats.

**EPA grounding resistance**  $1.0 \times 10^6 \leq R \leq 1.0 \times 10^8 \Omega$  (Conforming with IEC61340-5-1/5-2)

\*Use ground wire SKY-8E(sold separately).Ground the mat from back (black) side.

Specification	Thickness	Width	Length	Packing Unit
	1.5mm	910mm	10M/ roll	1roll



Test method



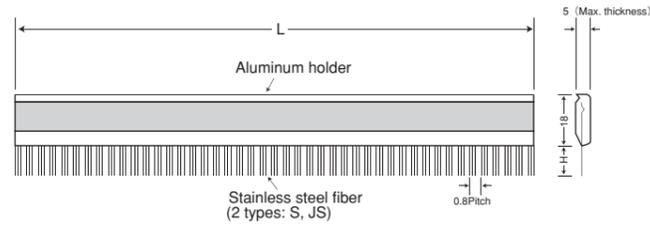
Easy testing with a single switch

**Product name** Wristalarm checker

**Product Code** D-080

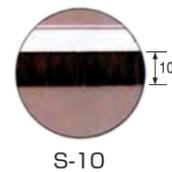
**Packing** 1set/1carton

## Static Dissipating Brushes



Product Code	L mm	H mm	Packing Unit
2S-800	800	10	10 pieces or more
2S-1000	1000		
2S-1200	1200		
2S-1500	1500	50	
2S-1800	1800		
2S-2100	2100		

\*JS type is binded electrode



※Remarks  
**S-10**  
 Electrode length  
 Regular electrode  
**JS-20**  
 Electrode length  
 Binded electrode

**Product name** Non Spark

**Product Code** NSP 2S

**Applications** Static dissipating brush for printers or film/paper production (note that brush should be grounded when in use).

**Features**

- **Efficient static dissipation as the brush is self discharging type**
- **Made-to-order brushes** are also available upon request.
- **JS series brush to be installed in upward direction** because of a stiff electrode.

**Warning** Clean the brush regularly, as dust accumulation may impair static dissipation capabilities.

## Ionizers



**Product name** Static Mate

**Product Code** RS-10N

**Applications** Eliminates static electricity by blowing ionized air. Air is ionized by High voltage AC corona discharge.

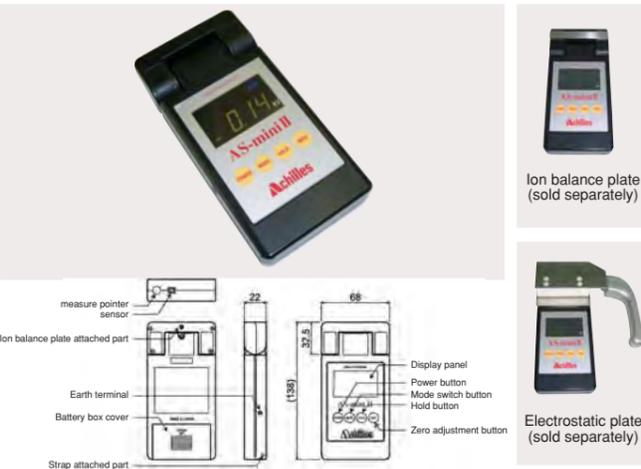
**Features**

- **Ion balance auto self-control system** (within  $\pm 10V$ )
- **Alarm is initiated in case ion-balance exceeds self-control limit.**
- **LED lamp is lit and buzzer sounds in case electrode becomes unclean or air filter is clogged.**
- **Easy to clean electrodes** because of easy access of front opened panel.
- **Easily replaceable electrodes** by adopting pin connectors.
- **Ozone free design allows odorless operation** (Ozone concentration of RS-10N: 0.003ppm or less)

**Warning** When at humidity over 65%RH; Ion balance may not be controlled within normal range.

**Caution** This is a non-explosion proof equipment. Do not use where solvents, flammable gasses or powders are handled.

## Electrostatic Voltmeters



**Product name** AS mini II

**Product Code** AS-20

**Applications** Handheld electrostatic voltage measuring device

**Features**

- **Contactless measuring instrument.**
- **Capable of checking offset voltage (ion balance) for ionizer** by 1V with balance plate (sold separately)
- **Rotary sensor head enables measurements in narrow spaces or from transfer lines.**
- **Bright and large LCD.**
- **Precise measurement with easy operation.**

**Warning** Do not place it near a charged object to avoid electric discharge. It may lead to device failure.

**Caution** This is a non-explosion proof instrument. Do not use where solvents, flammable gasses or powders are handled.

## Conductive Clear Files



Opening part : 2 sides  
Base material : PP

**Product name** STN File

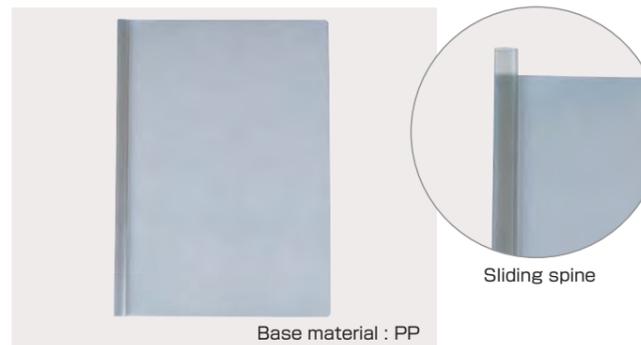
**Product Code** STN-100

**Applications** To store documents within ESD protected area.

**Features** ● **Excellent conductive properties.**

Specifications	Size	Packing Unit
	A3, A4, B4, B5	100pcs / carton

## Conductive Clear Folders



Sliding spine

Base material : PP

**Product name** STN Clear Folder

**Product Code** STN-120

**Applications** To store documents within ESD protected area.

**Features** ● **Excellent conductive property**

Specifications	Size	Packing Unit
	A4	50pcs / carton

## Conductive Hook and Loop Fasteners



**Product name** ST Hook and Loop fastener

**Product Code** ST-20

**Applications** To band together packaging trays for electronic components, etc. For clean room curtain fastener.

**Features**

- **Excellent antistatic performance.**
- **Easy opening and secure closing.**
- **Durable.**
- **Can be used in heat ovens.** (Satisfies surface resistance spec. under severe conditions of continuous heating 150°C x 100hrs)

Specifications	Material	Color	Width	Lengths
Fastener	Conductive Polyester	gray or green	16mm, 20mm, 25mm, 50mm, 100mm	25M / reel
Reel	Antistatic PS or paper			

## Conductive Binders



Base material : PP

**Product name** ST Binder

**Product Code** ST-745-A4

**Applications** To store documents within ESD protected area.

**Features**

- **Excellent conductive property.**
- **Clean material** : low outgas, low particle
- **Easy to separate** stainless steel ring and main body, **easy to dispose, and eco-friendly.**

Specifications	Product Code	Size	Base material (PP) Thickness	Binder width	Packing Unit
	ST-745-A4	A4	0.75mm	45mm	20pcs/carton

## Conductive Clip Boards



A4 : vertical

A4 : horizontal

Base material : PC, 3.0mmt

**Product name** ST Clip Board

**Product Code** ST-15

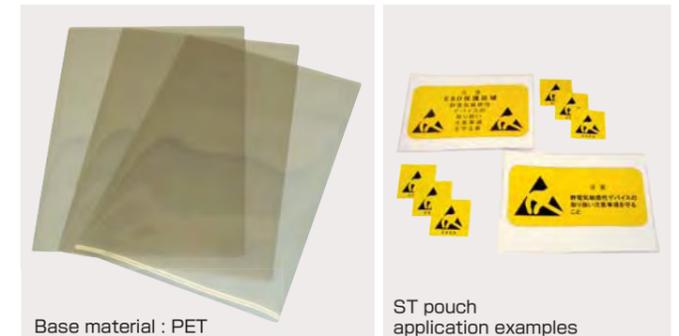
**Applications** To store documents within ESD protected area.

**Features**

- **Excellent conductive properties.**
- **Low outgas, low particle, and low ion contamination.**

Specifications	Size	Packing Unit
	A4 Vertical	20pcs / carton
	A4 Horizontal	20pcs / carton

## Conductive Pouches



Base material : PET

ST pouch application examples

**Product name** ST pouch

**Product Code** ST-21

**Applications** To store signs or documents within ESD protected area.

**Features**

- **High transparency**
- **Prevents dust generation** from paper.

Specifications	Size	Packing Unit
	A4	50pcs / case