3M

Static Control Products and Services Catalog

It's a Matter of Control.

3M™ Static Control Solutions

A Reputation of Trust. Over the past 100 years, 3M has become widely recognized as a world leader in product innovation. Our ability to combine core technologies has allowed more than 55,000 3M products to become an important part of everyday in many markets, including electronics, industrial, automotive, medical and consumer.

The Experts in Static Control. The need for static protection to drain electrostatic charges from personnel and materials is well accepted in many industries. It is of particular importance with the handling and protection of precision high-tech products such as disk drives, semiconductors, flat panel displays and other electronics. From air ionization to monitoring, flooring and shipping materials, 3M provides complete solutions to meet the challenge of electrostatic discharge (ESD) and adverse environmental conditions during handling and transportation.

It's a Matter of Control.

Assembly

Test

Assembly

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Test

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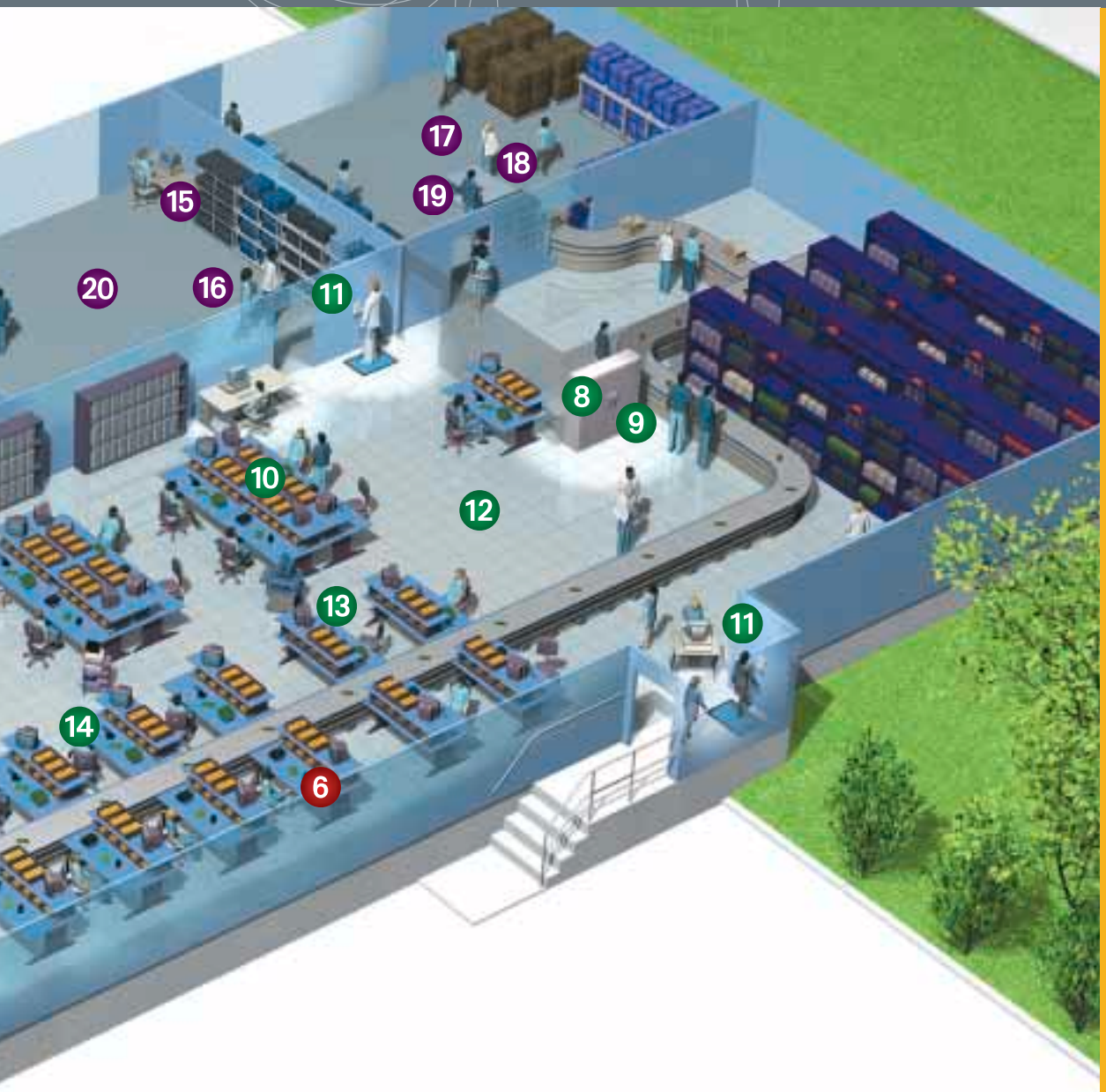
ESD PROTECTION FOR YOUR ENTIRE FACILITY

3M provides comprehensive solutions to protect your operation from electrostatic discharge every step of the way. The illustration above demonstrates where our products can help. Follow this chart, then turn to that page in this catalog for a complete listing of products in that category available from 3M.

ASSEMBLY

ESD protection in manufacturing and assembly is a critical area that requires a successful static control management system. 3M offers a complete line of grounding and static-protective products for use during these processes. From personnel to worksurfaces, floors, and packaging, 3M has you covered.

Packaging



TEST

Electrical overstress in components caused by ESD can result in either a catastrophic failure or a shortened life of the component. Damaged or destroyed devices typically are found in final testing, while weakened devices often result in a field failure. 3M™ monitoring systems can record ESD events in real time, providing instant notification of static-control equipment failures.

PACKAGING

Degraded or weakened devices that pass all factory tests, but then fail after they have reached the customer are a very expensive problem. 3M provides customers with value-added solutions for protecting devices from static and physical damage during material handling, storage and transport.

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A full range of products. Full-service solutions.






THE NEED FOR COMPLETE STATIC CONTROL SOLUTION

In an increasingly technological age, electrostatic discharge (ESD) is more than just an annoyance, it can be costly or even dangerous. In static-sensitive environments, ESD can damage sensitive electronic components, attract contaminants in clean environments or cause problems when handling films or small parts.

The cost of ESD-damaged electronic devices alone adds up, but the additional loss of production time is significant as well. Clearly, opportunities exist for significant improvements in reducing losses to ESD and static electricity.

GLOBAL SUPPORT FROM THE INDUSTRY LEADER

3M has built a global network of resources with the ability to address your needs on local, regional and international levels. With each facility in your operation, our experienced team works with you one-on-one to evaluate each step in the process to accurately provide a static control solution uniquely suited to meet your needs. 3M is your single source for fast, customized solutions anywhere in the world.

VALUE-ADDED SERVICES THAT SET US APART

Our products are designed to be reliable and dependable, but it is our customer services that truly demonstrate our extended value to you. To help you reduce your total cost of ownership, 3M offers a long list of value-added services, including local warehousing, custom make-to-order, just-in-time manufacturing (JIT), electronic funds transfer, web PO, EDI, extranet services for key customers, on-site training and more.

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Section Pages

Static Control Workstation Solutions

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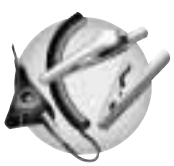
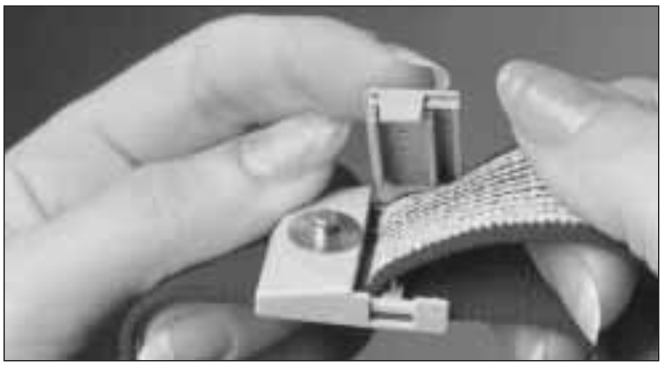
3M™ Electrostatic Discharge (ESD) Workstation Solutions provide a safe environment for the handling and assembly of sensitive components. These products drain static charge from personnel, limit the buildup of static charges on non-conductive materials on the benchtop, and monitor the system to ensure that it is operating properly. These various components can be configured to work together providing optimal protection for your application.






Adjustable Fabric Wrist Straps (Single Conductor)

3M™ Adjustable Wrist Straps are the front line of defense in all static control processes. Provide a comfortable, custom fit with these adjustable wrist straps. One size adjusts to any size wrist to provide reliable, 360 degree protection. These wrist straps feature a band made of a silverplated, monofilament, continuous thread woven together with elastic nylon to assure full conductivity, comfort and reliability, while providing rapid and continuous drain of static charge. Adjustability also simplifies ordering procedures and inventory control by eliminating the need to order and stock several band sizes. A one megohm resistor is built into the ground cord. All wrist strap sets include an alligator clip, which fits over the installed banana jack on the ground cord, to provide an alternative ground attachment method. Available with 4 mm snap end. Adjustable bands fit wrist circumference up to 9.0" (228, 6 mm).



Adjustable Wrist Strap for Single Conductor Cords

LISTED

Product No.	Description
2204	Adjustable Fabric Wrist Band, made of knitted fabric, in burgundy color.
2214	Fabric Wrist Band with coiled cord. 5 ft. (1,5 m) practical extended length with burgundy adjustable fabric band.
2224	Fabric Wrist Band with coiled cord. 10 ft. (3,0 m) practical extended length with burgundy adjustable fabric band.

Product No.	Description
2271	Economy Adjustable Fabric Wrist Band is made of stretch weave fabric, blue color with white trim.
2272	Economy Adjustable Wrist Band with coiled cord. 5 ft. (1,5 m) practical extended length, blue color with white trim.

Fixed Size Metal Wrist Straps (Single Conductor)

3M Metal Wrist Straps feature quality Speidel™ metal expansion bands for durability and comfort. Each link is covered with an insulative plastic cap. Compatible with the 3M™ Wrist Strap Ground Cords 2210, 2220 and 4610/4611.

Three sizes are available: small for wrists from 4.5 in. to 6 in. (114 mm to 152 mm) in circumference; medium for wrists from 5.5 in. to 7.25 in. (140 mm to 184 mm); and large for wrists larger than 6.5 in. (165 mm). All wrist strap sets include an alligator clip, which fits over the installed banana jack on the ground cord, to provide an alternative ground attachment method. Available with 4 mm snap end.

3M™ Wrist Band 2205 Series

Product No.	Description
2205	Bulk pack of 25 metal wrist bands. (Small)
2206	Bulk pack of 25 metal wrist bands. (Medium)
2207	Bulk pack of 25 metal wrist bands. (Large)

Adjustable Thermoplastic Wrist Straps

The 3M™ Adjustable Wrist Straps 4600 Series feature a thermoplastic band with an integrally molded conductive interior. The wrist strap utilizes an easy on/easy off adjustable "zipper" style latching mechanism and is available with 4 mm snaps and 5 ft. ground cords. (10 ft. ground cord available with 4 mm snap only.) All wrist straps and cords include alligator clips.

Product No.	Description
4610	Ground Cord, Coiled, 5 ft. (1,5 m), 4 mm snap end.
4611	Ground Cord, Coiled, 10 ft. (3,0 m), 4 mm snap end.

Wrist Band 4600 Series shown with ground cord and alligator clip

Product No.	Color	Description
4620	Blue	Wrist Band with 4 mm stud.
4650	Blue	Wrist Band with 5 ft. coiled cord, 4 mm stud.

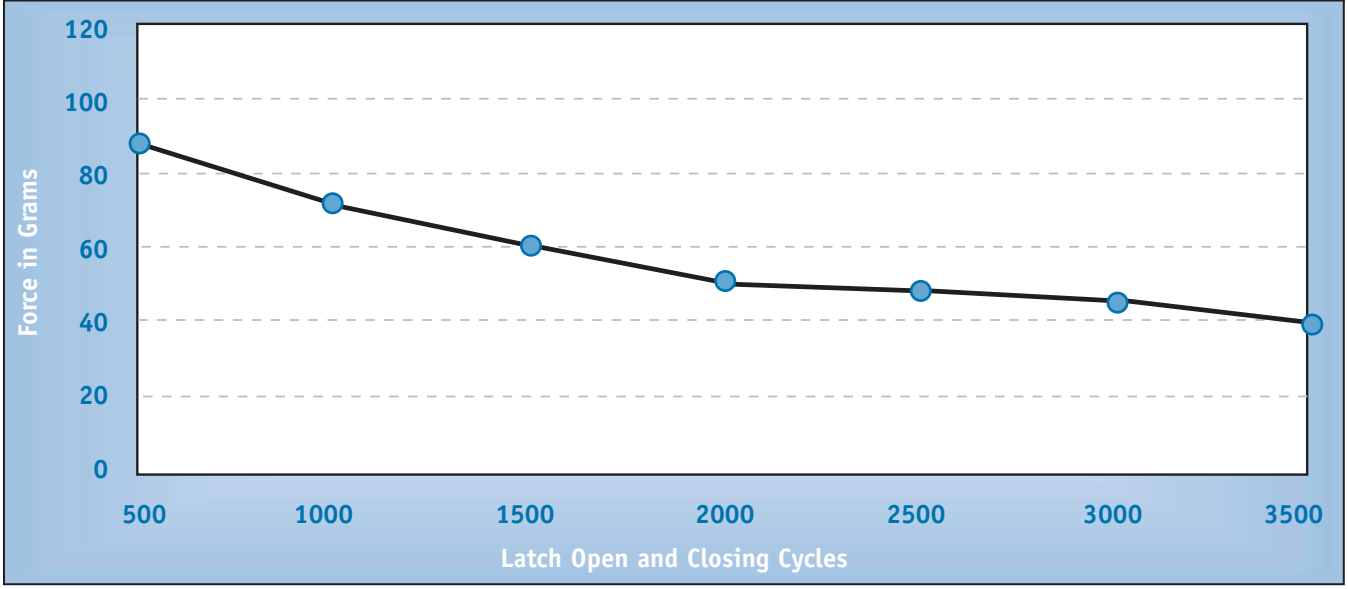
Grounding Cord 4600 Properties

Grounding Cord	Typical Value
Tensile Strength	> 15 lbs. (6,8 kg)
Average Termination flex life per ESD S1.1 and MIL-PRF-87893	> 200,000 flexes
Resistance End-to-end	1M K ± 20%
Resistor Type	1M K -metal film ± 20%

Wrist Band 4600 Properties

Wrist Strap	Typical Value
Wrist Band Size	Adjustable, small/large, trim to size 1.7 to 2.7 in dia. (43,2 mm to 68,6 mm)
Resistance - Inside/Outside> 100M K	
Cleanable	Water/mild detergent or 10% isopropyl solution

Latch Durability 4600 Series



Wrist Strap Ground Cords

3M™ Wrist Strap Ground Cords 2210, 2220 and 4610 Series are highly durable with segmented strain relief, and a single bundle of tinsel conductors laced for great strength and reinforced with strong synthetic fibers. These features provide long cord life and easy movement. Each cord has a 1 megohm resistor molded into the snap end. All wrist straps and cords include alligator clips.

Ground Cord 2210

Ground Cord 4610 (includes Alligator Clip not shown)

Product No.	Description
2210	Ground Cord, coiled 5 ft. (1,5 m) practical extended length.
2220	Ground Cord, coiled 10 ft. (3,0 m) practical extended length.
4610	Ground Cord, Coiled, 5 ft. (1,5 m), 4 mm snap end.
4611	Ground Cord, Coiled, 10 ft. (3,0 m), 4 mm snap end.

⚠ Warning on all wrist strap products:

A one megohm resistor is molded into 3M Wrist Strap Ground Cords. DO NOT REMOVE. If it becomes damaged, replace ground cord immediately. These products are not to be used in areas where the individual may come in contact with exposed electrical circuitry exceeding 250 Volts AC.

These products are for static control. They will not reduce or increase your risk of receiving electrical shock when using or working on electrical equipment. Follow the same precautions you would use without wrist straps, including:

- Make certain that equipment having a grounding type plug is properly grounded.
- Make certain that you are not in contact with grounded objects other than through the 3M Wrist Strap.

Disposable Wrist Straps

The 3M™ Disposable Wrist Strap 2209 provides cost-effective and reliable static protection. The wrist strap is ideally suited for shipment along with components and devices, such as memory upgrades, sound cards, etc., to provide protection at the receiving end. It may also be used for short-term use in the plant for visitors and others who don't need the durability of a reusable strap.

At the end that wraps around the wrist, a hypoallergenic adhesive provides 360-degree contact with the skin to minimize skin-to-band resistance. At the other end, the conductive adhesive on the copper foil tape adheres to any convenient electrical ground. A current-limiting resistance is fabricated into the plastic ribbon below the wrist band.

Each Disposable Wrist Strap 2209 is individually packaged in a clear poly envelope. Custom printing is available by special order.

Disposable Wrist Strap 2209

Disposable Wrist Strap 2209

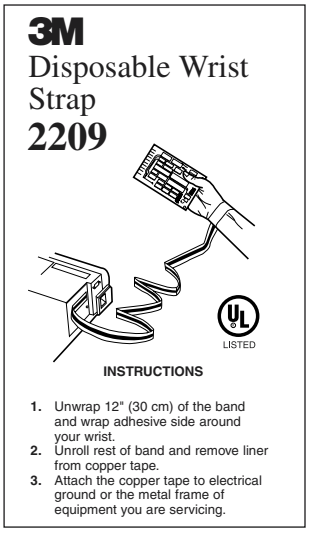
LISTED

Product No.	Description
2209	Disposable Wrist Strap.

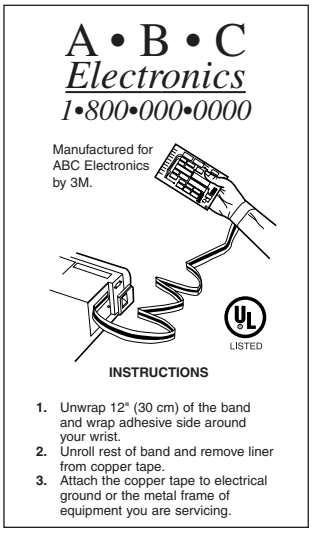
Custom envelope imprinting is available.

2209 Properties

Item	Typical Properties
Ground/Bonding End	Copper foil with conductive adhesive on both attached to conductive ribbon.
Conductive Ribbon	Flexible conductive film, with fabricated current limiting resistance near wrist band end. Conductive ribbon enclosed in non-woven adhesive tape.
Wristband End	Conductive ribbon with exposed hypo-allergenic adhesive along each side of conductive ribbon
Practical Working Length	4 ft. (1,2 m)
Electrical Resistance End to End	1.0 to 5.0 Megohms



Standard envelope



Custom envelope example

Disposable Shoe Grounding Assembly

3M™ Disposable Shoe Grounding Straps 2045 provide a reliable path for static charge to drain to ground when personnel are wearing shoes with insulative soles.

The shoe grounding straps are especially desirable in work situations where personnel must move around – wave soldering, automatic insertion or operation of sensitive computerized equipment. To be effective, the shoe grounders must be worn on both feet.

Product No.	Description
2045	Disposable Shoe Grounding Straps. (100 per box). One size fits all low cut shoes.

Disposable Shoe Grounding Straps 2045

⚠ Warning:

The Disposable Shoe Grounding Strap 2045 is not to be used in areas where the individual may come in contact with exposed electrical circuitry exceeding 120 Volts AC.

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life.

Toe Grounding Assembly

Designed for use with high-heeled shoes, the 3M™ Toe Grounding Assembly 2053 grounds personnel when they are in contact with conductive/dissipative flooring. A comfortable elastic ankle strap and 12-inch (30,5 cm) long conductive ribbon for insertion into the shoe complete the ground path to the operator. To be effective, the shoe grounders must be worn on both feet. Available with a 1 megohm resistor.

Product No.	Description
2053	Toe Grounding Assembly with a 1 megohm resistor.

Toe Grounding Assembly 2053

⚠ Warning:

The Grounding Assembly 2053 is not to be used in areas where the individual may come in contact with exposed electrical circuitry exceeding 250 Volts AC.

Heel Grounding Assembly

The 3M™ Economy Heel Grounder 2044—a cup-style heel grounder with a high visibility "yellow glow" strap that helps facility supervisors effectively manage their static control program. With the Economy Heel Grounder 2044, supervisors may now see at a single glance whether employees are properly wearing their heel grounding assemblies, and ensure their company is protected against static damage. Dependable and cost-efficient, the Heel Grounder 2044 effectively grounds mobile personnel when they are in contact with conductive and dissipative flooring, and should be an integral part of any static control system in the workplace.

In addition to the bright yellow coloring, the Heel Grounder's cup construction satisfies customer need for durability, while the one-inch width of the ankle strap material is designed with a "one size fits all" conformity of fit that will accommodate a wide variety of shoe shapes and sizes.

Shoe Grounding Assembly 2044

The 3M™ Shoe Grounding Assembly 2051 effectively grounds mobile personnel when they are in contact with conductive and dissipative flooring. The conductive, no-slip outer sole provides a reliable static ground. After being trimmed to a desired length, an extra-long contact ribbon is inserted between the shoe and sock. The function of the Shoe Grounding Assembly depends upon foot perspiration in the shoe to sustain electrical contact between the conductive ribbon and the body. The Shoe Grounding Assembly 2051 comes with a one megohm resistor.

Shoe Grounding Assembly 2051

Product No.	Description
2044	Economy Shoe Grounding Assembly with a 1 megohm resistor.
2051	Shoe Grounding Assembly with a 1 megohm resistor.
2056	Non-marking Shoe Grounding Assembly with a 1 megohm resistor.

*To be effective, shoe grounders must be worn on both feet.

⚠ Warning:

The 3M Heel Grounding Assemblies 2044, 2051 and 2056 Series are not to be used in areas where the individual may come in contact with exposed electrical circuitry exceeding 250 Volts AC.

The 3M™ Non-Marking Shoe Grounding Assembly 2056 reliably grounds mobile personnel when they are in contact with conductive and dissipative flooring. The non-marking conductive, carbon-free, non-slip outer layer provides a dependable static ground while the inner layer provides a non-marking surface for the shoe. After being trimmed to a desired length, an extra-long contact ribbon is inserted between the shoe and sock. The function of the heel grounding assembly depends upon the foot perspiration in the shoe to sustain electrical contact between the conductive ribbon and the body. The Shoe Grounding Assembly 2056 is designed with a one megohm resistor.

Non-marking Shoe Grounding Assembly 2056

Wrist Strap / Continuous Workstation Monitor Applications Chart

Function	Monitors				
	3M™ Equipment Ground Monitor 791E	3M™ Wrist Strap Monitor 791W	3M™ Static Monitor 790	3M™ Wrist Strap Workstation Monitor 724	3M™ Wrist Strap Monitor 725
					
Monitors one wrist strap					•
Monitors two wrist straps		•	•	•	
Monitors worksurface to ground connections	•			•	
Monitors equipment ground	•				
Monitors person's voltage		•	•		
Monitors wrist strap resistance				•	•
Uses dual conductor wrist strap		•	•	•	•
Logs data	•	•			
Feature					
Audible alarms	•	•	•	•	•
Visual alarms	•	•	•	•	•
Portable			•		•
Wrist band type					
Regular (Dual conductor)				•	•
VM Series (Dual conductor)		•	•		
Housing					
Stainless steel	•	•			
Anodized steel				•	
Dissipative plastic			•		•

Wrist Strap / Continuous Workstation Monitor Compatibility Chart

Wrist Band		Monitors			
Description	Model No.	3M™ Wrist Strap Monitor 791W (voltage type)	3M™ Static Monitor 790 (voltage type)	3M™ Wrist Strap Workstation Monitor 724 (resistance type)	3M™ Wrist Strap Monitor 725 (resistance type)
Fabric Wrist Band, Adjustable, Dual Conductor	2368			•	•
Fabric Wrist Band, Adjustable, Dual Conductor	2368VM	•	•		
Metal Wrist Strap with 5' Dual Conductor Cord, Small	2381			•	•
Metal Wrist Strap with 5' Dual Conductor Cord, Small	2381VM	•	•		
Metal Wrist Strap with 5' Dual Conductor Cord, Medium	2382			•	•
Metal Wrist Strap with 5' Dual Conductor Cord, Medium	2382VM	•	•		
Metal Wrist Strap with 5' Dual Conductor Cord, Large	2383			•	•
Metal Wrist Strap with 5' Dual Conductor Cord, Large	2383VM	•	•		
Metal Wrist Band, Dual Conductor Cord, Small	2384			•	•
Metal Wrist Band, Dual Conductor Cord, Small	2384VM	•	•		
Metal Wrist Band, Dual Conductor Cord, Medium	2385			•	•
Metal Wrist Band, Medium	2385VM	•	•		
Metal Wrist Band, Large	2386			•	•
Metal Wrist Band, Large	2386VM	•	•		
Dual Conductor Wrist Band, Blue 4	4720	•	•	•	•

Size Key:

Small—for wrists $4^1/_2$"–6"
Medium—for wrists $5^1/_2$"–$7^1/_4$"
Large—for wrists >$6^1/_2$"

Equipment Ground Monitor

The 3M™ Equipment Ground Monitor 791E is a time saving, cost effective solution for maintaining the new standards of static control safeguards through a reliable, automated data acquisition, logging, and reporting system.

Developed with the requirements of disk drive and semiconductor facilities in mind, this new continuous monitoring system communicates with the building monitoring system already in the workplace, offering early electrostatic discharge (ESD) detection of grounding problems. This saves your company valuable time and money caused by faulty or improperly grounded equipment. The monitor also allows for easy data collection, which in turn gives supervisors the information they need to make adjustments and improvements to the present ESD program by either replacing equipment or offering specialized ESD training for employees.

The 3M Equipment Ground Monitor 791E was developed as a modular cost-efficient system, thus allowing your company to purchase only the units required for your specific static control applications.

The 3M Equipment Ground Monitor 791E provides three channels to continuously measure the ground connections of manufacturing equipment and ESD worksurfaces.

Product Features

- Modular design
- Data output
- Small and compact size
- Stainless steel case
- Visual and audible alarms
- Regulatory compliance: UL and CE

Equipment Ground Monitor 791E

Product No.	Description
791E	Equipment Ground Monitor Monitor includes: • Equipment Ground Monitor 791E • Adapter 791AC (available without AC Adapter) • 5-Wire Connector • 3M™ Dual Lock™ Mounting Fasteners • Chassis Ground Cord 791CG

Product No.	Description
Accessories	
791AC	AC Adapter
791CG	Chassis Ground Cord
2390	10' Mat Ground Cord
791EVK	Verification Kit
791D6	6x6 Data Output Cord

791E Properties

Item	Typical Properties
Monitor Size	1.3 x 6.3 x 3.3 in. (33 x 160 x 84 mm), approximate H x W x D
Power Supply Requirements	
Input	120 Vac ±10% (North America)
Outside North America	(As required)
Output	18 Vdc @ 100 mA rated load
Output Plug Polarization	Center negative
Output Plug Dimensions	5,5 mm x 2,1 mm x 9,5 mm (OD x ID x l)
Self-Ground Monitoring	Five-wire quick disconnect screw terminal; 1 ohm ±20%
Measurement Voltage	Low Range : < 1 Vdc; High Range: < 12 Vdc
Measurement Current	Low Range : < 1 mA; High Range: < 1 uA
Data Output Jack	RJ-11 style; 10 foot cable (optional)
Environmental Operating Conditions	
Temperature	Max. 104°F (40°C); Min. 50°F (10°C)
Humidity	Max. 75% relative humidity
Accuracy	
Fixed	Low range 1K ± 20%; High range 5 M K ± 5%
Adjustable	Low range 1K to 100K ± 20% High range 5 M K to 35 M K ± 5%
Self-Ground Monitor (Mon)	1K – 20%

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Voltage Wrist Strap Monitor

The 3M™ Voltage Wrist Strap Monitor 791W is a time saving, cost effective solution for maintaining the new standards of static control safeguards through a reliable, automated data acquisition, logging, and reporting system.

Developed with the requirements of disk drive and semiconductor facilities in mind, this new continuous monitoring system communicates with the building monitoring system already in the workplace, offering early electrostatic discharge (ESD) detection of wrist strap problems. This saves your company valuable time and money caused by faulty or improperly worn wrist straps. The monitor also allows easy data collection, which in turn gives supervisors the information they need to make adjustments and improvements to the present ESD program by either replacing equipment or offering specialized ESD training for employees.

The 3M Voltage Wrist Strap Monitor 791W was developed as a modular cost-efficient system, thus allowing your company to purchase only the units required for your specific static control applications.

The Voltage Wrist Strap Monitor 791W is capable of grounding and monitoring two dual conductor wrist straps that plug into two separate remotes. The monitor simultaneously provides continuous monitoring of two operators by comparing the voltage on the operators to one of four internal voltage levels (1V, 3V, 6V, and 9V).

Product Features

- Modular design
- Data output
- Small and compact size
- Stainless steel case
- Visual and audible alarms
- Regulatory compliance: UL and CE
- VM and metal bands are to be used specifically with the 791W Monitor

Voltage Wrist Strap Monitor 791W

Product No.	Description
791W	Voltage Wrist Strap Monitor Monitor includes: • 791W Voltage Wrist Strap Monitor • 791AC AC Adapter (available without AC Adapter) • 791WR Wrist Strap Remote • 791D6 Remote Interface Cable (10') • 791CG Chassis Ground Cord • 2-Wire Connector • 3M™ Dual Lock™ Mounting Fasteners

Product No.	Description
Accessories	
791AC	AC Adapter
791CG	Chassis Ground Cord
791WVK	Verification Kit
791WR	Wrist Strap Remote
791D10	10x10 Data Output Cord
3057	Stand By Jack
	Dual Conductor Bands and Cords (see page 8 for additional information on wrist band and cord combinations.)

791W Properties

Item	Typical Properties
Monitor Size	1.3 x 6.3 x 3.3 in. (33 x 160 x 84 mm), approximate H x W x D
Power Supply Requirements	
Input	120 Vac ±10% (North America)
Outside North America	(As required)
Output	18 Vdc @ 100 mA rated load
Output Plug Polarization	Center negative
Output Plug Dimensions	5,5 mm x 2,1 mm x 9,5 mm (OD x ID x l)
Self-Ground Monitoring	Two-wire quick disconnect screw terminal; 1 ohm ±20%
Wrist Strap Remotes	Stainless steel; 10' cables (detachable); RJ-11 style mounting with 3M Dual Lock Fasteners
Data Output Jack	RJ-45 style; 10 foot cable (optional)
Environmental Operating Conditions	
Temperature	Max. 104°F (40°C); Min. 50°F (10°C)
Humidity	Max. 75% relative humidity
Accuracy	
Input	1V ± 15%; 3V, 6V and 9V ± 10%
Ground Disconnect	1K ± 20%
Analog Output	Voltage 1-5 Vdc ± 10%, 4-20 mA ± 10%

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Static Monitor

The 3M™ Static Monitor 790 is a cost efficient unit that is small, compact and versatile in its usage, and may be mounted directly onto device handling equipment, testers, and auto insertion equipment.

Housed in static dissipative plastic, the Static Monitor 790 works by measuring the voltage potential on a person referenced to earth ground. The monitor uses a slide switch allowing the user to select the voltage level necessary for the specific job function being performed.

The Static Monitor 790 has two wrist strap input jacks located on its front, which allows two operators to use one monitor unit at a workstation simultaneously. Power is supplied to the unit through an AC adapter.

Three distinct alarms make it easy to identify operators and the type of fault condition. The audible alarm can be adjusted to a low or high level to overcome background noise from other equipment that may be in use in the area. Ring terminals on the end of the unit's ground and chassis cords provide a permanent connection.

Product Features

- Audible and visual alarms
- Compact system
- Select voltage alarm levels of 1V, 3V, 6V & 9V
- Static-dissipative plastic housing
- Mounts easily to ESD worksurface
- Regulatory Compliance: UL & CE
- VM fabric and metal bands are to be used specifically with the Static Monitor 790

Static Monitor 790

Product No.	Description
790	Static Monitor Monitor includes: • 790 Static Monitor • 790AC Adapter (available without AC Adapter) • 3M™ Dual Lock™ Mounting Fasteners • 2-Wire Connector

Product No.	Description
Accessories	
790MP	Mounting Plate for 790 (10 per package)
790VK	Verification Kit
3057	Stand By Jack
	Dual Conductor Bands and Cords (see page 8 for additional information on wrist band and cord combinations.)

790 Properties

Item	Typical Properties
Monitor Size	3.5 x 4.0 x 1.25 in. (8,9 x 10,2 x 3,2 cm), approximate H x W x D
Power Supply Requirements	
Input	120 Vac ±10% (North America)
Outside North America	(As required)
Output	25 Vdc @ 50 mA rated load
Output Plug Polarization	Center negative
Output Plug Dimensions	5,5 mm x 2,1 mm x 9,5 mm (OD x ID x l)
Accuracy	(The following parameters are valid for altitudes up to 2000 m. Pollution degree 2, Class 3, Equipment)
Voltage Detection Levels	(1V ±15%) (3V, 6V, & 9V ±10%)
Ground Disconnect	10 ohms ±20%
Environmental Operating Conditions	
Temperature	Max. 104°F (40°C); Min. 50°F (10°C)
Humidity	Max. 75% relative humidity

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Static Monitor

The 3M™ Wrist Strap Workstation Monitor 724 continuously verifies the resistance of the operator and worksurface ground connections. The monitor uses a reliable resistance method that actually includes the operator's skin resistance to determine if the system is operating properly. If the operator's resistance exceeds pre-set levels of 10 megohms or 35 megohms, or the wiring connections exceed 3.7 megohms, audible and visible alarms are triggered. The unit will also warn of potentially dangerous low-resistance situations. A switch allows the user to select either a 9V or 16V test voltage, and 10 megohms or 35 megohms resistance setting.

The monitor uses the light, compact dual conductor wrist strap (purchased separately; see page 16). Dual conductors provide the resistance circuit that is monitored and grounding redundancy. If one conductor fails, the other will still function to prevent sensitive components from being exposed to static.

The Wrist Strap Workstation Monitor 724 monitors a visitor to the workstation or a second operator. In addition, the loudness of the alarm is adjustable. A quick connect/disconnect Dual Remote 732 comes with the Wrist Strap Workstation Monitor.

Wrist Strap Workstation Monitor 724 pictured with 3M™ Dual Remote 732, 3M™ Dual Conductor Wrist Band 4700 and the 3M™ Dual Conductor Cord 2360. (Ground Cord and band not included)

c UL us LISTED CE

Product No.	Description
724	Workstation Monitor complete with a quick connect/disconnect 732 Remote Jack and mounting hardware.

Manufactured in ISO 9002 registered facility.
Packaged with Certificate of Conformance.

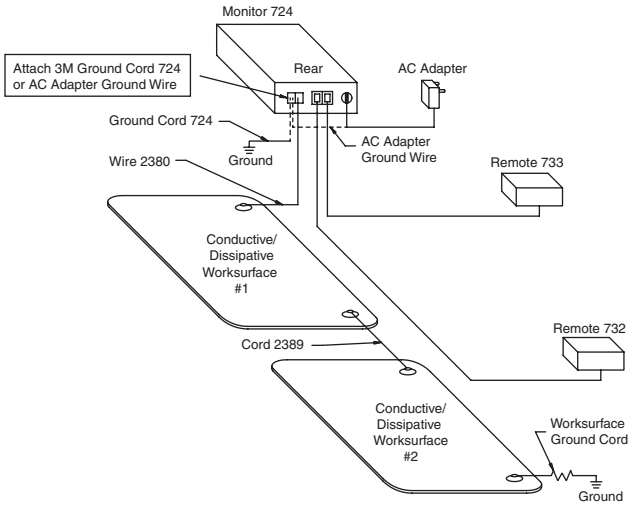
724 Properties

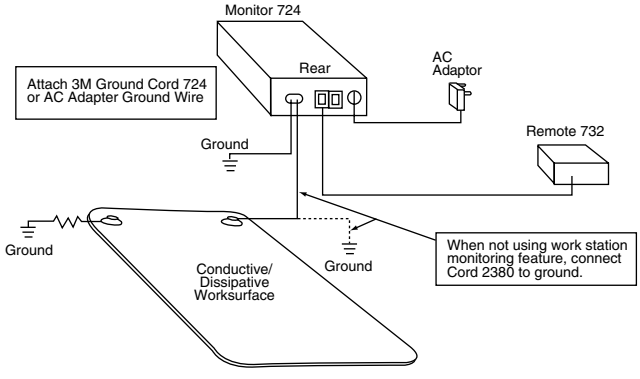
Item	Typical Properties
Dimensions	6.5 x 3.125 x 1.375 in. (16,5 x 7,9 x 3,5 cm)
Power Supply	25 Vdc @ 50 mA minimum
Test Voltage	9 Vdc or 16 Vdc (Switch selectable)
Test Current	Less than 3 microamps
Upper Resistance Limits	Wrist Strap: 10 or 35 Megohms Switch selectable Worksurface: 3.7 Megohms
Lower Resistance Limit	Wrist Strap: 1.5 Megohms Worksurface: None
Accuracy	± 15%
Environmental Operating Conditions	
Temperature	Max. 110°F (43°C) Min. 50°F (10°C)
Humidity	Max. 75% R.H.
Accessories	Model 733 Remote Splitter Kit Model 3057 Stand-By Jack

Note: Only use 3M Dual Conductor Bands and Cords with Monitors 724 and 725. 3M workstation monitors were designed to work with the 3M Worksurfaces 8200, 8300 and 8800 Series. Other types of mats may cause the "Mat" lamp on the monitor to light. This is due to a high electrical resistance between the grounding snaps.

The worksurface ground resistance circuit of the 3M workstation monitor indicates a malfunction when the ground loop resistance exceeds 3.7 megohms. To determine if your mat is within this limit, perform the following procedure using an ohmmeter.

Measure the resistance between the snap on the mat, where you intend to connect the monitor mat cord (2380), and the ground point for the mat. Be sure the mat is connected to ground.





Dual Conductor Portable Wrist Strap Monitor

The 3M™ Wrist Strap Monitor 725 is a small, compact, battery-powered unit that continuously monitors both the worker and the worker's wrist strap. The monitor uses a reliable resistance method that includes the worker's skin resistance to determine if the system is operating properly. The monitor uses the same dual conductor wrist strap as used with the 3M™ Workstation Monitor 724. In addition, the monitor 725 also monitors the ground wire connection and battery level.

The Wrist Strap Monitor 725 immediately alerts the individual when a wrist strap is operating improperly. The monitor 725 continuously supplies a current that is returned through a wrist band and cord that contain two separate independent conductors.

The monitor is a compact, portable, battery-powered unit with a visual and an audible alarm. A "parking plate" mounted on the monitor 725 allows an individual to disconnect the ground cord and clip it to the parking plate to "silence" the alarm when moving from one work area to another. The 3M™ Belt Clip 723 is available as an accessory item and may be purchased separately.

The competitively priced Wrist Strap Monitor 725 can be used in manufacturing and field service environments. By contributing to the protection of static sensitive devices and printed circuit boards from static damage, the monitor can save money and time as a result of improved yield rates and lower field service costs.

The Wrist Strap Monitor 725 is manufactured in an ISO 9002 registered facility and ships with a Certificate of Conformance.

Product No.	Description
725	Personal and portable Wrist Strap Monitor for use in manufacturing and field service environments. The monitor 725 features wrist strap monitoring and grounding for ESD mats/work surfaces. Accessory belt clip 723 converts the monitor into a portable/personal monitor.
723	Accessories: Belt Clip 723 Size, in. (cm) 2.5 x 2.625 x 1.125 (6,4 x 6,7 x 2,9)

725 Properties

Item	Typical Properties
Dimensions	2.5 x 2.6 x 1.1 in. (6,4 x 6,6 x 2,8 cm)
Power Supply	9 Volt alkaline battery (Not supplied)
Test Voltage	9 Vdc maximum
Test Current	Less than 1 microamp
Upper Resistance Limits	Wrist Strap: 35 Megohms Ground Clip: 10 Megohms
Accuracy	± 15%
Environmental Operating Conditions Temperature Humidity	 Max. 110°F (43°C), Min. 50°F (10°C) Max. 75% R.H.
Accessories	Belt Clip 723

Wrist Strap Monitor 725

c UL us LISTED CE

Note: Only use 3M Dual Conductor Bands and Cords with the Monitor 725. See page 8 for additional information on wrist band and cord combinations.

Belt Clip 723

Product Referral Generator

Verification Kits 724VK and 725VK..... pg. 14

Monitor Verification Kits

The 3M™ Verification Kits 724VK and 725VK were designed to check the wrist strap input resistance ranges of the 700 Series Workstation, Wrist Strap, and Worksurface Monitors. The 3M™ Verification Kit 790VK contains hardware items for connecting to the 3M™ Static Monitor 790, that are recommended when performing the verification procedure. Use of this kit allows for reliable connections to the Monitor 790. In addition to this kit, a DC power supply and resistance substitution box are required (supplied by user). See instruction manual for complete details. The 3M™ Verification Kits 791EVK and 791WVK are used with the 3M™ Equipment Ground Monitor 791E and 3M™ Workstation Monitor 791W.

Verification Kit 724VK

Verification Kit 725VK

Verification Kit 790VK

Verification Kit 791EVK

Product No.	Description
724VK	Verification Kit Six 1% Resistor Plugs and Case
725VK	Verification Kit Four 1% Resistor Plugs and Case
790VK	Verification Kit One 5' 2360 dual conductor cord, one test wrist band socket assembly, and one two-wire male connector with 24" lead wire.
791EVK	Verification Kit
791WVK	Verification Kit

724VK Properties

Item	Typical Properties
Test Plug #1	Resistor, Metal Film, 1.33 Megohms ± 1%, 1/4 Watt
Test Plug #2	Resistor, Metal Film, 1.69 Megohms ± 1%, 1/4 Watt
Test Plug #3	Resistor, Metal Film, 8.45 Megohms ± 1%, 1/4 Watt
Test Plug #4	Resistor, Metal Film, 11.5 Megohms ± 1%, 1/4 Watt
Test Plug #5	Resistor, Metal Film, 29.4 Megohms ± 1%, 1/4 Watt
Test Plug #6	Resistor, Metal Film, 40.2 Megohms ± 1%, 1/4 Watt

725VK Properties

Item	Typical Properties
Test Plug #1	Resistor, Metal Film, 29.4 Megohms ± 1%, 1/4 Watt
Test Plug #2	Resistor, Metal Film, 40.2 Megohms ± 1%, 1/4 Watt
Test Plug #3	Resistor, Metal Film, 4.99 Megohms ± 1%, 1/4 Watt
Test Plug #4	Resistor, Metal Film, 11.5 Megohms ± 1%, 1/4 Watt

Verification Kit 791WVK

Dual Conductor Remote Input Jacks

The 3M™ Remote Input Jack 732 may be purchased as a replacement part for the 3M™ Workstation Monitor 724. It provides two phonejacks – one for the primary worker and one for use by visitors to the work area. The 3M™ Remote Splitter Kit 733 may be purchased for use in conjunction with the Workstation Monitor 724. It offers the versatility of grounding and monitoring two workers at independent workstations that are in close proximity. The units feature a quick "connect/disconnect" system.

Remote Input Jack 732

Remote Splitter Kit 733

Product No.	Description
732	Replacement Remote Input Jack for the 724 Workstation Monitor. 6 ft. (1,8 cm) long cord. **Size, in. (cm)** 3.188 x 1 x 1.5 (8,1 x 2,5 x 3,8)
733	Remote Splitter Kit, 6 ft. (1,8 cm) long cord. **Size, in. (cm)** 3.188 x 1 x 1.5 (8,1 x 2,5 x 3,8)

Monitor Stand-By Jack

The 3M™ Monitor Stand-by Jack 3057 allows an operator to disconnect a ground cord from the wrist band and leave the workstation without deactivating the Workstation Monitor 724 or the 3M™ Static Monitor 790. Simply detach the cord from the wrist band and plug it into the 3M Stand-by Jack 3057.

Product No.	Description
3057	Stand-By Jack.

Stand-By Jack 3057

Monitor/Table Mat Replacement Cord

The 3M™ Monitor/Table Mat Replacement Cord 2380 extends from the Workstation Monitor 724 to the static-control worksurface to be monitored.

The 3M™ Monitor/Table Mat Interconnect Cord 2389 is a 10 ft. straight cord with male snap fasteners at each end. It is used to interconnect two monitored worksurfaces together.

Product No.	Description
2380	Monitor/Table Mat Replacement Cord, 6 ft. (1,8 m).
2389	Monitor/Table Mat Interconnect Cord, 10 ft. (3 m).

Note: These cords do not have a resistor molded into the snap fastener cap.

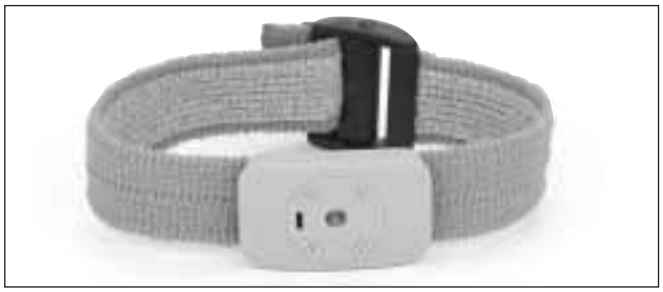
Monitor/Table Replacement Cord 2380

Monitor/Table Mat Interconnect Cord 2389

Dual Conductor Fabric Wrist Straps for Monitors

The 3M™ Dual Conductor Fabric Wrist Strap 2368 is used exclusively with the 3M™ Workstation Monitor 724 and 3M™ Wrist Strap Monitor 725.

One size adjusts to any size wrist to provide reliable protection. The wrist strap features a band made of a silver plated, monofilament, continuous thread woven together with elastic nylon to maintain full conductivity, comfort and reliability, while providing rapid and continuous drain of static charge. Two-one megohm resistors are built into the ground cord. Adjustability also simplifies ordering procedures and inventory control by eliminating the need to order and stock several band sizes.



Fabric Wrist Band 2368

Note: The 3M 2300 Series, 2300VM Series and 2200 Series bands and cords are not interchangeable. See page 8 for additional information on wrist band and cord combinations.

Product No.	Description
2368	Turquoise Dual Conductor Adjustable Fabric Wrist Band.
2368VM	Turquoise Dual Conductor Adjustable Fabric Wrist Band.
2360	Dual Conductor Coiled Cord, 5 ft. (1,5 m) practical length.
2370	Dual Conductor Coiled Cord, 10 ft. (3,0 m) practical length.
2371	Dual Conductor Coiled Cord, 20 ft. (6,0 m) practical length.

⚠ Warning:

These products are not to be used in areas where the individual may come in contact with exposed circuitry exceeding 250 Volts AC.

These products are for static control. It will not reduce or increase your risk of receiving electrical shock when using or working on electrical equipment. Follow the same precautions you would use without wrist straps, including:

- Make certain that equipment having a grounding type plug is properly grounded.
- Make certain that you are not in contact with grounded objects other than through the 3M Wrist Strap.
- A current limiting resistor(s) is located in these 3M Ground Cords. DO NOT REMOVE. If the resistor(s) become damaged, replace ground cord immediately.

Dual Conductor Metal Wrist Straps for Monitors

The 3M Dual Conductor Metal Wrist Straps 2300 Series are for use exclusively with the Workstation Monitors 724 and Wrist Strap Monitor 725. These long lasting metal expansion bands are for use in clean rooms and applications requiring extended band life.

Three sizes are available: small for wrists from 4.5 in. to 6 in. (114 mm to 152 mm) in circumference; medium for wrists from 5.5 in. to 7.25 in. (140 mm to 184 mm); and large for wrists larger than 6.5 in. (165 mm).

Metal Wrist Strap 2381

Note: The 3M Bands and Cords 2300 Series, 2300VM Series, and 2200 Series are not interchangeable. See page 8 for additional information on wrist band and cord combinations.

Product No.	Description
2381	Dual Conductor Metal Wrist Strap. Includes band and 5 ft. (1,5 m) cord. (Small)
2381VM	Dual Conductor Metal Wrist Strap. Includes band and 5 ft. (1,5 m) cord. (Small)
2382	Dual Conductor Metal Wrist Strap. Includes band and 5 ft. (1,5 m) cord. (Medium)
2382VM	Dual Conductor Metal Wrist Strap. Includes band and 5 ft. (1,5 m) cord. (Medium)
2383	Dual Conductor Metal Wrist Strap. Includes band and 5 ft. (1,5 m) cord. (Large)
2383VM	Dual Conductor Metal Wrist Strap. Includes band and 5 ft. (1,5 m) cord. (Large)
2384	Dual Conductor Metal Wrist Band. (Small)
2384VM	Dual Conductor Metal Wrist Band. (Small)
2385	Dual Conductor Metal Wrist Band. (Medium)
2385VM	Dual Conductor Metal Wrist Band. (Medium)
2386	Dual Conductor Metal Wrist Band. (Large)
2386VM	Dual Conductor Metal Wrist Band. (Large)
2360	Dual Conductor Coiled Cord, 5 ft. (1,5 m) practical length.
2370	Dual Conductor Coiled Cord, 10 ft. (3,0 m) practical length.
2371	Dual Conductor Coiled Cord, 20 ft. (6,0 m) practical length.

Dual Conductor Wrist Bands

Made to be used in conjunction with the 3M™ Workstation Monitor 724 and the 3M™ Wrist Strap Monitor 725, the Dual Conductor Band 4720 offers several unique features to provide high-tech businesses cutting edge equipment at low cost.

The dual conductor wrist band is connected to the 3M Workstation or Wrist Strap Monitor via a 3M Dual Conductor Ground Cord 2300 Series. The cords (2360, 2370, and 2371) are sold separately to allow customers the option of purchasing a cord in 5', 10' and 20' lengths respectively.

3M's exclusive "comfort bumps" design on the conductive interior insert ensures not only increased contact with the skin, but also air flow between the band and skin, resulting in more comfort for the wearer.

Made of thermoplastic material, the Dual Conductor Wrist Bands 4720 are lightweight and low profile, making reliable contact to the skin, improving employee acceptance while providing an effective grounding device. It is well known that high contact resistance between a wrist band and arm can be attributed to improper fit, dry skin or arm hair. The pliable thermoplastic material of the Wrist Band 4720 conforms to the arm, increasing the amount of contact area. In 3M field trials with the wrist bands, reduced contact resistance between the wrist band and arm were noted. This improvement was also observed when compared to standard metal and fabric wrist bands.

The "zipper" style latching mechanism easily adjusts to any size wrist, effecting a "one size fits all," allowing for a secure and comfortable fit. After adjusting for proper fit, any excess band material is cut off. The wrist band is highly visible, making it easy for supervisors to see that the wrist straps are properly used.

The 3M™ Dual Conductor Wrist Strap Ground Cord is for use exclusively with 3M™ Dual Conductor Wrist Straps. Used in conjunction with 3M's ESD workstation monitors, the 3M Dual Conductor Cord 2300 series features an improved grip that is wider in diameter and easier to grasp when inserting and removing the cord from the remote unit. The terminations at both ends of the cord have been redesigned for a secure fit when plugged into the dual remote.

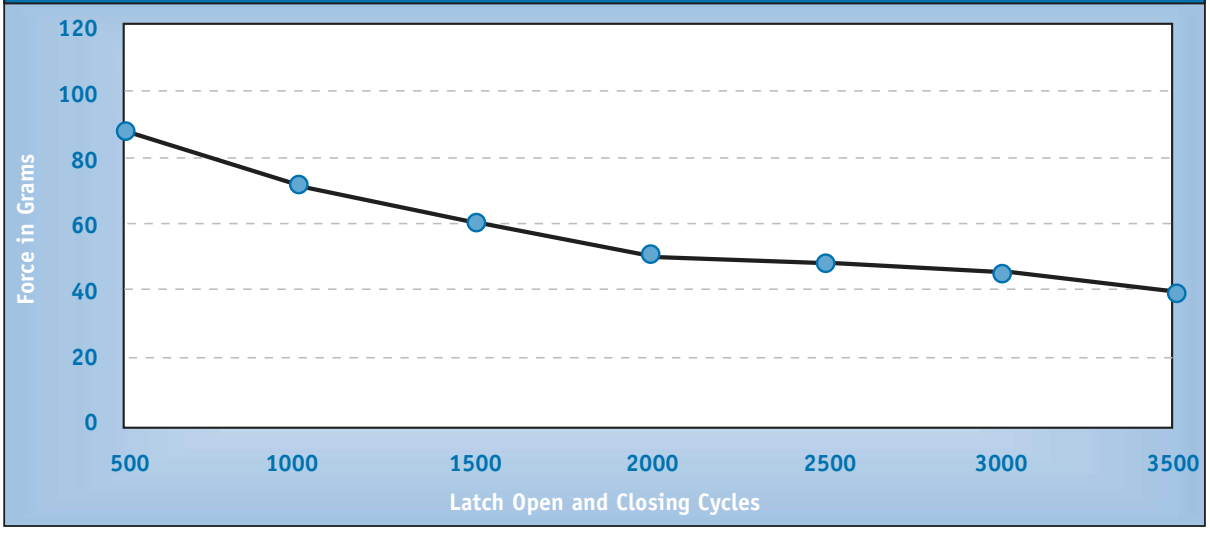
Product No.	Color	Description
4720	Blue	Dual Conductor Wrist band.*

*Ground Cord not included

Product No.	Description
2360	Dual Conductor Coiled Cord, 5 ft. (1,5 m) practical length.
2370	Dual Conductor Coiled Cord, 10 ft. (3,0 m) practical length.
2371	Dual Conductor Coiled Cord, 20 ft. (6,0 m) practical length.

Wrist Band 4720 with Dual Conductor Wrist Strap Ground Cord 2360

3M Dual Conductor Wrist Band 4700 Series



Dissipative Vinyl Three-Layer Mats and Runners

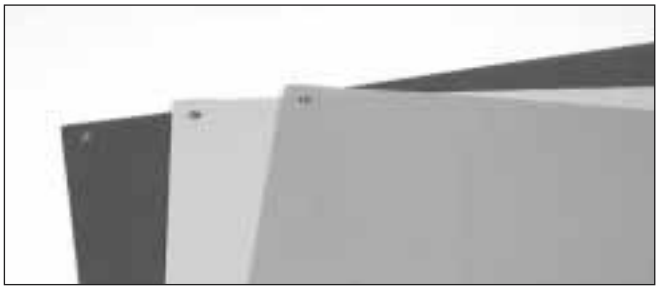
3M™ Mats and Runners 8200 Series are soft table and floor mats with a unique three-layer construction. The top layer is durable static dissipative vinyl, which has sufficiently low resistance to discharge static-laden conductors, yet will prevent the shorting of pins on the backs of printed circuit boards laid on the mat. The middle layer is a highly conductive scrim that provides the main discharge path to ground, and the bottom layer is static-dissipative foam, providing a durable nonskid cushion. Nonstandard sizes are available on a custom order basis.

Floor Mats 8200 Series
Includes one 15 ft. (4,6 m) 3M™ Ground Cord 3040 and two 3M™ Snap Fasteners 3050 (installed).

Floor Runners 8250 Series
Includes two 15 ft. (4,6 m) 3M Ground Cords 3040 and two 3M Snap Fasteners 3050 to be installed by customer.

Table Mats 8210 Series
Includes two 3M Snap Fasteners 3050 (installed) and one 3M™ Wrist Strap Grounding System 3048. Wrist Straps must be ordered separately.

Table Runners 8260 Series
Includes two 15 ft. (4,6 m) 3M Ground Cords 3040 and two 3M Snap Fasteners 3050 to be installed by user.



Mats and Runners 8200 Series

Properties

Property	Typical Value
Material	Top and Bottom Layers - Vinyl
Thickness	0.138 in. (3,5 mm)
Hardness	40 – 50 Shore A
*Resistance	
(Surface to Ground)	1×10^7 K
(Surface to Surface)	4×10^7 K

* Tested per ESD Association Standard S4.1 at 72°F, 50% RH using 3M Test Kit 701 for Static Control Surfaces (Megohmmeter)

Note: Non-standard sizes available on custom order basis up to 50 ft. maximum length

Product No.	Description	Size, ft.	(m)
8201	Floor Mat, Brown.	4 x 6	(1,2 x 1,8)
8203	Floor Mat, Gray.	4 x 6	(1,2 x 1,8)
8204	Floor Mat, Blue.	4 x 6	(1,2 x 1,8)
8211	Table Mat, Brown.	2 x 4	(0,6 x 1,2)
8213	Table Mat, Gray.	2 x 4	(0,6 x 1,2)
8214	Table Mat, Blue.	2 x 4	(0,6 x 1,2)
8251	Floor Runner, Brown.	4 x 24	(1,2 x 7,2)
8253	Floor Runner, Gray.	4 x 24	(1,2 x 7,2)
8254	Floor Runner, Blue.	4 x 24	(1,2 x 7,2)
8261	Table Runner, Brown.	2 x 24	(0,6 x 7,2)
8263	Table Runner, Gray.	2 x 24	(0,6 x 7,2)
8264	Table Runner, Blue.	2 x 24	(0,6 x 7,2)
8281	Floor Runner, Brown.	2 x 40	(0,6 x 12,2)
8283	Floor Runner, Gray.	2 x 40	(0,6 x 12,2)
8284	Floor Runner, Blue.	2 x 40	(0,6 x 12,2)
8291	Floor Runner, Brown.	4 x 40	(1,2 x 12,2)
8293	Floor Runner, Gray.	4 x 40	(1,2 x 12,2)
8294	Floor Runner, Blue.	4 x 40	(1,2 x 12,2)

Product Referral Generator

Cleaner 8001 for Static Control Mats..... pg. 24, 30
Shoe Straps ..... pg. 6-7
Wrist Straps..... pg. 2-5, 16-17

Dissipative Rubber Mats and Runners

3M™ Static Dissipative Rubber Mats and Runners 8800 Series consist of a top layer of static dissipative rubber laminated to a bottom layer of conductive rubber. Both layers are made from vulcanized synthetic rubber, which offers excellent resistance to oil, grease and most common solvents. They offer superior resistance to heat and hot solder as compared to vinyl or olefinic materials. Non-standard sizes are available on a custom order basis.

Floor Mats 8870 Series

Dissipative floor mats include one 15 ft. (4,6 m) 3M™ Ground Cord 3040 and two 3M™ Snap Fasteners 3034 (installed).

Floor Runners 8880 Series

Dissipative floor runners include two 15 ft. (4,6 m) 3M Ground Cords 3040 and five 3M Snap Fasteners 3034 to be installed by user.

Table Mats 8810/8820/8830 Series

Dissipative table mats include two 3M Snap Fasteners 3034 (installed) and one 3M™ Wrist Strap Grounding System 3048.

8840/8850/8860 Series

Dissipative table runners include two 15 ft. (4,6 m) 3M Ground Cords 3040 and five 3M Snap Fasteners 3034 to be installed by the user.

Static Dissipative Rubber Mat

Product No.	Description	Size, ft. (m)	
8810	Table Mat, Gray	2 x 4	(0,6 x 1,2)
8811	Table Mat, Blue	2 x 4	(0,6 x 1,2)
8830	Table Mat, Gray	3 x 4	(0,9 x 1,2)
8831	Table Mat, Blue	3 x 4	(0,9 x 1,2)
8840	Table Runner, Gray	2 x 24	(0,6 x 7,2)
8841	Table Runner, Blue	2 x 24	(0,6 x 7,2)
8860	Table Runner, Gray	3 x 24	(0,9 x 7,2)
8861	Table Runner, Blue	3 x 24	(0,9 x 7,2)
8870	Floor Mat, Gray	4 x 6	(1,2 x 1,8)
8871	Floor Mat, Blue	4 x 6	(1,2 x 1,8)
8880	Floor Runner, Gray	4 x 24	(1,2 x 7,2)
8881	Floor Runner, Blue	4 x 24	(1,2 x 7,2)

Non-standard sizes available on custom order basis up to 50 ft. maximum length.

Properties

Property	Typical Value
Material	Top and Bottom Layers - Nitrile™ Rubber
Thickness	0.065 in. (1,7 mm)
Hardness	60 Shore A
*Resistance	
(Surface to Ground)	1×10^6 K to 5×10^6 K
(Surface to Surface)	1×10^6 K to 1×10^7 K

* Tested per ESD Association Standard S4.1 at 72°F, 50% RH using 3M Test Kit 701 for Static Control Surfaces (Megohmmeter)

Conductive Floor Mats for Hard Floors

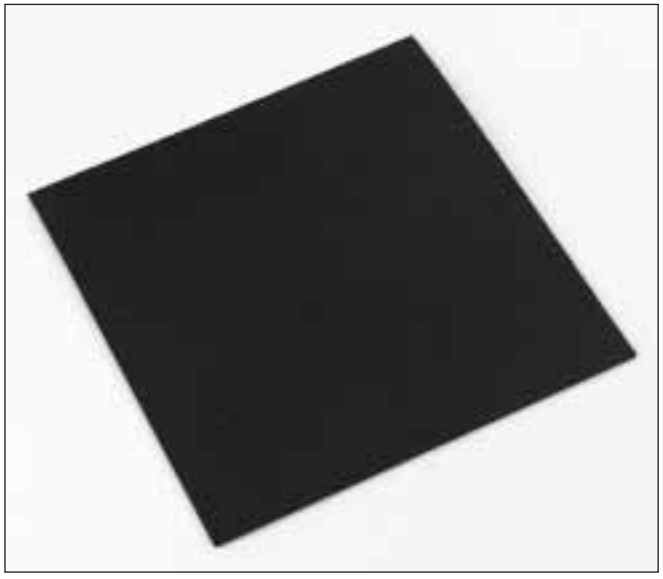
The main purpose of a conductive floor mat or runner is to remove static charge from personnel as they approach work areas. This could include supervisors and parts delivery personnel, as well as the worker who removes his or her wrist strap and momentarily steps away. Floor mats provide significant passive protection in well-traveled assembly areas. Continuous runners extend static protection throughout and between entire areas.

3M™ Floor Mat 1864

Semi-flexible conductive floor mat that contains a rubber filler for resilience. It also has a textured surface for better traction. It includes two 3M Snap Fasteners 3034 (installed) and one 15 ft. (4,6 m) 3M Ground Cord 3040 with a 1 megohm resistor.

Floor Runner 1864R

The 3M™ Floor Runner 1864R is a 50 ft. long runner of the mat material 1864. It includes two 15 ft. (4,6 m) 3M Ground Cords 3040 with 1 megohm resistor, five 3M Snap Fasteners 3034 and one 3M Snap Fastener Installation Tool.



Floor Mat 1864

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life.

Product No.	Description
1864	Floor Mat. 0.125 in. (3,2 mm) thick. Size ft. (m) 4 ft. x 6 ft. (1,2 x 1,8) 4 ft. x 8 ft. (1,2 x 2,4)
1864R	Floor Runner. 0.125 in. (3,2 mm) thick. Size ft. (m) 2 x 50 (0,6 x 15,0)

Conductive floor mats 1864 are black.
Nonstandard sizes are available on a custom order basis.

Properties

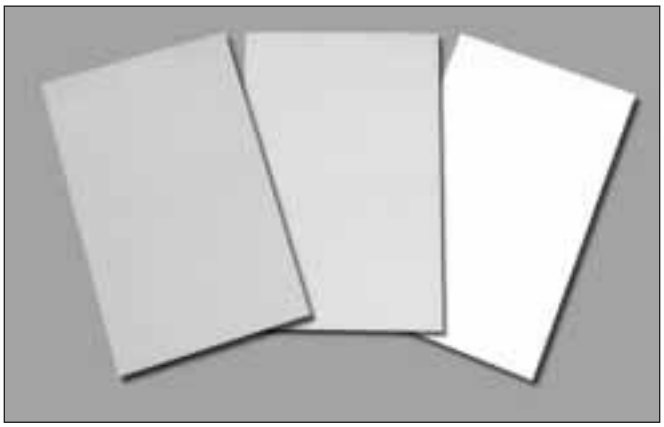
Property	Typical Value
Material	EVA Copolymer/Rubber
Thickness	0.125 in. (3,2 mm)
Hardness	80-85 Shore A
*Resistance (Surface to Ground) (Surface to Surface)	 9×10^2 K 6×10^2 K
**Resistivity	10^2 K-cm

* Tested per ESD Association Standard S4.1 at 72°F, 50% RH using 3M Test Kit 701 for Static Control Surfaces (Megohmmeter)
**Tested per ASTM D 257

Dissipative Hard Laminate Sheets

3M™ Dissipative Hard Laminate Sheets are used where a hard, durable, electrically safe surface is needed, providing a low coefficient of friction to permit heavy objects to slide easily. Controlled conductivity (surface-to-ground) eliminates shock hazard when working on a powered component.

This material is post-formable with normal high pressure laminate process techniques used by furniture makers. Using this technique, a tight 0.5 in. (12,7 mm) radius is possible, which allows installation without seams in corners and over rounded edges when forming parallel to sanding lines. The laminate can provide a comfortable rounded front on which personnel can rest their arms. It is resistant to common solvents and to hot solder droppings.



Dissipative Hard Laminate Sheets

Note: For consistent static charge dissipation from rigid, conductive flat-bottomed totes and trays, use of a pad or mat of 3M Dissipative Hard Laminate material 8200 in conjunction with this static-protective hard laminate is suggested, especially in areas where relative humidity often drops below 30%.

Product No.	Color	Size, ft. (m)	
8360	Beige	4 x 8	(1,2 x 2,4)
		3 x 12	(0,9 x 3,7)
		5 x 12	(1,5 x 3,7)
8365	Gray	4 x 8	(1,2 x 2,4)
		3 x 12	(0,9 x 3,7)
		5 x 12	(1,5 x 3,7)
8375	White	5 x 12	(1,5 x 3,7)

Nonstandard sizes and colors are also available, subject to minimum order quantity.

Properties

Property	Typical Value
Thickness	0.037 in. (0,94 mm)
Hardness Abrasion resistance:	 > 1500 cycles Tabor Wheel 32
*Resistance (Surface to Ground) (Surface to Surface)	 7×10^6 K 6×10^7 K

* Tested per ESD Association Standard 4.1 at 72°F, 50% RH using 3M Test Kit 701 for Static Control Surfaces (Megohmmeter)

Product Referral Generator

Wrist Straps ..... pg. 2-5, 16-17
Monitors ..... pg. 8-13
Cleaner 8001 for Static Control Mats ..... pg. 24, 30

Dissipative Rigid Worksurfaces

3M™ Static Dissipative Rigid Worksurface 8300 Series have the high abrasion resistance of a laminate, yet are as easy to install as table mats. The nonglare surface also resists staining, scorching and common solvents. All edges and corners are rounded, and the laminate comes ready to use with two factory-installed snap fasteners, and one 3M™ Grounding System 3048 for wrist strap/table mat.

Rigid Worksurface 8300 Series

Product No.	Color	Size, in. (cm)	
8343	Beige	0.125 x 24 x 36	(0,32 x 61,0 x 91,0)
8344	Gray	0.125 x 24 x 36	(0,32 x 61,0 x 91,0)
8353	Beige	0.125 x 24 x 48	(0,32 x 61,0 x 122,0)
8354	Gray	0.125 x 24 x 48	(0,32 x 61,0 x 122,0)

Product Referral Generator

Cleaner 8001 for Static Control Mats ..... pg. 24, 30
Dissipative Rubber Mats/Runners 8800 Series ..... pg. 19
Static Conductive Floor Tile 8400 Series ..... pg. 66-67
ESD Epoxy Flooring 8900 Series ..... pg. 68-69
Anti-Fatigue Mats/Runners 9500 Series ..... pg. 22

Anti-Fatigue Mats

3M™ Anti-Fatigue Matting 9500 Series may be the simplest and most effective way to reduce standing worker fatigue while providing ideal protection against static electricity problems. Physical fatigue is reduced by encouraging subtle movement of leg and calf muscles, which in turn promotes blood flow back to the heart. The use of 3M Anti-Fatigue Mats/Runners 9500 is designed to result in more comfortable, more productive workers.

The anti-fatigue mats/runners have excellent static-control properties. They are carbon loaded rubber with the carbon being mixed evenly throughout the material to ensure the edges are as conductive as the center. Resistance from the surface of the mat to the grounding point – the truest measure of the mat's static draining capability – is typically in the range of 2.5 x 10^4 to 1 x 10^7 ohms (measured according to ESD Standard 7.1).

The rubber surface is bonded to a highly resilient insulative sponge base. This construction provides outstanding cushioning, and reduces stress on the spine and lower back muscles, which reduces worker fatigue.

3M mats/runners 9500 Series can be cleaned by all common commercial detergents (3M Cleaner 8001 for Static Control Mats), and may be either scrubbed with a brush or damp mopped. Let dry before returning to service.

Anti-Fatigue Mat 9500

Values

Features	Advantages	Benefits
Rubber surface bonded to highly resilient sponge base.	Exceptional comfort Long lasting Easy to clean	Reduce worker fatigue; May improve productivity; durable and low maintenance
Carbon filled (conductive)	Excellent static dissipation	Reliable grounding
Heavy	Will stay in place	Customer acceptance
Smooth surface maintenance	Easy to clean	Low cost
Custom sizes available	Better meet application needs	User acceptance

Product No.	Description	Size, ft. (m)
9500	Static Control Anti-Fatigue Mat (includes one installed ground snap and one 15' ground cord)	3 x 5 (0,9 x 1,5)
9510	Static Control Anti-Fatigue Mat (includes one ground snap installed every 15 linear feet with appropriate number of ground cords)	3 x up to 75 (0,9 x up to 22,9)

Note: Anti-Fatigue Mat 9510 non-standard sizes available on custom order basis.

Properties

Property	Test Method	Typical Value	
Material	Top Layer Bottom Layer	Carbon Filled Styrene Butadiene Rubber - 100% Natural Rubber	
Electrical	ESD-S7.1	2.5x10^4 to 1x10^7 ohms (surface to ground resistance)	
Thickness	Caliper	0.5 in.	
Flammability	ASTM D 2859	Non-burning	
Tensile Strength	3M	630 PSI	
Durometer	Shore A	82	
Coefficient of Friction	ASTM 2047	Surpasses ADA and OSHA Recommendations	
Temperature	3M	5 to 40°C	
Compression Strength (Resiliency)	ASTM 1667	Recovery after 30 minutes = 80% Recovery after 24 hours = 69%	
Chemical Deflection	ASTM 1056	3.0 - 5.0 PSI	
Compression Set	ASTM 1056	Recovery after 24 hours = 77%	
Chemical	ASTM D 543	Acetone	No visual effect
		Detergent	No visual effect
		Heptane	No visual effect
		Gasoline	No visual effect
		Isopropanol	No visual effect
		Mineral Oil	No visual effect
		Mineral Spirits	No visual effect
		Potassium Hydroxide	No visual effect
		Sodium Hydroxide	No visual effect
		Trichloroethylene	No visual effect
		Xylene	No visual effect

Anti-Fatigue Mat 9500

Anti-Fatigue Mat ground snap

Workstation Grounding Kits

Each 3M™ Workstation Grounding Kit provides the basic items needed to create a static-safe work environment. They include a floor mat, table mat, adjustable wrist strap with grounding cord and accessories to properly connect all of the kit components.

Each kit contains:

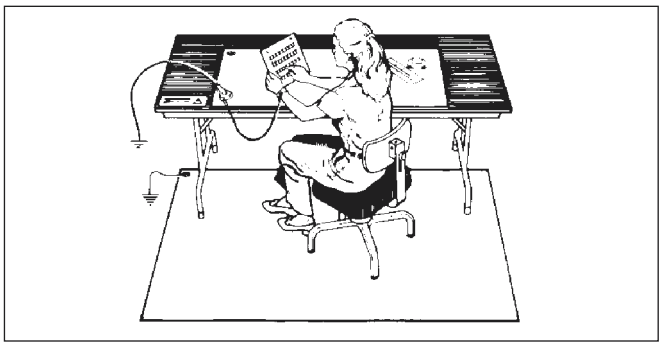
- Table Mat; 2 ft. x 4 ft. (0,6 m x 1,2 m)
- Floor Mat; 4 ft. x 6 ft. (1,2 m x 1,8 m)
- 3M™ Ground Cord 3040; 15 ft. (4,6 m)
- 3M™ Grounding System 3048 for Wrist Strap/ Table Mat
- 3M™ Adjustable Wrist Strap 2214

Workstation Grounding Kit 8020 Series

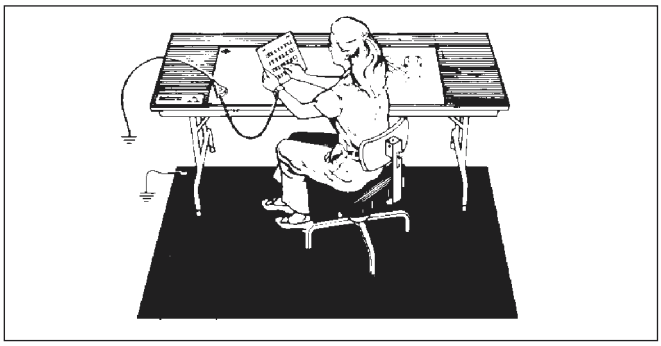
The 3M Workstation Grounding Kits 8020 provide the complete static protection offered by all the 3M kits. Both the floor and table mats (8200) are made from our soft three-layer static dissipative material.

Workstation Grounding Kit 8030 Series

These kits contain two different types of static control mats. The table mat is made of the soft three-layered, static dissipative material 8200, while the floor mat (1864) is of the more rigid, conductive material.



8021–8024



8031–8034

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life. Not recommended for use with chairs that have wheels.

Product No.	Description
8021	Brown Table and Floor Mat, 3-layer construction.
8023	Gray Table and Floor Mat, 3-layer construction.
8024	Blue Table and Floor Mat, 3-layer construction.
8031	Brown 3-layer Table Mat, Black Velostat Floor Mat.
8033	Gray 3-layer Table Mat, Black Velostat Floor Mat.
8034	Blue 3-layer Table Mat, Black Velostat Floor Mat.

Product Referral Generator

Test Kit 701 ..... pg. 27, 52
Wrist Strap Workstation Monitor 724 ..... pg. 12

Worksurface Cleaning Products

The 3M™ Cleaner 8001 for static control mats is an extra-strength fluid that removes ordinary dirt and grime as well as difficult spots and stains from all types of static control surfaces, such as table mats, floor mats, hard-laminate benchtops, portable field-service kit work surface, etc. Unlike many cleaning products, the 3M Cleaner 8001 is not corrosive, per FTMS 101C, Method 3005, and leaves no tacky residue that attracts dirt, attacks delicate parts, or increases the contact resistance of the surface. It is a clear, colorless, homogeneous, water-based liquid that contains detergents, conditioners and other cleaning additives and has a fresh, clean scent.

3M laboratory tests have proven the cleaner to be an excellent topical antistat, maintaining a consistent surface resistivity ($1x10^{11}$ ohms/square) over extended periods in both normal (55% RH) and dry (13% RH) environments. Simply spray on any washable surface and wipe off with a clean cloth or sponge—no rinsing required. The cleaner is designed to be used full-strength and supplied in handy quart spray bottles. Also available in a five-gallon jug with spigot.

Product No.	Description
8001	Cleaner for Static Control Mats. Size 1 quart spray (32 oz.) 5-gallon jug with spigot Shelf life two years

Cleaner 8001 for Static Control Mats

Clean Walk Mats

3M™ Clean Walk Mats 5830 remove dirt and contaminants from shoe soles, wheels and other passing objects on contact. When the top sheet becomes soiled, it can be peeled back to reveal a clean adhesive sheet underneath.

Clean Walk Mat 5830

Product No.	Description
5830	Clean Walk Mats, 30 mats per pad. Size, in. (cm) 18 x 36 (45,7 x 85,7) 18 x 45 (45,7 x 114,3) 25 x 45 (63.5 x 114,3)

Field Service Kits

Sensitive microelectronic components can be damaged, even destroyed, by one ever-present enemy – static electricity. Electronic equipment is especially susceptible to static electricity during servicing.

Static-dissipative products manufactured by 3M are designed to provide protection at a variety of field service sites, from typical office environments to remote telephone terminals. The standard field service kit quickly and reliably removes any static charge on the technician and provides a durable, static-free surface upon which to lay parts. The lightweight version offers the same protection in a flexible, compact package. The telephone terminal service kit is especially designed to be installed at remote telephone switches or CEVs to ensure convenient static protection on site.

Practicing proper static control in the field can save time, money, and aggravation for both your customers and your company. Enable your technicians to do the job right the first time – safely and productively – with a static-dissipative portable field service kit from 3M.

Portable Field Service Kit

The 3M™ Portable Field Service Kit 8501 provides effective static protection in a compact package for the electronics field technician. The entire kit folds to a size that fits easily into most tool cases. Two pockets sewn into the worksurface provide storage for the cords.

Field Service Kit 8501

Product No.	Description
8501	Static-Dissipative Portable Field Service Kit. Kit includes: • Static-Dissipative Worksurface 0.021 in. x 22 in. x 24 in. (0,53 mm x 56 cm x 61 cm) • Ground Cord Assembly 3051 • Alligator Clip 3038 • Adjustable Wrist Band 2204

Custom logo imprinting on the worksurface is available.

8501 Properties

Typical Property	Value
Resistance: (Surface-to-ground)	1 x 10^6 K to 1 x 10^9 K

Tested per ESD Association Standard 4.1 at 72°F, 50% RH using 3M™ Test Kit 701 for Static Control Surfaces (Megohmmeter).

Telecommunications Field Service Kit

The 3M™ Static-Dissipative Field Service Kit 8502 is a specially designed static-dissipative kit for installation in remote, unattended telephone switching enclosures.

The worksurface has a strip of 3M™ Hook and Loop Fastener Tape stitched to the back so it can be left suspended from the permanently mounted instruction sign.

Field Service Kit 8502

Product No.	Description
8502	Static-Dissipative Field Service Kit for remote, unmanned telephone switching sites. Kit includes: • Static-Dissipative worksurface 0.021 in. x 8.75 in. x 24 in. (0,53 mm x 22,2 cm x 61 cm) with two pockets • Two 5 ft. (1,5m) coiled ground cords; one for mat, one for wrist band • Adjustable Wrist Band 2204 • Static Caution Sign • Plastic Instruction Sign

8502 Properties

Typical Property	Value
Resistance: (Surface-to-ground)	1 x 10^6 K to 1 x 10^9 K

Tested per ESD Association Standard 4.1 at 72°F, 50% RH using 3M™ Test Kit 701 for Static Control Surfaces (Megohmmeter).

Portable Field Service Kit

The 3M™ Portable Field Service Kit 8505 is a small, lightweight kit that offers the same level of static control as the full-sized 3M™ Field Service Kit 8501, yet is small enough to fit in a shirt pocket.

Field Service Kit 8505

Product No.	Description
8505	Lightweight Portable Field Service Kit. Kit includes: • Static-Dissipative Worksurface with Pocket 0.015 in. x 15 in. x 20 in. (0,38 mm x 38 cm x 51 cm) • Adjustable Wrist Band 2204 • Lightweight Heavy-Duty Coiled Ground Cords: Wrist Strap Ground Cord 2240, 5 ft. (1,5 m) Extension Ground Cord 2243, 5 ft. (1,5 m) Worksurface Ground Cord3063, 5 ft. (1,5 m) • Alligator Clip 3038

Custom logo imprinting on the worksurface is available.

8505 Properties

Typical Property	Value
Resistance: (Surface-to-ground)	1 x 10^6 K to 1 x 10^9 K

Tested per ESD Association Standard 4.1 at 72°F, 50% RH using 3M™ Test Kit 701 for Static Control Surfaces (Megohmmeter).

Portable Field Service Kit

The 3M™ Field Service Kit 8507 with a 3M™ Wrist Strap Monitor 725 bundles together two static control products to give a field technician the same continuously monitored, static protected working environment as that enjoyed by workers in a manufacturing facility.

Field Service Kit 8507

Product No.	Description
8507	Portable Field Service kit includes Wrist Strap Monitor 725 and Dual Conductor Wrist Strap Kit includes: • Static-Dissipative Worksurface, foldable, 0.021" x 22" x 24" red with gray cotton edging. Two pockets, each 8" x 11" ground snap. • Portable Wrist Strap Monitor 725, 2.5" x 2.6" x 1.1", black. Battery-powered, 9V (not included). Ground cord, 6', with ground clip. Ground snap on unit to connect to the worksurface. • Dual-Conductor Fabric Wrist Band 2368, adjustable. • Dual-Conductor Wrist Strap Ground Cord 2370, 10'.

Test Kits for Static Control Surfaces

The 3M™ Test Kit 701 contains a lightweight, user-friendly megohmmeter plus all of the components needed to make testing mats and other surfaces simple and accurate. All of the items are packaged in a foam-lined carrying case.

The kit meets the intent of ANSI/ESD Standard 4.1, "Worksurfaces – Resistive Characterization." ANSI/ESD Standard 7.1, "Floor Materials – Resistive Characterization of Materials," and MIL-PRF-87893, "Workstation, Electrostatic Discharge (ESD) Control," for auditing purposes. The meter has separate scales and test settings for measuring surface-to-ground and surface-to-surface resistance at two prescribed test voltages (10V and 100V), and system continuity. The easy to read scales are both color-coded and numbered.

Test Kit 701

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Product No.	Description
701	Test Kit for Static Control Surfaces. (Certified and non-certified) Kit contains: • 1 Megohmmeter 12 oz. (340 g) 1.8 x 3.3 x 4.6 in. (4,57 x 8,38 x 11,68 cm) • 2 Test Weights 5 lbs. (2,27 kg) each • 2 Test Leads, 10 ft. (3 m) each • 1 Insulated Bulldog Clip • 1 Alligator Clip • 1 Continuity Test Plate • 2 Batteries (22.5V and 1.5V) • 1 Operator's Manual • 1 Molded Carrying Case
701-L	Test Leads
701-M	Megohmmeter only
701-W	5 lb. Test Weight

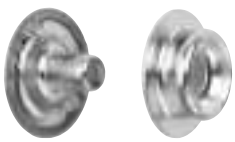
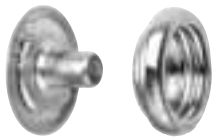
Test Kit Properties

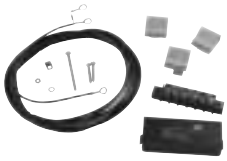
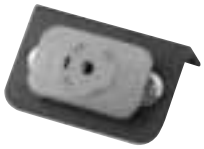
Product	Item	Typical Properties
Kit	Weight:	14 pounds (6,35 kg)
	Case Dimensions:	5.125" x 10" x 13.5" (13,02 cm x 25,4 cm x 34,29 cm)
	Case Material:	Blow-molded, high density polyethylene with foam inserts
	Case Color:	Gray
Meter	Weight:	12 ounces (0,34 kg)
	Dimensions:	1.8" x 3.3" x 4.6" (4,57 cm x 8,38 cm x 11,68 cm)
	Resistance Ranges:	
	Continuity Test Mode	0 – 10M K (internal R=500 K K)
	10V Surface Test Mode	10^5 – 10^{11} K (internal R=2 M K)
	100V Surface Test Mode	10^5 – 10^{11} K (internal R=2 M K)
Weights	2 Test Weights:	5 pounds (2,27 kg) each
	Dimensions:	Diameter – 2.5 in. (6,35 cm) Height – 5.06 in. (12,85 cm); includes handle and pad
	Pad Material:	Conductive silicone rubber
	Pad Dimensions:	Diameter – 2.5 in. (6,35 cm) Thickness – 0.25 in. (0,64 cm)
Leads	Length:	10 feet (3,05 m)
	Wire Size:	18 gauge
	Insulation:	Silicone rubber
	Diameter:	0.125" (0,32 cm)
Power Supply	Batteries (2):	22.5 volt (Eveready #505 or equivalent) and 1.5 volt (AA).

Product Referral Generator

Floor Mats/Runners 8200 Series ..... pg. 18
Dissipative Rubber Mats/Runners 8800 Series ..... pg. 19
Anti-Fatigue Mats/Runners 9500 Series ..... pg. 22
Static Conductive Floor Tile 8400 Series ..... pg. 66-67
ESD Epoxy Flooring 8900 ..... pg. 68-69

	Product No.	Description
	723	Accessory Belt Clip to be used with the 3M™ Wrist Strap Monitor 725.
	724P	Power supply for Monitor 724 and Static Monitor 790.
	724VK	Verifies the resistance range of the Workstation Monitor 724.
	725VK	Verifies the resistance range of the Monitor 725.
	732	Replacement Remote Input Jack. 6 ft. (1,8 m) long cord. To be used with Workstation Monitor 724.
	733	Remote Splitter Kit. 6 ft. (1,8 m) long cord. To be used with Workstation Monitor 724.
	740P	Power Supply for 740.
	790VK	Verification Kit. One 5′ 2360 dual conductor cord, one test wrist band socket assembly, and one two-wire male connector with 24″ lead wire.
	791CG	Chassis Ground Cord
	791D6	6x6 Data Output Cord
	791D10	10x10 Data Output Cord

	Product No.	Description
	791WVK	Verifies the resistance range of the Voltage Wrist Strap Monitor 791.
	791EVK	Verifies the resistance range of the Equipment Ground Monitor 791.
	2380	Monitor/Table Mat Replacement Cord, 6 ft. (1,8 m), with 10 mm snap. Extends from the Workstation Monitor 724 to the static control worksurface to be monitored. This cord does not have a resistor molded into the snap fastener cap.
	2389	Monitor/Table Mat Interconnect Cord, 10 ft. (3 m), with 10 mm snap A straight cord with male snap fasteners at each end, and no resistors. Used to interconnect two monitored worksurfaces.
	2390	Mat Replacement Cord for use with 791E, 10 ft. (3 m) with 10 mm snap. Extends from the Equipment Ground Monitor 791E to the static control worksurface to be monitored.
	3033	Snap Fastener, male, 0.125 in. (3,2 mm) hole, 10 mm diameter. For mats and runners.
	3034	Snap Fastener, female, 0.125 in. (3,2 mm) hole, 10 mm diameter. For mats and runners.
	3037	Insulated Bulldog Clip. Fits standard banana plug.
	3038	Uninsulated Alligator Clip. Fits standard banana plug.
	3040	Ground Cord, 15 ft. (4,6 m), with 10 mm snap. Molded-in male snap fastener with integral 1-megohm resistor on one end, solderless terminal on other. Connects all 3M™ static control mats and runners to building ground.

	Product No.	Description
	3041	Grounding Kit for Static Protective Hard Laminate includes #10 screw, lock washer, #10 nut, lock washer wing nut, #10 self-tapping screw and one 10 ft. (3,0 m) ground cord. Ground cord has a 1-megohm resistor.
	3042	Wrist Strap Grounding System. Grounds two single conductor wrist straps and conveniently mounts beneath the edge of most work benches. Comes complete with 10 ft. (3,0 m) ground cord.
	3043	Interconnect Cord 5 ft. (3,5 m), with 10 mm. Snap molded-in male snap fastener at each end. Connects all 3M™ static control mats and runners to each other. Ground cord has a 1-megohm resistor.
	3047	Common Point Grounding System, 10 ft (3m) to ground workstation components. Single-row, six-terminal strip, protective cover, three cable clips. Ground cord has a 1-megohm resistor.
	3048	Grounding System for Wrist Strap/Table Mat. Easily snaps onto mats and runners, (10 mm snap); grounds two single conductor wrist straps. Comes complete with ring connector and 15 ft. (4,6 m) ground cord. Ground cord has a 1-megohm resistor for mat connection only.
	3050	Snap Fastener, female, 10 mm diameter. For 3M™ table and floor mats and runners 8200 series.
	3051	Ground Cord with center snap for standard field service kits. Wrist strap cord section 10 ft. (3,0 m) and ground cord section 5 ft. (1,5 m). Each contains a 1-megohm resistor.
	3057	Monitor Stand-By Jack. Allows operator to disconnect a ground cord from the wrist band and leave the workstation without deactivating the 3M™ Workstation Monitor 724 or 3M Static Monitor 790.
	8001	Cleaner for Static Control Mats. One quart (32 oz.) trigger-spray bottle or 5-gallon jug with spigot. An extra-strength cleaner for removing dirt and stains from all types of static control surfaces, including table and floor mats, hard laminate bench tops and portable field service kits. It will also remove difficult grime from epoxy or tile flooring. Used full strength, it is a clear, colorless, water-based liquid that leaves no tacky or corrosive residue. Read all Health Hazard Precautionary and First Aid statements found in the Material Safety Data sheet and/or product label prior to handling or using. Refer to www.3M.com to obtain copy of MSDS.

High Performance Scotch-Brite Cloth

The 3M™ Scotch-Brite™ High Performance Cloth 2011 is an efficient cleaning tool consisting of microfibers in a unique knit pattern. The Scotch-Brite High Performance Cloth is specifically designed with a unique combination of bi-component microfibers and knit construction. This combination provides excellent dust, oil, and water pickup with minimal linting. The bi-component aspect of the microfibers allows for both oil and water absorption while the microfiber's ribbon-like shape provides the maximum surface area for the collection of dust, oil, and water. The unique knit pattern of tufts and valleys allows both small and large particulates to be trapped within the Scotch-Brite High Performance Cloth. The combination of microfiber and knit construction provide a versatile non-scratching tool allowing the Scotch-Brite Cloth to be used on a wide variety of substrates including delicate surfaces.

The Scotch-Brite High Performance Cloth may be used dry or damp, with or without cleaning chemicals.

Scotch-Brite™ High Performance Cloths 2011

Product No.	Description
2011	50 Scotch-Brite™ High Performance Cloths per case. **Examples of Intended Use** Fingerprint removal from glass Removing glaze and polish from painted metals Polishing furniture Cleaning and polishing brass Dust removal **Standard Size** 12.6 in X 14.2 in (32 cm X 36 cm) **Colors** Blue Green Red Yellow White

Note: The 3M Scotch-Brite High Performance Cloth 2011 does not have static dissipative properties.

Physical Characteristics

Property	Typical Value	Test Method
Size:	12.6 in X 14.2 in (32 cm X 36 cm)	HCC-TM-69
Thickness	0.062 in (1,57 mm)	HCC-TM-69
Weight:	1.09 oz (30,8 g)	HCC-TM-69
Fiber Type	Polyester and nylon	
Tuft density	37 per square cm	HCC-TM-86
Water absorption	7.2 g water per g wipe	HCC-TM-73
Oil absorption	7.1 g oil per g wipe	HCC-TM-73
Artificial Sebum removal (Artificial skin oil)	98% gloss recovery	HCC-TM-90
Drag (dry, kinetic coefficient) Glass Formica	 0.85 0.41	HCC-TM-75 (modified)
Tear resistance (6400 g pendulum) Machine Direction Cross Direction	 5570 gram force 4290 gram force	HCC-TM-75
Resistant to	Household Ammonia Household Bleach Household Cleaner/Degreaser Vinegar Mineral Oil Vegetable Oil	
Linting	Minimal	
Laundering	Launderable to 95°C (200°F)	

Overhead Air Ionizer

Using steady-state DC technology, the 3M™ Overhead Air Ionizer 990 enables consistent static control coverage. With its overhead mounting system, the 990 does not compromise valuable space on the workbench, allowing for neutralization of static charge. The ionizer's steady-state DC ion emission enables fast discharge with low air-flow, providing a more comfortable work environment for operators. Emitter points are placed behind the fan to eliminate field-induced charge and to ensure a homogeneous mixture of ionized air. Also featured in the Air Ionizer 990 are open-cell foam filters on fan intakes that protect the internal components from environmental contamination.

Overhead Air Ionizer 990

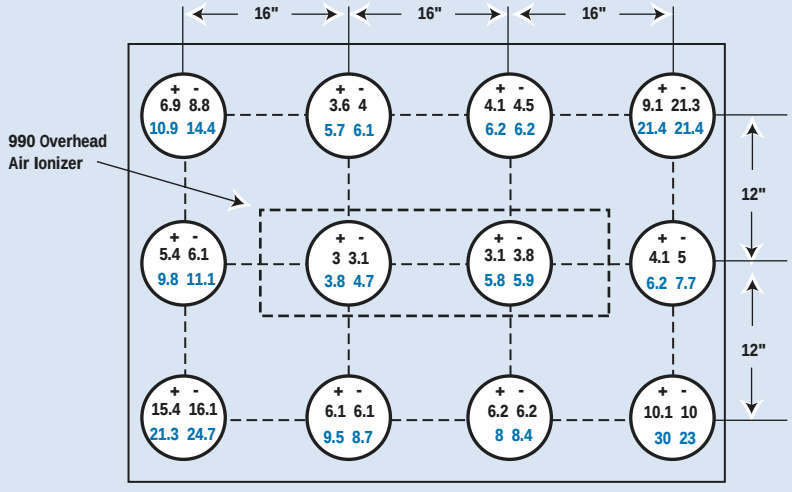
Electrical Specifications	
Ion Emission and Balance*	Steady-state ± DC; Self-balancing to within < ± 20 V at 24" (61 cm)
Emitter Points	0.012" diameter tungsten wire, internally shielded
Discharge Time*	Ionizer will discharge a charged plate from 1000 volts to 100 volts in ten (10) seconds (±1 second) at 24" (61 cm) directly below fans
Air Flow Volume	112 CFM (per fan, free-air typical)
Air Filters	Replaceable open-cell foam
Coverage Area	2' x 3', typical, directly under blower
Audible Noise*	58 dB, fans at high speed
Input Power	100-240 VAC ± 10%, 50/60 Hz, 40 watts max; Input current: 0.4 amps max
Controls	Power/fan speed rocker switch: High/Off/Low settings
Indicators	Power on: green LED; Power Supply Failure: red LED
Ozone Level	< 0.05 ppm; 24 hr. accumulation

* Measurements taken at high fan speed.

Physical Specifications	
Chassis	Aluminum with epoxy-polyester powder coat
Mounting	Four 1 1/8" S-hooks provided
Dimensions	4"H x 6"W x 36"L (10.16 x 15.24 x 91.44 cm)
Weight	8 lbs. (3.6 kg)
Certifications	C-TUV-US, CE, CB, C-TICK

Product No.	Description
Accessories 990F	Foam Filters, two per carton

Overhead Ionizer 990 Test Position



***These are typical decay rates, not specifications.**

1st Column: Positive Decay time (+)
2nd Column: Negative Decay time (-)

Black: High Speed
Red: Low Speed

Testing performed using EOS/ESD 3.1 Standard

***Time is measured in seconds (s)**

Decay time is the amount of time it takes to discharge from 1000V to 100V

Ionized Air Gun

The 3M™ Ionized Air Gun 980/980E is an excellent tool for blowing particulate contamination off of any surface. It releases a balanced stream of compressed ionized air that neutralizes the static charge that can hold particulates to a surface. The loose particles can then be easily blown away. Patented technology ensures balanced ionization for consistent control of surface charges. The air gun does not need adjustment and requires very little maintenance.

Ionized Air Gun 980

LISTED

The 3M Air Gun 980 is a multi-component device that consists of a hand unit, an air hose and a mounting console. Compact and lightweight, the console for the unit can be mounted anywhere on the workstation for easy access. It connects to any supply of clean, dry air or nitrogen, and an internal disposable filter collects particles from the air supply. The low-voltage electrical feed from the console to the hand unit is incorporated into the 7 ft. (2,1 m) light, flexible air hose. The gun itself is very lightweight and ergonomically designed for long-term user comfort and efficient operation. The console, gun and air hose are all made of static-dissipative, ESD-safe materials.

The 3M Air Gun 980 operates from 100/120 AC power; the 3M™ Air Gun 980E is a 230V version for European use.

Product No.	Description
980	Ionized Air Gun AC 100/120V 50/60 Hz Hand unit 8.0 in. x 3.0 in. x 1.0 in. (20,3 cm x 7,6 cm x 2,5 cm) Construction: Dissipative rigid polycarbonate Weight: 12.0 oz (341 g) with 7 ft. air hose Emitter points: Tungsten alloy Air Hose Construction: Dissipative flexible polyurethane Size: 7 ft. long, 0.38" OD Filter efficiency: 99.9% for 0.1 micron particle size Console 8.5 in. x 3.0 in. x 1.6 in. (21,6 cm x 7,6 cm x 4,1 cm)
980E	Ionized Air Gun – European version AC 230V ~ 50/60 Hz Hand unit 8.0 in. x 3.0 in. x 1.0 in. (20,3 cm x 7,6 cm x 2,5 cm) Console 8.5 in. x 3.0 in. x 1.6 in. (21,6 cm x 7,6 cm x 4,1 cm)

Product No.	Description
Accessories	
980F	Replacement Air Filters (4 pack of 3)
980T	Replacement Nozzle Tip
960X/980X	Replacement Wall Transformer, 120V
980E-X	Replacement Wall Transformer, 230V

Benchtop Air Ionizers

The use of ionized air in electronics work environments will remove the build up of potentially damaging static charges. Air ionizers are primarily used to control static charge on nonconductive materials. The 3M™ Benchtop Air Ionizer 963 Series blanket the benchtop with ionized air to help prevent static from damaging sensitive electronics.

Features

- Two versions available: the Benchtop Air Ionizer 963 operates using AC 120V power, and the Benchtop Air Ionizer 963E from DC 24V power supplied by an included universal power transformer (power line cord not included).
- Fast neutralization of static charges on nonconductive objects. < 1 second at 1 ft. (30 cm) distance using ANSI/ESD S3.1 test procedure.
- Maintains equal balance of positive-negative ions
- Two-speed fans
- Static-dissipative housing prevents static charge build-up on the surface of the housing, a common problem with ionizers. "ESD-safe" design allows the ionizer to be part of your overall static-safeguarded electronic workstation.
- UL, C-UL, NOM certification. CE-marked.

Product No.	Description
963	Benchtop Air Ionizer, including ionizer, Operator's Manual, and power cord; 120VAC
963E	Benchtop Air Ionizer, including ionizer, Operator's Manual, and power transformer, 100VAC-240VAC

Benchtop Air Ionizer 963

LISTED

Product Referral Generator

Floor Mats/Runners 8200 Series ..... pg. 18
Dissipative Rubber Mats/Runners 8800 Series ..... pg. 19
Air Ionizer Test Kit 718A ..... pg. 36

Property	Typical Values	
	963	963E
Power Ratings	AC 120V 60 Hz 0.20 A 20 W	DC 24V 0.5A 10W
Power Inlet	IEC 320 Socket	Mini DIN socket
Power Transformer	-	Input: AC 100V-240V, 0.4A, 50/60 Hz Into IEC320 Socket. Output: DC24V, 0.5A 3' (0.9M) cord with Mini DIN plug
Power Outlet Cord	6' (1.8 m) cord with IEC 320 and NEMA 5-15 plugs	Not included
Dimensions (w/mounting base)	7.0" W x 9" H x 4" D 18 cm W x 23 cm H x 10 cm D	7.0 in. W x 9 in. H x 4 in. D 18 cm W x 23 cm H x 10 cm D
Weight	2.5 lb. (1.1 kg)	2.5 lb. (1.1 kg)
Air Flow Low Speed Feet per Minute Standard Cubic Feet per Minute High Speed Feet per Minute Standard Cubic Feet per Minute	 200 fpm (1.0 m/s) 56.8 scfm 370 fpm (1.8 m/s) 105 scfm	 100 fpm (0.5 m/s) 37.3 scfm 300 fpm (1.5 m/s) 112 scfm
Operating Temperature	59°F (15°C) to 104°F (40°C) 59°F	59°F (15°C) to 104°F (40°C)
Static discharge time * @ 1 ft. (30 cm)	< 1 second	< 1 second
Offset Voltage	±15V	±15V
Certifications and approvals	UL, C-UL, NOM	UL, C-UL, NOM, CE
Warranty	1-year	1-year

* When tested according to ANSI/ESD S3.1-1991 at high fan speed.

Mini Air Ionizer

The 3M™ Mini Air Ionizer 960 is a small and versatile blower available for equipment or local area ionization. Its small size makes it ideal for use in those situations where space is at a minimum. Possible applications include in or around electronic product equipment, inside OEM equipment, or on ESD workstations.

The Mini Air Ionizer 960 generates a well-balanced flow of ionized air particles, which neutralizes any stray electrostatic buildup on a surface. Charges are dissipated in seconds and the possibility of a damaging electrostatic discharge (ESD) event is minimized. The ionizer also maintains a reasonably balanced flow (± 20V) of ionized air.

The unit runs off of low-voltage 24 VAC power, that can be supplied by the 3M™ Wall Transformer 960X (sold separately). Included with the ionizer are a mounting bracket and a 3ft. telephone cable (with modular plugs) to connect the ionizer to the Wall Transformer 960X.

Features

- Steady-state DC ion emission for efficient ion delivery
- Intrinsically balanced - no adjustment necessary
- Small/compact design utilizes very little work bench space
- UL/C-UL/CE for global acceptance

Mini Air Ionizer 960

LISTED

Product No.	Description
960	Mini Air Ionizer
960X/980X	Wall Transformer

Mini Air Ionizer 960

Item	Typical Properties
Input Voltage	AC 24V
Power	5.5 watts
Power Input Connection	RJ-11 socket
Size	4.5 in. (H) x 3.3 in. (W) x 2 in. (D) (including bracket) 11.5 cm x 8.4 cm x 5.1 cm
Weight	0.75 lb.
Air Flow Velocity	(@1 ft. in front of grille): 300 ft./min.
Air Flow Volume	22 scfm
Certifications	UL, C-UL, CE
*Offset Balance @ 1 ft.	± 20 V
*On Center Discharge Times	@ 1 ft.<4 seconds @ 2 ft.<10 seconds @ 3 ft.<18 seconds @ 4 ft.<28 seconds

*Testing was performed with a charged plate monitor in accordance with ionization standard ANSI/ESD 3.1 - 1991.

Wall Transformer 960X/980X (sold separately)

Item	Typical Properties
Input	AC 120V, 50/60 Hz, 270 mA
Output	AC 24V, 1.0 A through RJ-11 socket connector
Dimensions	3.2 in. (H) x 2.6 in. (W) x 1.9 in. (D) 8.1 cm x 6.6 cm x 4.8 cm
Weight	16 oz.
Certifications	UL

Note: One transformer will supply four Mini Air Ionizers 960.

Air Ionizer Tester/Field Meter and Charger

Static Sensor

The 3M™ Static Sensor 718 is an easy-to-use, hand-held instrument designed to measure static voltages on objects and surfaces, arising from electrostatic charge buildups. This instrument can play a valuable role in an organization's ESD-control program by helping the user locate and quantify ESD trouble-spots.

Features

- Small-size, lightweight, conductive plastic housing
- Membrane switches for Power, Range/Zero, and Hold functions
- Digital, LCD (liquid-crystal) display is easy to read and updates quickly
- Ranging systems assist user in making quick and easy measurements
- Measurements accurate to 5%
- Output jack available for continuous measurements

Static Sensor 718

Air Ionizer Test Kit

The 3M™ Air Ionizer Test Kit 718A, when used in conjunction with the Static Sensor 718, can be used for periodic verification of air ionizer performance. The unit consists of a charge plate and a charger.

Air Ionizer Test Kit 718A

Product No.	Description
718	Static Sensor, including meter, Operator's Manual, and Certificate of Performance verification. Available in certified.
718A	Air Ionizer Test Kit, including charge plate assembly, charger, Operator's Manual, and Certificate of Performance verification.

Static Sensor 718 Physical Characteristics

Item	Typical Properties
Dimensions	0.85" (H) x 2.4" (W) x 4.15" (L) 2.2 cm (H) x 6.1 cm (W) x 10.5 cm (L)
Weight	4.5 oz. (128 g) with battery
Power Requirements	One 9-volt alkaline battery (not included)
Measurement Ranges	0 – 2 kV Low Range 0 - 20 kV High Range
Voltage Display	3½ digit liquid crystal display
Distance indicator	LED targets. Aligned targets indicate 1 in. (2.54 cm) measurement distance
Measurement accuracy	Within 5% of actual voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

3M Air Ionizer Test Kit 718A Physical Characteristics

Item	Typical Properties
Charge Plate Assembly	Per ESD Association Standard Practice - 3.3
Charge Plate assembly Weight	2.5 oz (70 g)
Charger Dimensions	0.85" (H) x 2.4" (W) x 5.0" (L) 2.2 cm (H) x 6.1 cm (W) x 12.7 cm (L)
Charger Weight	6 oz. (170 g) with battery
Charger Power Requirements	One 9 volt alkaline battery
Charger Output	1100V minimum for positive or negative voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

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Static Control Packaging and Transportation Products

2

3M provides a wide range of static shielding and barrier packaging products to protect sensitive electronic components from static charges during transit and while in storage. To meet your specific needs, 3M provides shielding bags, cushioned bags and wrap, moisture barrier bags and more in a variety of sizes and material composition.

3M™ conductive resin products are easily grounded to prevent holding a static charge. Available as film, tubing, bags and drum liners, this material is made of opaque, volume-conductive, carbon-impregnated polyolefin. The electrical characteristics are not affected by humidity, and are suited for material handling, shipping and storage.

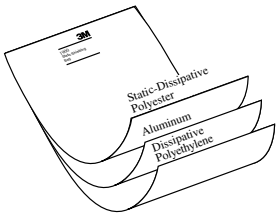
Static Shielding Bags

The 3M™ Metal-In Static Shielding Bag 1900/1910 is an economical alternative shielding bag for less demanding applications where testing and reusing bags are not prime considerations.

Aluminum is vapor-coated on half-mil polyester. This shielding layer is bonded between the polyester layer and a static-dissipative polyethylene inner layer. Static Shielding Bags 1900/1910 are amine-free, non-corrosive and meet EIA-541 definition for static shielding/dissipative packaging.

The Static Shielding Bag 1910 features a zipper closure for easy opening and closing.

Static Shielding Bag 1900/1910



Cross-section

Static Shielding Bag 1900/1910 Properties

Property	Test Method	Typical Value
Thickness	ASTM D2103	2.9 mil (74 microns)
Strength		
Tensile	ASTM D882	15 lbs./in. width > 5200 PSI MD/TD
Puncture	FTMS 101, Method 2065	>12 lbs. (5,4 kg)
Seam	MIL PRF 81705	Pass
Optical Density	ASTM D1003	.35–.45
Surface Resistance/Resistivity		
Interior	ESD S-11.11	$<10^{11}$ ohms
Exterior	ESD S-11.11	$<10^{11}$ ohms
Metallized Layer	Monroe #267	$<10^{2}$ ohm/sq.
Electrostatic Shielding	EIA-541 (V-Zap) ANSI/ESD S11.31	<30V <25nJ
Electrostatic Decay		
Interior	EIA-541	<2 sec.
Contact Corrosivity	FTMS 101C, Method 3005	Pass
Outgassing		
TML	ASTM E595	<1.0%
CVCM	ASTM E595	<0.1%
Heat Seal Properties		
Temperature		180°F – 250°F (82°C – 121°C)
Time		0.5 – 5.0 Sec.
Pressure		20 – 60 PSI (1.4×10^5 – 4.1×10^5 N/m^2)
Shelf Life (from date of manufacture)		1 – Year

Product No.	Description
1900	Metal-In Static Shielding Bag. 100 bags per pack

Standard Sizes, in.	(cm)
3 x 5	(7,6 x 12,5)
4 x 4	(10,2 x 10,2)
4 x 6	(10,2 x 15,2)
4 x 24	(10,2 x 61)
4 x 26	(10,2 x 66,0)
4 x 30	(10,2 x 76,2)
5 x 8	(12,7 x 20,3)
5 x 10	(12,7 x 25,4)
6 x 8	(15,2 x 20,3)
6 x 10	(15,2 x 25,4)
7 x 15	(17,8 x 38,1)
8 x 8	(20,3 x 20,3)
8 x 10	(20,3 x 25,4)
8 x 12	(20,3 x 30,5)
10 x 12	(25,4 x 30,5)
10 x 14	(25,4 x 35,6)
10 x 24	(25,4 x 61)
10 x 26	(25,4 x 66,0)
10 x 30	(25,4 x 76,2)
11 x 15	(27,9 x 38,1)
12 x 16	(30,5 x 40,6)
12 x 18	(30,5 x 45,7)
14 x 18	(35,6 x 45,7)
15 x 18	(38,1 x 45,7)
16 x 24	(40,6 x 61)
18 x 18	(45,7 x 45,7)
18 x 24	(45,7 x 61)

Custom Size Limits, in.	(cm)
2 x 3 to 36 x 36	(5,1 x 7,6 to 91,4 x 91,4)

Product No.	Description
1910	1900 with Zipper Closure. 100 bags per pack

Standard Sizes, in.	(cm)
3 x 5	(7,6 x 12,5)
4 x 4	(10,2 x 10,2)
4 x 6	(10,2 x 15,2)
5 x 8	(12,7 x 20,3)
6 x 8	(15,2 x 20,3)
6 x 10	(15,2 x 25,4)
8 x 10	(20,3 x 25,4)
8 x 12	(20,3 x 30,5)
10 x 12	(25,4 x 30,5)
10 x 14	(25,4 x 35,6)
11 x 15	(27,9 x 38,1)
12 x 12	(30,5 x 30,5)
12 x 16	(30,5 x 40,6)
12 x 18	(30,5 x 45,7)
18 x 18	(45,7 x 45,7)

Custom Size Limits, in.	(cm)
3 x 3 to 24 x 30	(7,6 x 7,6 to 61 x 76,2)

Dimensions are inside measurements (W x L).
Custom printing on bags also available by special order.
(Please contact 3M Customer Service for quotations.)

Product Referral Generator

Antistatic Utility Tape 40 ..... pg. 72

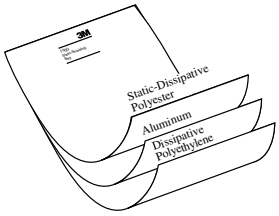
Static Shielding Bags

The 3M™ Static Shielding Bags 1970 are designed to meet the demanding static shielding requirements in the electronic assembly and disk drive storage markets. The Static Shielding Bag 1980, a zipper version, is also available upon request in the same standard sizes.

Static Shielding Bag 1970 Properties

Property	Test Method	Typical Value
Thickness	Measure	2.9 mil. (74 microns)
Tensile Strength	ASTM D 882	>6200 PSI MD/TD (2.4×10^7 N/m^2)
Puncture Strength	FTMS 101C	>10 lbs. (>4,54 kg) Method 2065
Optical Density	ASTM D 1003	0.35-0.45
Transparency	ASTM D 1003	40%
Seam Strength	Mil PRF 81705D	Pass (3.5 lb./1,6 kg Hanging weight)
Surface Resistance	ANSI/ESD S 11.11	<1 x 10^{11} ohms @12% R.H.
Static Discharge Shielding	ANSI/ESD S 11.31	< 25 nJ
Outgassing	Dynamic Headspace	<100µg/g total outgassing Total < 1µg/g Hydrocarbons
Ionic Contamination	Extraction/IC	<30ng/cm^2: Na, F, PO_4, SO_4, Cl, NH_4 <150ng/cm^2: NO_3
Non Volatile Residue	ASTM E 1235 (reference)	< 1µg/cm^2
Polycarbonate	EIA 564	Pass - 185°F (85°C), 3400 PSI
Compatibility Amines, Amides, Silicone	FTIR/NMR	None Added
Shelf life (from date of manufacture)		1 year

Product No.	Description	Standard Sizes, in.	(cm)
1970	Static Shielding Bag.	3 x 5	(7,6 x 12,5)
		4 x 6	(10,2 x 15,2)
		5 x 8	(12,7 x 20,3)
		6 x 10	(15,2 x 25,4)
		7 x 10	(17,8 x 25,4)
		8 x 10	(20,3 x 25,4)
		8 x 12	(20,3 x 30,5)
		10 x 12	(25,4 x 30,5)
		10 x 14	(25,4 x 35,6)
		11 x 15	(27,9 x 38,1)
		12 x 16	(30,5 x 40,6)
		15 x 18	(38,1 x 45,7)



Cross-section

Product No.	Description	Standard Sizes, in.	(cm)
1980	Static Shielding Bag with Zipper Closure.	3 x 5	(7,6 x 12,5)
		4 x 6	(10,2 x 15,2)
		5 x 8	(12,7 x 20,3)
		6 x 10	(15,2 x 25,4)
		8 x 10	(20,3 x 25,4)
		10 x 12	(25,4 x 30,5)

Static Shielding Bags

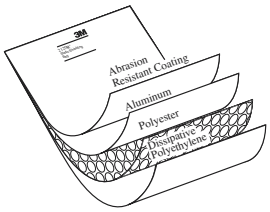
3M™ Metal-Out Static Shielding Bags 2100R are produced with a construction in which the shielding layer is very near the exterior surface. A thin abrasion-resistant coating protects this metal surface from scratches, but still permits rapid charge draining when the bag is placed on a conductive or dissipative worksurface.

The bags use a polyester layer that is double the thickness found in economy bags. This polyester is the sturdy foundation to which the thin metallization layer is applied. This makes the bags more durable and provides electrical isolation that prevents electrical currents from passing through the bag.

The interior features an amine-free antistat agent that limits triboelectric charging of parts as they move around inside the bag. It does not contribute to corrosion of parts or crazing of polycarbonate materials, and it does not rely solely on the ambient humidity for effective performance.
It functions properly in conditions as low as 10% R.H.

3M™ Static Shielding Bag 2110R uses the same film as the 2100R, but features a zipper closure for easy opening and closing.

Static Shielding Bag 2100R



Cross-section

Static Shielding Bag 2100R/2110R Properties

Property	Test Method	Typical Value
Thickness	ASTM D2103	3.2 mil (81 microns)
Strength		>20 lbs. (>6250 PSI, 4.3 x 10^7 N/m^2)
Tensile	ASTM D882	9000 PSI (6.2 x 10^7 N/m^2)
Puncture	FTMS 101	24 lbs. (10,9 kg)
Seam	MIL PRF 81705	Pass
Optical Density	ASTM D1003	.35–.45
Surface Resistance/Resistivity		
Interior	ANSI/ESD S11.11	<10^{11} ohms
Exterior	ANSI/ESD S11.11	<10^9 ohms
Metallized Layer	Monroe #267	<10^2 ohm/sq.
Electrostatic Shielding	EIA-541 (V-Zap)	<30V
	ANSI/ESD S11.31	<25nJ
Decay Time	EIA-541	<2 sec.
Contact Corrosivity	FTMS 101C Method 3005	Pass
Outgassing		
TML	ASTM E595	<1.0%
CVCM	ASTM E595	<0.1%
Heat Seal Properties		
Temperature		180°F - 250°F (82°C – 121°C)
Time		0.5 – 5.0 sec.
Pressure		20 – 60 PSI
Shelf Life (from date of manufacture)		1 – Year

Product No.	Description
2100R	Metal-Out Static Shielding Bag. 100 bags per pack

Standard Sizes, in.	(cm)
3 x 5	(7,6 x 12,5)
4 x 4	(10,2 x 10,2)
4 x 6	(10,2 x 15,2)
4 x 26	(10,2 x 66,0)
4 x 30	(10,2 x 76,2)
5 x 8	(12,7 x 20,3)
6 x 8	(15,2 x 20,3)
6 x 10	(15,2 x 25,4)
7 x 15	(17,8 x 38,1)
8 x 8	(20,3 x 20,3)
8 x 10	(20,3 x 25,4)
8 x 12	(20,3 x 30,5)
10 x 12	(25,4 x 30,5)
10 x 14	(25,4 x 35,6)
10 x 24	(25,4 x 61)
11 x 15	(27,9 x 38,1)
12 x 16	(30,5 x 40,6)
12 x 18	(30,5 x 45,7)
14 x 18	(35,6 x 45,7)
15 x 18	(38,1 x 45,7)
16 x 24	(40,6 x 61)
18 x 18	(45,7 x 45,7)
18 x 24	(45,7 x 61)

Custom Size Limits, in.	(cm)
2 x 3 to 36 x 36	(5,1 x 7,6 to 91,4 x 91,4)

Product No.	Description
2110R	2100R with Zipper Closure. 100 bags per pack

Standard Sizes, in.	(cm)
3 x 5	(7,6 x 12,5)
4 x 4	(10,2 x 10,2)
4 x 6	(10,2 x 15,2)
5 x 8	(12,7 x 20,3)
6 x 8	(15,2 x 20,3)
6 x 10	(15,2 x 25,4)
8 x 10	(20,3 x 25,4)
8 x 12	(20,3 x 30,5)
10 x 12	(25,4 x 30,5)
10 x 14	(25,4 x 35,6)
11 x 15	(27,9 x 38,1)

Custom Size Limits, in.	(cm)
3 x 3 to 24 x 30	(7,6 x 7,6 to 61 x 76,2)

Dimensions are inside measurements (W x L).
Custom printing on bags available by special order.
(Please contact 3M Customer Service for quotations.)

Static Shielding Bags

3M™ Metal-Out Cushioned Static Shielding Bags 2120R protect devices from physical damage as well as provide proper static shielding. The open-cell cushioning structure provides physical shock protection even when punctured. This system offers a more convenient packaging method than two-part packaging systems.

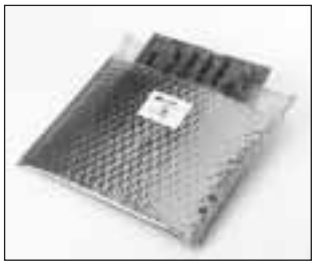
The five-layer construction of the bag protects against direct discharge, triboelectric charge and static fields. The inside layer, next to the components, is a smooth static-dissipative polyethylene liner that minimizes snagging of pins or sharp edges during insertion or removal.

Static Shielding Bag 2120R Properties

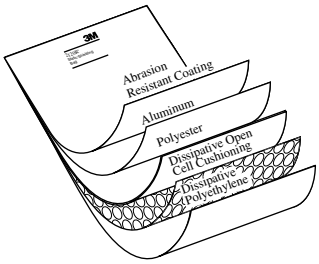
Property	Test Method	Typical Value
Thickness	PPP-C-1842	125 mil (3,175 mm)
Strength		
Tensile	ASTM D882	34 lbs./in.
Puncture	FTMS 101	22 lbs. (10 kg)
Seam	MIL PRF 81705	Pass
Surface Resistance/Resistivity		
Interior	EIA-541, ASTM D257	$<10^{12}$ ohm/sq.
Exterior	ANSI/ESD S11.11	$<10^{11}$ ohms
Metallized Layer	Monroe #267	$<10^{2}$ ohm/sq.
Shielding	EIA-541 (V-Zap)	<30V
Electrostatic Decay		
Interior	EIA-541	<2 sec.
Contact Corrosivity	FTMS 101C, Method 3005	Pass
Shelf life (from date of manufacture)		1 - Year

Product No.	Description	
2120R	Cushioned Static Shielding Bags. 100 bags per pack	
	Standard Sizes, in.	**(cm)**
	6 x 7	(15,2 x 17,8)
	8 x 7	(20,3 x 17,8)
	8 x 11	(20,3 x 27,9)
	10 x 7	(25,4 x 17,8)
	12 x 11	(25,4 x 27,9)
	14 x 11	(35,6 x 27,9)
	14 x 15	(35,6 x 38,1)
	16 x 11	(40,6 x 27,9)
	16 x 15	(40,6 x 38,1)
	18 x 11	(45,7 x 27,9)
	18 x 15	(45,7 x 38,1)
	18 x 23	(45,7 x 58,4)
	Custom Size Limits, in.	**(cm)**
	5 x 4 to 24 x 23	(12,7 x 10,2 to 61 x 58,4)

Dimensions are inside measurements (W x L).



Static Shielding Bag 2120R

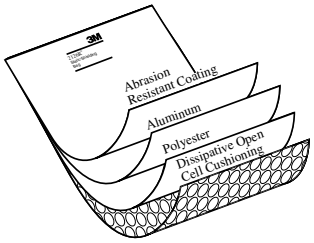


Cross-section

Cushioned Static Shielding Wrap

3M™ Cushioned Wrap 2126R provides static shielding and physical protection for large or irregularly shaped circuit boards. It is made of the same open-cell cushioning construction used for the bag and is heat-sealable, but does not have the smooth inner liner. Supplied in rolls, it can be cut to fit various wrapping applications.

Static Shielding Wrap 2126R



Cross-section

Product No.	Description	
2126R	Cushioned Static Shielding Wrap. Supplied in rolls	
	Standard Sizes, in. x ft. (cm x m)	
	24 x 250	(61 x 76)
	48 x 250	(122 x 76)

2126R Properties

Property	Test Method	Typical Value
Thickness	PPP-C 1842	125 mil
Strength		
Tensile	ASTM D882	34 lbs./in.
Puncture	FTMS 101	22 lbs. (10 kg)
Surface Resistance/Resistivity		
Interior	ANSI/ESD S11.11	$<10^{12}$ ohm/sq.
Exterior	ANSI/ESD S11.11	$<10^{11}$ ohms
Metallized Layer	Monroe #267	$<10^{2}$ ohm/sq.
Shielding	EIA-541 (V-Zap)	<30V
Electrostatic Decay		
Interior	ANSI/ESD S11.11	<2 sec.
Contact Corrosivity	FTMS 101C, Method 3005	Pass
Shelf life (from date of manufacture)		1 - Year

Moisture Vapor Barrier Bag

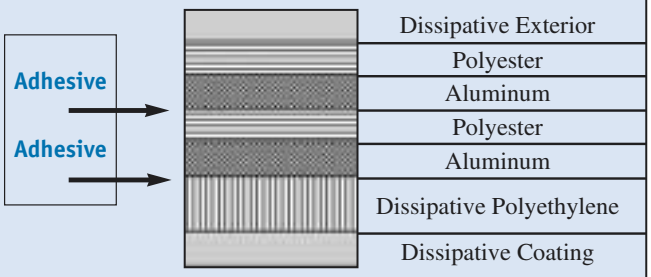
The 3M™ Moisture Barrier Bag 3370 has been designed to meet the demanding moisture protection needs of the electronics market.

- **Durability** – Utilizes a multi-layer 3.6 mil film design that provides puncture and tear resistance. Proven reliability in vacuum packaging applications.
- **Moisture Protection** – Provides proven long-term protection in the most critical seepage area – the seams. 3M provides a 1/2" side seam to increase reliability that the finished bag is capable of maintaining the MVTR level equivalent to that of the film. The bag's multi-layer design eliminates problems associated with "pinholes" found in many foil bags.
- **ESD/EMI shielding** – Provides high frequency protection and static shielding to protect the most sensitive parts.
- **Cleanliness** – Uses a clean barrier film which exceeds the requirements of EIA-583 Class I and contains no amines, amides or N-Octanoic Acid. Outgassing levels are extremely low.
- **Construction** – Opaque bag is a highly durable construction (from the outside layer to the innermost layer): static dissipative layer, two aluminized polyester layers each 48 gauge, 2.6 mil static dissipative polyethylene.
- **Industry Standards** – Meets the electrical and physical requirements of JESD 625A, MIL-PRF-81705, Type 1, EN100015, IEC61340-5-1.

The bag is available in many standard sizes and can be custom-sized for your specific application.

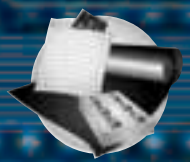
Product No.	Description	
3370	Moisture Vapor Barrier Bag. 100 bags per pack.	
	Size, in.	**(cm)**
	4 x 6	(10,2 x 15,2)
	5 x 8	(12,5 x 20,3)
	6 x 10	(15,2 x 25,4)
	8 x 10	(20,3 x 25,4)
	10 x 12	(24,4 x 30,5)
	12 x 16	(30,5 x 40,6)
	16 x 18	(40,6 x 45,7)
	18 x 24	(45,7 x 61)

Construction:



Static Shielding Bag 3370

Property	Test Method	Typical Value
Thickness	Measure	3.6 mil. (92 microns)±10%
Moisture Vapor Transmission Rate	ASTM F 1249	< 0.015 grams/100 inches^2 /24 hours (645.2 cm^2) (film and seams)
Tensile Strength	ASTM D 882	> 8200 PSI (5.7 x 10^7 N/m^2)
Puncture Resistance	FTMS 101C Method 2065	> 20 lbs. (9.07 kg)
Seam Strength	Mil PRF 81705(D)	Pass (3.5 lb./1,6 kg hanging weight)
Surface Resistance (Interior and Exterior)	ANSI/ESD S 11.11	<1 x 10^{11} ohms @12% R.H.
Metal Layer	Monroe 267 Buried Layer	< 100 ohms
Static Discharge Shielding	ANSI/ESD S 11.31	< 7 nJ
Outgassing	Dynamic Headspace	<100µg/g Total outgassing, < 1µg/g Hydrocarbons
Ionic Contamination	Extraction/IC	<20ng/cm^2: Na, F, PO_4, SO_4, Cl, NH_4 <100 ng/cm^2: NO_3
Non Volatile Residue	ASTM E 1235 (reference)	<1 µg/cm^2
Polycarbonate Compatibility	EIA 564	Pass - 185°F (85°C), 3400 PSI
Amines, Amides, Silicone	FTIR/NMR	None Added

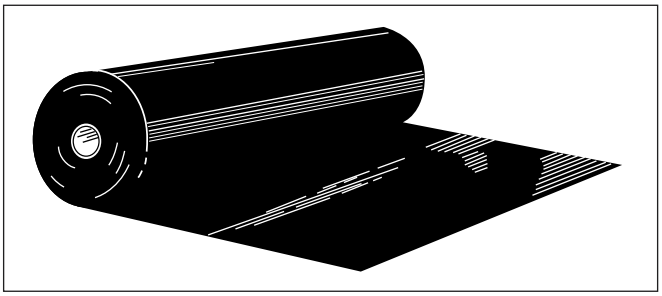


Conductive Film and Tubing

The 3M™ family of conductive film and tubing products is made of opaque, volume-conductive, carbon-impregnated polyolefin. Easily grounded, the electrical characteristics are not affected by age or humidity, and are suited for material handling, shipping and storage.

Electrically Conductive Film

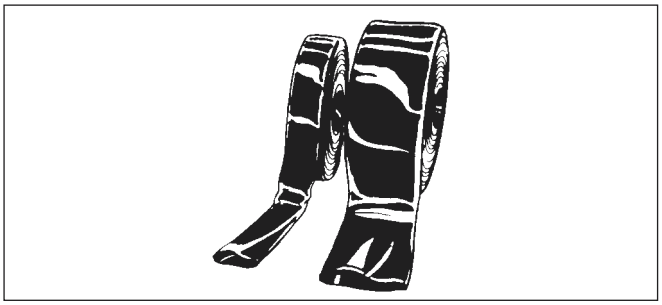
Made of opaque, volume-conductive, carbon-impregnated polyolefin film, in both short and long rolls. Versatile product – adaptable to numerous applications commonly found in the electronic or chemical industries.



Film 1700, 1760 Series

Conductive Tubing

3M™ Conductive Tubing 1724 is made of opaque, volume-conductive carbon-impregnated polyolefin in 500 ft. (152 m) rolls, and is used to make bags or protective sleeves for specialized packaging or storage requirements. The tubing is heat-sealable and is readily adaptable to automated packaging lines.



Tubing 1724

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life.

Product No.	Description
Short Rolls	
1704	Film. Thickness: 4.0 mil. (102 microns) **Widths, in. (m)** — **Approximate Length/Roll, ft. (m)** 36 (0,9) — 150 (45,7) 54 (1,4) — 150 (45,7) 72 (1,8) — 150 (45,7)
1706	Film. Thickness: 6.0 mil. (152,4 microns) **Widths, in. (m)** — **Approximate Length/Roll, ft. (m)** 36 (0,9) — 150 (45,7) 45 (1,1) — 150 (45,7) 72 (1,8) — 150 (45,7)
1708	Film. Thickness: 8.0 mil. (203,2 microns) **Widths, in. (m)** — **Approximate Length/Roll, ft. (m)** 36 (0,9) — 150 (45,7) 54 (1,4) — 150 (45,7) 72 (1,8) — 150 (45,7)
Long Rolls	
1764	Film. Thickness: 4.0 mil. (102 microns) **Widths, in. (m)** — **Approximate Length/Roll, ft. (m)** 36 (0,9) — 1,500 (457)

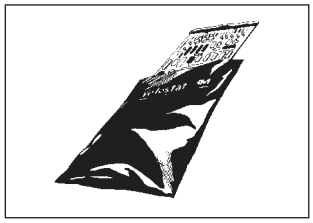
Product No.	Description
1724	Lay Flat Conductive Tubing. Thickness: 4.0 mil. (102 microns) **Widths, in. (cm)** — **Approximate Length/Roll, ft. (m)** 5 (12,7) — 500 (152) 12 (30,5) — 500 (152)

Other widths and lengths available upon quotation.

Conductive Bags and Drum Liners

Conductive Bags

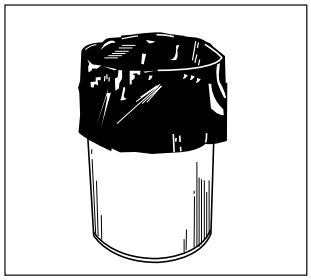
3M™ Conductive Bags 2004 are made of opaque, volume–conductive carbon-impregnated polyolefin. They are easily grounded, and the electrical characteristics are not affected by age or humidity. The standard bags are readily heat-sealable and 4 mil thick.



Shielding Bags 2004

Drum Liners

3M™ Drum Liners 2014 are simply larger sizes of the Conductive Bags 2004; bags wider than 18 inches (45,7 cm) are called drum liners. They do not hold static charge when grounded. They are commonly used for holding explosive chemicals that could be ignited by a static-caused spark, or dry chemicals that tend to cling to ordinary nonconductive static-laden plastics. A common application in the electronic or chemical industries is as a waste container liner.



Drum Liner 2014

Film, Bag and Tubing Properties*

Property	Test Method	Typical Value
Thickness	ASTM D2103	4 mil (102 microns)
Strength		
Breaking Factor	ASTM D882	10 lbs./in.
Puncture	Fed Std 101	8 lbs.
Heat Seal Parameters		
Temperature		180°F – 250°F
Time		0.5 – 5.0 sec.
Pressure		20 – 60 PSI ($1.4 \times 10^5 - 4.1 \times 10^5$ N/m^2)
Temperature Limits		-50°F – 150°F (-46°C – 66°C)
Vicat Softening Temperature	ASTM D1525	83°C
Electrical Properties		
Volume Resistivity	ASTM D991	<500 ohm-cm
Static Decay	EIA-541	<2 sec.
Water Vapor Transmission	ASTM F372	3 g/sq. m/day
Chemical Susceptibility	ASTM D543	
Dilute Acids and Alkalies		Resistant
Concentrated Acids & Alkalies		Slight attack
Alcohols (Isopropanol)		Resistant
Hydrocarbons (Heptane)		Moderate attack
Ketones (Acetone)		Slight attack
Oil and Gasoline		Moderate attack
Aromatic Hydrocarbons (Toluene)		Severe attack
Shelf Life		Indefinite

* Typical values for 4.0 mil film.
Physical characteristics will change with other thicknesses.

Product No.	Description
2004	Conductive Bags. Wall thickness: 4.0 mil. (102 microns) 100 bags per pack **Standard Sizes, in. (cm)** 5 x 8 (12,7 x 20,3) 8 x 12 (20,3 x 30,5) 10 x 12 (25,4 x 30,5) 12 x 16 (30,5 x 40,6) 15 x 18 (38,1 x 45,7) **Custom Size Limits, in. (cm)** 4 x 4 to 42 x 72 (10,2 x 10,2 to 106,7 x 182,9)

Product No.	Description
2014	Drum Liners. Wall thickness: 4.0 mil. (102 microns) 100 per box **Typical Drum Size, in. (cm)** 5 gallon: 18 x 24 (45 x 60) 20 gallon: 24 x 36 (61 x 91) 30 gallon: 30 x 36 (76 x 91) *55 gallon: 38 x 58 (96 x 147) * available 50 per box

Dimensions are inside measurements (W x L).
Other film thicknesses and bag sizes are available by special order.

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life.

Single Card Carriers

3M™ Static-Shielding Single Card Carriers protect individual printed circuit boards from static and physical damage during storage and transport. Interiors are lined with dissipative cushioning foam.

Single Card Carrier

Product No.	Length, in. (cm)	Width, in. (cm)	Depth, in. (cm)
8520	10 (25,4)	8 (20,3	1.25 (3,2)
8521	12 (30,5)	9 (22,9)	1.25 (3,2)
8522	18 (45,7)	17 (43,2)	2 (5,1)
8523	10 (25,4)	8 (20,3)	2 (5,1)

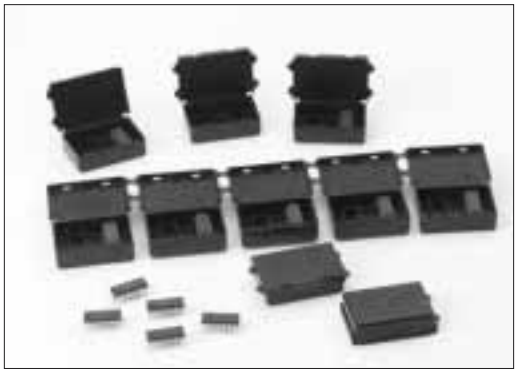
All dimensions are referenced from the inside bottom of the container and are nominal dimensions.

Single Device Carrier

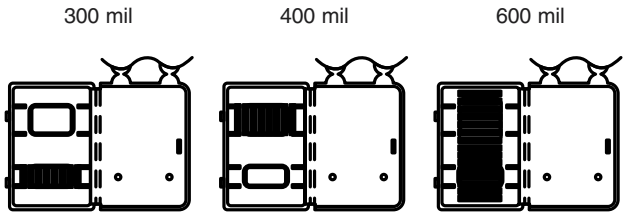
The rugged injection-molded 3M™ Single Device Carrier 5701 provides cost-effective physical and static protection for DIPs. The conductive units are volume resistive and will not lose their conductivity with age, nor do they depend on humidity to function. Single Device Carrier 5701 meets EIA-541 requirements for static shielding. A unique “saddle” design supports device leads and helps prevent accidental bending. Other design features include a smooth front surface on the container to adhere labels and a living hinge cover that snaps securely shut. Carrier accepts up to 18-pin 300 mil and 400 mil devices, and up to 28-pin 600 mil devices.

Product No.	Length, in. (cm)	Width, in. (cm)	Depth, in. (cm)
5701	1.55 (3,9)	1.01 (2,6)	0.46 (1,2)

All dimensions are referenced from the inside bottom of the container and are nominal dimensions.



Single Device Carrier 5701



Connector Covers

3M™ Connector Covers 4270 Series feature a unique conductive composite material. The material is made intrinsically conductive by uniformly distributing a conductive matrix of fibers during compounding. The covers are permanently volume conductive and free of carbon black particulate. The covers do not leave black marks and are more suited to clean situations.

Connector Covers 4270 Series

Product No.	Description
4270	Feature a unique conductive composite material. Noncorrosive and produce no visible corrosion. Connector Covers 4270 Series were designed to meet the requirements and intentions of MS90376 and MIL PRF 5501/31A or 32A.

Military Application

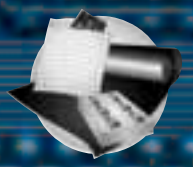
Circular Connectors Covers 4270 Series were designed to meet the requirements and intentions of MS90376, and MIL PRF 5501/31A or 32A. Prominent military contractors have qualified these materials to their own specifications and are encouraging their use.

Material Properties

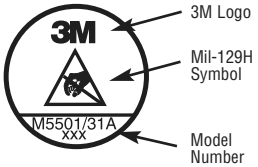
Property	Test Method	Typical Value
Resistivity	ASTM D991	$<10^5$ ohm-cm
Contact Corrosivity (Kovar plate)	FTMS 101C Method 3005	Pass
Crayoning	3M	Not visible
Elongation	ASTM D638	25%
Tensile	ASTM D638	1500 PSI (1.0 X 10^7 N/m^2)
Vicat Softening	ASTM MD 1525	205°F (96°C)
Out Gassing	ASTM E595	Pass

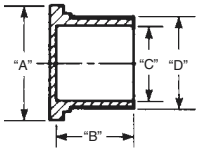
Material Properties

Chemical	Reactions
Dilute Acids	Slight Attack
Dilute Alkalines	Slight Attack
Concentrated Acids	Severe Attack
Concentrated Alkalines	Severe Attack
Methanol, Ethanol, and Isopropanol	Resistant
Hydrocarbons	Slight Attack
Ketones	Dissolves
Oil and Gasoline	Severe Attack



3M™ Circular Cover 4270





Product Description	Old Prod. Desc.	"A"	"B"	"C"	"D"
Packaged 100/bag; 10 bags/box					
4270 M5501-31A-250	4270-4R	.670	.500	.250	.336
4270 M5501/31A-313	4270-5R	.670	.500	.313	.399
4270 M5501/31A-375	4270-6R	.670	.500	.375	.461
4270 M5501/31A-413	4270-8Y	.670	.625	.413	.483
4270 M5501/31A-480	4270-8R	.740	.500	.480	.540
4270 M5501/31A-500	4270-9R	.750	.500	.500	.586
4270 M5501/31A-530	4270-10Y	.750	.625	.530	.595
4270 M5501/31A-605	4270-10R	.840	.500	.605	.665
4270 M5501/31A-655	4270-12Y	.860	.625	.655	.715
4270 M5501/31A-720	4270-12R	.970	.500	.720	.755
4270 M5501/31A-785	4270-14Y	1.031	.625	.785	.845
4270 M5501/31A-850	4270-14R	1.125	.500	.850	.905
4270 M5501/31A-893	4270-16Y	1.125	.625	.893	.963
4270 M5501/31A-973	4270-16R	1.220	.500	.973	1.035
4270 M5501/31A-1028	4270-18Y	1.250	.625	1.028	1.088
4270 M5501/31A-1093	4270-18R	1.330	.562	1.093	1.155
4270 M5501/31A-1125	4270-19R	1.400	.562	1.125	1.213

Product Description	Old Prod. Desc.	"A"	"B"	"C"	"D"
Packaged 50/bag; 10 bags/box					
4270 M5501/31A-1150	4270-20Y	1.406	.625	1.150	1.215
4270 M5501/31A-1231	4270-20R	1.465	.562	1.231	1.301
4270 M5501/31A-1270	4270-22Y	1.500	.625	1.270	1.340
4270 M5501/31A-1340	4270-22R	1.590	.562	1.340	1.410
4270 M5501/31A-1390	4270-24Y	1.640	.625	1.390	1.460
4270 M5501/31A-1463	4270-24R	1.700	.562	1.463	1.533
4270 M5501/31A-1540	4270-25Y	1.810	.625	1.540	1.580
4270 M5501/31A-1645	4270-28Y	1.875	.625	1.645	1.718
4270 M5501/31A-1715	4270-28R	1.950	.562	1.715	1.790
Packaged 25/bag; 10 bags/box					
4270 M5501/31A-1890	4270-32Y	2.125	.625	1.890	1.970
4270 M5501/31A-1965	4270-32R	2.220	.562	1.965	2.040
4270 M5501/31A-2140	4270-36Y	2.340	.625	2.140	2.210
4270 M5501/31A-2215	4270-36R	2.435	.600	2.215	2.290
4270 M5501/31A-2380	4270-40Y	2.600	.625	2.380	2.450
4270 M5501/31A-2440	4270-40R	2.660	.600	2.440	2.530
4270 M5501/31A-2630	4270-44Y	2.875	.625	2.630	2.700
4270 M5501/31A-2720	4270-44R	2.960	.600	2.720	2.812
4270 M5501/31A-2880	4270-48Y	3.125	.625	2.880	2.950
4270 M5501/31A-2960	4270-48R	3.225	.600	2.960	3.050

Labels

3M™ Labels 7000 Series are designed to alert personnel handling bags, boxes or other carriers that the contents are static-sensitive. When made part of a comprehensive static control process, the labels help prevent improper handling of static-sensitive components. Available in single use or reusable forms using the accepted industry static symbols: JEDEC-14 (Joint Electronic Device Engineering Council) and Military Standard 129.

7101/Reusable

7102/Destructible

7201/Reusable
7202/Destructible
7203/Reusable
7204/Destructible

Product No.	Description	Labels per Roll
7101	Reusable Orange w/Black Type JEDEC-14 Symbol	500
7102	Destructible Yellow w/Black Type JEDEC-14 Symbol	500
	Size, in. (cm)	
	1.875 x 2.5 (4,6 x 6,4)	
7201	Reusable Yellow w/Black Type MIL-STD-129 Symbol	500
7202	Destructible Yellow w/Black Type MIL-STD-129 Symbol	500
	Size, in. (cm)	
	2 x 2 (5,1 x 5,1)	
7203	Reusable Yellow w/Black Type MIL-STD-129 Symbol	250
7204	Destructible Yellow w/Black Type MIL-STD-129 Symbol	250
	Size, in. (cm)	
	4 x 4 (10,2 x 10,2)	

Hinged Containers

3M™ Hinged Containers are made from injected-molded plastic, and are noncorrosive and lightweight. The containers feature molded pin hinges that provide better security and reliability than traditional snap hinges.

Static-sensitive devices can be transported in these containers which provide protection from direct static discharges as well as from static fields from charged personnel and materials.

Hinged Containers

3M™ Containers are injection-molded in a variety of shapes and sizes. They are ideal for static-safe storage, kitting, and in-process handling and transporting of static-sensitive assemblies and devices.

Round Containers

Product No.	Length, in. (cm)	Width, in. (cm)	Depth, in. (cm)
4021	2.88 (7,3)	1.19 (3,0)	0.5 (1,3)
4022	3.88 (9,8)	1.94 (4,9)	0.5 (1,3)
4023	2.56 (6,5)	3.5 (8,9)	1.75 (4,4)
4024	7 (17,8)	3.5 (8,9)	1 (2,5)
4025	7 (17,8)	5 (12,3)	0.5 (1,3)

All dimensions are referenced from the inside bottom of the container and are nominal dimensions.

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life.

Product No.	Diameter, in. (cm)	Height, in. (cm)
4011	2.38 (6,0)	0.88 (2,2)
4012	3.38 (8,6)	0.88 (2,2)
4013	1.81 (4,6)	4 (10,2)
4014	4.06 (10,3)	2.34 (6,0)
4015	3.81 (9,7)	4.69 (11,9)

All dimensions are referenced from the inside bottom of the container and are nominal dimensions.

Container Properties

Typical Property	Test Method	4540 EVA Copolymer Compound / 1801 Sheet Stock Typical Value*	4520 Polypropylene Compound / 1840 Sheet Stock Typical Value**
Hardness	ASTM D2240	58 - 62 Shore D	67 - 71 Shore D
Heat Deflection Temp.	ASTM D648	38° - 43°C @ 264 PSI	100°C @ 66 PSI; 50°C @ 264 PSI
Water Absorption	ASTM 570	0.1 - 0.2%	0.1 - 0.2%
Vicat Softening	ASTM D1525	88° - 92°C	148°C
Flammability	ASTM D635	4.5 - 5.5 cm/min.	2 cm/min.
Impact Resistance	ASTM D256	2.9 - 3.7 ft.-lbs./in. @ 72°F	8 - 10 ft.-lbs./in. @ 72°F
Notched Izod		0.6 - 1.3 ft.-lbs./in. @ 25°F	7 - 9 ft.-lbs./in. @ 25°F
Maximum Temp. Exposure	3M	150°F	180°F
Tensile Strength	ASTM D638	1700 - 2000 PSI	2800 - 3000 PSI
Flex Modulus	ASTM D790	40,000 - 50,000 PSI	130,000 - 150,000 PSI
Mold Shrinkage	ASTM 955	15 - 20 mil/in.	10 - 20 mil/in.
Electrical Conductance			
Volume Conductive	ASTM D991	< 500 ohm-cm	< 500 ohm-cm
Chemical Resistance	ASTM D543		
Alcohol		Resistant	Resistant
Aromatic Hydrocarbons		Severe Attack	Severe Attack
Aliphatic Hydrocarbons		Moderate Attack	Moderate Attack
Concentrated Acids		Slight Attack	Slight Attack
Concentrated Alkalines		Slight Attack	Slight Attack
Dilute Acids		Resistant	Resistant
Dilute Alkalines		Resistant	Resistant
Kerosene		Severe Attack	Severe Attack
Ketones (Acetone)		Moderate Attack	Moderate Attack
Mineral Oil		Slight Attack	Slight Attack
Oil and Gasoline		Moderate Attack	Moderate Attack

*EVA copolymer technical data for 4540 Resin; 1801; 4251-4254A Snap on Covers.

**Polypropylene technical data for 4520 Resin; 1840; 4011-4016 Round Containers and Lids; 4021-4025 Hinged Containers; 5701 Single Device Carriers; and 8520-8523 Single Card Carriers.

Note: Shelf life of products made with conductive resin is five years. Variations in storage conditions such as temperature fluctuation, exposure to sunlight or high humidity may reduce the shelf life.

Test Equipment

3

3M offers a complete selection of test equipment to verify the correct functioning of static control systems. These test products measure static voltages on objects and surfaces, verify air ionizer performance and test static control wrist straps and footwear.

Test Equipment

	3M™ Test Equipment	Measures	Application
	**701** Test Kit for Static Control Surfaces (Certified only)	Resistance: surface-to-ground and surface-to-surface	Velostat™ Mats and Sheets 1800 Series Workstation Kits 8000 Series Mats 8200 Series Laminate 8300 Series Floor Tile 8400 Series Field Service Kits 8500 Series Rubber Mats 8800 Series Epoxy Flooring 8900 Series Anti-Fatigue Mats 9500 Series Other static-dissipative surfaces and surface treatments
	**711** Charge Analyzer (Certified only)	Charge retention/drainage Charge generation/drainage	Ionized Air Blowers 960/963 Ionized Air Gun 980 Other benchtop air ionizers Static Shielding Bags Velostat Mats and Sheets 1800 Series Mats 8200 Series Other mats Floor Tile 8400 Series Rubber Mats 8800 Series ESD Epoxy Flooring 8900 Series Anti-Fatigue Mats 9500 Series Wrist Straps 2200 Series Shoe Straps 2050 Series Other wrist straps and shoe straps Tapes
	**718** Static Sensor (Non Certified and Certified versions available)	Static Voltages	Objects and Surfaces
	**718A** Air Ionizer Test Kit	Ion balance Static decay	Air Ionizers
	**724** Continuous Workstation Monitor	Resistance	Velostat™ Mats and Sheets 1800 Series Mats 8200 Series Hard Laminate 8300 Series Mats 8800 Series Dual Conductor Wrist Straps

	3M™ Test Equipment	Measures	Application
	725 Continuous Wrist Strap Monitor	Resistance	Dual Conductor Wrist Straps
	740 Wrist Strap and Footwear Tester (Non Certified and Certified versions available)	Resistance	Single Conductor Wrist Straps Other single conductor wrist straps
	746 Wrist Strap Tester (Non Certified and Certified versions available)	Resistance	Single Conductor Wrist Straps Other single conductor wrist straps
	747 Shoes/Wrist Strap Tester (Certified only)	Resistance	Single Conductor Wrist Straps Other single conductor wrist straps Data logging capability
	790 Static Monitor	Voltage	Dual Conductor Wrist Straps
	791W Wrist Strap Monitor	Voltage	Dual Conductor Wrist Straps
	791E Equipment Ground Monitor	Resistance Data logging capability	Monitoring equipment grounds

Test Kit 701

The 3M™ Test Kit 701 contains a lightweight, user-friendly megohmmeter plus all of the components needed to make testing mats and other surfaces simple and accurate. All of the items are packaged in a foam-lined carrying case.

The kit meets the intent of ANSI/ESD Standard 4.1, "Worksurfaces – Resistive Characterization." ANSI/ESD Standard 7.1, "Floor Materials – Resistive Characterization of Materials," and MIL-PRF-87893, "Workstation, Electrostatic Discharge (ESD) Control," for auditing purposes. The meter has separate scales and test settings for measuring surface-to-ground and surface-to-surface resistance at two prescribed test voltages (10V and 100V), and system continuity. The easy to read scales are both color-coded and numbered.

Test Kit 701

c UL us LISTED CE

Product No.	Description
701	Test Kit for Static Control Surfaces. Also available in Certified. Kit contains: • 1 Megohmmeter 12 oz. (340 g) 1.8 x 3.3 x 4.6 in. (4,57 x 8,38 x 11,68 cm) • 2 Test Weights 5 lbs. (2,27 kg) each • 2 Test Leads, 10 ft. (3 m) each • 1 Insulated Bulldog Clip • 1 Alligator Clip • 1 Continuity Test Plate • 2 Batteries (22.5V and 1.5V) • 1 Operator's Manual • 1 Molded Carrying Case
701-L	Test Leads
701-M	Megohmmeter only
701-W	5 lb. Test Weight

Test Kit Properties

Product	Item	Typical Properties
Kit	Weight:	14 pounds (6,35 kg)
	Case Dimensions:	5.125" x 10" x 13.5" (13,02 cm x 25,4 cm x 34,29 cm)
	Case Material:	Blow-molded, high density polyethylene with foam inserts
	Case Color:	Gray
Meter	Weight:	12 ounces (0,34 kg)
	Dimensions:	1.8" x 3.3" x 4.6" (4,57 cm x 8,38 cm x 11,68 cm)
	Resistance Ranges:	
	Continuity Test Mode	0 – 10M K (internal R=500 K K)
	10V Surface Test Mode	10^5 – 10^{11} K (internal R=2 M K)
	100V Surface Test Mode	10^5 – 10^{11} K (internal R=2 M K)
Weights	2 Test Weights:	5 pounds (2,27 kg) each
	Dimensions:	Diameter – 2.5 in. (6,35 cm) Height – 5.06 in. (12,85 cm); includes handle and pad
	Pad Material:	Conductive silicone rubber
	Pad Dimensions:	Diameter – 2.5 in. (6,35 cm) Thickness – 0.25 in. (0,64 cm)
Leads	Length:	10 feet (3,05 m)
	Wire Size:	18 gauge
	Insulation:	Silicone rubber
	Diameter:	0.125" (0,32 cm)
Power Supply	Batteries (2):	22.5 volt (Eveready #505 or equivalent) and 1.5 volt (AA).

Product Referral Generator

Floor Mats/Runners 8200 Series ..... pg. 18
Dissipative Rubber Mats/Runners 8800 Series ..... pg. 19
Anti-Fatigue Mats/Runners 9500 Series ..... pg. 22
Static Conductive Floor Tile 8400 Series ..... pg. 66-67
Epoxy Flooring 8900 ESD ..... pg. 68-69

Charge Analyzer

The 3M™ Charge Analyzer 711 was designed to test the performance of products used for the purpose of static control and elimination. The Charge Analyzer 711 can be used as a laboratory analytical tool, evaluating the performance of ionizing equipment, static-protective packaging, worksurfaces, and personnel grounding systems. It is very effective for use as a demonstration tool in employee static awareness training sessions.

The lightweight and compact construction of the unit offers versatility in the workplace. The modular internal construction simplifies modifications and repair by exchange of the functional printed circuit boards. All parameter settings are controlled via a built-in EEPROM. Periodic calibrations can be performed without the need to open the chassis. When the analyzer is switched off, all last set parameters are stored in the EEPROM. These parameters are defaulted to when the unit is switched on again. The 711 is powered by built-in rechargeable NiMH-batteries or an AC wall plug-in adapter. All interfacing connections are made at the rear of the unit.

Product No.	Description
711	The Charge Analyzer 711 is shipped in a durable black case with foam interior, containing the following accessories: (Certified only) Cup electrode Plate electrode Cylinder electrode AC/DC Adapter, DC 12 V / 500 mA Sensor cover Teflon™ measuring lead, 1 m Grounding cord with alligator clip RS 232 interface cable 50 mm (2 inches) high conductive container with insulating handle Insulated bulldog clip Metal spacers (3) with thread, 76 mm, (3 in. length) Software disk for data acquisition Operating instructions Transport case Certificate of Conformity Sensor, 711 RS for measuring electrostatic fields, with 2 meter cord (6.5 ft.)

Charge Analyzer 711

Charge Analyzer 711

CE

3M™ Charge Analyzer 711 Properties

Item	Typical Properties
Dimensions	Base unit: 6 x 6 x 6 inches (15,2 x 15,2 x 15,2 cm)
Weight	3.53 lbs. (1,6 kg)
High Voltage Power Supply (internal)	> 1100 V positive or negative (current limiting resistor: 10 MK)
Low Voltage Power Supplies	Built-in NiMH-rechargeable batteries, 1400 mAh AC/DC Adapter: secondary side, DC 12 V/500 mA
Operating Time (rechargeable batteries)	4 hours (approximately) with full charge
Storage Memory Capacity	128 k EEPROM (e.g. sufficient for approximately 100 CPM*-measurements)
Response Time	0 to 100%; 100 ms
Impedance	10^{15} K (Teflon™-separators cleaned)
Accuracy	± 2.5% of range end value (digitized) ± 5% for the analog output (for 1000 Volt range) ± 10% for the analog output (25, 100, 500 and 5000 Volt ranges)
Operating Functions	CPM* (positive/negative/automatic), voltmeter and fieldmeter
Interfaces	Analog output ± 2 V (± 1 V, in 500 V range for voltmeter), serial PC-COM, and external field sensor type 711 RS
Displays	Two, 11-segment positive & negative LED-bar charge indicators 16-digit alphanumeric dual row LCD
Settings - CPM* Operating Function	Starting voltage: 600 V - 1200 V in 1 V-steps Stop voltage: 1 V - 500 V in 1 V-steps (in decimal mode)
Static Decay Time	0.1 seconds - 99.9 seconds
Offset-Voltage Time	1 - 10 seconds in 1 second steps and 10 - 60 seconds in 10 second steps
Voltmeter Operating Function	Ranges: 25 V, 100 V, 500 V, 1.0 kV, 5.0 kV and auto range
Fieldmeter Operating Function	Ranges: Manual 1.25 kV/m, 5 kV/m, 25 kV/m, 50 kV/m, 250 kV/m, and automatic
Plate Electrode	SS-steel (152 x 152) mm/(6 x 6) inches, removable, capacitance (20 ± 2) pF
Cup Electrode	Gold-plated electrode with 4mm-banana socket, for voltage measurements
Selection of Operating Function	Pre-setting is "FIELDMETER," additional automatic settings by applying the plate or cup electrode
Operating Temperature	32°F to 113°F (0°C to 45°C)
Humidity	Maximum 60 % Note: At high relative humidity, charge leakage may occur affecting the decay time measurement.
Storage Temperature	-22°F to 140°F (-30°C to 60°C)
Declaration of Conformity	EN 60204-1/85 EN 60204-1/91 EN 61010 (SAFETY) EN 50082-1 EN 50082

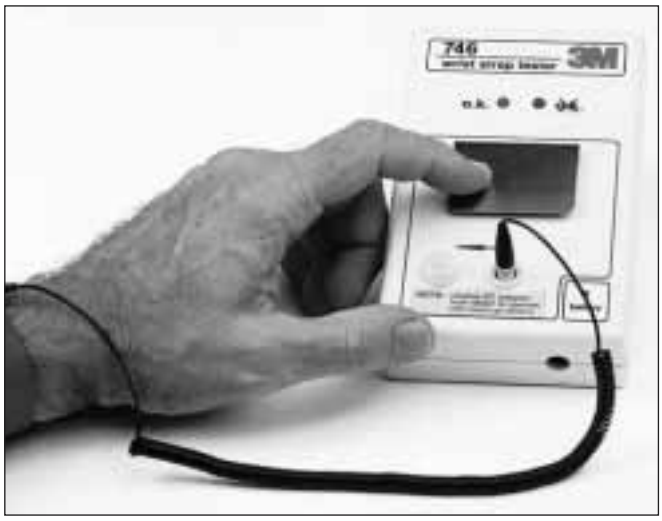
*Charge Plate Monitor

Wrist Strap Tester

The 3M™ Wrist Strap Tester 746 can be used to test wrist straps in a variety of situations, from daily testing in a production facility to periodic testing at remote sites or field service locations. This versatility allows the Wrist Strap Tester 746 to be the standard for all applications in your company.

The tester is supplied with an AC adapter, but it also contains a long-life lithium battery as back-up power for portable applications or during power failures. (A "battery" light notifies the user when the battery needs replacement.)

As with other 3M wrist strap testers, the unit is easy to use. It can test the entire wrist strap system while it is being worn, or it can test the individual components to isolate a fault condition.



Wrist Strap Tester 746

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AC Adapter 746P

Product No.	Description
746	Wrist Strap Tester supplied with an AC adapter, a lithium battery, and a wall mounting kit. Also available in Certified. **Size, in. (cm)** 6.25 x 3.75 x 1.25 (15,8 x 9,5 x 3,3)

Wrist Strap Tester 746 Properties

Item	Typical Properties
Weight	7 oz. (200 g) without battery
Power	9-volt regulated 75 mA AC/DC adapter (supplied with 746)
Battery	9-volt lithium manganese (NEDA 1604LC) (supplied with 746) *does not contain mercury, cadmium, or lead.
Test Voltage	19 Volts DC, ± 1 volt (open circuit)
Resistance Ranges	Upper limit – 10 M ohms ± 10% Lower limit – 750K ohms +20% -0%
Wall Mounting	3M™ Dual Lock™ System
AC Adapter Specifications	
Input Voltage:	AC 120 V
Output Voltage:	DC 9 V (Regulated)
Output Current:	75 mA
Output Connector Dimensions:	5.5 mm (O.D.) x 2.1 mm (I.D.) x 11 mm (L)
Output Connector Polarity:	Center Negative

Shoes/Wrist Strap Tester

3M™ Shoes/Wrist Strap Tester 747

Daily inspection and recording of wrist straps and shoes testing are very important as a fundamental countermeasure against static on personnel. A fully functional resistance tester, the new 3M Shoes/Wrist Strap Tester 747 makes it possible to control both in a single unit. Use of the external data port allows automatic recording of test results eliminating manual recording and possible errors.

Product No.	Description
747	Shoes/Wrist Strap Tester (Certified only)

Features

- Checks personnel wearing wrist straps, ESD shoes and heel straps against preset resistance limits
- Actual measurements are indicated on a 3½ digit display and by LED lamps
- Test results available on RS-232C Serial Port and output jack
- Testing data automatically recorded when utilizing the 3M™ Data Logging Software 747DLS

ESD Shoe and Heel Strap Testing

- Electrical resistance of ESD shoes and heel straps is measured and compared to preset limits.
- Set value for the upper and lower resistance limits can be varied. Upper limit: 10M ohms, 35M ohms, or 100M ohms. Lower limit: 100k ohms, 1.0M ohms.
- LCD display (3½ digit) indicates actual resistance measurement value.*
- LEDs on the tester indicate Low, OK, and High test results.
- Measurement requires standing on the Shoe Testing Plate and pressing the touch panel.

*Includes body resistance

Wrist Strap Testing

- Electrical resistance of wrist straps is measured and compared to preset limits.
- Set value for an upper resistance limit can be varied. (5M ohms, 10M ohms and 35M ohms). Lower resistance limit 650K ohms preset internally.
- LCD display (3½ digit) indicates actual resistance measurement value.*
- LEDs on the tester indicate (Low, OK and High) test results.
- Measurement requires inserting ground cord plugs into a test jack and pressing the touch panel.

*Includes arm to wrist band contact resistance

External Output Functions

- RS-232C Serial Data Port provides resistance value and pass/fail test result information for computer data logging. Used with 3M Data Logging Software 747DLS.
- Open collector output configuration provides High and Low signal levels for pass/fail test result indication. When used with an external relay door, entries can be controlled.

Shoes/Wrist Strap Tester 747 Properties

Item	Typical Properties
Dimensions	7.7" x 4.7" x 1.89" (H x W x D) 196 mm x 120 mm x 48 mm
Weight	1.2 lb. (550 g) without batteries
Power Requirements	AA (LR6) alkaline battery (1.5 VDC x 6) or AC adapter (9 VDC, center positive)
Environmental Operating Conditions	Temperature range (0° to 40°C) 80% Relative Humidity

Shoes/Wrist Strap Tester 747

Data Logging Software

3M™ Data Logging Software 747DLS

Designed to work with the 3M™ Shoes/Wrist Strap Tester 747, the 3M™ Data Logging Software 747DLS offers you a complete system of testing and recording results of your wrist straps and footwear. Our complete system performs an accurate resistance measurement of either or both your wrist straps and footwear. Once completed, the results will then be automatically saved on a PC which allows efficient data storage and faster data retrieval.

The software communicates via RS-232 signal to a personal computer and can handle up to eight stations using a single PC. Longer distances of up to 4000 ft. (1200 m) can also be accommodated.

Product No.	Description
747DLS	Data Logging Software

Shoes/Wrist Strap Tester 747

Features

- Electronic data logging eliminates manual logging thus provides highly reliable record
- Can accommodate up to 8 stations which saves money
- Can be used with barcode, magnetic stripe or proximity card readers/identification cards
- Can be used for up to 4000 ft. (1200m), allowing it to serve almost an entire facility
- Incorporates a pilot lamp in monitoring so it can identify which testing stations are currently being used
- Printable records feature allows hard copies to be kept for documentation

System Requirements

Windows™ 95, 98 2nd Edition, 2000 with Service Pack 2 and Millenium Edition. Pentium 133 MHz; 32 MB RAM; 26 MB Hard Disk Space; 800x600 True Color 32 Bit Display. It will also require one (1) PCI available slot, two (2) are recommended for multi-station. For a single station, it will only require two (2) communications ports available (COM1 & COM2).

Card Reader Technical Requirements

Serial Interface Specification	
Bit Rate	110, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 (selectable)
Word Length	Data Format–4, 5, 6, 7, 8 (selectable); Parity Bit–Even, Odd, None, Mark, Space (selectable); Stop Bit–1, 1.5, 2 (selectable)
Handshaking (Flow Control)	None, Xon/Xoff, RTS/CTS, RTS/Xon/Xoff (selectable)
Magnetic Card Reader Data	
Message Indicator	Start of Text - Single ASCII character; End of Text - Single ASCII character
Track Framing Characters	Track 1 Start - Single ASCII character; Track 1 End - Single ASCII character
	Track 2 Start - Single ASCII character; Track 2 End - Single ASCII character
	Track 3 Start - Single ASCII character; Track 3 End - Single ASCII character
Barcode Reader Data	
Message Indicator	Start of Text - Single ASCII character; End of Text - Single ASCII character
Proximity Card Reader Data	
	Start of Text - Two ASCII characters; End of Text - CR, LF, CR/LF (selectable)

Wrist Strap and Footwear Tester

Wrist Strap and Footwear Tester 740

The 3M™ Wrist Strap and Footwear Tester 740 is an AC-powered unit designed to be wall-mounted in a production facility for daily testing of employees' static control wrist straps. Use of the optional 3M™ Shoe Electrode 741 attachment allows the tester to be used as a footwear tester as well. The optional Shoe Electrode 741 is a test plate that connects to the Wrist Strap and Footwear Tester 740. By standing on the shoe electrode, personnel can use the wrist strap and footwear tester to check the operation of static control footwear, heel straps and the like. This electrode, constructed of rugged stainless steel in a molded plastic base, must be ordered separately.

Simple to operate, the unit has several useful features and options. Red and green LEDs give a clear "go" or "no go" indication. The user can select any of four different resistance levels, making the tester a versatile instrument to meet varying industry, corporate and global standards. The unit tests the wrist band and cord while they are being worn, and can also test each component independently to isolate an indicated fault. There is also a digital output that can be used to interface with a computer, automatic door lock, alarm or other control device.

The wrist strap and footwear tester comes with the base unit, output connector, 3M™ Dual Lock™ Wall-Mounting System and template, cover for the wrist strap plug-in jack and the AC/DC transformer.

Wrist Strap Tester 740 Properties

Item	Typical Properties
Dimensions	5.43 in. x 7.48 in. x 2.09 in. (13,8 cm x 19,0 cm x 5,3 cm)
Weight	15.75 oz. (450 gm)
Power Supply	27 volt DC transformer, 150 mA (AC/DC adapter supplied) 6 ft. (1,8 m) wire
Test Voltage	20 volts DC, ± 1 volt (open circuit)
Resistance Ranges	Lower limit: 750K ohms
Upper Limit Wrist Strap	2, 5, 10 and 35M ohms
Upper Limit Footwear	10, 35, 50 and 100M ohms
Accuracy	+ 20%,- 0% for 750K ohms lower limit ± 10% for 2M, 5M, 10M, 35M and 50M ohms ± 20% for 100M ohms
Output	Open collector at pins 1, 2, 4 and 5. DC return at pin 6. + 5 volts at pin 3.
Wall Mounting	3M™ Dual Lock™ System.

Shoe Electrode 741 Properties

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Item	Typical Properties
Dimensions	20 in. x 16 in. (50,8 cm x 40,6 cm)
Weight	5 lbs. (2,3 kg)
Construction	1 mm stainless steel plate and molded plastic base
Other	3M adhesive strip prevents unit from sliding while in use. Shoe electrode interconnect cord 6 ft. (1,8 m).

Note: The Shoe Electrode 741 is not included with the Wrist Strap and Footwear Tester 740 and must be ordered separately.

Air Ionizer Tester/Field Meter and Charger

Static Sensor 718

The 3M™ Static Sensor 718 is an easy-to-use, hand-held instrument designed to measure static voltage, on objects and surfaces, arising from electrostatic charge buildups. This instrument can play a valuable role in an organization's ESD-control program by helping the user locate and quantify ESD trouble-spots.

Features

- Small-size, lightweight, conductive plastic housing
- Membrane switches for Power, Range/Zero, and Hold functions
- Digital, LCD (liquid-crystal) display is easy to read and updates quickly
- Ranging systems assist user in making quick and easy measurements
- Measurements accurate to 5%
- Output jack available for continuous measurements

Static Sensor 718

Air Ionizer Test Kit 718A

The 3M™ Air Ionizer Test Kit 718A, when used in conjunction with the Static Sensor 718, can be used for periodic verification of air ionizer performance. The test kit consists of a charge plate and a charger.

Air Ionizer Test Kit 718A

Product No.	Description
718	Static Sensor, including meter, Operator's Manual, and Certificate of Performance verification. Also available in Certified.
718A	Air Ionizer Test Kit, including charge plate assembly, charger, Operator's Manual, and Certificate of Performance verification.

Static Sensor 718 Properties

Item	Typical Properties
Dimensions	0.85" (H) x 2.4" (W) x 4.15" (L) 2.2 cm (H) x 6.1 cm (W) x 10.5 cm (L)
Weight	4.5 oz. (128 g) with battery
Power Requirements	One 9-volt alkaline battery (not included)
Measurement Ranges	0 – 2 kV Low Range 0 - 20 kV High Range
Voltage Display	3½ digit liquid crystal display
Distance indicator	LED targets. Aligned targets indicate 1 in. (2.54 cm) measurement distance
Measurement accuracy	Within 5% of actual voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

Air Ionizer Test Kit 718A Properties

Item	Typical Properties
Charge Plate Assembly	Per ESD Association Standard Practice - 3.3
Charge Plate assembly Weight	2.5 oz (70 g)
Charger Dimensions	0.85" (H) x 2.4" (W) x 5.0" (L) 2.2 cm (H) x 6.1 cm (W) x 12.7 cm (L)
Charger Weight	6 oz. (170 g) with battery
Charger Power Requirements	One 9 volt alkaline battery
Charger Output	1100V minimum for positive or negative voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

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Product Referral Generator

Mini Air Ionizer 960 ..... pg. 35
Benchtop Air Ionizer 963/963E ..... pg. 34
Ionized Air Gun 980/980E ..... pg. 33
Overhead Air Ionizer 990 ..... pg. 32

Notes:

Training

4

To help create and maintain the highest standards of protection against ESD in the workplace, 3M offers several options for employee training and program development. A two-day, intensive workshop is conducted four times a year in Austin, Texas as a "train-the-trainer" or for the ESD program manager. Awareness, testing and measuring, standards development, and much more, comprise this course. 3M also regularly conducts local one-day static awareness seminars for electronics manufacturers, so contact your local 3M representative for more information. When employee training is needed, 3M can provide solutions as well. As part of our product support, 3M can deliver various versions of training for your organization, be it basic or advanced. Having the facts presented properly, in terms easily understood, can help facilitate your ESD control program.

3M Hosts ESD Training on Static Control in Austin

3M offers an in-depth training program on static control at the 3M Austin Center. The two-day course is designed for people responsible for implementing or managing a company's ESD program.

The course content, designed for the beginner to intermediate level, will cover such topics as:

- What are the foundations of ESD? This includes terminology, basic electricity and its relationship to ESD, basic ESD controls and how parts fail.
- How can static electricity be controlled?
- How do I conduct a plant survey or audit?
- What are appropriate surfacing and grounding materials and techniques?
- How and why do I use static-protective packaging materials?
- What is ionization, how do I properly test ionizers, and how do I use ionization effectively?
- What about field service? Do my customers or I need it?
- What do I need to know about testing and measuring – frequency of tests, methods, equipment, interpretation of results and use of appropriate test techniques?
- How and when do I use continuous wrist strap and/or work station monitoring – installation, operation and attributes?
- How do I know if I have a static problem?

Please contact Customer Service at 1-800-328-1368 for registration information and class schedule. To view current agenda, or learn more about 3M training seminars, refer to www.3M.com/market/electronic/ehpd/esd_training

20.20 Standard Requires Training

by Bill Pellegrin, ESD Training Manager

The new ANSI/ESD 20.20 standard truly breaks new ground in the standardization of static control for electronics, but are you aware that it contains a requirement for training?

If training has been nonexistent or scattered in your organization, you will need to make it a high priority in adopting 20.20. You must first decide on a schedule for training. Will it be once a year, twice a year, or more often? Ideally, the schedule will correspond to the needs of your organization. Perhaps you expect to hire large numbers of new employees. Or maybe you must train employees in rapidly changing technologies and manufacturing methods. The schedule should reflect those needs.

Who is trained and on what? Some organizations require that all employees, from the general manager to the clean-up crew, take the same training. Other organizations develop a high level of training for assemblers, a medium level for inventory and shipping clerks, and a basic level of training for office staff and others who rarely enter the manufacturing area.

How will you provide the training? Will you use "live" instructors, video tapes, individualized computer-based training programs, or a combination of these methods? From my experience, I have found that a "live" instructor is the most effective because the training is interactive. The instructor can answer questions and tailor the training to the trainees' education and experience. The video approach is the least effective because it requires no interaction, only passive watching and listening.

How will you verify trainees' understanding of static control? You can accomplish this through a written test, on-the-job observation, computer-based testing or a personal interview. My preference would be for the class to verbally review all the critical points of training as the means to check their retention, and follow that with on-the-job observation to ensure they are practicing proper static control procedures.

Finally, 20.20 training should include a mechanism for updating your employees in response to changes in product sensitivity, introduction of new products, upgrades in manufacturing techniques, and other changes. Ideally, you will provide training with every change so employees can adjust accordingly.

Training is so fundamental to an effective program of static control that it has been made a requirement under the ANSI/ESD 20.20 standard. When your employees understand how electrostatic discharge occurs, the extent of its damage, and how to protect against it, they will be more likely to use static protection equipment properly and abide by static control procedures. They will better understand their role in producing high quality, profitable products.

Charge Analyzer

The 3M™ Charge Analyzer 711 was designed to test the performance of products used for the purpose of static control and elimination. The Charge Analyzer can be used as a laboratory analytical tool, evaluating the performance of ionizing equipment, static-protective packaging, work-surfaces, and personnel grounding systems. It is very effective for use as a demonstration tool in employee static awareness training sessions.

The lightweight and compact construction of the unit offers versatility in the workplace. The modular internal construction simplifies modifications and repair by exchange of the functional printed circuit boards. All parameter settings are controlled via a built-in EEPROM. Periodic calibrations can be performed without the need to open the chassis. When the analyzer is switched off, all last set parameters are stored in the EEPROM. These parameters are defaulted to when the 711 is switched on again. The Charge Analyzer is powered by built-in rechargeable NiMH-batteries or an AC wall plug-in adapter. All interfacing connections are made at the rear of the unit.

Product No.	Description
711	The Charge Analyzer 711 is shipped in a durable black case with foam interior, containing the following accessories: Cup electrode Plate electrode Cylinder electrode AC/DC Adapter, DC 12 V / 500 mA Sensor cover Teflon™ measuring lead, 1 m Grounding cord with alligator clip RS 232 interface cable 50 mm (2 inches) high conductive container with insulating handle Insulated bulldog clip Metal spacers (3) with thread, 76 mm, (3 in. length) Software disk for data acquisition Operating instructions Transport case Certificate of Conformity Sensor, Model 711 RS for measuring electrostatic fields, with 2 meter cord (6.5 ft.)

Charge Analyzer 711

Charge Analyzer 711

CE

Product Referral Generator

Also see Test Equipment Section pg.49-59

3M™ Charge Analyzer 711 Properties

Item	Typical Properties
Dimensions	Base unit: 6 x 6 x 6 inches (15,2 x 15,2 x 15,2 cm)
Weight	3.53 lbs. (1,6 kg)
High Voltage Power Supply (internal)	> 1100 V positive or negative (current limiting resistor: 10 MK)
Low Voltage Power Supplies	Built-in NiMH-rechargeable batteries, 1400 mAh AC/DC Adapter: secondary side, DC 12 V/500 mA
Operating Time (rechargeable batteries)	4 hours (approximately) with full charge
Storage Memory Capacity	128 k EEPROM (e.g. sufficient for approximately 100 CPM*-measurements)
Response Time	0 to 100%; 100 ms
Impedance	10^{15} K (Teflon™-separators cleaned)
Accuracy	± 2.5% of range end value (digitized) ± 5% for the analog output (for 1000 Volt range) ± 10% for the analog output (25, 100, 500 and 5000 Volt range)
Operating Functions	CPM* (positive/negative/automatic), voltmeter and fieldmeter
Interfaces	Analog output ± 2 V (± 1 V, in 500 V range for voltmeter), serial PC-COM, and external field sensor type 711 RS
Displays	Two, 11-segment positive & negative LED-bar charge indicators 16-digit alphanumeric dual row LCD
Settings - CPM* Operating Function	Starting voltage: 600 V - 1200 V in 1 V-steps Stop voltage: 1 V - 500 V in 1 V-steps (in decimal mode)
Static Decay Time	0.1 seconds - 99.9 seconds
Offset-Voltage Time	1 - 10 seconds in 1 second steps and 10 - 60 seconds in 10 second steps
Voltmeter Operating Function	Ranges: 25 V, 100 V, 500 V, 1.0 kV, 5.0 kV and auto range
Fieldmeter Operating Function	Ranges: Manual 1.25 kV/m, 5 kV/m, 25 kV/m, 50 kV/m, 250 kV/m, and automatic
Plate Electrode	SS-steel (152 x 152) mm/(6 x 6) inches, removable, capacitance (20 ± 2) pF
Cup Electrode	Gold-plated electrode with 4 mm-banana socket, for voltage measurements
Selection of Operating Function	Pre-setting is "FIELDMETER," additional automatic settings by applying the plate or cup electrode
Operating Temperature	32°F to 113°F (0°C to 45°C)
Humidity	Maximum 60% Note: At high relative humidity, charge leakage may occur affecting the decay time measurement.
Storage Temperature	-22°F to 140°F (-30°C to 60°C)
Declaration of Conformity	EN 60204-1/85 EN 60204-1/91 EN 61010 (SAFETY) EN 50082-1 EN 50082-2

*Charge Plate Monitor

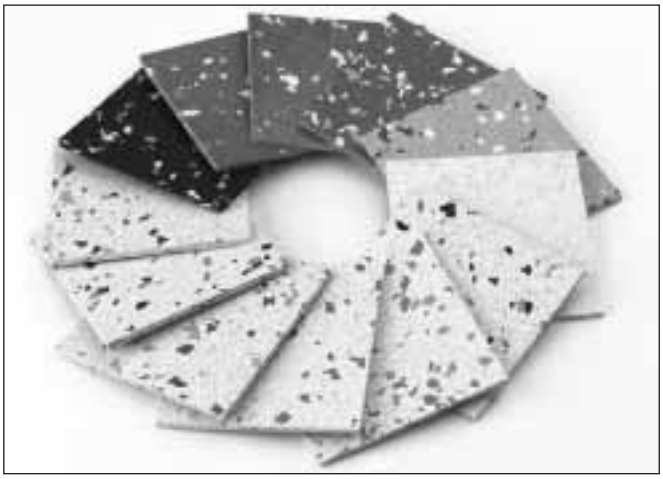
Permanent Flooring Products

5

3M tile and epoxy flooring systems provide a first line of defense against the buildup of static charge on personnel and equipment. Static protective permanent flooring, in conjunction with conductive footwear or heel grounding straps, drains static charge away to ground through the floor. It is a solid foundation for a comprehensive static control system.

Static Control Vinyl Floor Tile

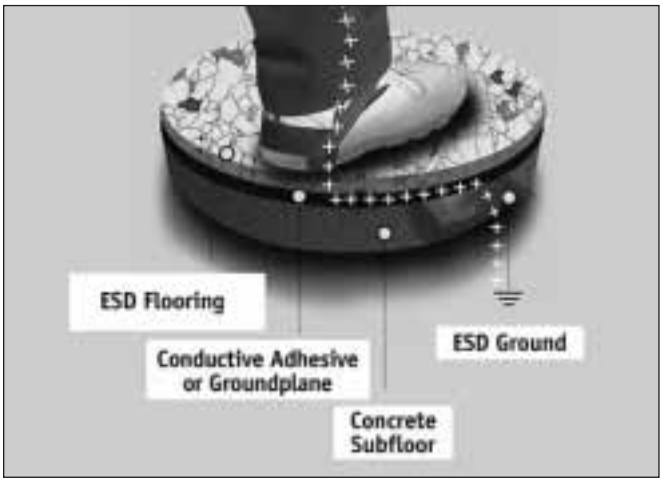
3M™ Static Control Floor Tile 8400 Series is a long-term solution to controlling electrostatic discharge. This solid vinyl tile is durable and attractive and can easily be installed by competent flooring contractors. The flexible, resilient tiles are made with only 100% pure vinyl and contain a minimum amount of filler and none of the regrind that can make tile brittle. Both the "conductive" and "static-dissipative" versions are available in a selection of bright, vivid colors. A proprietary manufacturing process completely seals in the conductive carbon medium, resulting in a unique tile that can be easily cleaned and shined to a gloss while maintaining its electrical properties—without the use of an ESD wax or polish.



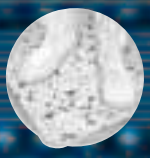
Static Control Vinyl Floor Tiles 8400 Series

Key Features

- Lifetime warranty on electrical performance
- 10-year limited warranty on materials
- Long-term ESD protection
- Superior wear resistance and durability
- Low outgassing
- Easy, low-cost maintenance (no waxing — ever!)
- Made with 100% pure homogeneous vinyl; no regrind
- Micro-edged for perfect squareness for ease of installation
- Available in 24.25" size for raised access floors, plus 12", 24", and 36" sizes
- Available in 12 standard colors; custom colors can be formulated
- May be seam welded or self-coved



Product No.	Color
Static Dissipative	
8411	Brown
8412	White
8413	Gray
8414	Blue
8415	Green
8416	Maroon
8417	Black
8421	Reverse Brown
8423	Reverse Gray
8424	Reverse Blue
8425	Reverse Green
8427	Reverse Black
Conductive	
8431	Brown
8432	White
8433	Gray
8434	Blue
8435	Green
8436	Maroon
8437	Black
8441	Reverse Brown
8443	Reverse Gray
8444	Reverse Blue
8445	Reverse Green
8447	Reverse Black
Accessories	
8403	Conductive Adhesive. Two-Part Epoxy. (1-gallon unit. covers approx. 135 sq. ft.)
8405	Calcium Chloride Moisture Test Kit.



Static Control Vinyl Floor Tile

"No Wax" ESD Tile

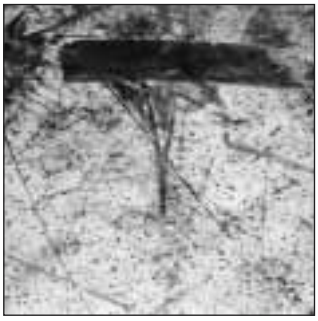
One of the key attributes of 3M™ ESD Vinyl Tile is its ability to be cleaned and maintained with a minimum of cost and effort.

See 3M™ ESD Floor Tile 8400 Series instructions for complete maintenance details.

Unique Cleanability

Our customers report that 3M™ ESD Floor Tile 8400 Series is unique in the industry in its ability to be repeatedly cleaned and then buffed to a high sheen without ever using wax.

With other ESD tiles, normal cleaning procedures may dull the finish and can even degrade the electrical properties. Expensive conductive wax or glaze must then be used to restore their shine and conductivity. 3M Tiles 8400 Series maintain their electrical properties and can be shined like new with simple buffing. The photos below graphically demonstrate this feature.



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The floor section shown is a test patch of 3M™ white static-dissipative tile 8412 installed in a high-traffic area of a regional telephone company warehouse. To determine whether the tile could truly withstand serious abuse and then be returned to "like new" condition with simple cleaning and without wax, the section was intentionally left unattended for 11 months as it was subjected to the wear and grime of continual forklift traffic. The result of this abuse is evident in Photo 1.

After being swept, the tile was scrubbed with neutral cleaner, left to dry, and then buffed according to the maintenance procedure established. As Photos 2 and 3 show, in spite of nearly a year of dramatic abuse, the high gloss of the restored floor finish is similar to that of the tile when it is newly installed—without the use of any kind of wax.

This trial is an impressive demonstration of the durability of the 3M ESD tile and its unique "no wax" feature.

Mechanical Properties (typical)—ESD Tile

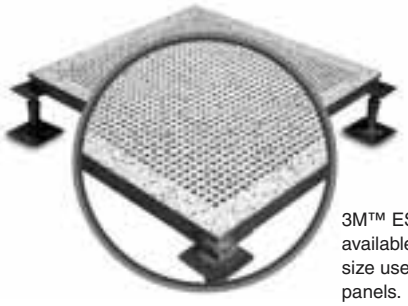
Static-Dissipative Floor Tile (Model numbers 8411-8427) Conductive Floor Tile (Model numbers 8431-8447)	
Flammability Flame Spread Index (ASTM E162/ASTM E84) Smoke Development (ASTM E84)	 Meets Class 1 requirements Meets Class 1 requirements
Critical Radiant Flux (ASTM E648/NFPA 253)	>1.1 w/cm2
Physical Specifications	Meets ASTM F1066-99 Meets US Federal Specification SS-T-312B
Hardness (ASTM D 2240)	55 ± 5 Shore D
Flexibility (CSA 126.2) 100 mm mandrel @ 25 C	 Does not break
Abrasion Resistance (ASTM D 3389) Taber H22 wheel, 70 rpm	 0.445 grams (weight of tile removed per 1000 cycles)
Static Load (ASTM F970) 125 lbs, 0.25 in. diameter indentor foot, 24 hours Residual indentation 700 lbs., 1.125 in. diameter indentor foot, 24 hours Residual indentation	 2500 PSI point load 3% of tile thickness 700 PSI point load 1% of tile thickness

Electrical Properties (typical)—ESD Tile

Static-Dissipative	Conductive
Electrical Resistance (Surface-to-ground, ESD S7.1) 1 x 10^6 to 1 x 10^9 ohms	 2.5 x 10^4 to 1 x 10^6 ohms
Static Generation (With conductive footwear at 20% RH) <50 volts	 <25 volts
Static Decay (Federal TM 101C, Method 4046 @ 15% RH [5000 volts to 0 volts]) <0.10 sec.	 <0.03 sec.

Sizes

Static-Dissipative and Conductive
0.125 x 12 x 12 in. (3.2 x 305 x 305 mm) 0.125 x 24.25 x 24.25 in. (3.2 x 615 x 615 mm) -for raised access floor panels
0.125 x 24.25 x 24.25 in. (3.2 x 610 x 610 mm) 0.125 x 36 x 36 in. (3.2 x 915 x 915 mm) -for seamwelded installations



3M™ ESD Floor Tile 8400 Series is available in the special 24.5" x 24.5" size used for raised access floor panels.

Epoxy Flooring System

The 3M™ ESD Epoxy Flooring System 8900 is a multi-layer, self-leveling liquid epoxy system that hardens to an attractive durable finish. Its formula can be adjusted to produce electrical properties in the conductive range and it can be installed in standard thicknesses from 45 mil to 125 mil (0.017" to 0.125"). Custom thicknesses are also available.

Key Features

- Tough and abrasion-resistant; excellent for heavy traffic (forklifts, constant cart or foot traffic, etc.).
- Electrical properties can be formulated for resistance-to-ground readings in the conductive (2.5×10^4 to 1×10^6 ohms) range.
- 10-year limited warranty on electrical properties, 3-year limited warranty on surface integrity.
- Resistant to most chemicals used in the electronics industry.
- Resistant to fire; does not support combustion.
- Available in seven standard colors. Custom colors available upon request.
- Custom logos or messages can be embedded.

Epoxy Flooring System

Installation

3M™ ESD Epoxy Flooring System 8900 should be applied by a 3M-approved, highly trained applicator.

Maintenance

3M ESD Epoxy Flooring 8900 is a true "no-wax" system. The cost of cleaning and maintenance over the life of the floor is among the lowest of any type of ESD flooring.
(See 3M Epoxy Flooring Maintenance Instructions for complete details.)

Product No.	Description
8900	ESD Epoxy Flooring System. Standard Colors **White** **Light Gray** **Medium Gray** **Dark Gray** **Light Blue** **Medium Blue** **Medium Green** Note: Colors represented on inside back cover of catalog

Epoxy Flooring System 8900

Mechanical	Test Method	Typical Value
Tensile Strength	ASTM D 638	2000 PSI (minimum)
Compressive Strength	ASTM C 579	6000 PSI (minimum)
Flexural Strength	ASTM D 790	2325 PSI
Surface Abrasion (Taber)	ASTM D 4060	<0.20% loss 1000 cycles
Hardness	ASTM D 2240	50-80 Shore D
Indentation @ 2000 lbs.		None
Coefficient of Friction	Slip Coefficient	0.507
Rate of Burning	ASTM D 635	Self-extinguishing
Linear Thermal Expansion	ASTM E 831	No expansion noted
Water Absorption	ASTM C 413	0.03%
Elongation		(70) 3.5%
Electrical		
Electrical resistance (Surface-to-ground, ESD S.7.1)		Can be formulated to either the conductive (2.5×10^4 to 1×10^6 ohms) or static-dissipative (1×10^6 to 1×10^9 ohms) range.

Test Your ESD Flooring

Only systematic testing of your static-control flooring products can assure that they are providing the protection you paid for. 3M test equipment will be calibrated and certified on request in a 3M laboratory with NIST Traceable equipment specified in MIL-STD 45662A.

3M™ Test Kit 701

All of the surfacing products in this catalog remove static charges by grounding; their effectiveness is determined by the amount of "surface-to-ground" resistance. The 3M Test Kit 701 meets all the requirements defined in ESD Association Standards S4.1/S7.1 and MIL-PRF-87893 for surface testing methods and equipment. It contains all of the components and instructions needed to properly test the charge-draining capability of any static-control surface, including mats, laminate, tile, epoxy floors, and waxes. The Test Kit 701 comes with all of its components nested in a foam-lined, molded plastic carrying case, and is designed to be very "user friendly." The small, lightweight meter is easy to use, with its scales both color-coded and numbered. The meter also includes separate scales for surface resistance measurements, battery testing and continuity testing. The five-pound test weights are covered in a black, anti-static jackets and are fitted with easy-to-grasp handles and conductive silicone-rubber contact pads. The two test leads are insulated with silicone rubber, making them virtually tangle-free in spite of their generous 10-foot length. The right-angle banana plugs at the meter end are designed to seat close to the meter face; at the weight end, the plugs are covered by retractable sheaths for added safety. Use the Test Kit 701 to verify that your 3M static-control surfacing products perform within the resistance values allowable. Your local 3M sales representative is always available to assist you with static-control testing.

The 3M Test Kit 701 includes:
- One Megohmeter 701
- Two five-pound test weights
- Two 10-foot test leads
- One insulated bulldog clip
- One non-insulated alligator clip
- Two batteries
- One continuity test plate
- Operators manual
- Molded carrying case

For additional information, refer to pages 27, 50, 52.

Tapes

6

To aid in the various processes typical of the electronics industry, 3M has assembled a wide selection of tapes including antistatic utility tapes for use in static sensitive areas, tapes designed for wave soldering applications, foil shielding tapes and other related tapes and accessories.

Antistatic Tape

3M™ Antistatic Utility Tape 40 combines 3M's remarkable antistatic adhesive with a clear, one mil polyester film backing, and is perfect for use in static-sensitive areas. In fact, an optional special pattern of ESD symbols alerts users that this is the only tape that should be used in static-safe areas.

At the heart of all 3M antistatic tapes is a unique, conductive polymer adhesive that suppresses static, both during unwind from the roll and during removal from a surface. In fact, they generate less than 50 volts on unwind from the roll or removal from a stainless steel surface, even in extremely dry conditions of 10% relative humidity.

Use Antistatic Utility Tape 40 as a third hand to hold work orders, notes, documentation or instructions in place, to seal static shielding bags and boxes containing electronic components, or to bundle DIP tubes and JEDEC shipping trays. It can also be used to hold down obstructions such as wires or attachments during manufacturing.

Antistatic Utility Tape 40PR

Product No.	Description
40/40PR*	3 in. Antistatic Plastic Cores Antistatic Utility Tape.*

Widths, in. (mm)		Length, yd. (m)	
0.25	(6,3)	72	(66)
0.375	(9,5)	72	(66)
0.50	(12,7)	72	(66)
0.625	(15,8)	72	(66)
0.75	(19,0)	72	(66)
0.875	(22,2)	72	(66)
1	(25,3)	72	(66)

1 in. Antistatic Plastic Cores

Widths, in. (mm)		Length, yd. (m)	
.50	(12,6)	36	(33)
.75	(19,0)	36	(33)

Specify at time of order.
Custom widths available upon request.

*PR designation means printed

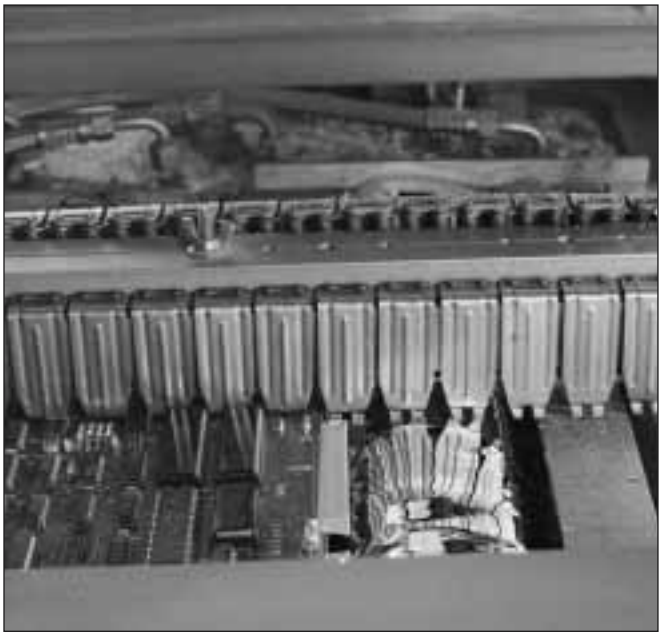
Antistatic Utility Tape 40 and 40PR Tape Properties

Property	Test Method	Typical Value
Static Charge Generation		
Removal from Roll, 10% RH, volts	3M	20
Removal from Roll, 50% RH, volts	3M	5
Removal from Stainless Steel, 10% RH, volts	3M	20
Removal from Stainless Steel, 50% RH, volts	3M	5
Surface Resistance		
Adhesive @ 50% RH	ESD S11.11	5×10^6 K
Adhesive @ 10% RH	ESD S11.11	5×10^8 K
Tape Properties		
Adhesion to Steel	ASTM D1000	19 oz/in.
Unwind Force from Roll	ASTM D1000	24 oz/in.
Thickness	ASTM D1000	2.2 mils
Break Strength	ASTM D1000	20 lb/in.
Slit Width	ASTM D1000	± 1/64 in.
Rolling Ball Tack	ASTM D1000	70 mm
Outgassing		
TML	ASTM E595	<1.0%
CVCM	ASTM E595	<0.1%

Antistatic Tape

3M™ Antistatic High Temperature Masking Tape 42 is perfect for protecting gold leads and other components on boards with sensitive integrated circuits. It withstands the high temperatures of wave soldering, and leaves virtually no residue, which can help reduce the after soldering cleaning process.

To give the convenience of a wave solder masking tape without the fear of static damage, 3M has combined a special antistatic adhesive with a high-temperature polyimide backing that withstands temperatures up to 500°F (260°C).



Antistatic Utility Tape 42

Product No.	Description			
42	3 in. Antistatic Plastic Core Antistatic High Temperature Mask Tape.			
	Widths, in. (mm)		**Length, yd. (m)**	
	0.25	(6,3)	36	(33)
	0.375	(9,53)	36	(33)
	0.50	(12,6)	36	(33)
	0.75	(19,0)	36	(33)
	0.875	(22,2)	36	(33)
	1	(25,3)	36	(33)

Custom widths available upon request.

Antistatic Utility Tape 42 Properties

Properties	Test Method	Typical Value
Static Charge Generation (12 in./sec.) Volts		
Removal from Core, 10% RH	3M	20
Removal from Core, 50% RH	3M	5
Residual charge on substrate (12 in./sec.) Volts		
Removal from Stainless Steel, 10% RH, volts	3M	50
Removal from Stainless Steel, 50% RH, volts	3M	5
Surface Resistance	ESD Assoc.	<1 x 10^{11} K
Tape @ 10% RH	50% RH	<1 x 10^{9} K
Tape Properties		
Application Temperature Range		>40°F (5°C)
Upper range Dwell Time, 5 sec.		<500°F (260°C)
Unwind Force from Core	ASTM D1000	30 oz./in.
Thickness	ASTM D1000	2.2 mils
Break Strength	ASTM D1000	28 lb./in.
Slit Width Tolerance	ASTM D1000	± 1/64 in.
Outgassing		
TML	ASTM E595	<1.6%
CVCM	ASTM E595	<0.1%
Chemical Properties		
Contact Corrosivity, FTMS 101C, Method 3005		
Copper		Pass
Aluminum		Pass
Stainless Steel		Pass
Silver		Pass
Tin Lead		Pass
Kovar		Pass

Antistatic Utility Tape Dispenser

The 3M™ Tape Dispenser 620 is designed for use in ESD protected areas. The dispenser is made of conductive and static-dissipative materials which will minimize or eliminate problems associated with conventional dispensers.

Antistatic Tape Dispenser 620

Tape Dispenser 620 Properties

Property	Typical Value
Body	Stainless steel frame Accepts tape roll up to 2 in. wide. Accepts tape on either 3 in. or 1 in. core. Unit is shipped with 3 in. dissipative drum.
Blade	Stainless Steel Replacement blade
Base	Cast iron Dimensions 5 x 9 in. (13 cm x 23 cm) Weight 7.5 lbs. (3,4 kg)
Accessories	1 in. drum
Decay Time	From 1000V to < 100V less than 2 seconds (3 in. core)
Recommended Tapes	Antistatic Film Tape 40 Antistatic Masking Tape 42 Low Static Polyimide Film Tape 5419

Product No.	Description
620	Tape Dispenser Drum for Manual Dispenser, 1" Manual Dispenser with base Manual Dispenser without base Replacement Blade

Silicone Adhesive Tapes

The 3M™ Polyimide Film Tape 5413 consists of a Kapton® polyimide film and silicon adhesive. It is designed for high temperature applications. Temperature use range is –100° to 500°F (–73°C to 260°C).

3M™ Low Static Polyimide Film Tape 5419 is a translucent, polyimide film-backed silicone adhesive tape with unique and extremely low electrostatic discharge properties. Use the 3M Tape 5419 to mask printed circuit boards during the wave solder or solder dip process.

Product No.	Description
5413	Polyimide Film Tape. Silicone Adhesive.

Widths, in. (cm)		Length, yd. (m)	
0.50	(1,2)	36	(33)
0.75	(1,9)	36	(33)
1	(2,5)	36	(33)
2	(5,1)	36	(33)

Product No.	Description
5419	Low Static Polyimide Film Tape. Silicone Adhesive.

Widths, in. (cm)		Length, yd. (m)	
0.25	(0,6)	36	(33)
0.375	(0,9)	36	(33)
0.50	(1,3)	36	(33)
0.75	(1,9)	36	(33)
0.875	(2,2)	36	(33)
1	(2,5)	36	(33)

Water Soluble Tape

3M™ Water Soluble Wave Solder Tape 5414 has a poly-vinyl alcohol backing which is water soluble, and a synthetic water soluble adhesive. This tape is designed to mask gold fingers on printed circuit boards during wave soldering.

Product No.	Description	Widths, in. (cm)		Length, yd. (m)	
5414	Water Soluble Wave Solder Tape.	0.50	(1,3)	36	(33)
		0.75	(1,9)	36	(33)
		1	(2,5)	36	(33)

Die-Cut Circles are also available. Circles are 0.50 inches in diameter. 1000/roll.

Vinyl Tape

3M™ Vinyl Tape 471 is a conformable colored (nine colors plus transparent) vinyl backing with a rubber adhesive ideal for many lane and safety markings, color coding, abrasion protection, masking, sealing, splicing and other general purpose applications. The tape's pigmented backings maintain their vivid colors even when exposed to heavy abrasion. Sharper colors for color coding or marking systems draw attention and help enhance plant safety. Dead stretch properties provide straighter lines when masking, marking and sealing.

Product No.	Description	Widths, in. (cm)		Length, yd. (m)	
471	Plastic Film Tape, Black	0.50	(1,2)	36	(33)
		0.75	(1,9)	36	(33)
		1	(2,5)	36	(33)
		1.5	(3,8)	36	(33)
		2	(5,0)	36	(33)
		3	(7,6)	36	(33)
		4	(10,1)	36	(33)
	Plastic Film Tape, Blue	0.25	(6,3)	36	(33)
		0.50	(1,2)	36	(33)
		0.75	(1,9)	36	(33)
		1	(2,5)	36	(33)
		1.5	(3,8)	36	(33)
		2	(5,0)	36	(33)
		3	(7,6)	36	(33)
	Plastic Film Tape, Red	0.25	(6,3)	36	(33)
		0.375	(6,3)	36	(33)
		0.50	(1,2)	36	(33)
		0.75	(1,9)	36	(33)
		1	(2,5)	36	(33)
		1.5	(3,8)	36	(33)
		2	(5,0)	36	(33)
		3	(7,6)	36	(33)
		4	(10,1)	36	(33)

EMI Shielding Tapes

3M™ EMI Shielding Tapes are designed for applications requiring reliable point-to-point electrical contact, particularly EMI shielding, grounding and static charge draining. The tapes have a multitude of uses in electronic design and test laboratories for prototyping, design and troubleshooting.

Foil Shielding Tape Engineering Kit

The Engineering Kit enables engineers who need only a few inches of a particular tape for specifying, prototyping, troubleshooting, testing and repairing to avoid the problems and expense associated with meeting minimum order quantities. The kit also eliminates the problem of rolls of tape lost between multiple users or kept loose in desk drawers.

The compact dispenser box also serves as a desktop reference for the tapes. The box panels provide basic technical information about each tape, including product number, backing and adhesive type and thickness, adhesion, resistance and shielding effectiveness.

Engineering Kit for Foil Shielding Tapes

Engineering Kit: Kit includes one roll of each foil tape, 3/4 in. x 4 yds. (1,9 cm x 8,3 m)

Dispenser box is 4 in. x 4 in. x 8.5 in. (10,0 cm x 10,0 cm x 21,3 cm)

1170 — Smooth aluminum foil, conductive acrylic adhesive, 3.2 mil total, supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.875	(1,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1181 — Smooth copper foil, conductive acrylic adhesive, 2.6 mil total, supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.875	(1,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1182 — Smooth copper foil coated on both sides, conductive acrylic adhesive, 3.5 mil total, supplied with liner on each side.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1183 — Smooth tin-plated copper foil, conductive acrylic adhesive, 2.6 mil total, supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1190 — Copper-plated, polyester ripstop fabric, conductive acrylic adhesive, 5.5 mil total, supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.875	(1,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1194 — Smooth copper foil, nonconductive acrylic adhesive, 3.0 mil total, supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	36	(33)
0.75	(1,9)	36	(33)
0.50	(1,2)	36	(33)
0.375	(9,5)	36	(33)
0.25	(6,3)	36	(33)

1245 — Embossed copper foil, nonconductive acrylic adhesive, 4.0 mil total, conductivity "through the adhesive," supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.875	(1,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1267 — Embossed aluminum foil, nonconductive acrylic adhesive, 5.0 mil. total, conductivity "through the adhesive," supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.875	(1,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

1345 — Embossed tin-plated copper foil, nonconductive acrylic adhesive, 4.0 mil. total, conductivity "through the adhesive," supplied on liner.

Widths, in. (cm)		Length, yd. (m)	
1	(2,5)	18	(16.5)
0.75	(1,9)	18	(16.5)
0.625	(1,5)	18	(16.5)
0.50	(1,2)	18	(16.5)
0.375	(9,5)	18	(16.5)
0.25	(6,3)	18	(16.5)

All tapes are furnished on 3 in. (7,6 cm) I.D. cores.
Minimum width is 1/4 in. (0,6 cm). Maximum width is 23 in. (58 cm).

Static Control Measures for Handling Electronic Parts

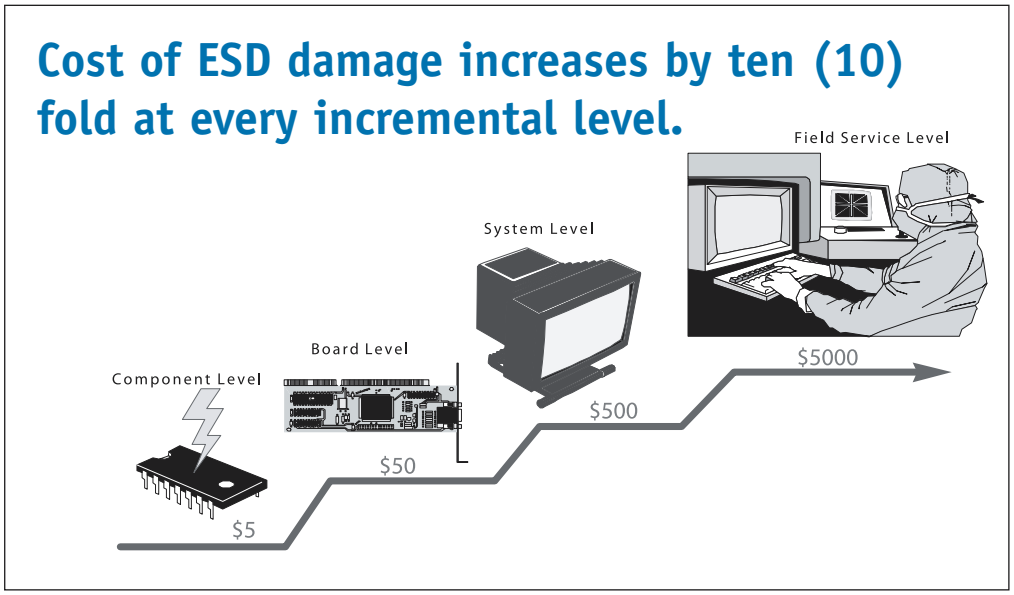
Why should I care about Electrostatic Discharge?

Electrostatic discharge (ESD) costs the electronics industry millions of dollars annually in damaged and degraded parts. A study in Semiconductor Reliability News estimated that approximately 60% of device failures are EOS/ESD caused.

What Is ESD?

The contact and separation of materials creates a static charge. An example of a common electrostatic event occurs when a charged individual discharges to a doorknob.

The contact and separation of feet when walking across a floor creates a charge on the individual. The discharge to the doorknob is an example of an electrostatic discharge. The simple act of walking across a floor can generate 15,000 volts of static electricity.



Human Awareness Levels

- We feel the discharge if it is greater than 3,500 volts.
- We hear the discharge if it is greater than 5,000 volts.
- We see the discharge if it is greater than 8,000 volts.
- By comparison, integrated circuits that are used to make electronic circuit boards can be damaged by voltages as low as 100 to 1,000 volts.

What is Device Sensitivity?

Once a charge is generated, a charge can be induced from one object onto another. This is called charge transfer. The damage is a result of energy shifting from one charged object to another object. Static sensitive devices are subject to damage or degradation from Electrostatic Discharge (ESD). Damage occurs because small traces and materials cannot withstand the amount of energy surge introduced by an electrostatic field or discharge. Damage and degradation can also result from an electrostatic field.

Typical Electrostatic Voltages

Event	Voltages at Relative Humidity		
	10%	40%	55%
Walking Across Carpet	35,000	15,000	7,500
Walking Across Vinyl Floor	12,000	5,000	3,000
Motions of Individuals Not Grounded	6,000	800	400
Remove Bubble Pack from Package	26,000	20,000	7,000

Device Sensitivity Threshold Levels

Generally, device sensitivity threshold levels are well below a person's ability to detect.

Device Type	Threshold Susceptivity (Volts)
MOSFET	10-100
VMOS	30-1800
NMOS	60-100
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